APPENDIX A

Figures and Tables

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Chapter 1
Figures

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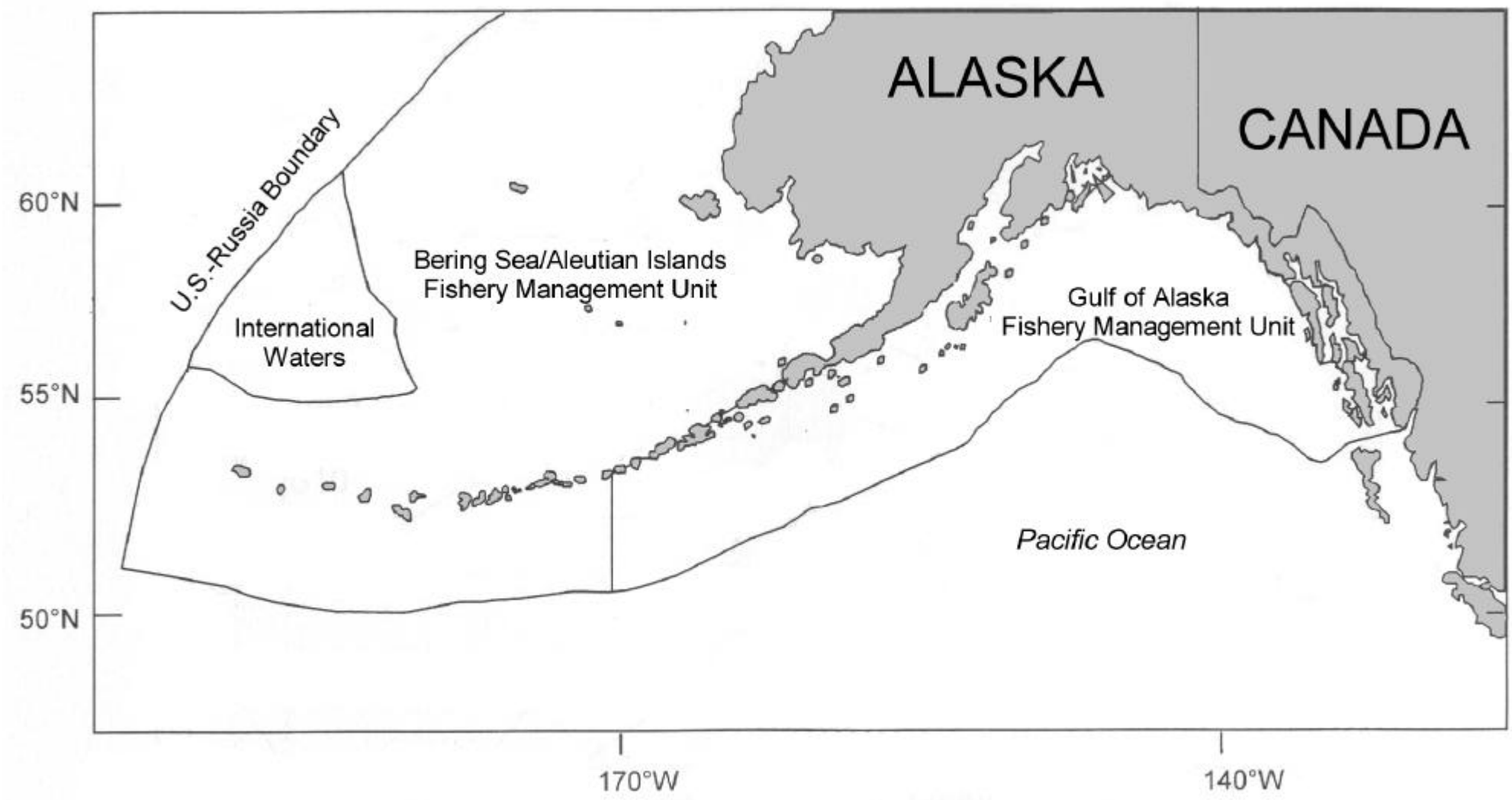

Figure 1.2-1. Subject groundfish fisheries in the Bering Sea and north Pacific.

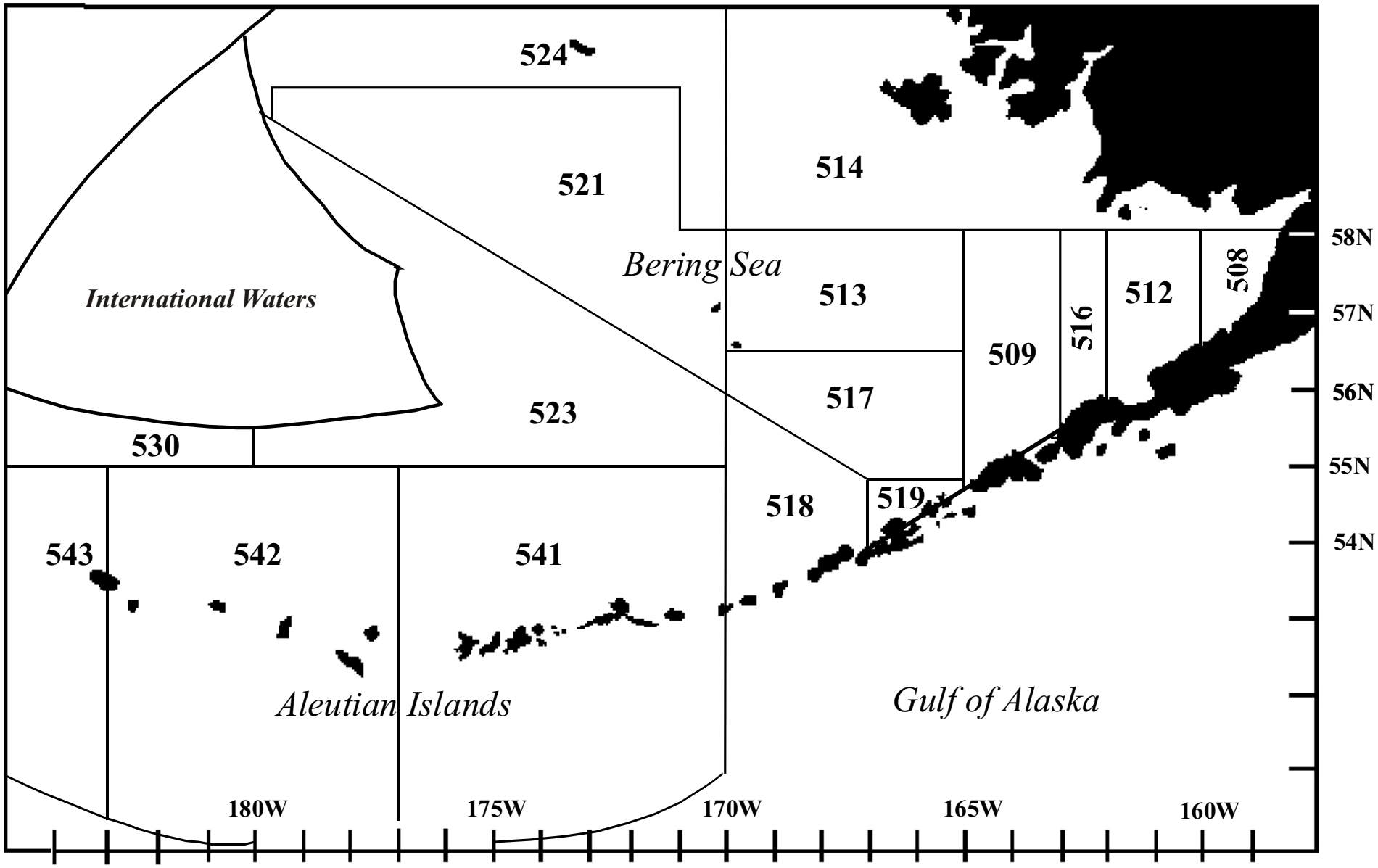

Figure 1.2-2. Bering Sea and Aleutian Islands sub-areas of management and reporting.

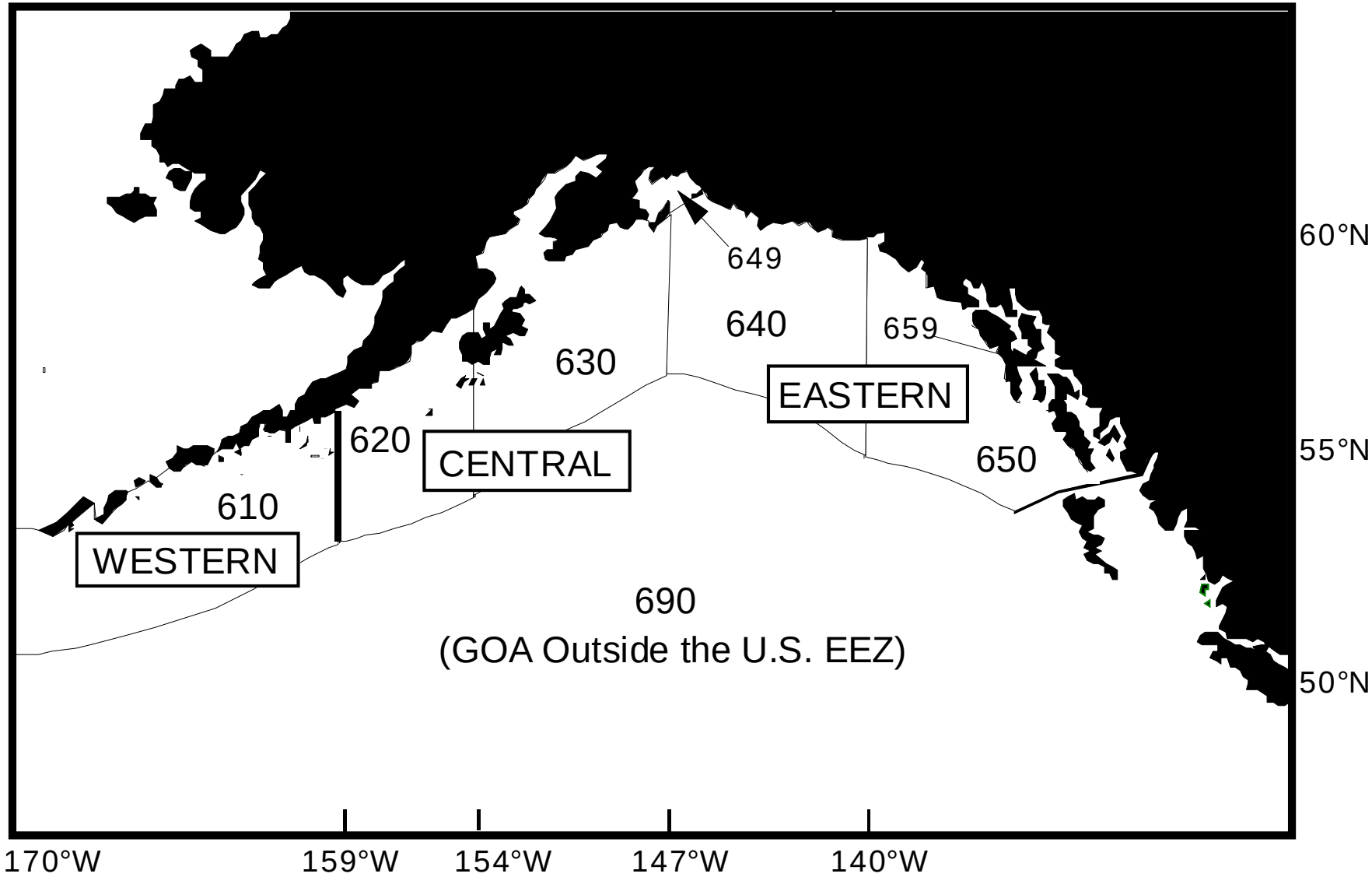

Figure 1.2-3. Gulf of Alaska sub-areas of management and reporting.

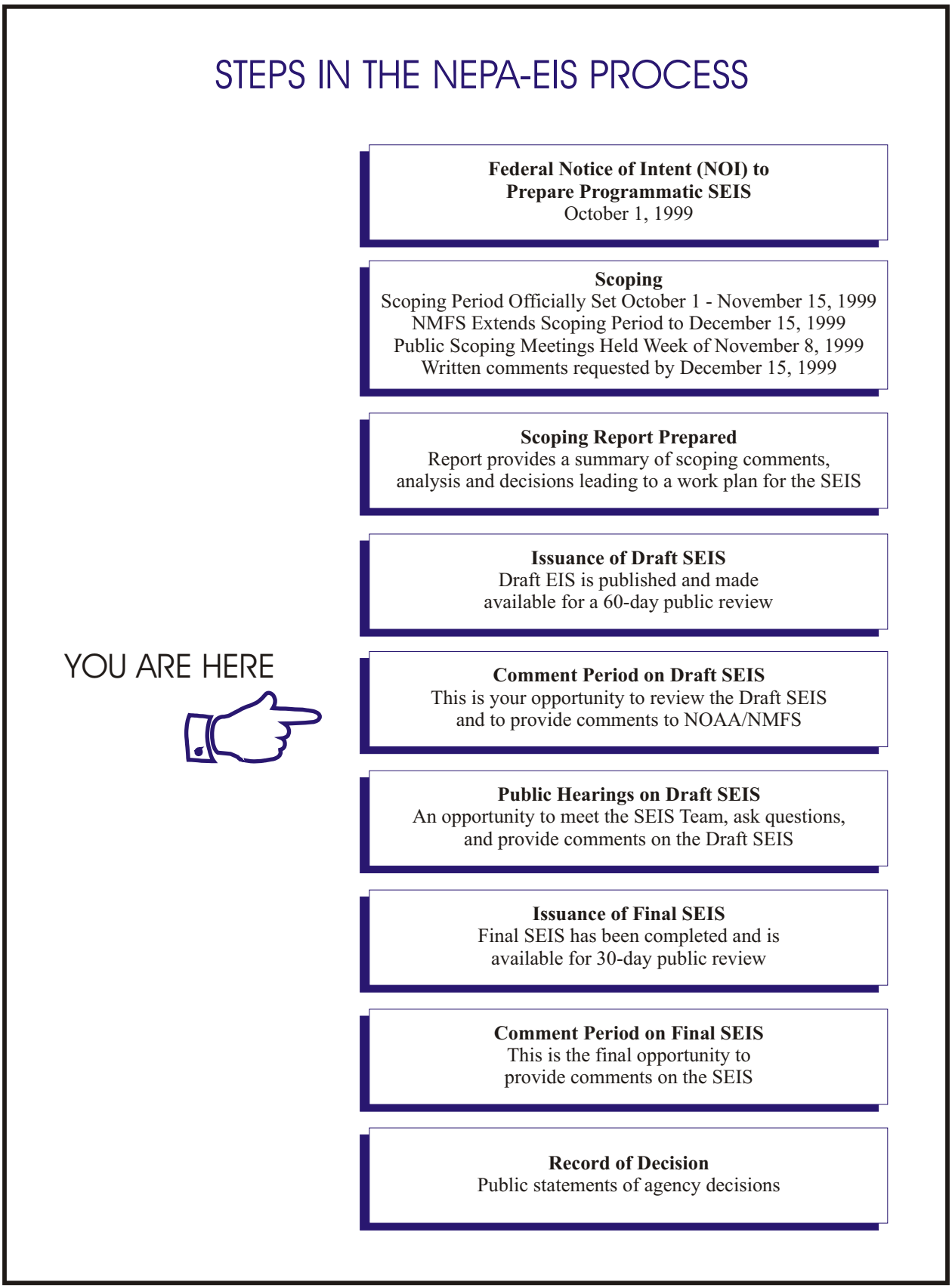

Figure 1.4-1. Steps in the NEPA-EIS Process

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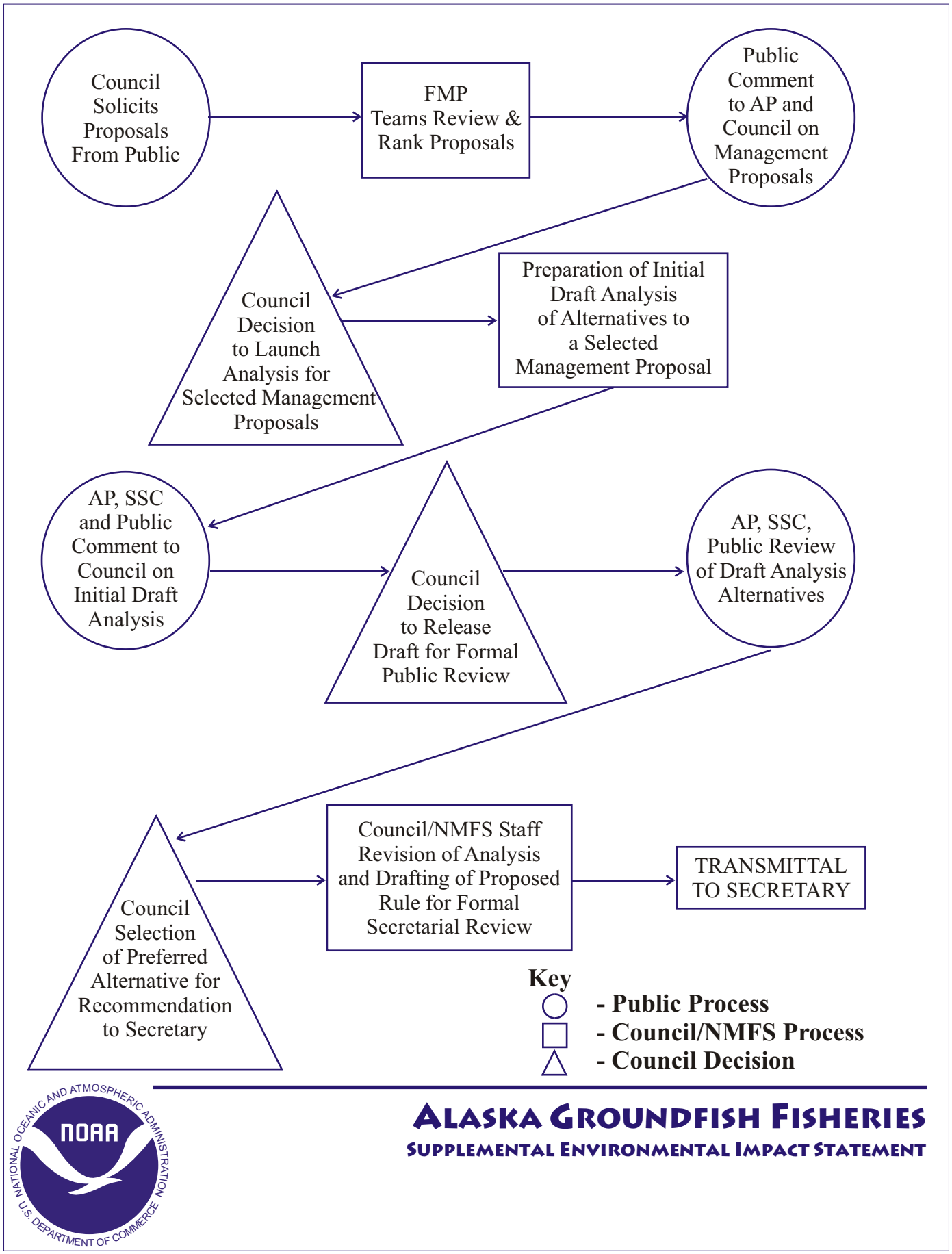

Figure 2.4-1. Council process for developing fishery management plans and regulatory amendments.

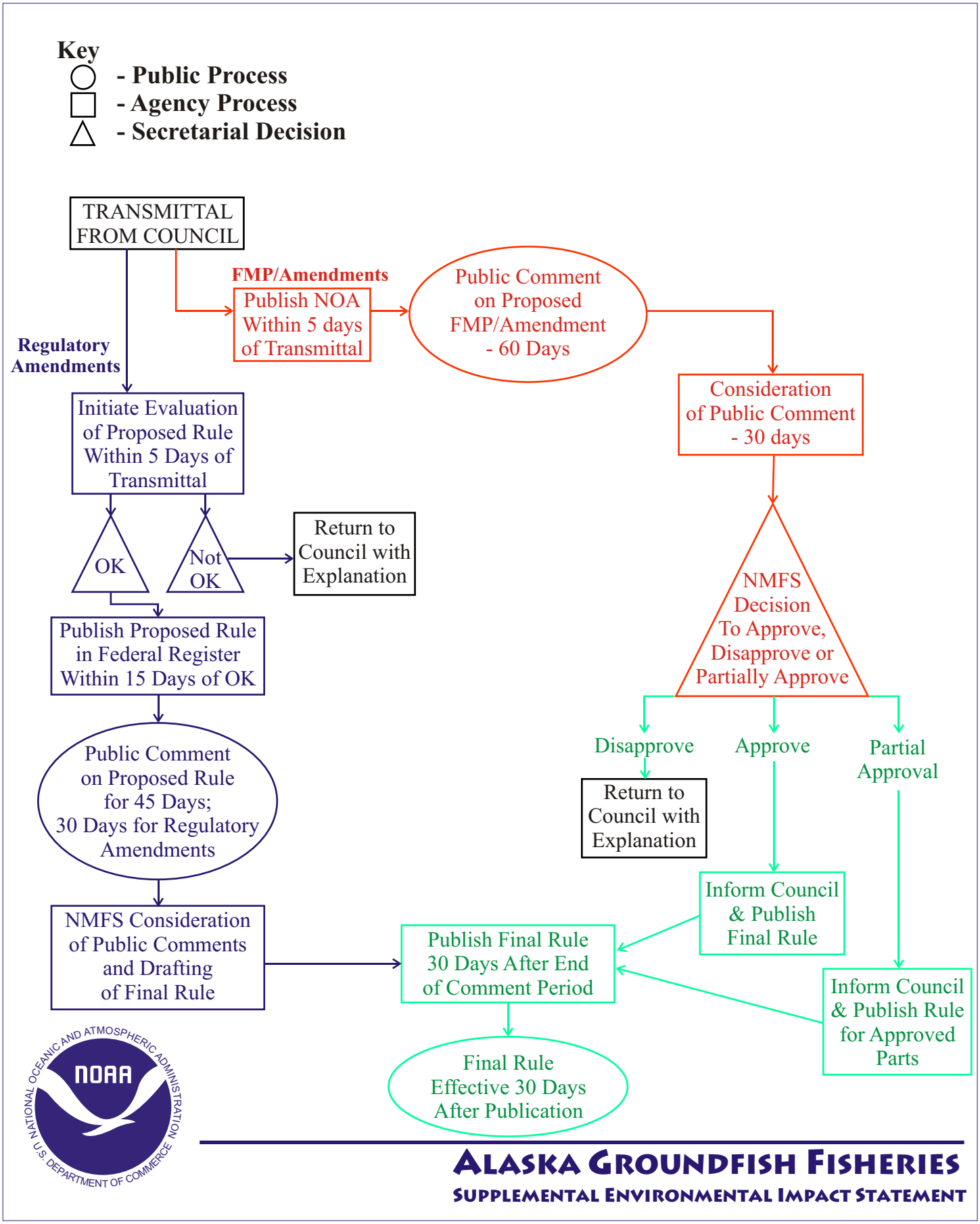

Figure 2.4-2. Secretarial process for review of council-proposed FMP and regulatory amendments.

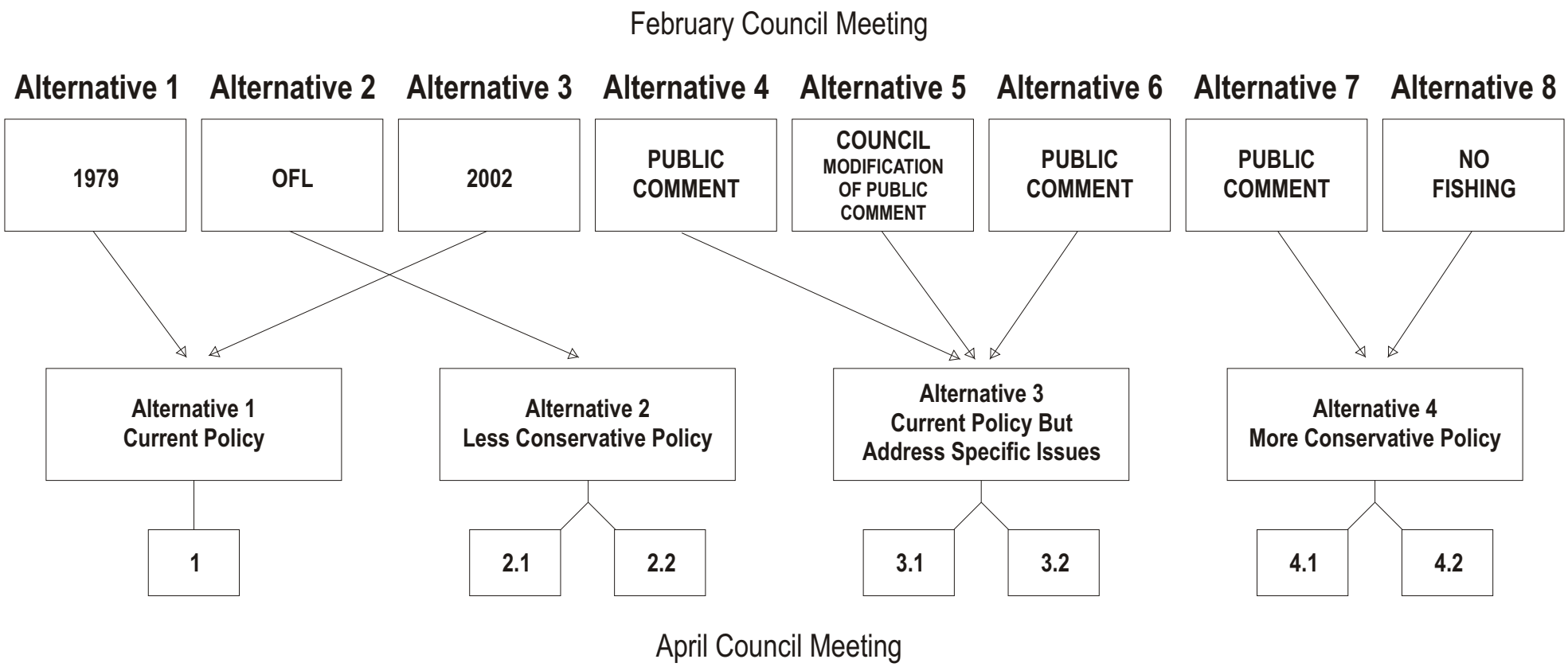

Figure 2.6-1. Consolidation of the eight SEIS policy alternatives to four broad-band policy alternatives.

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Chapter 3
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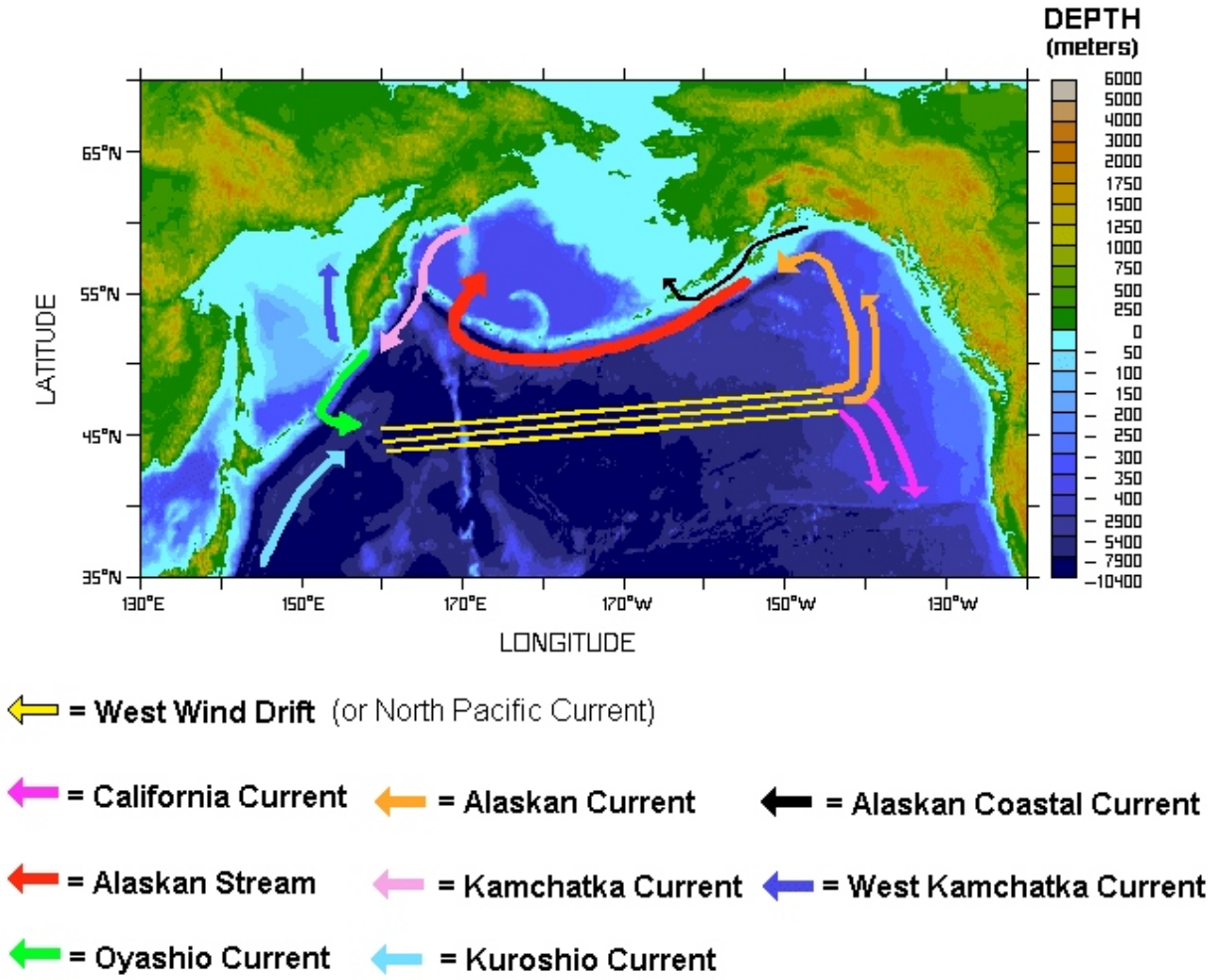
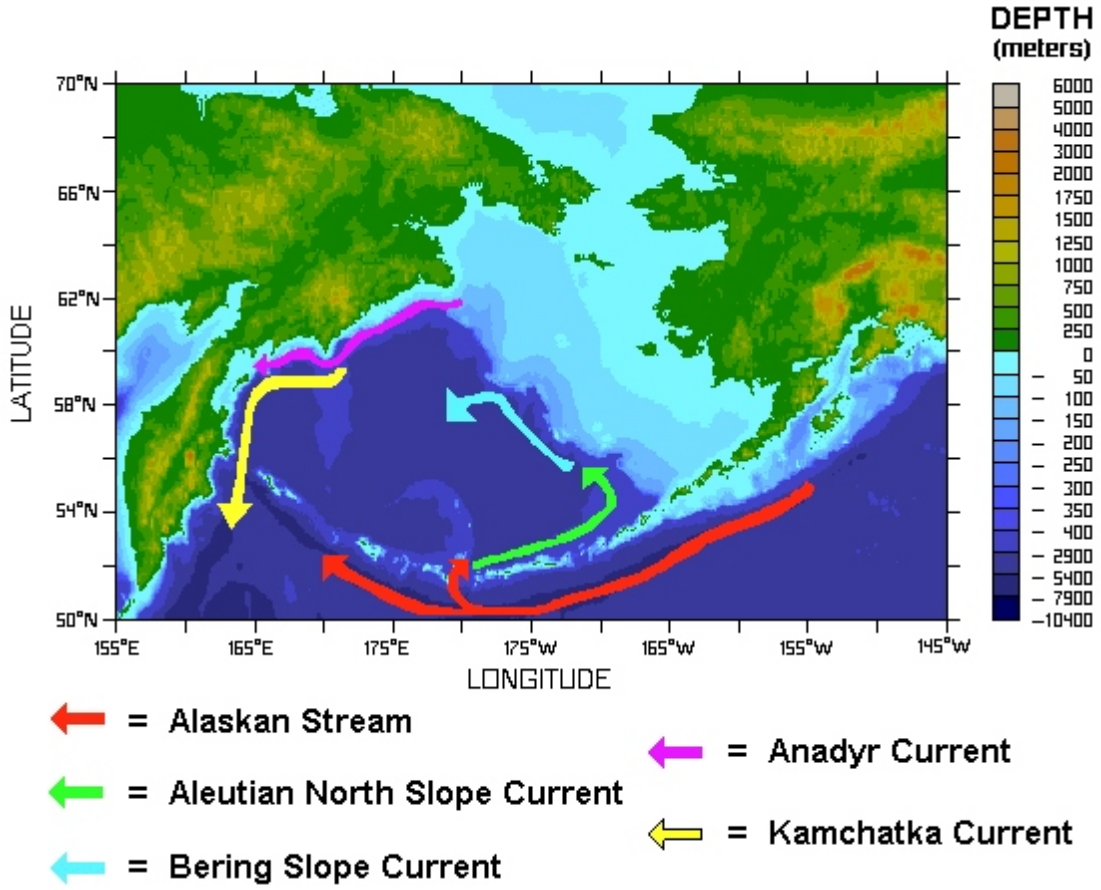


Source: http://www.pmel.noaa.gov/bering/pages/npmap4.html

Figure 3.3-1. North Pacific ocean currents.



Source: http://www.pmel.noaa.gov/bering/pages/bseamap5.html

Figure 3.3-2. Major currents of the Bering Sea.

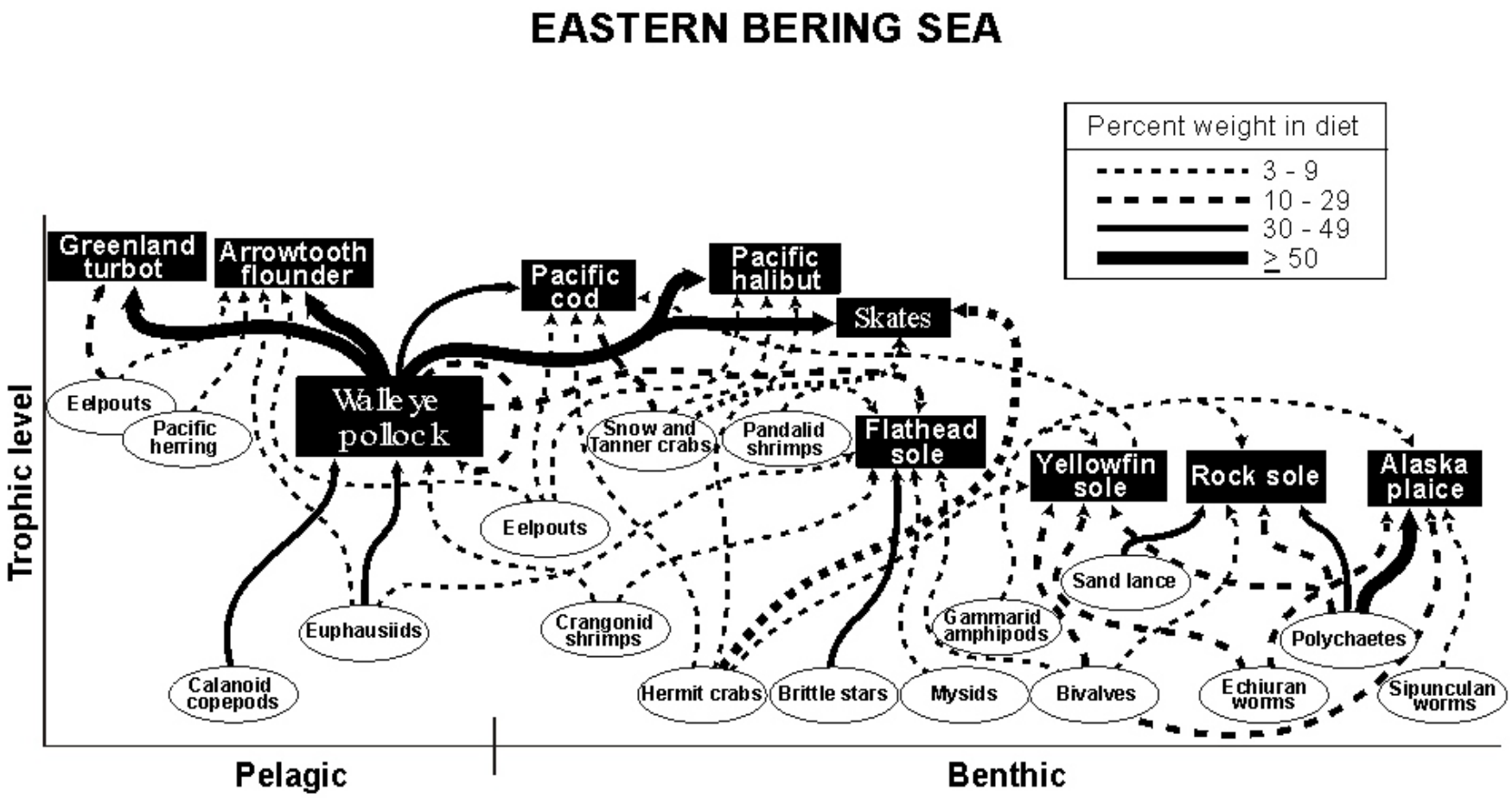


Figure 3.5-1. Trophic interactions of key eastern Bering Sea groundfish. Source: NMFS.

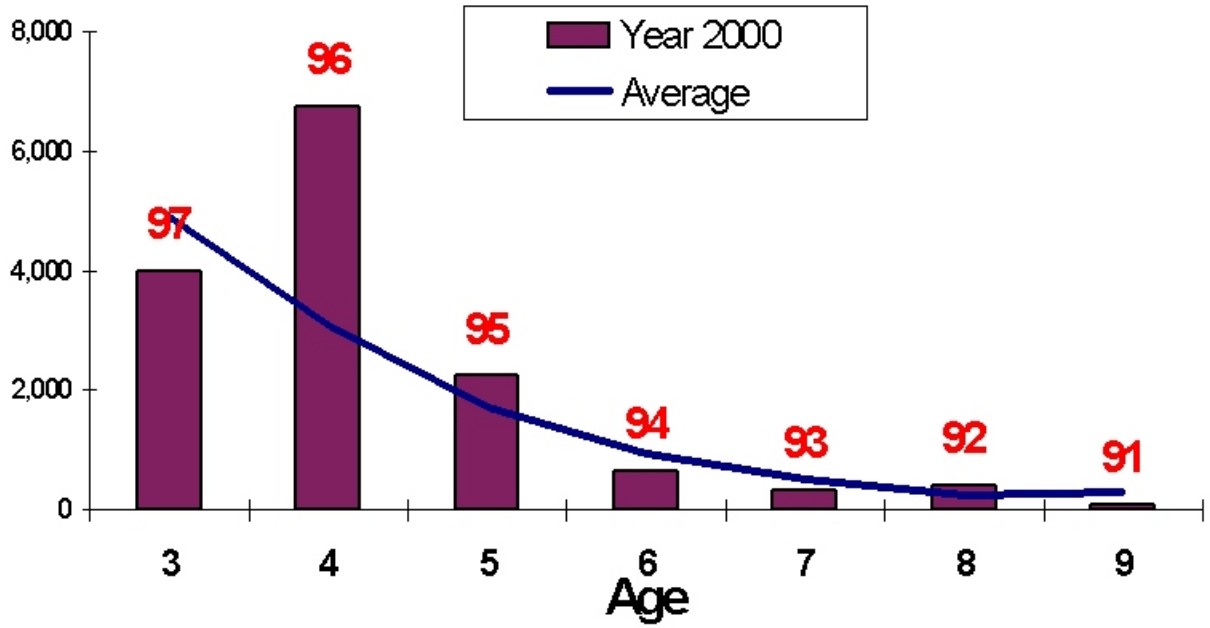


Figure 3.5-2. Projected age distribution (year classes noted on bottom of bars) and long-term average (solid line) for eastern Bering Sea pollock, 2000. Source: NMFS.

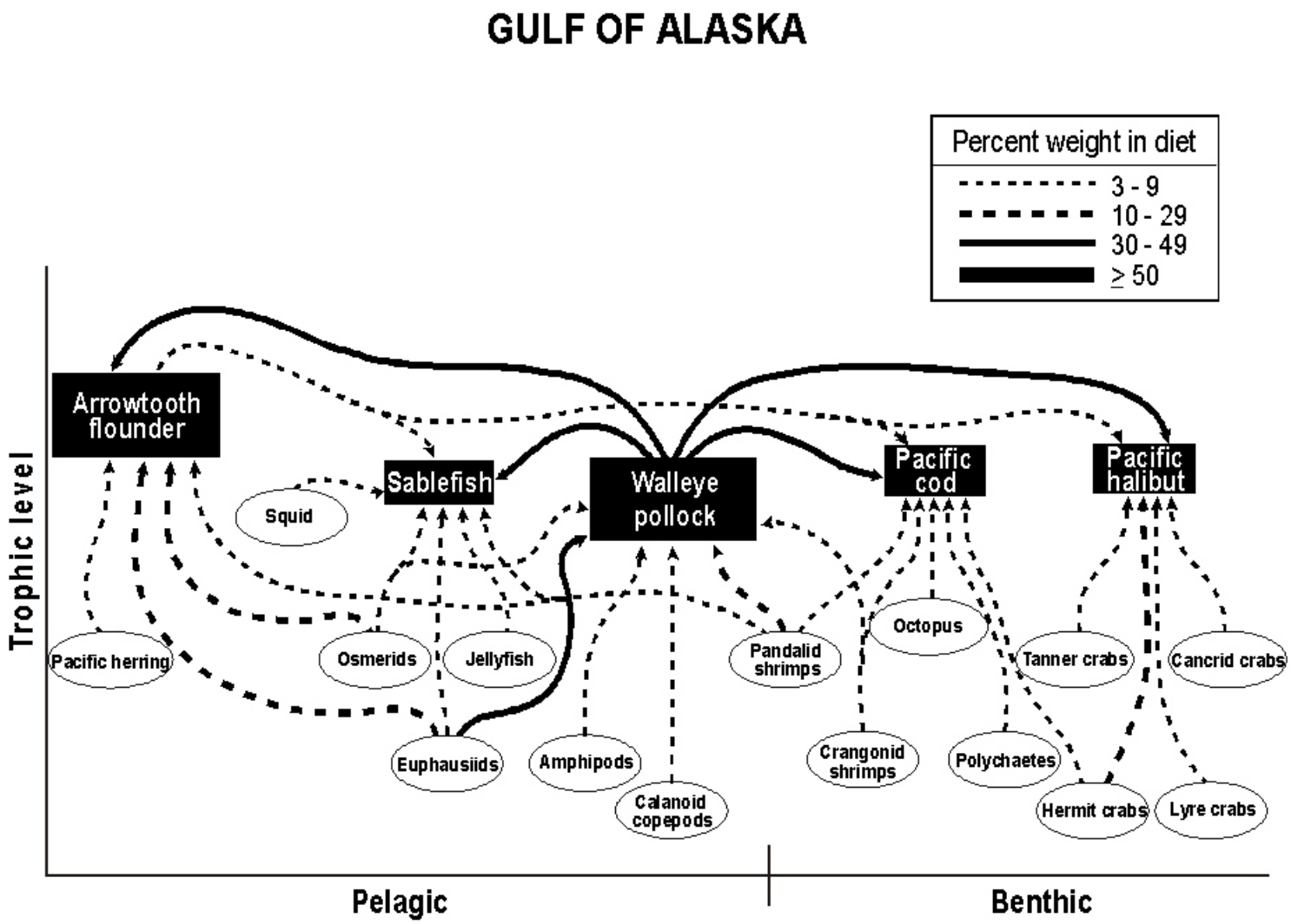


Figure 3.5-3. Trophic relationships of the groundfishes in the Gulf of Alaska. Source: NMFS.

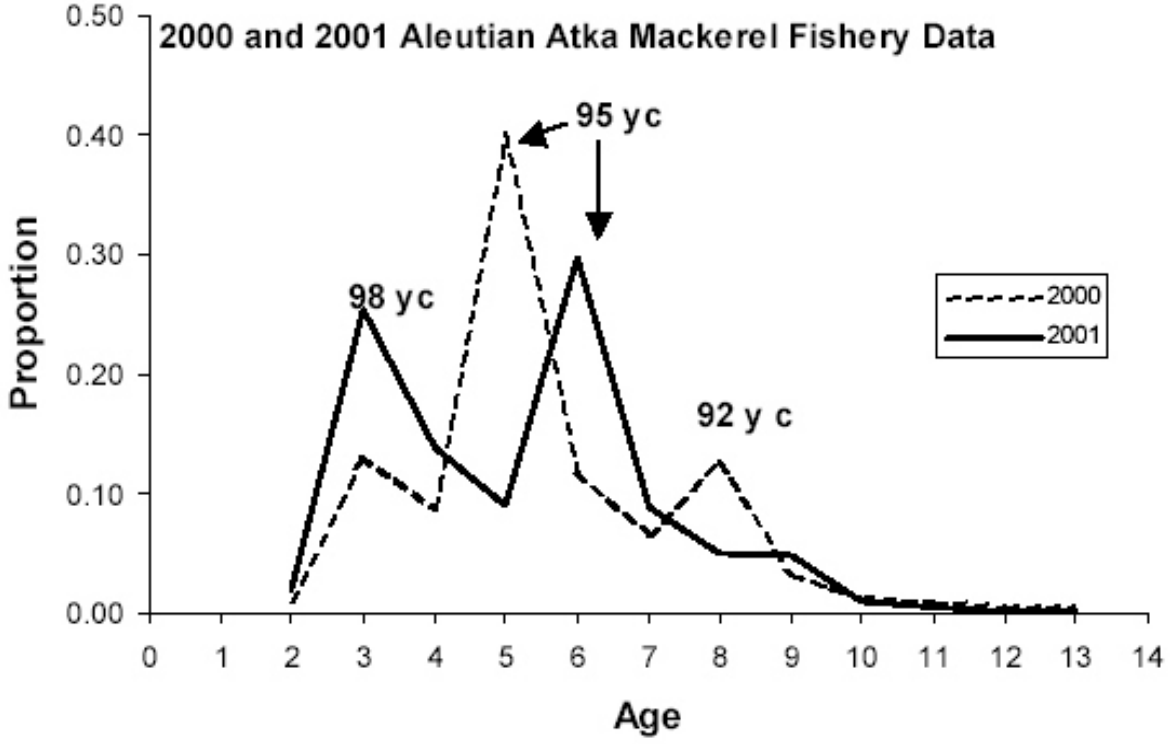


Figure 3.5-4. 2000 and 2001 Aleutian Islands Atka mackerel fishery age composition data.

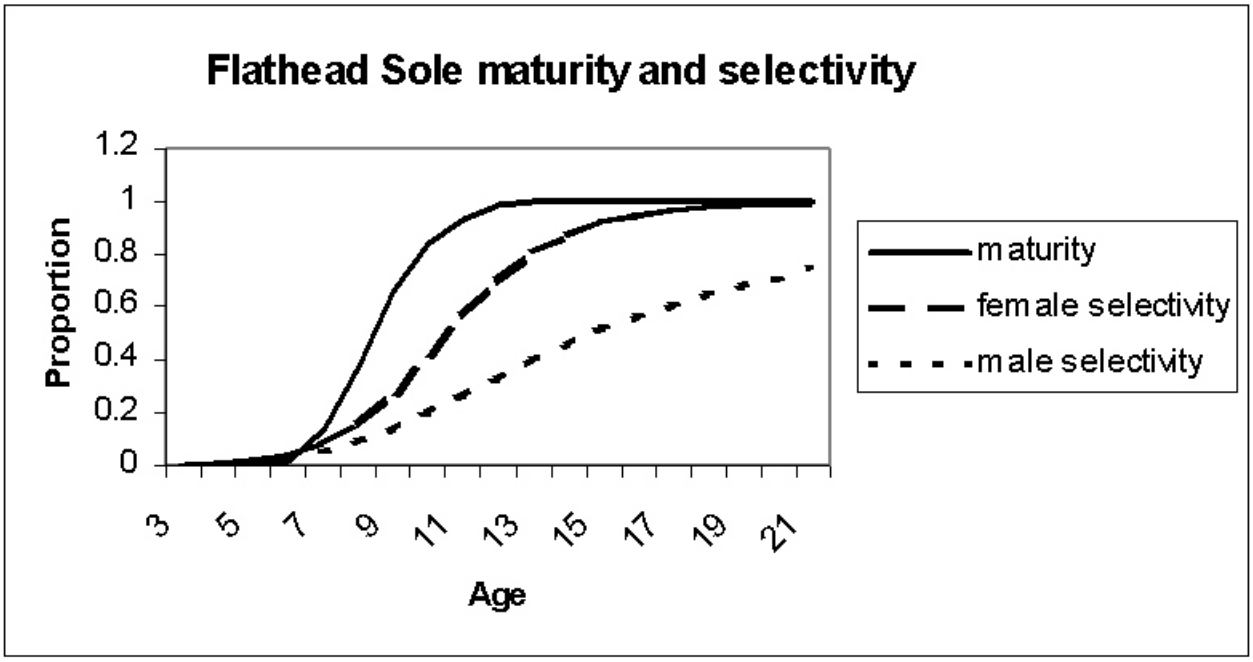


Figure 3.5-5. Bering Sea and Aleutian Islands flathead sole maturity and selectivity.

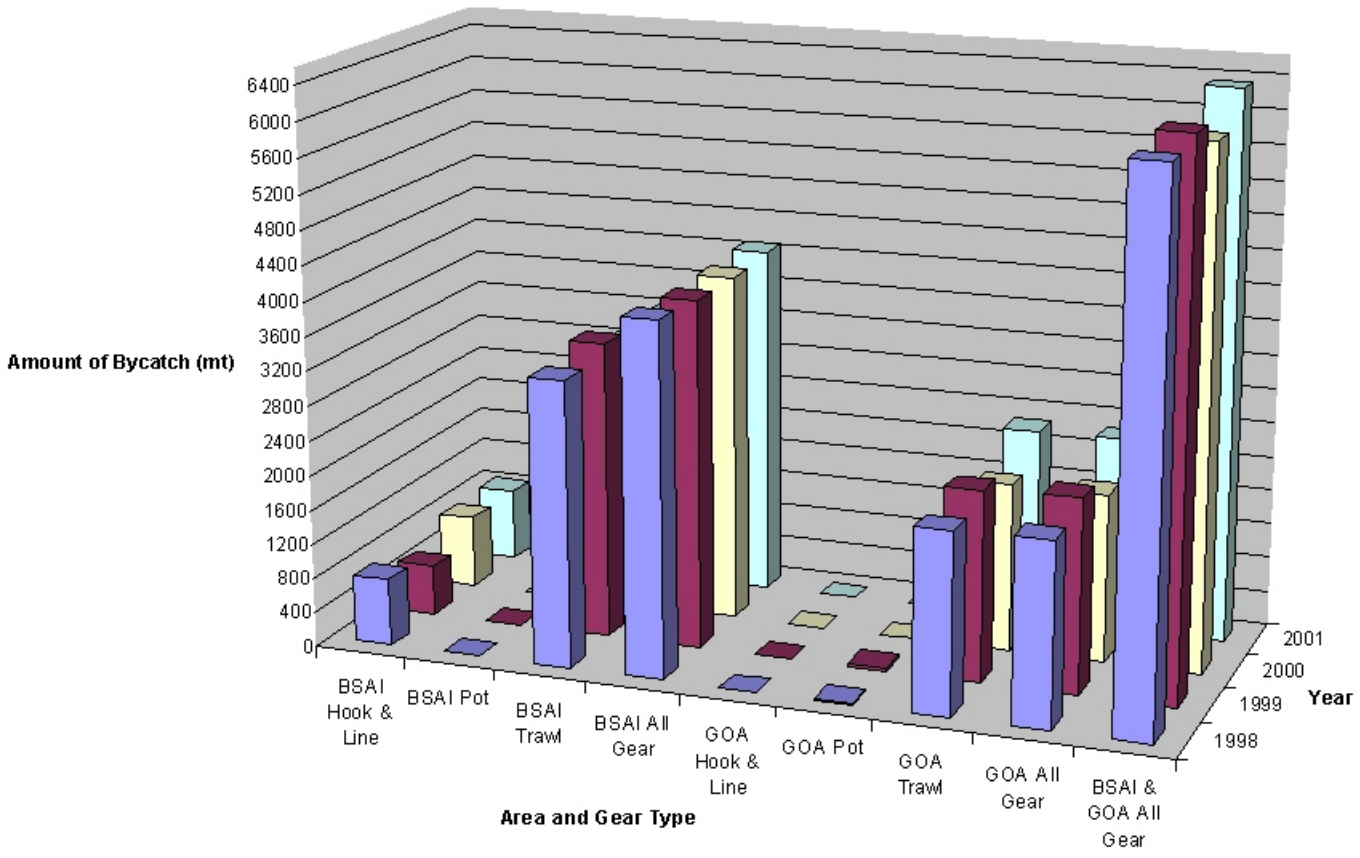


Figure 3.5-6. Halibut bycatch by area and gear, 1998-2001.

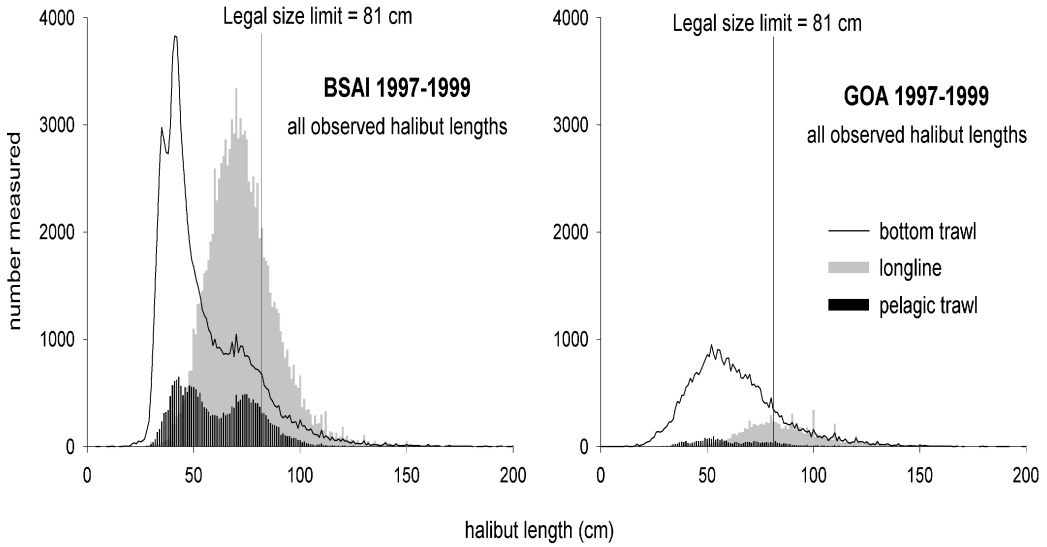


Figure 3.5-7. Length frequency of halibut observed in Bering Sea and Aleutian Islands and Gulf of Alaska groundfish fisheries, 1997-1999. Source: NMFS.

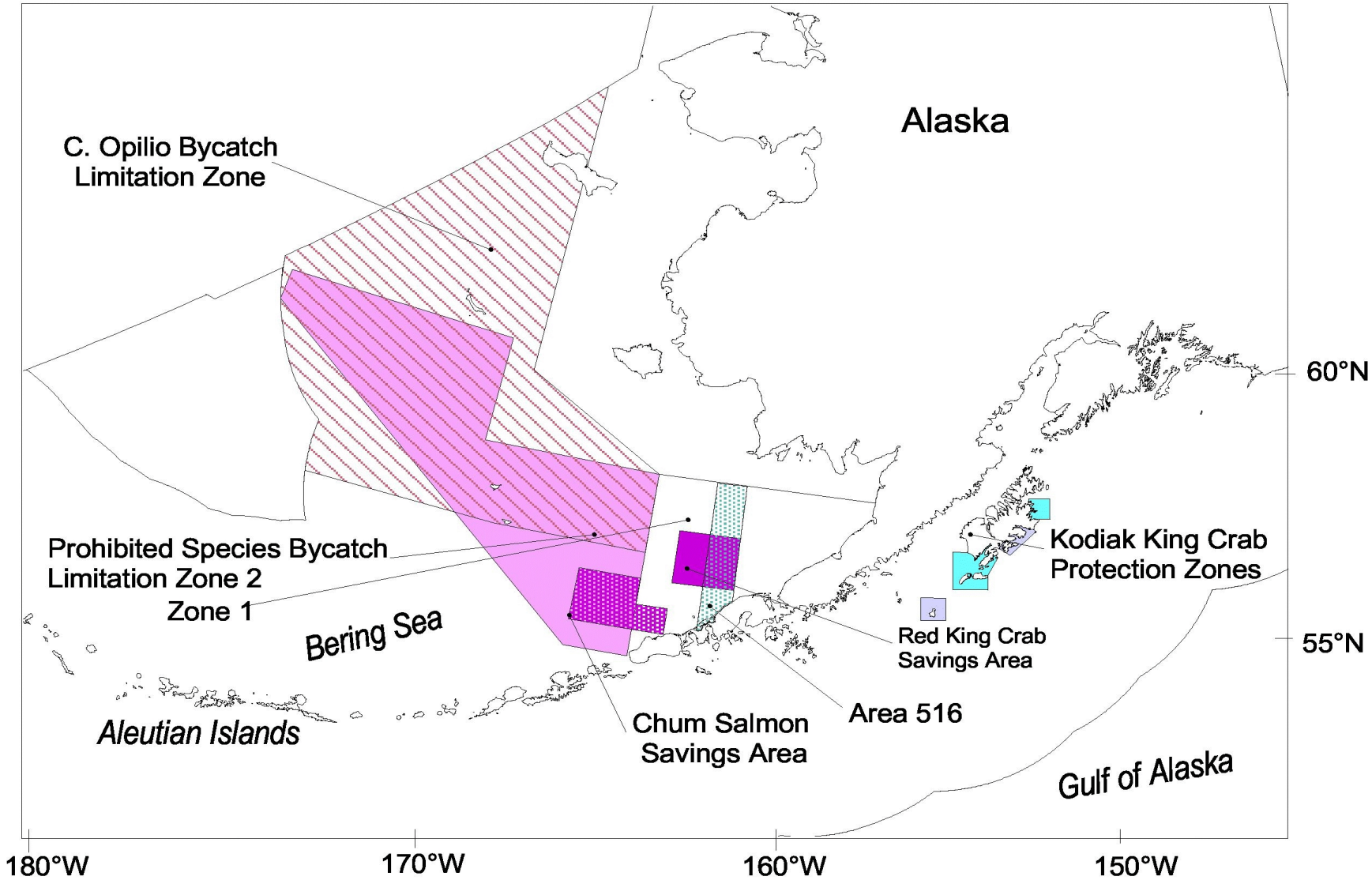


Figure 3.5-8. Management areas involving prohibited species in the Bering Sea and Gulf of Alaska. Source: NMFS.

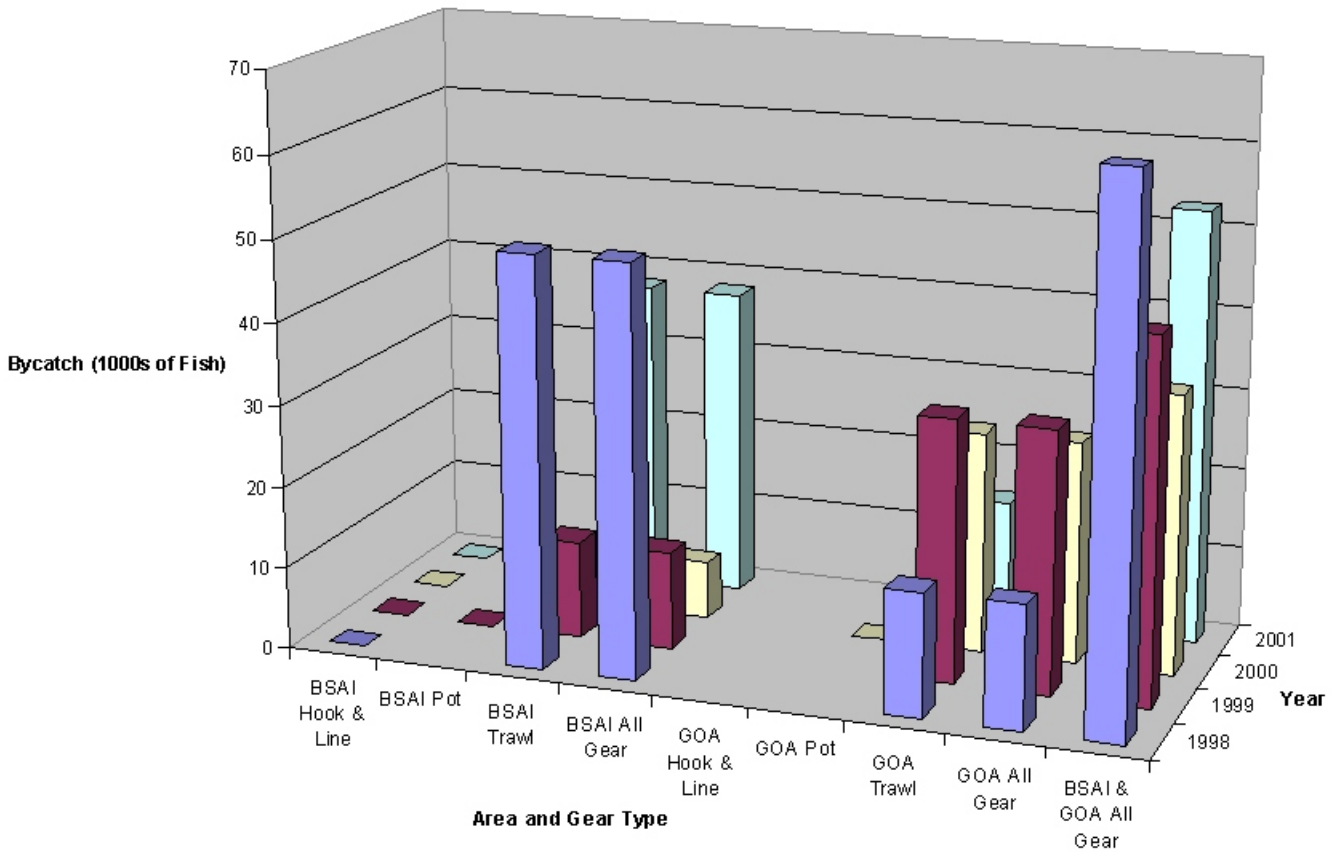


Figure 3.5-9. Chinook salmon bycatch by area and gear, 1998-2001.

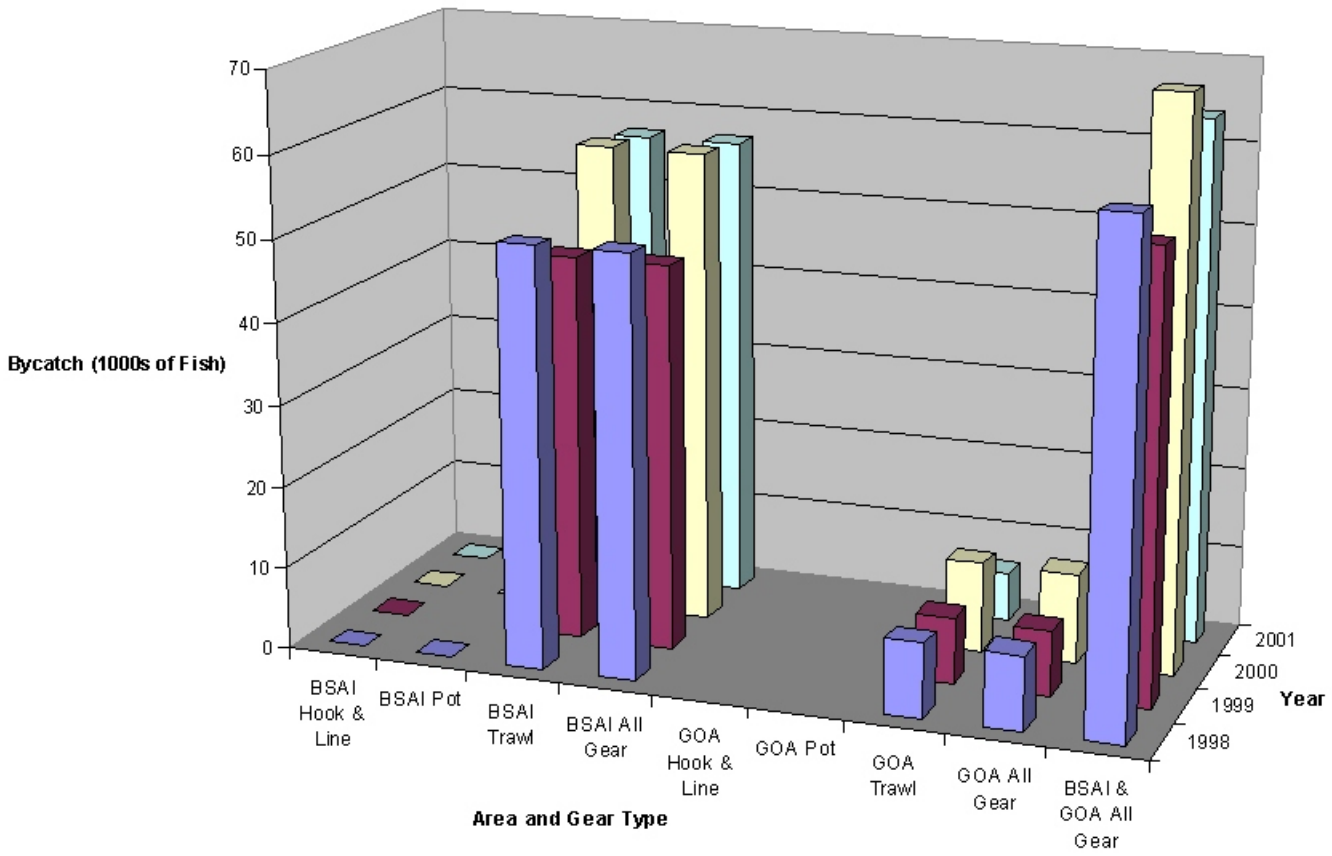


Figure 3.5-10. Other salmon bycatch by area and gear, 1998-2001.

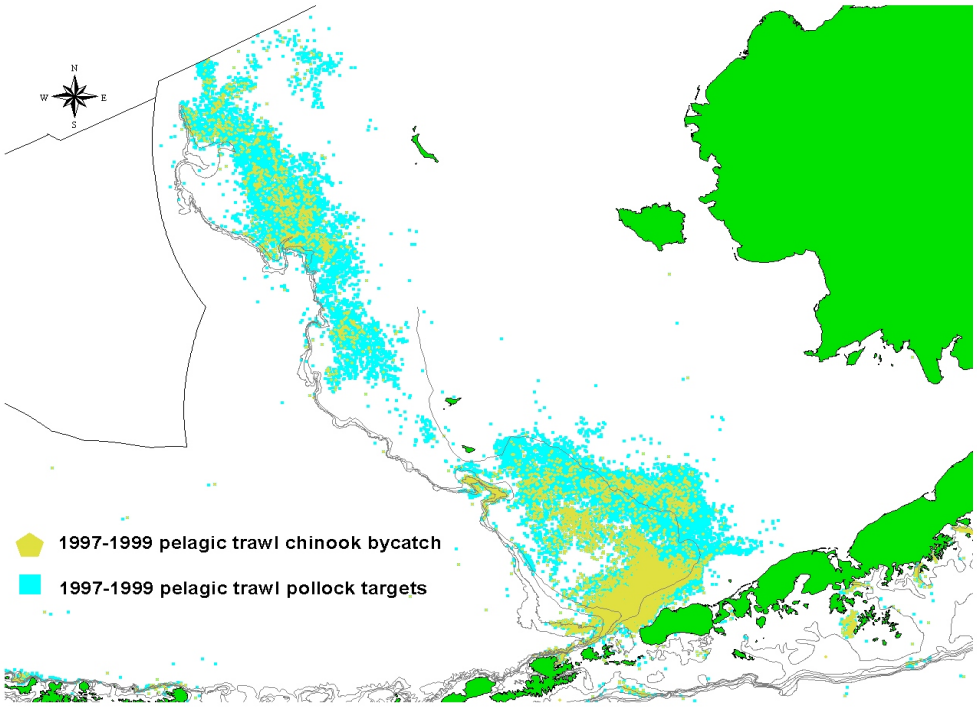


Figure 3.5-11. Distribution of salmon bycatch in the pelagic trawl fishery, 1997-1999.

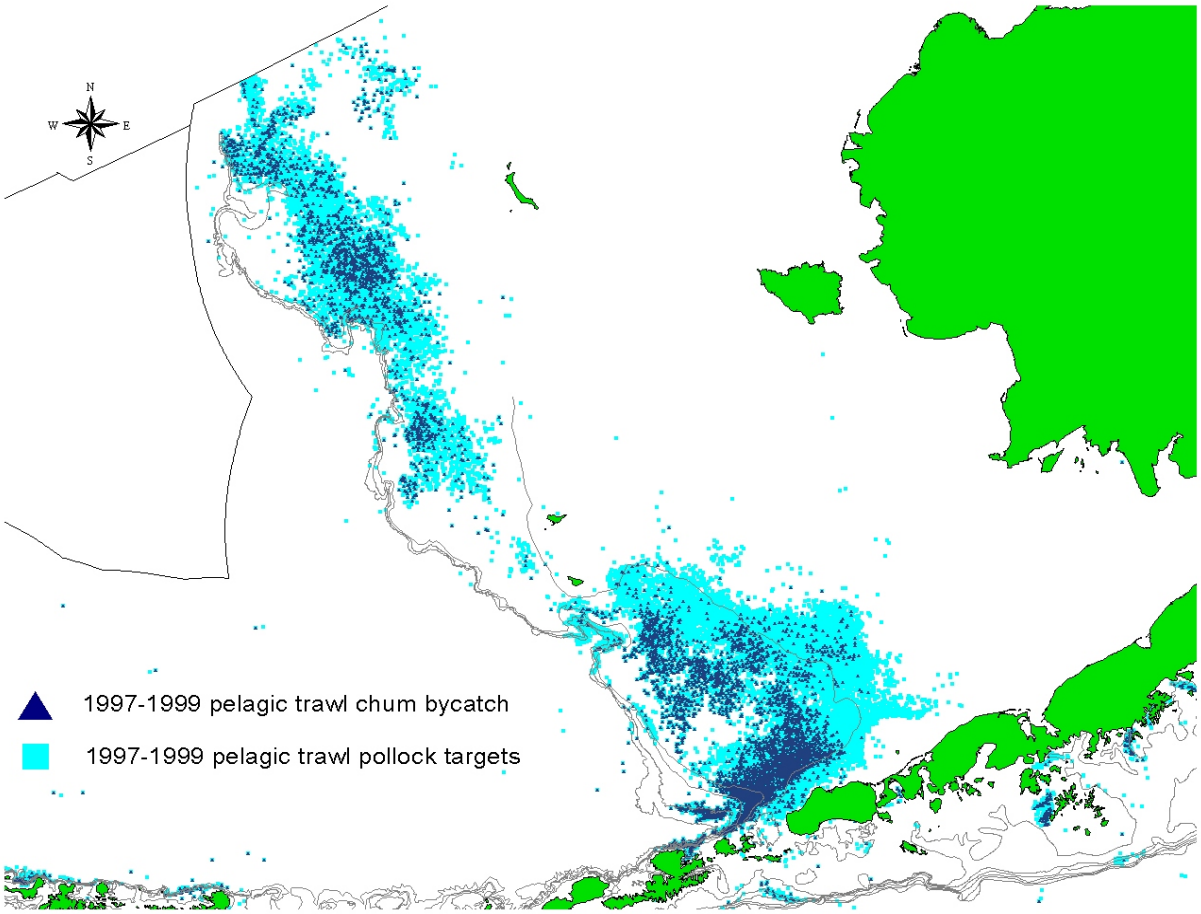


Figure 3.5-12. Distribution of Bering Sea and Aleutian Islands chum salmon bycatch in the pelagic trawl fishery, 1997-1999.

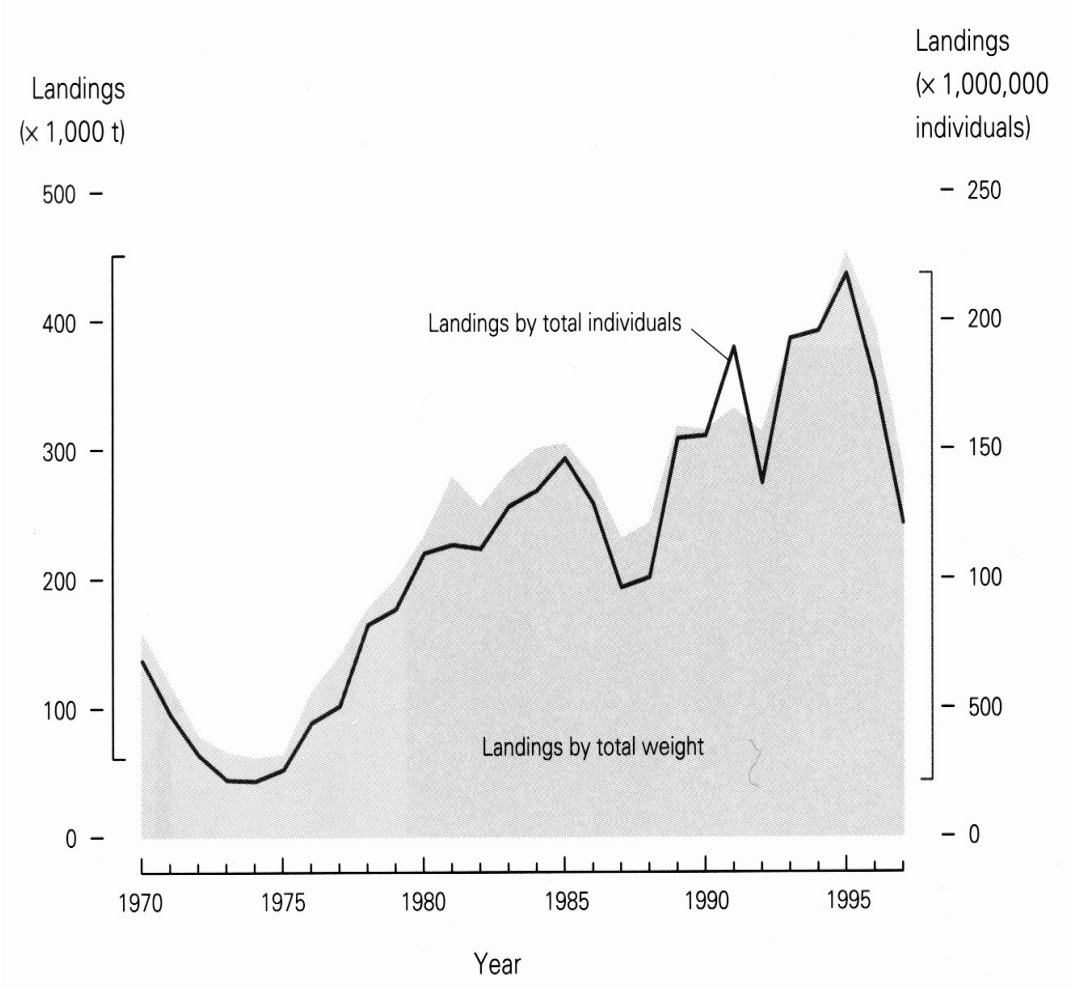


Figure 3.5-13. Commercial landings of Alaska salmon, all species, 1970-1997, by metric tons and numbers of fish. Source: NOAA 1999.

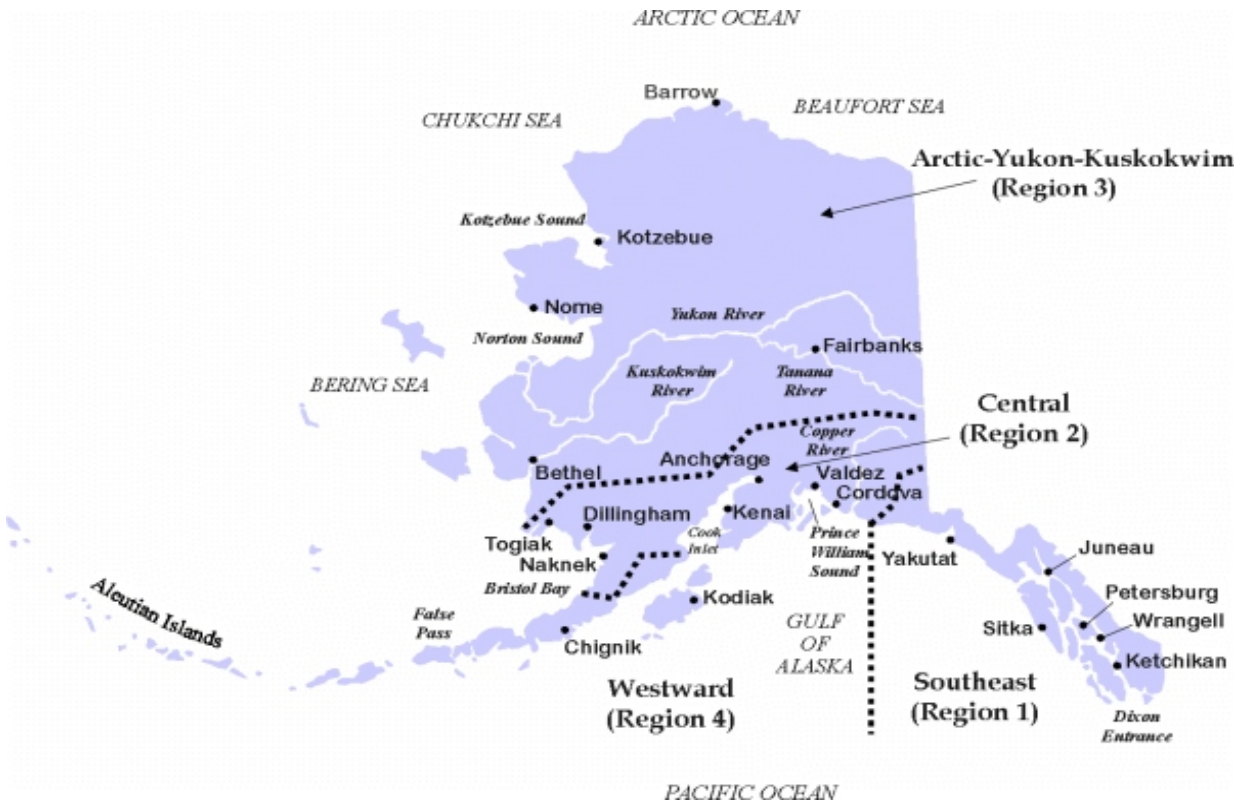


Figure 3.5-14. Salmon management areas established by Alaska Department of Fish and Game.

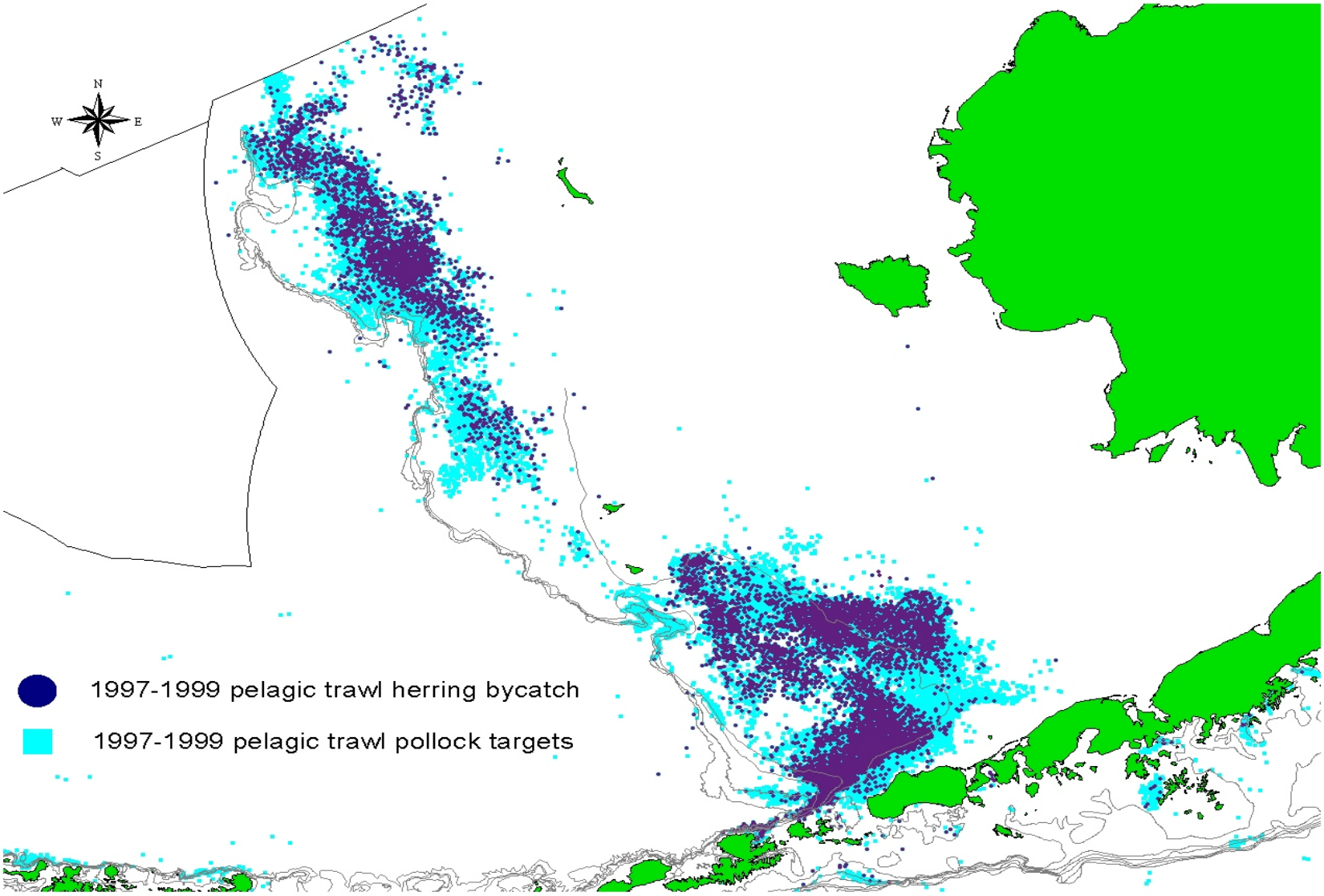


Figure 3.5-15. Spatial distribution of herring bycatch within the Bering Sea and Aleutian Islands pelagic pollock fishery, 1997-1999.

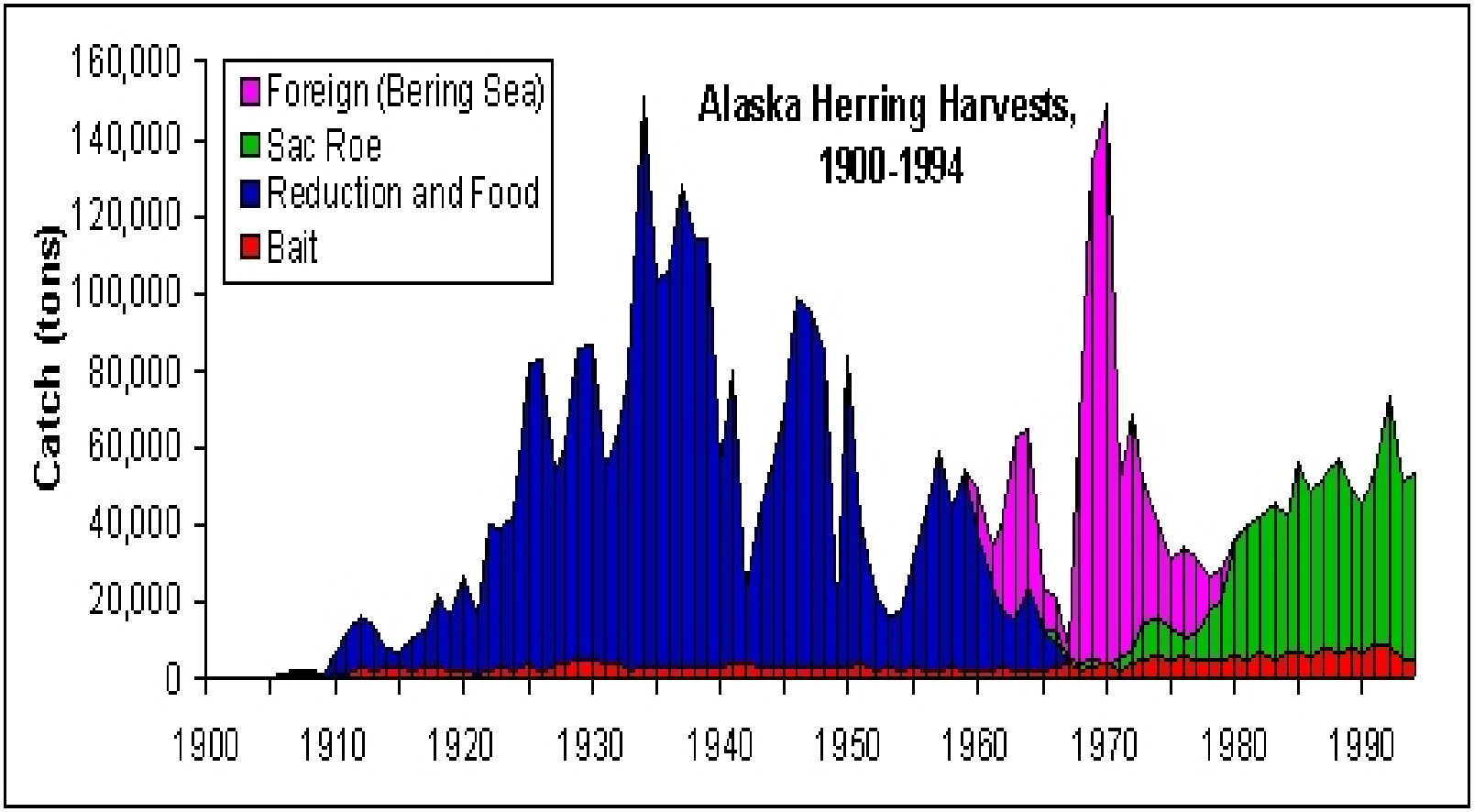


Figure 3.5-16. Historical catch of Pacific herring in Alaska. Source: ADF&G 2000.

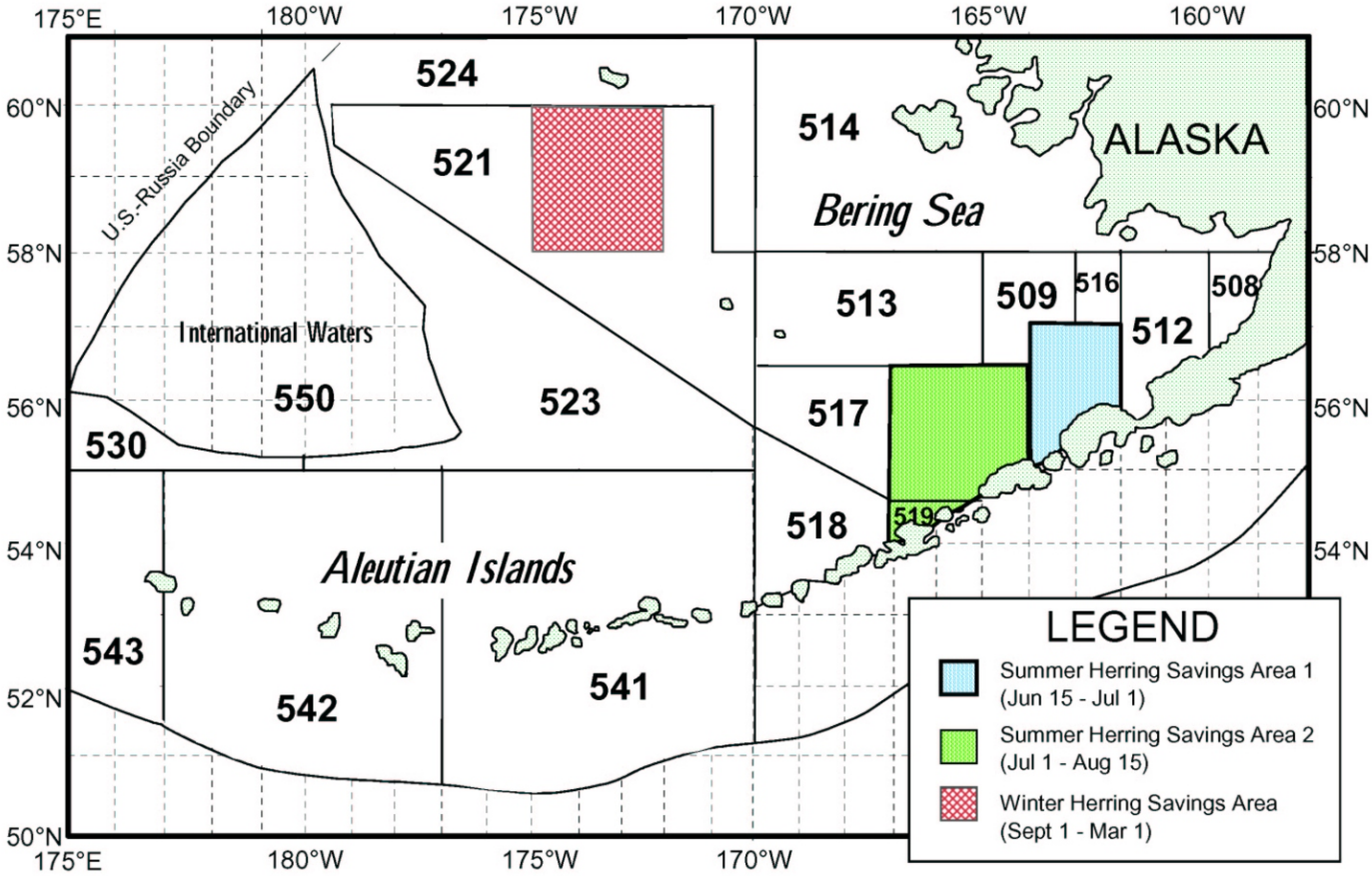


Figure 3.5-17. Designated herring savings areas

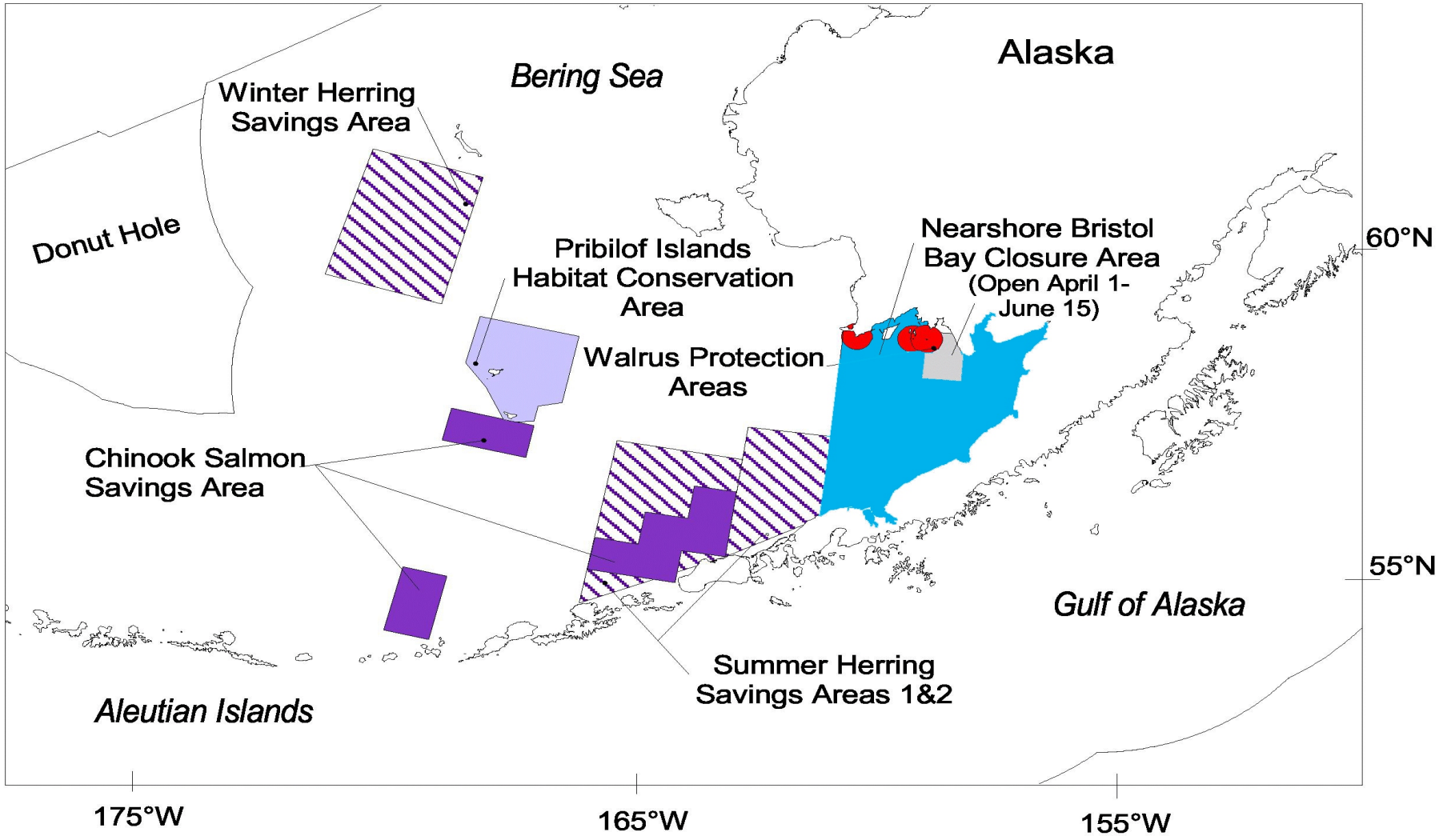


Figure 3.5-18. Management areas involving prohibited species and walrus in the Bering Sea. Source: NMFS.

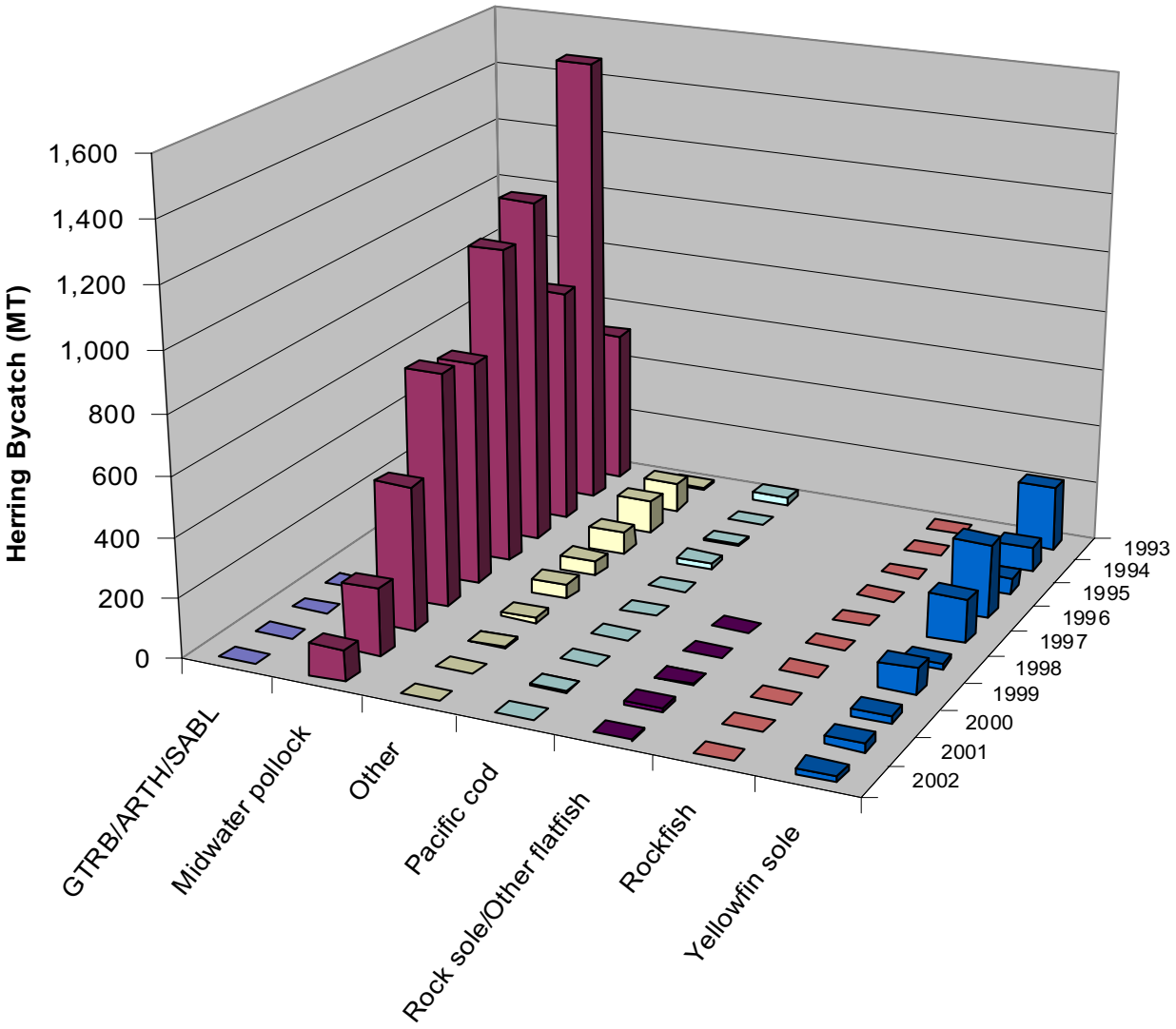


Figure 3.5-19. Herring bycatch by fishery and year in the Bering Sea and Aleutian Islands trawl fisheries.

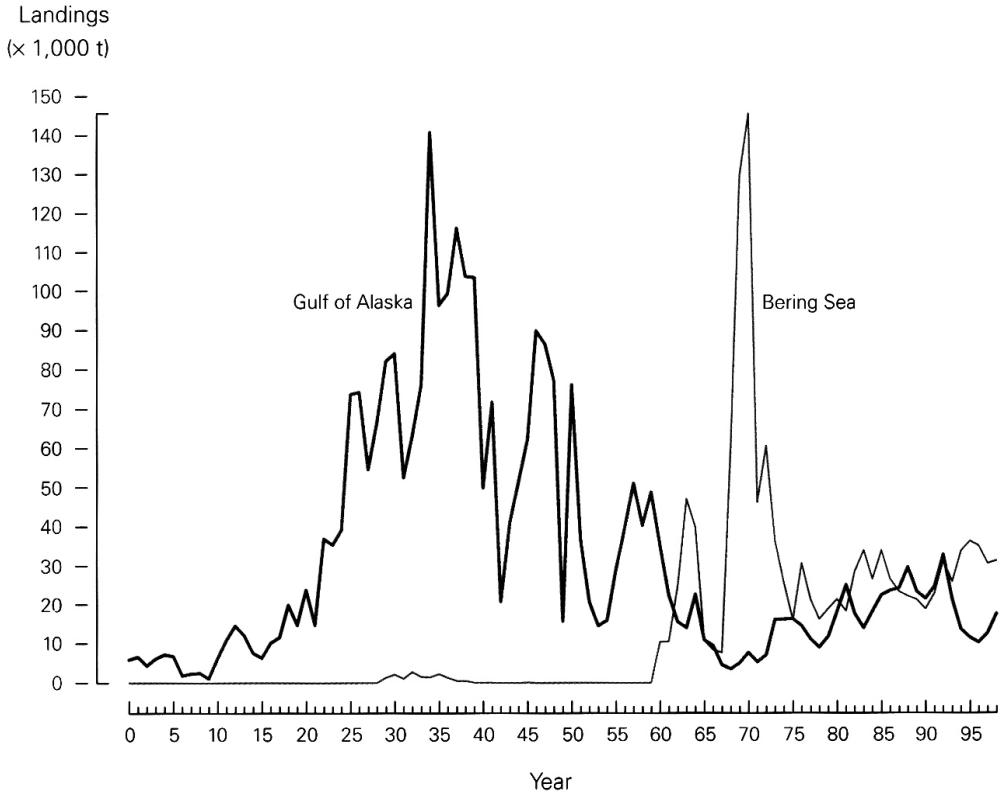


Figure 3.5-20. Historical trend of Pacific herring catch in the Bering Sea and Gulf of Alaska, 1900-1998. Source: NOAA 1999.

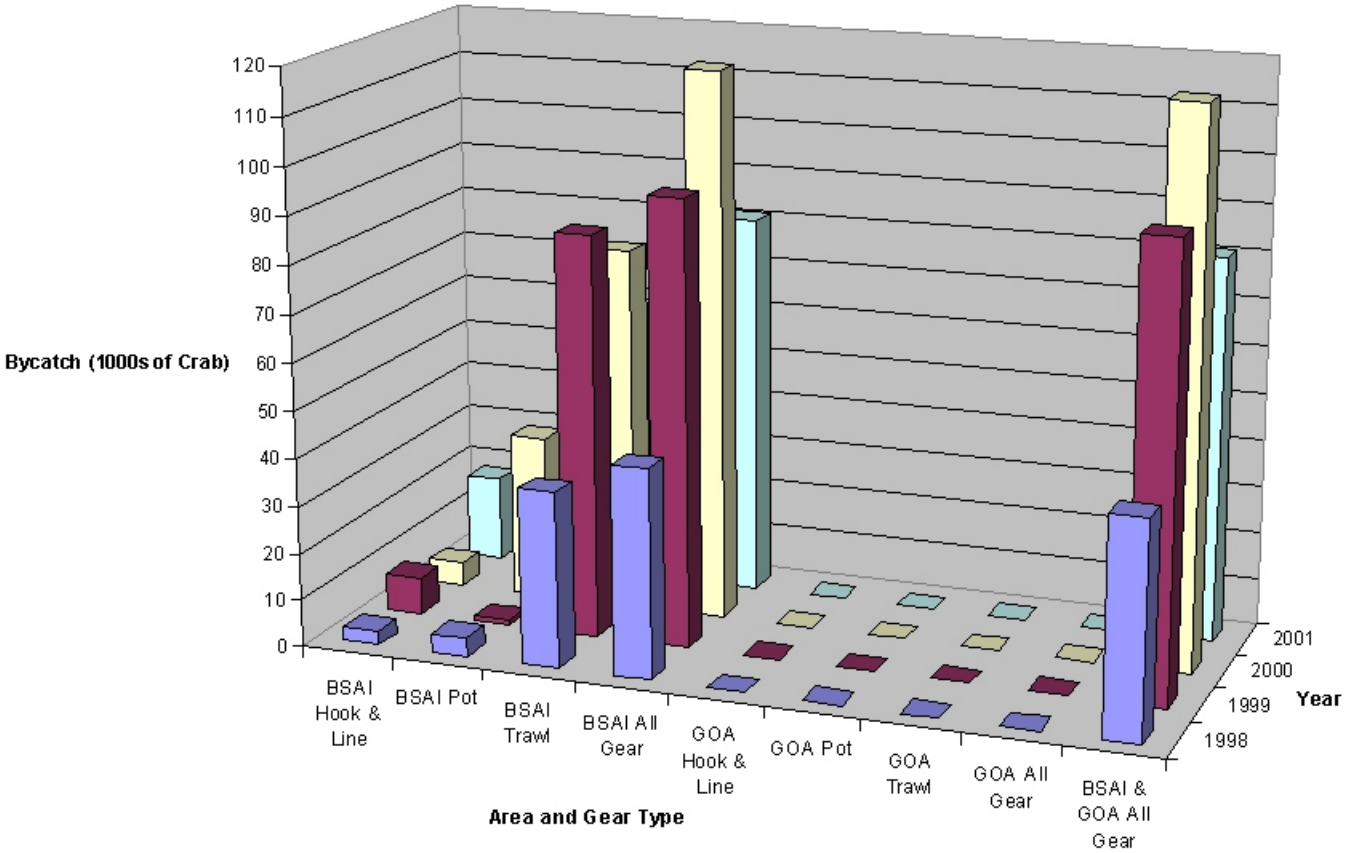


Figure 3.5-21. Red King crab bycatch by area and gear, 1998-2001.

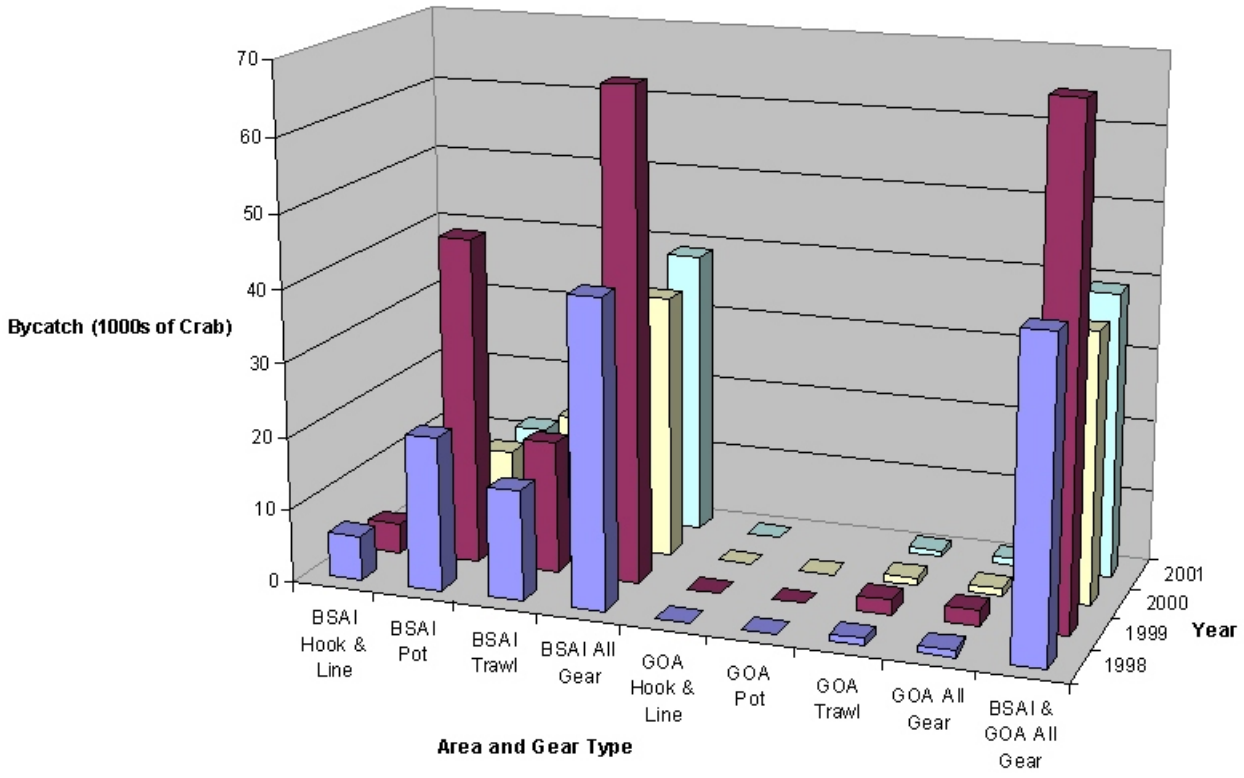


Figure 3.5-22. Other king crab bycatch by area and gear, 1998-2001.

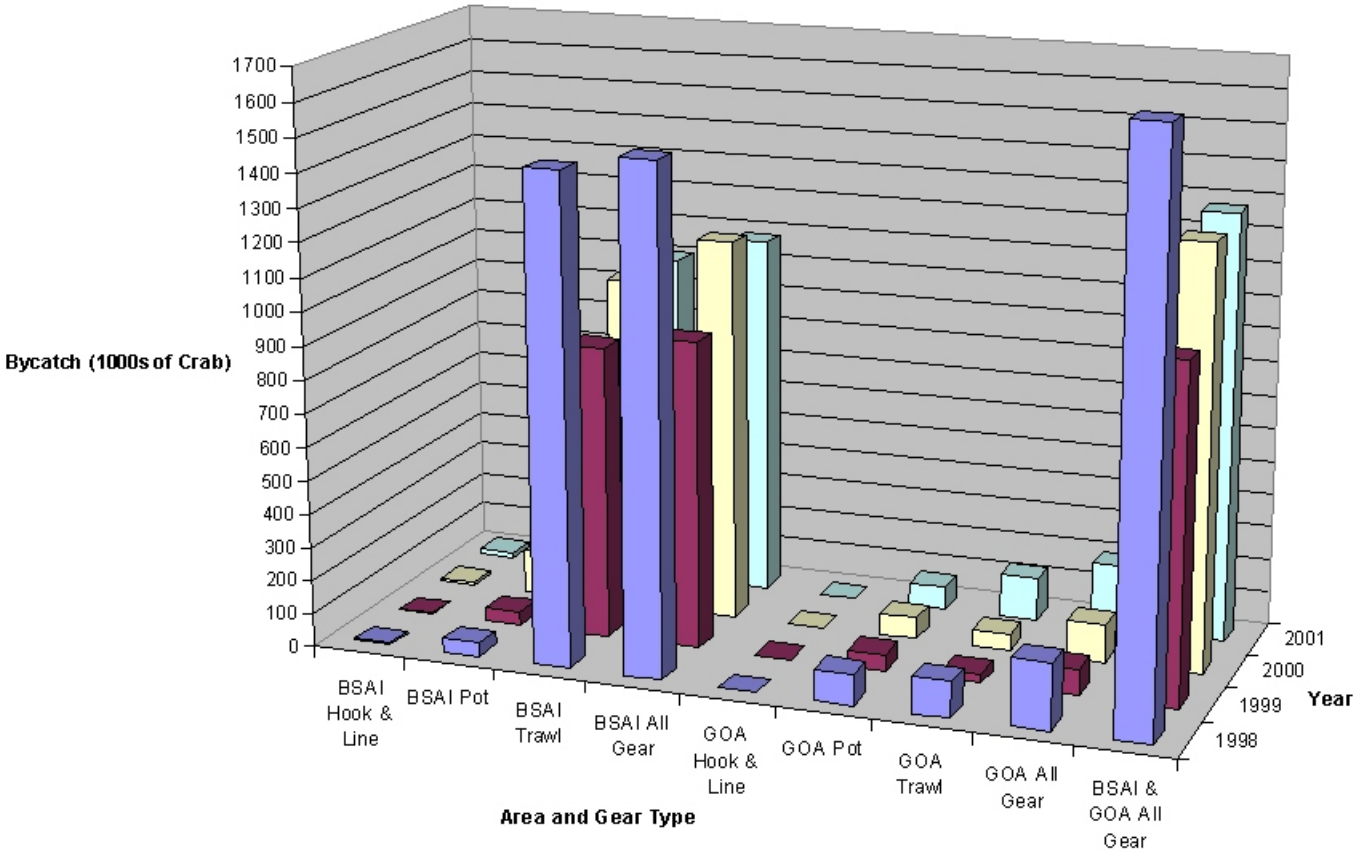


Figure 3.5-23. Bairdi crab bycatch by area and gear, 1998-2001.

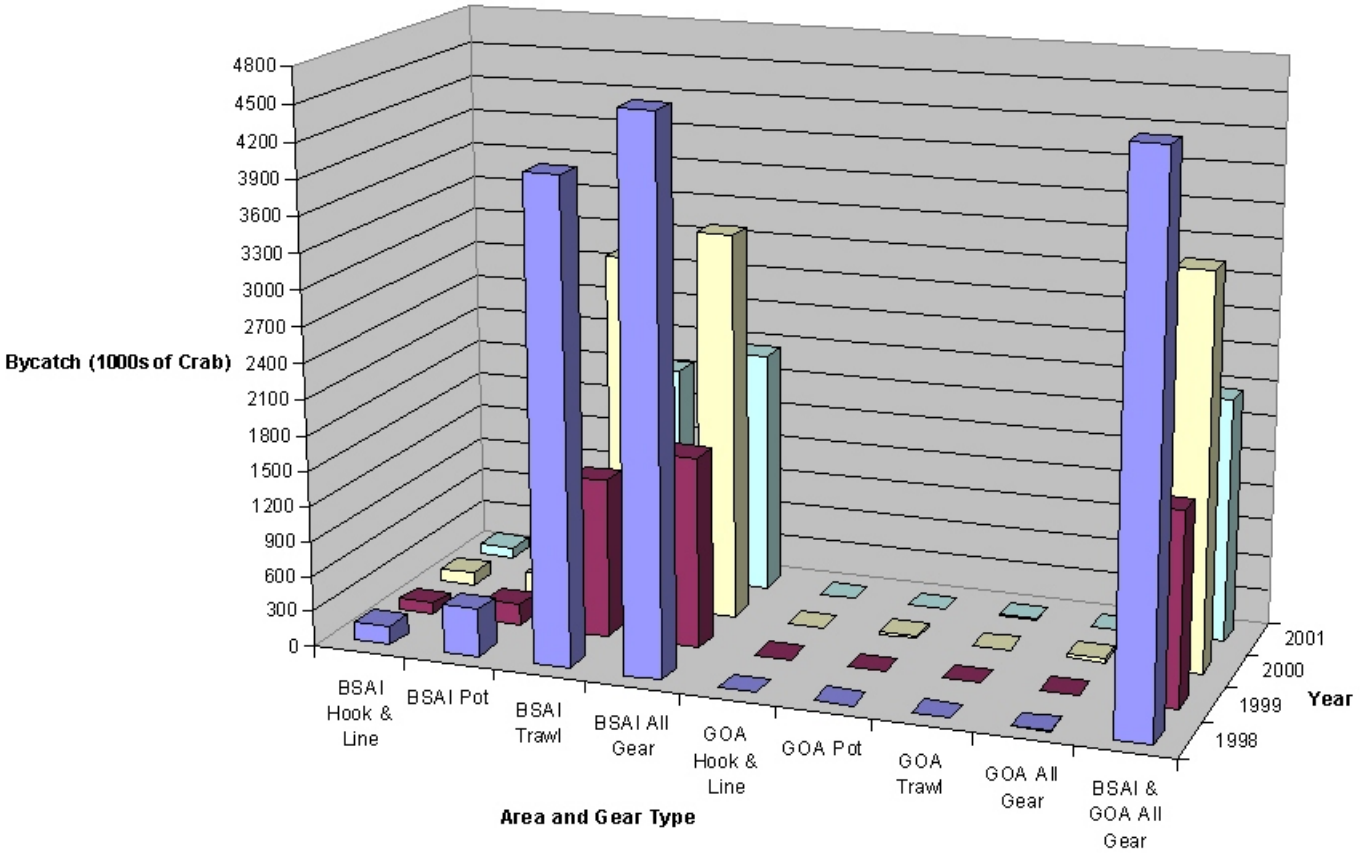


Figure 3.5-24. Other tanner crab bycatch by area and gear, 1998-2001.

Figure 3.5-25. The magistrate armhook squid, *Berryteuthis magister*.

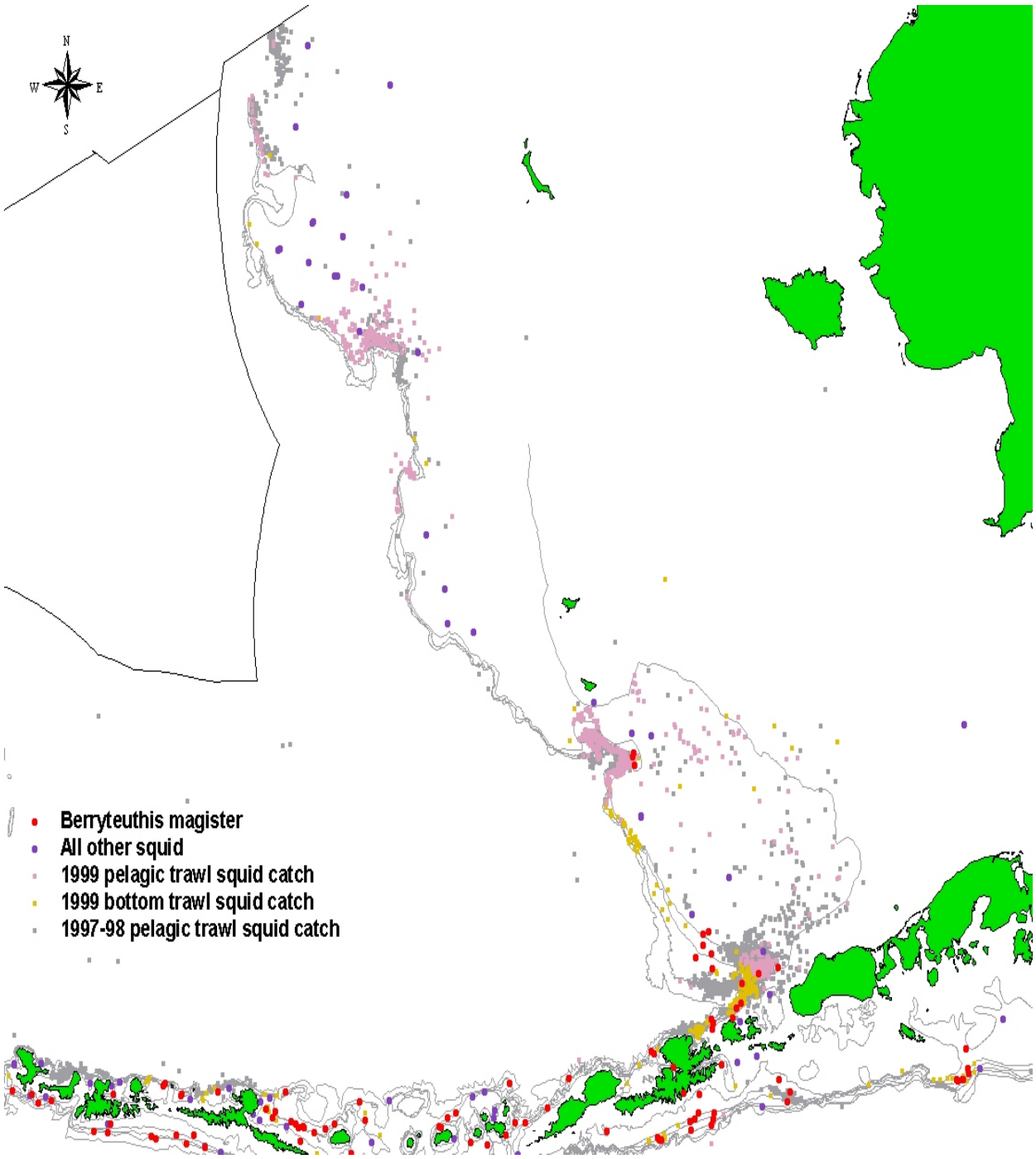


Figure 3.5-26. Distribution of squid species from bottom trawl and midwater surveys (dots) and catch (shaded squares), 1997-1999.

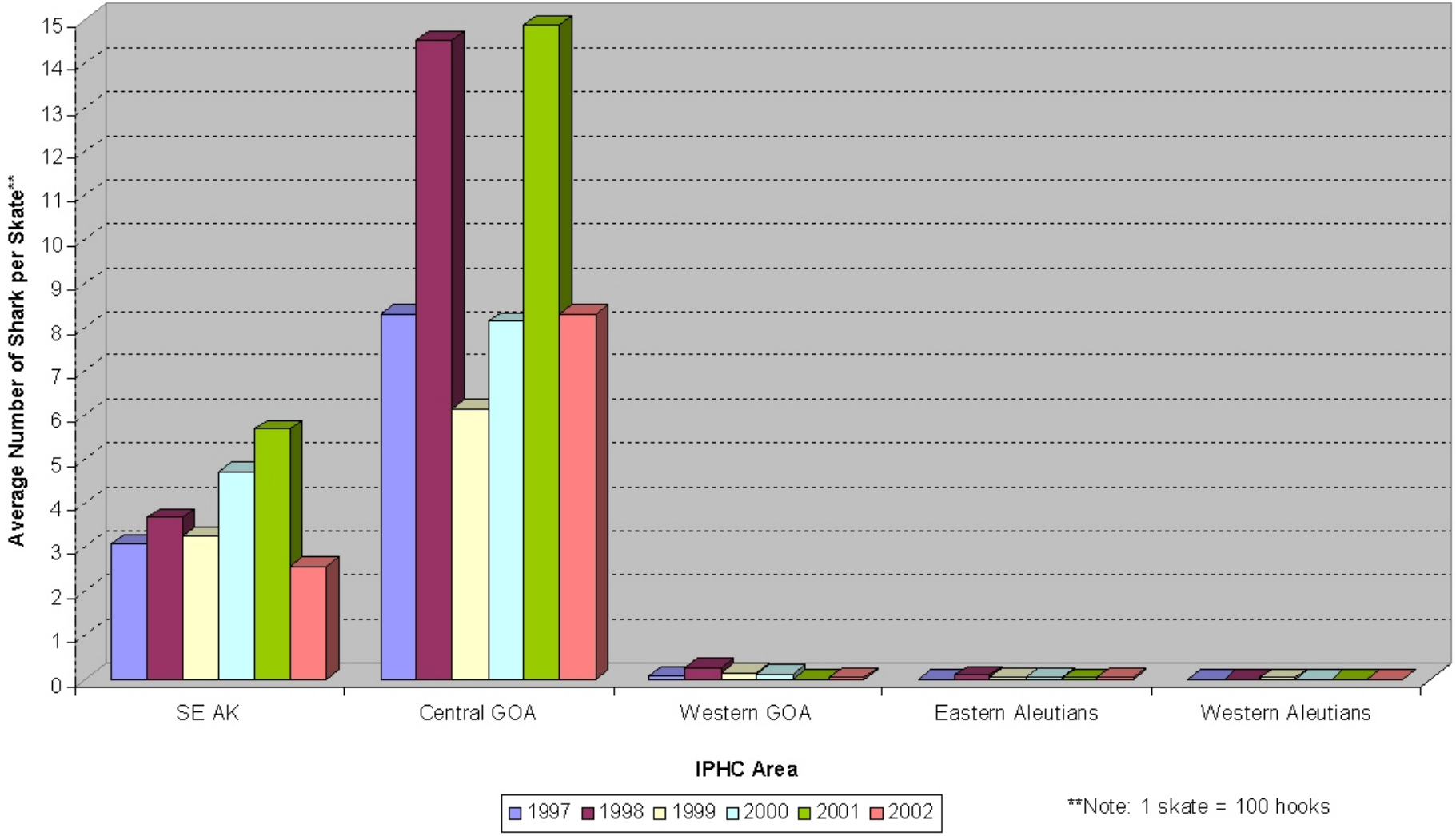


Figure 3.5-27. Average stock density of dogfish estimated by International Pacific Halibut Commission setline surveys in Alaska, 1997-2002.

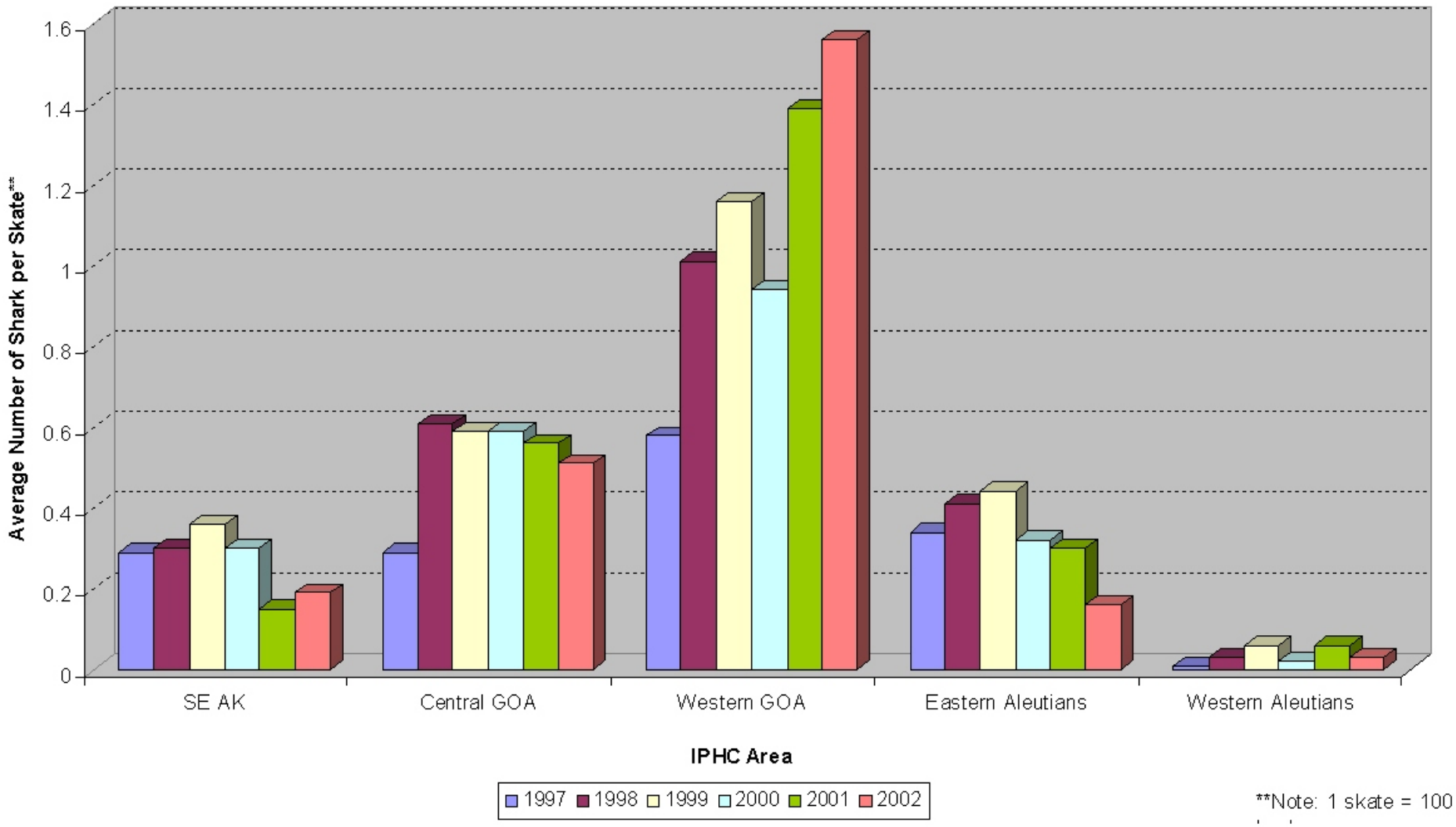


Figure 3.5-28. **Average stock density of sleeper shark estimated by International Pacific Halibut Commission setline surveys in Alaska, 1997-2002.**

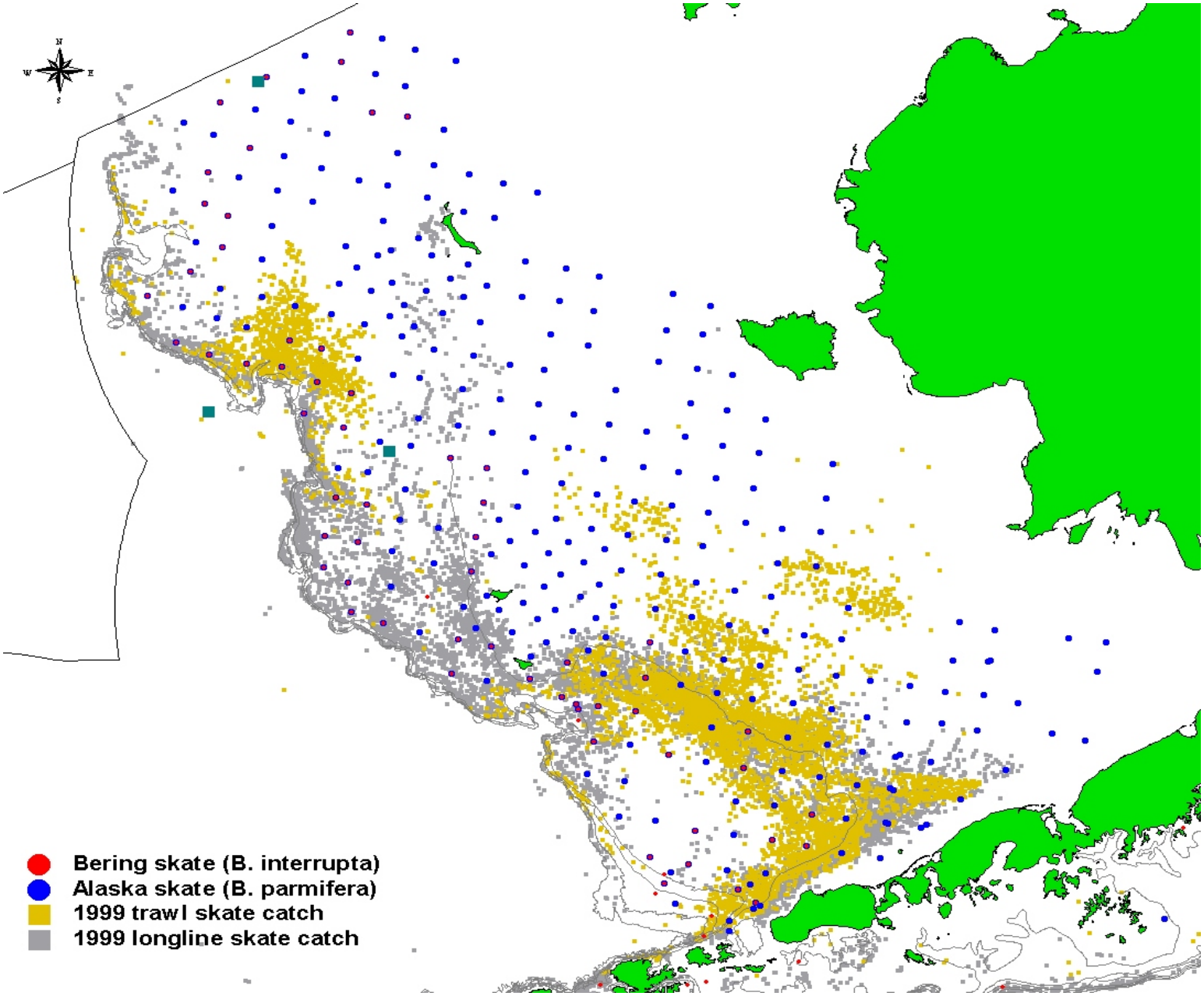


Figure 3.5-29. Distribution of skate species and skate catch in the eastern Bering Sea, 1999.

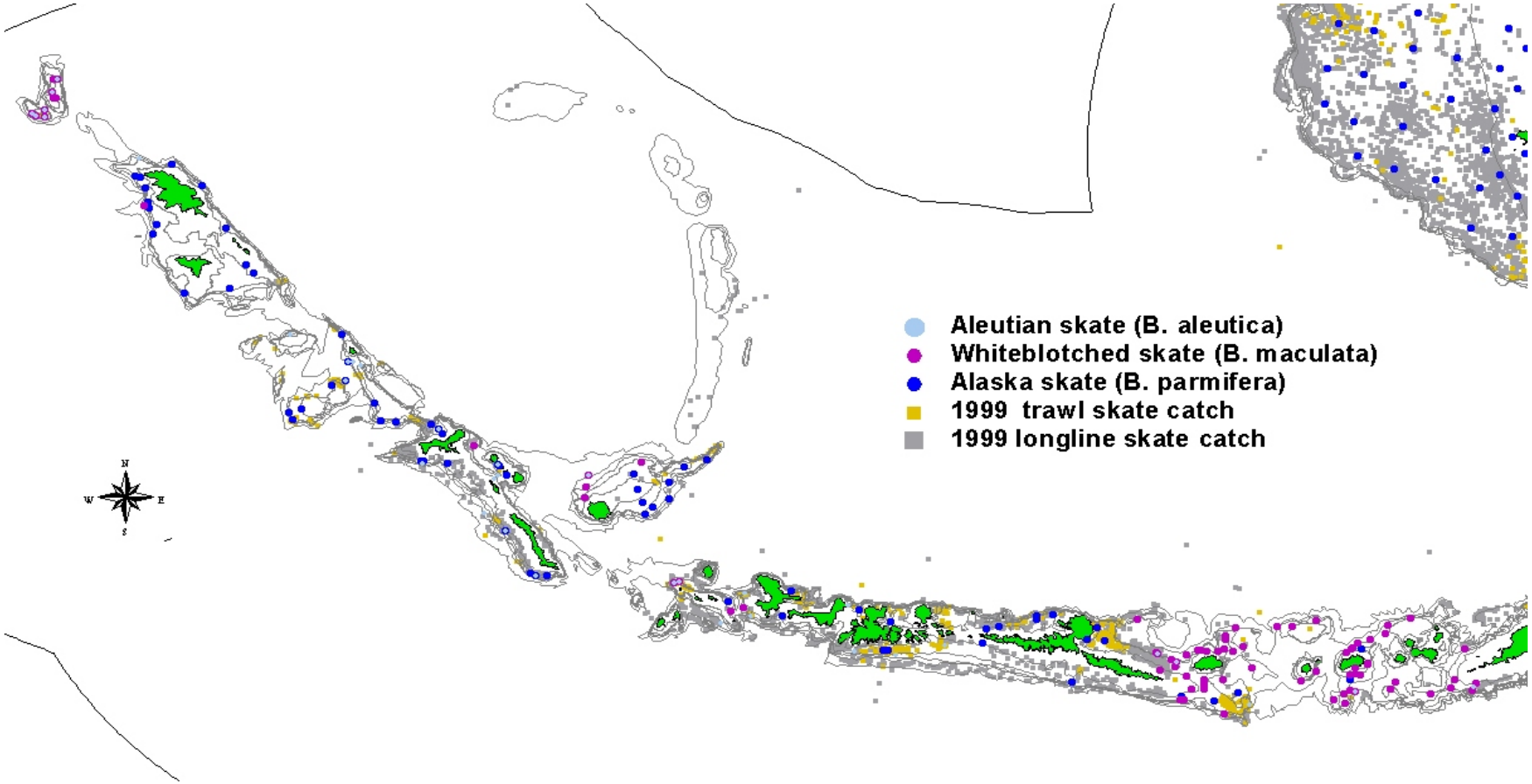


Figure 3.5-30. Distribution of skate species (1997 survey) and skate catch in the Aleutian Islands, 1999.

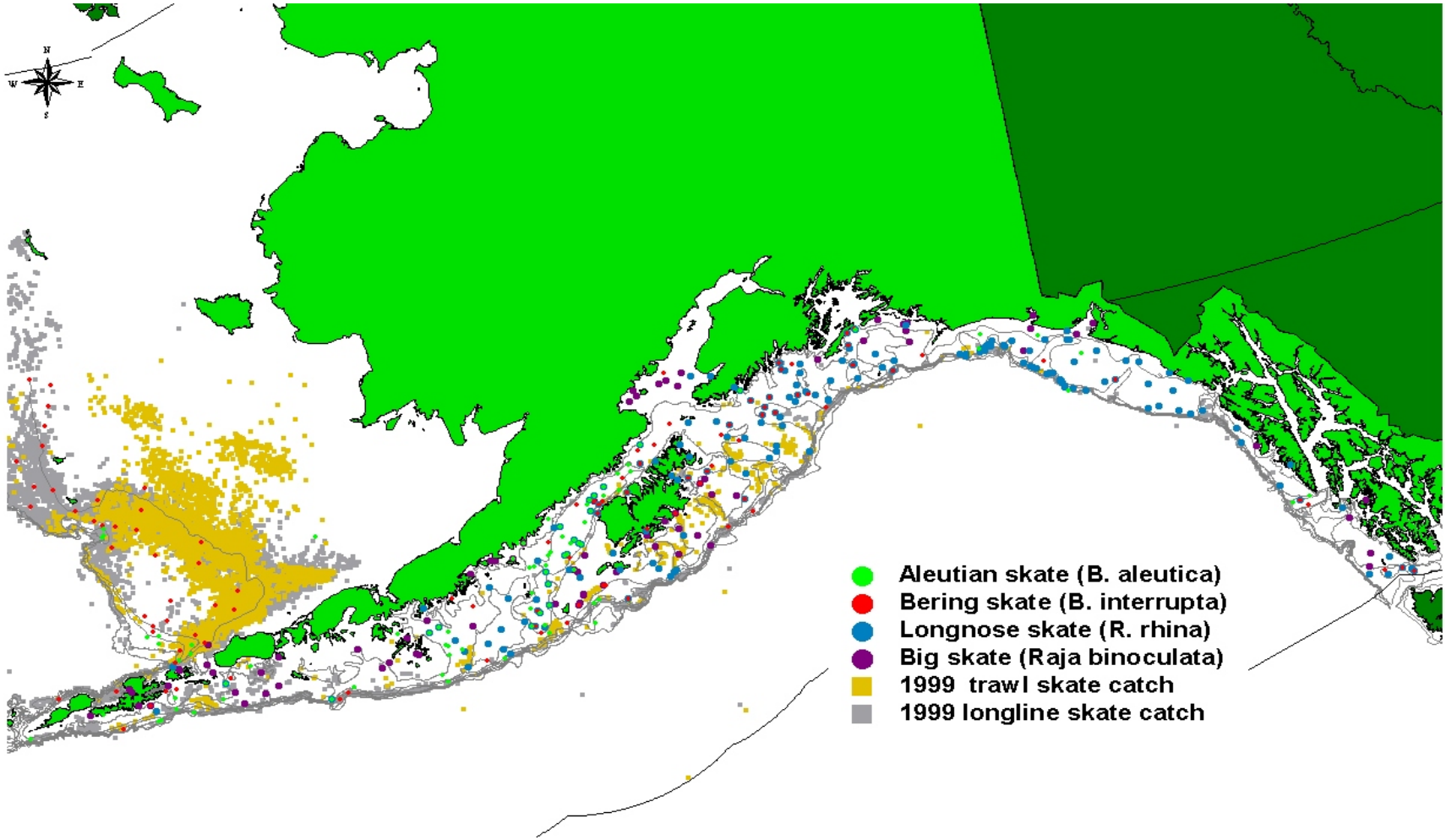


Figure 3.5-31. Distribution of skate species (1999 survey) and skate catch in the Gulf of Alaska, 1999.

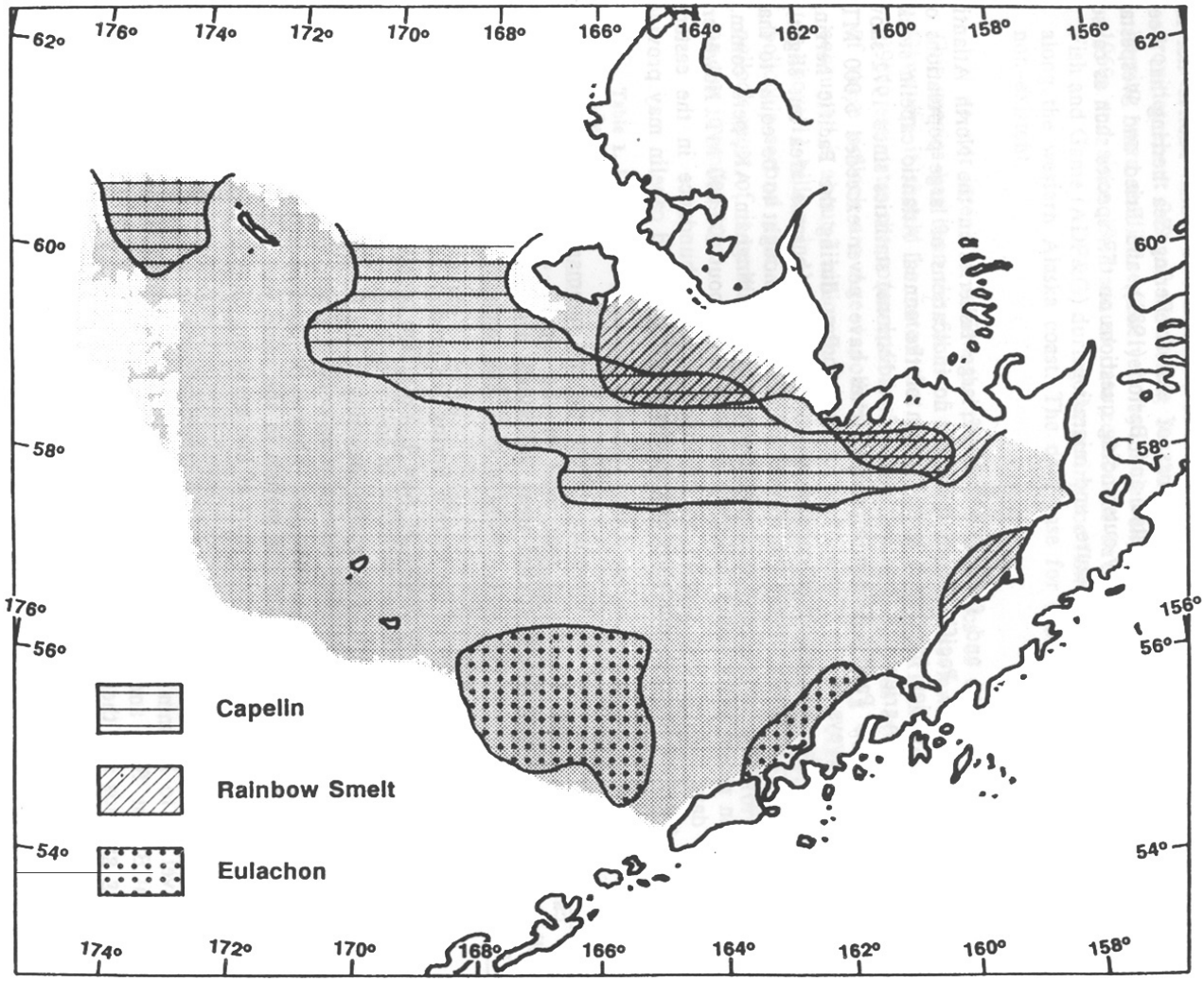


Figure 3.5-32. Distribution of capelin, rainbow smelt, and eulachon in Alaska Fisheries Science Center summer groundfish trawl surveys. Source: NMFS.

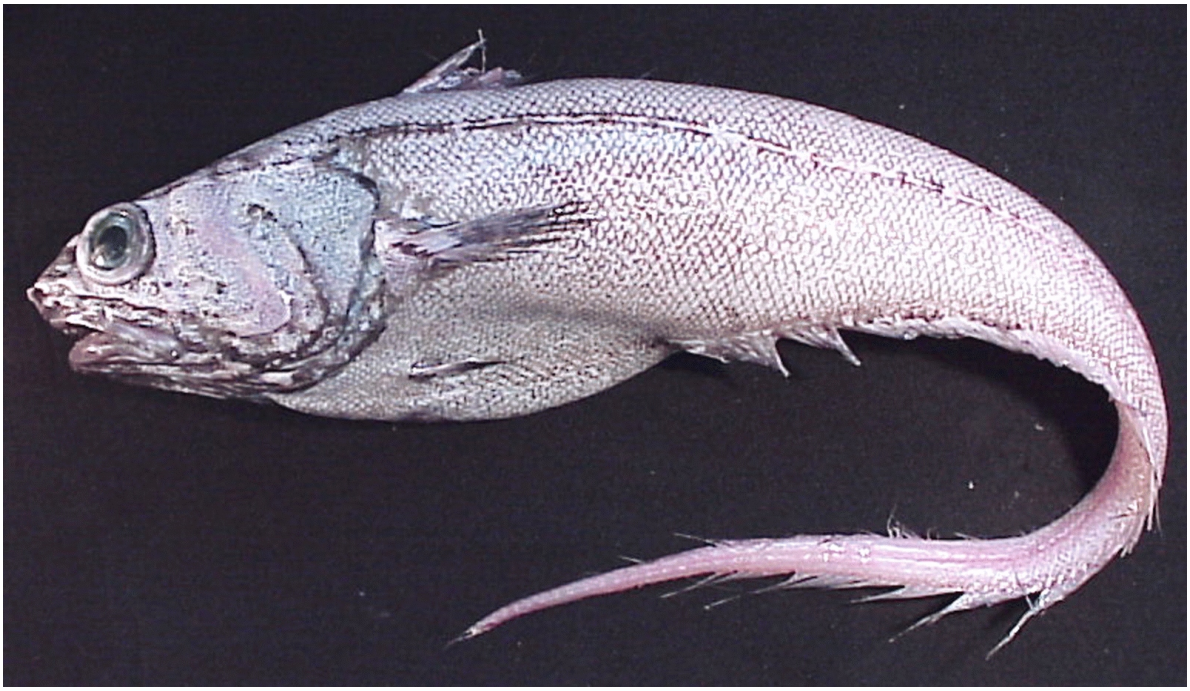


Figure 3.5-33. The giant grenadier, *Albatrossia pectoralis.*

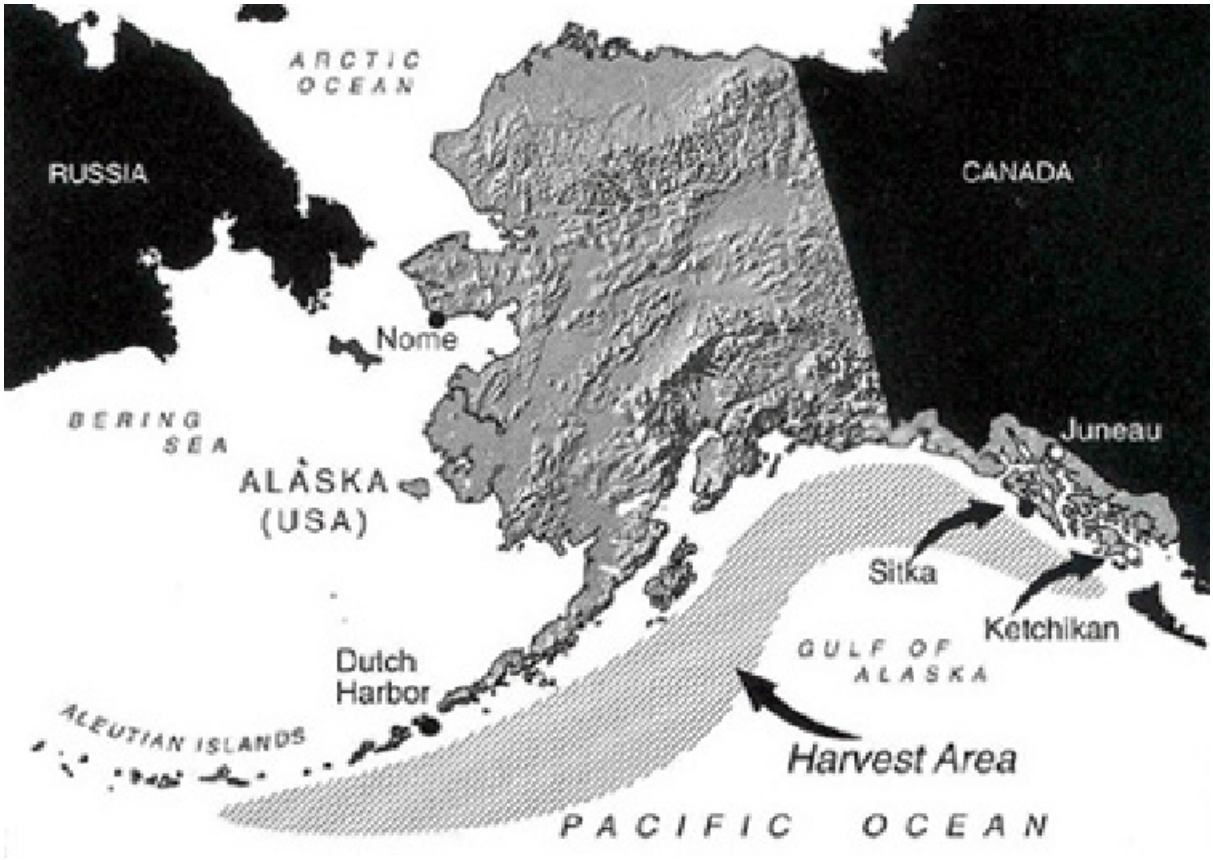


Figure 3.5-34. Distribution of grenadiers (sablefish) in the Gulf of Alaska (harvest area map from eastern Yakutat to the western gulf area).

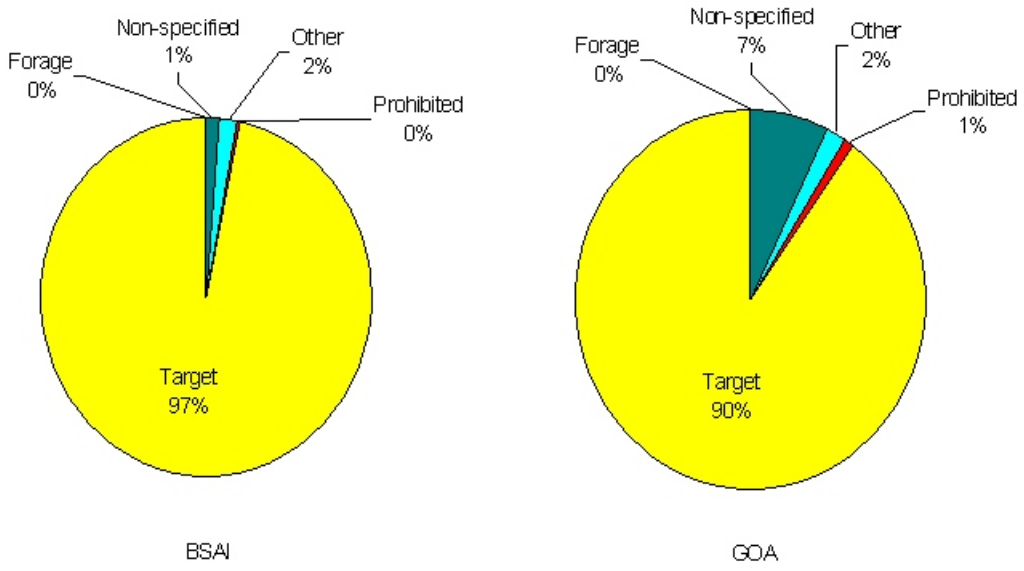


Figure 3.5-35. All catch (retained and discarded) by fishery management plan species category in each area, 1997 to 1999. Proportions are based on weight. Non-target species include the forage, nonspecified, other, and prohibited species categories.

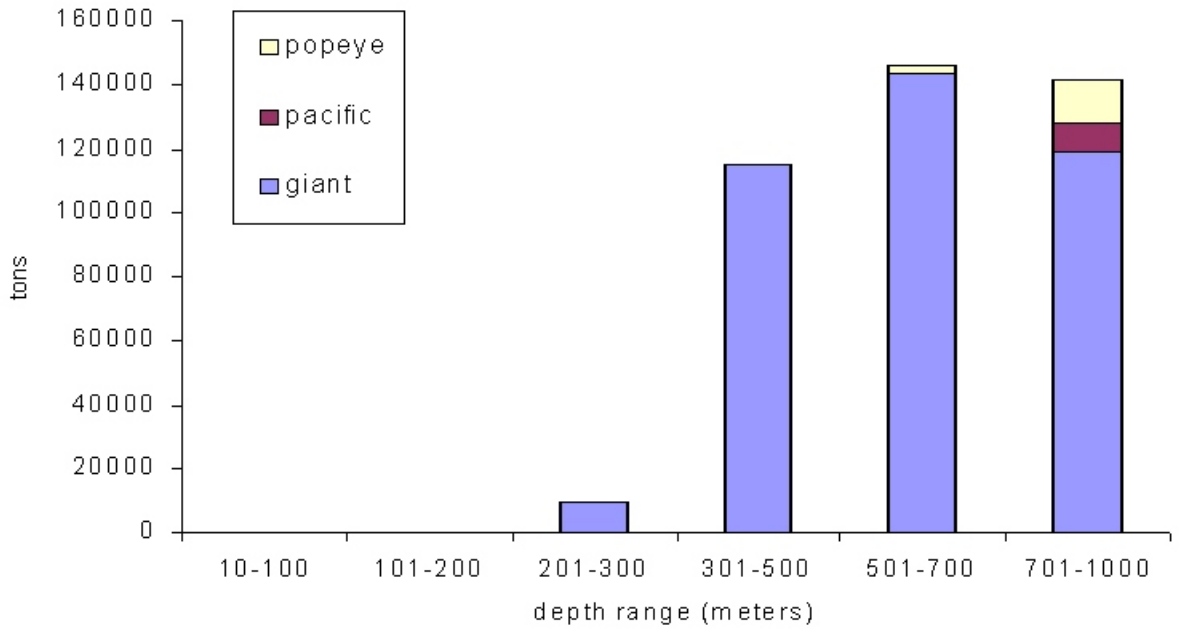


Figure 3.5-36. Depth distribution of grenadier biomass in the 1999 Gulf of Alaska survey.

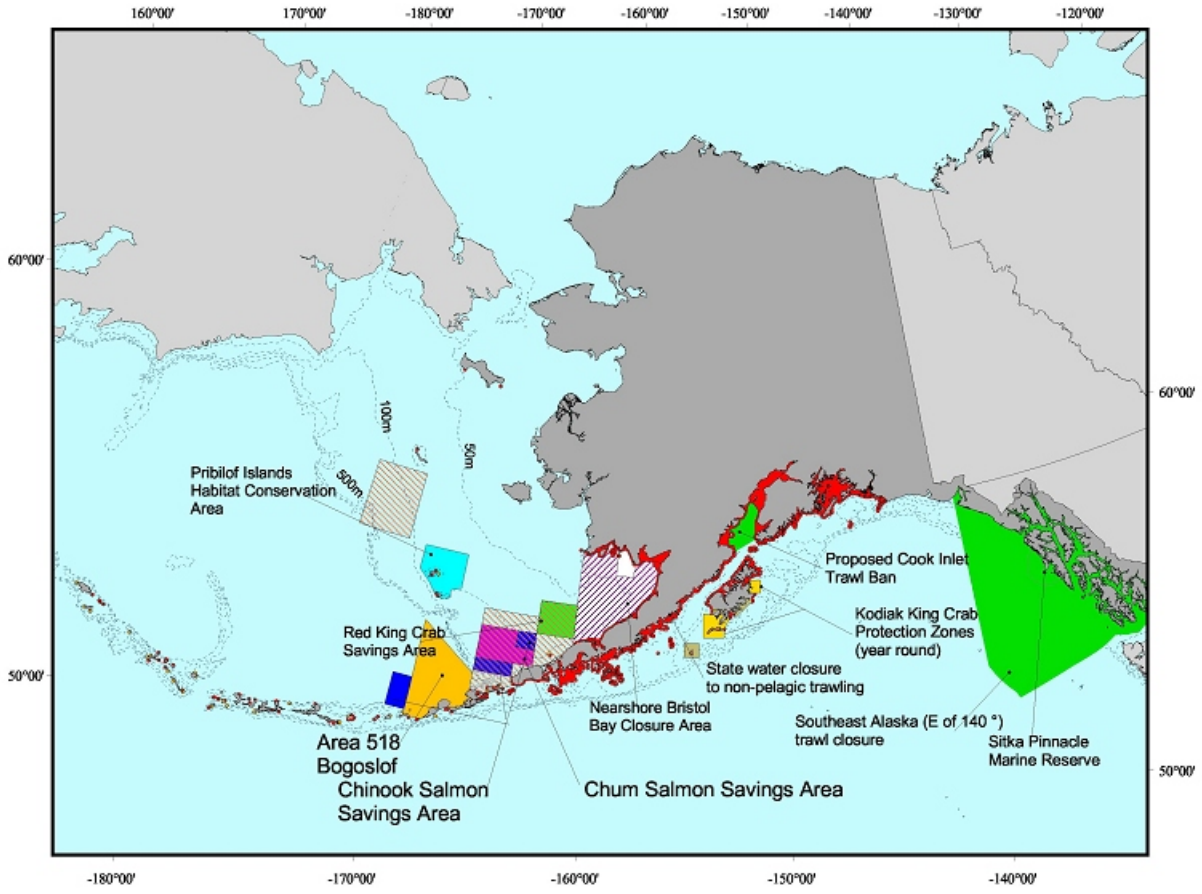


Figure 3.6-1. Groundfish closures in Alaska's exclusive economic zone. Source: C. Coon, NPFMC.

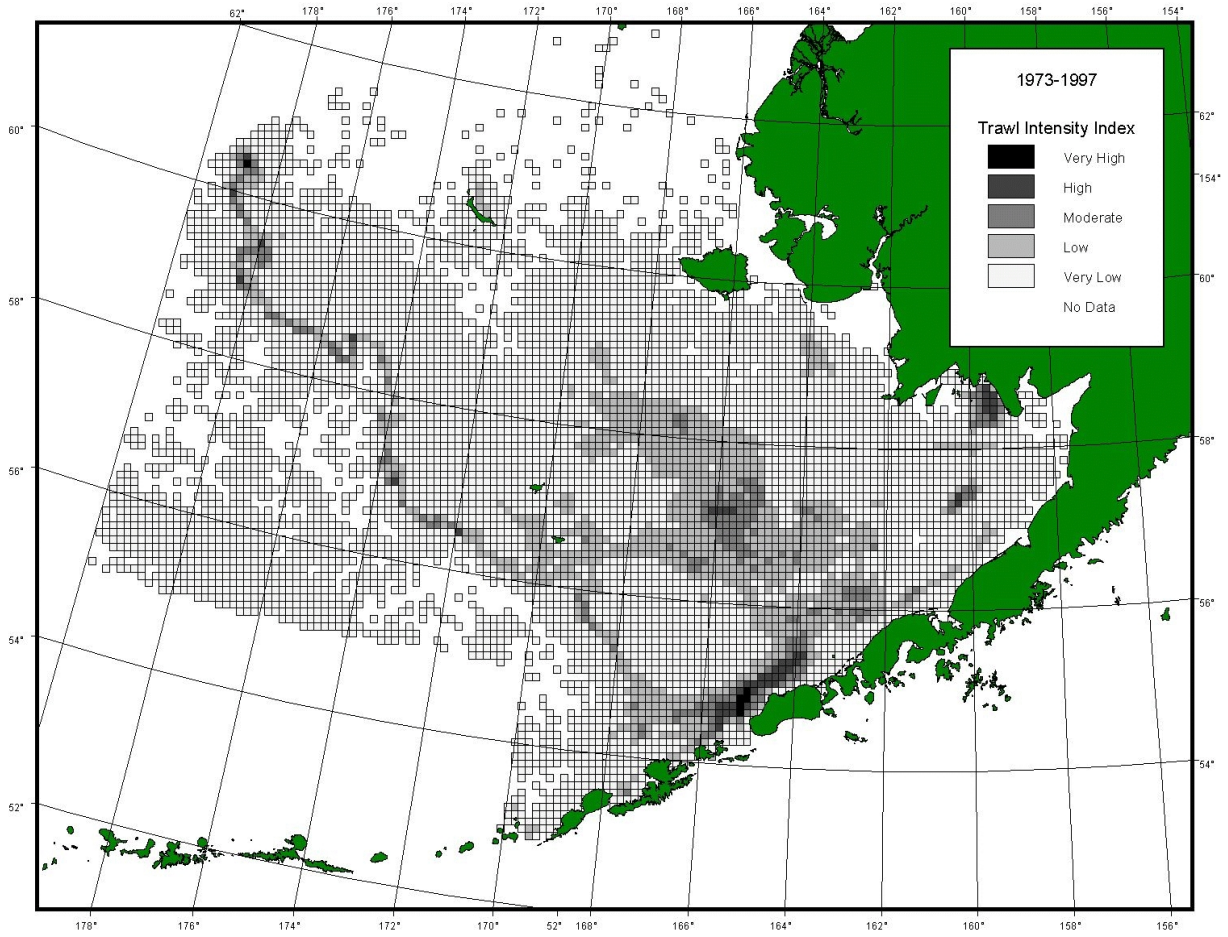


Figure 3.6-2. Location and intensity of bottom trawl efforts in the Bering Sea, 1973-1997. Source: NMFS

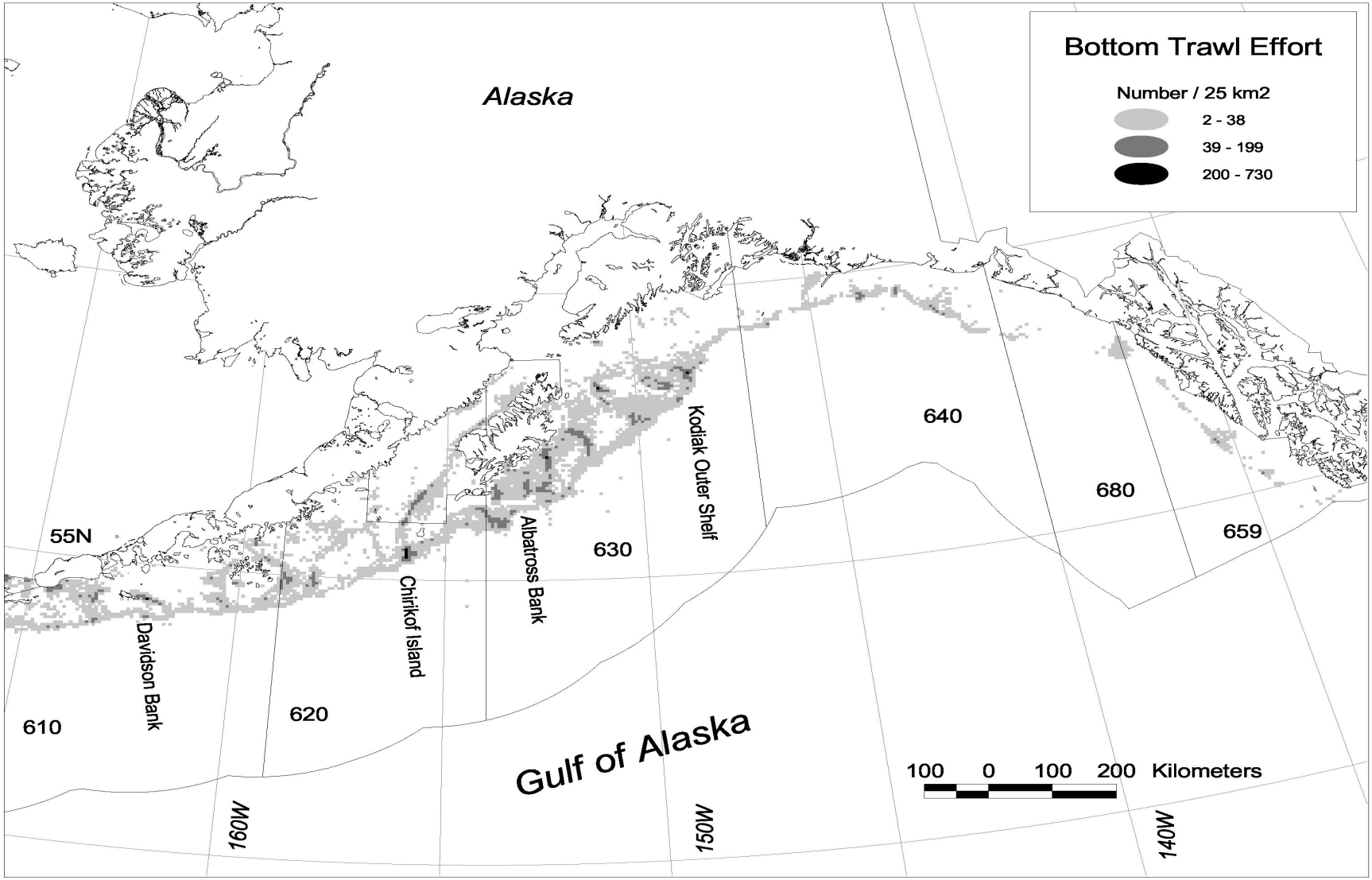


Figure 3.6-3. Location and density of bottom trawl efforts in the Gulf of Alaska, 1990-1998. Source: NMFS.

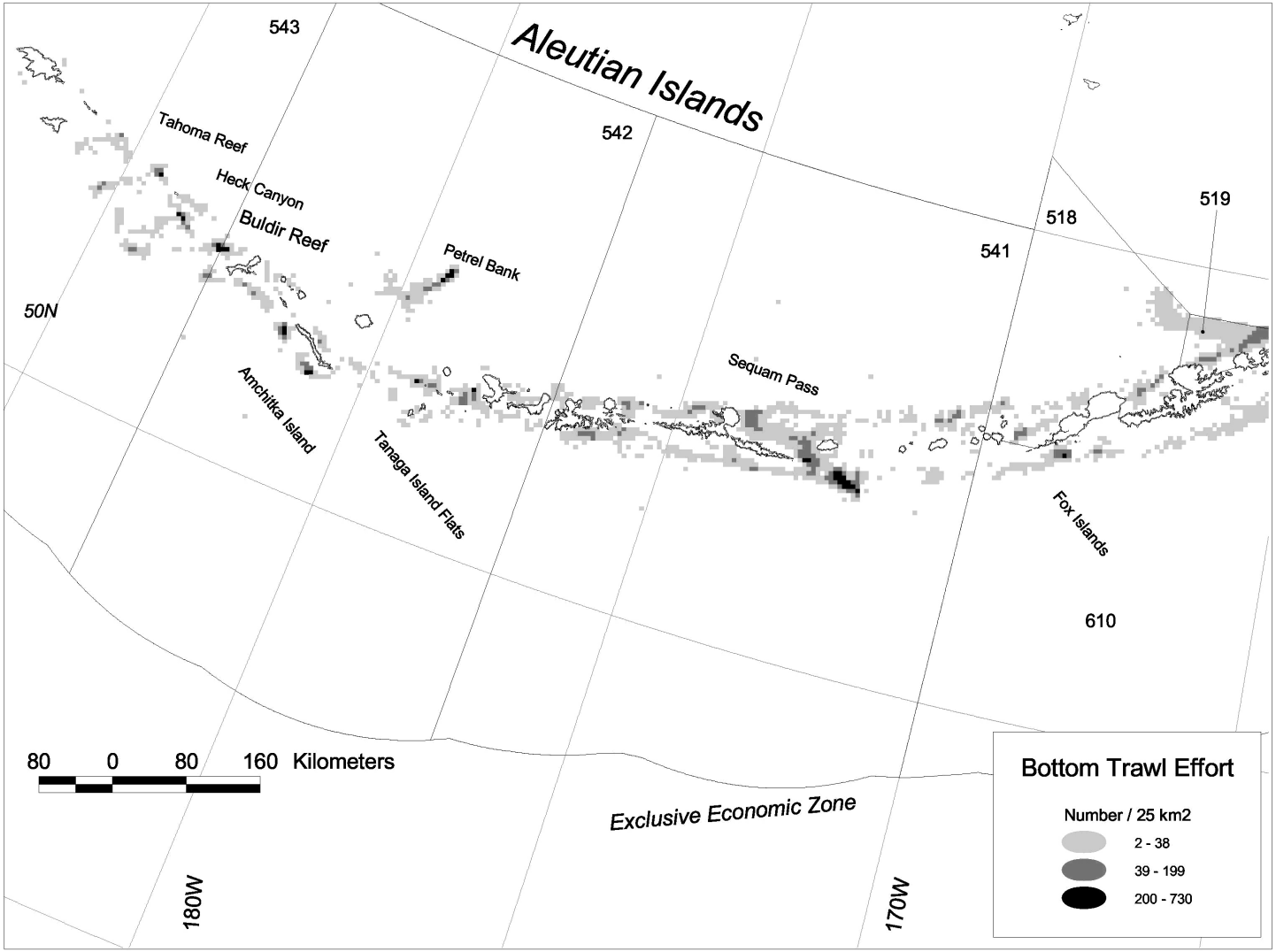
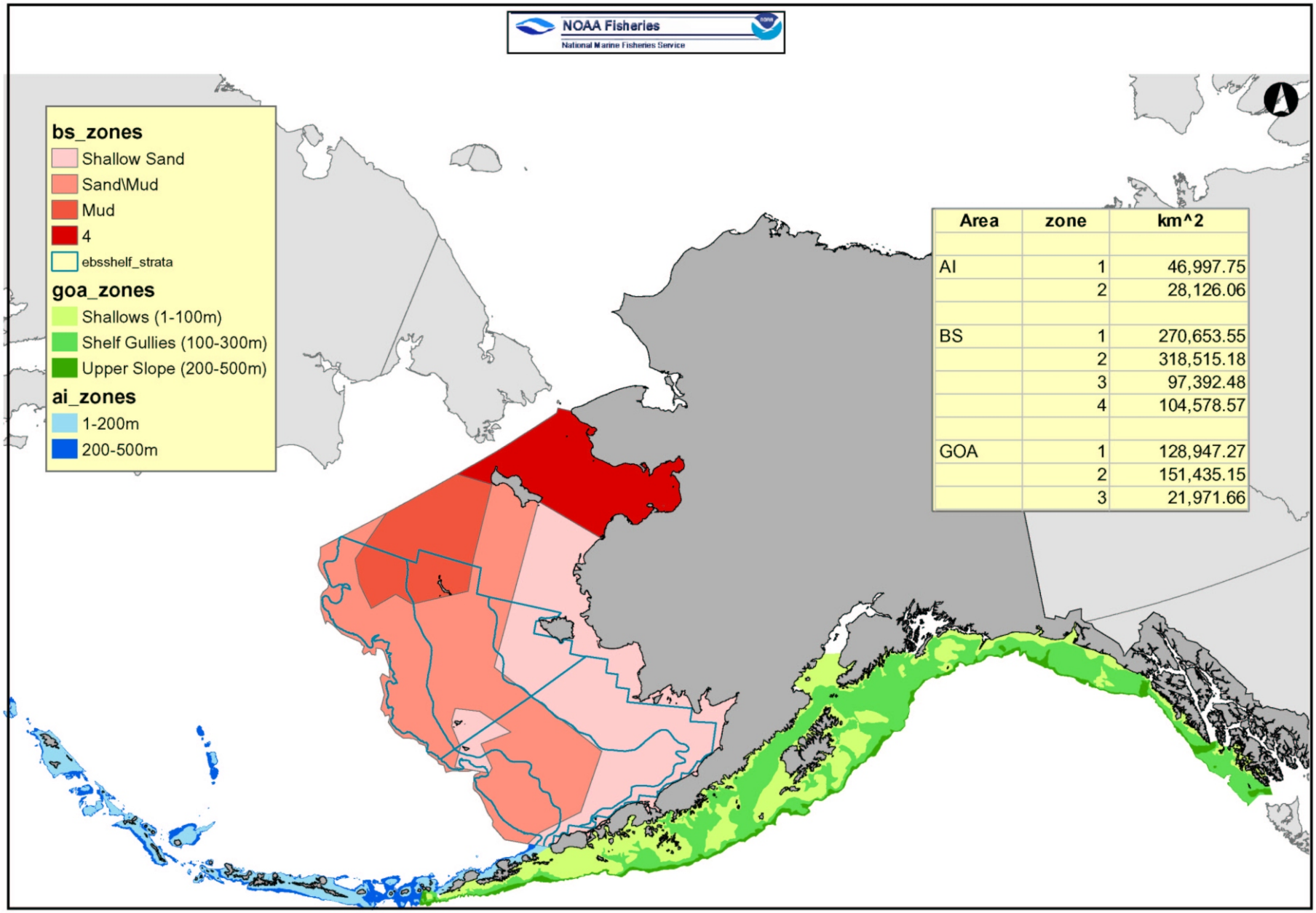


Figure 3.6-4. Location and density of bottom trawl effort in the Aleutian Islands, 1990-1998. Source: NMFS.



Area	zone	km^2
AI	1	46,997.75
	2	28,126.06
BS	1	270,653.55
	2	318,515.18
	3	97,392.48
	4	104,578.57
GOA	1	128,947.27
	2	151,435.15
	3	21,971.66

Figure 3.6-5. Essential fish habitat delineation.

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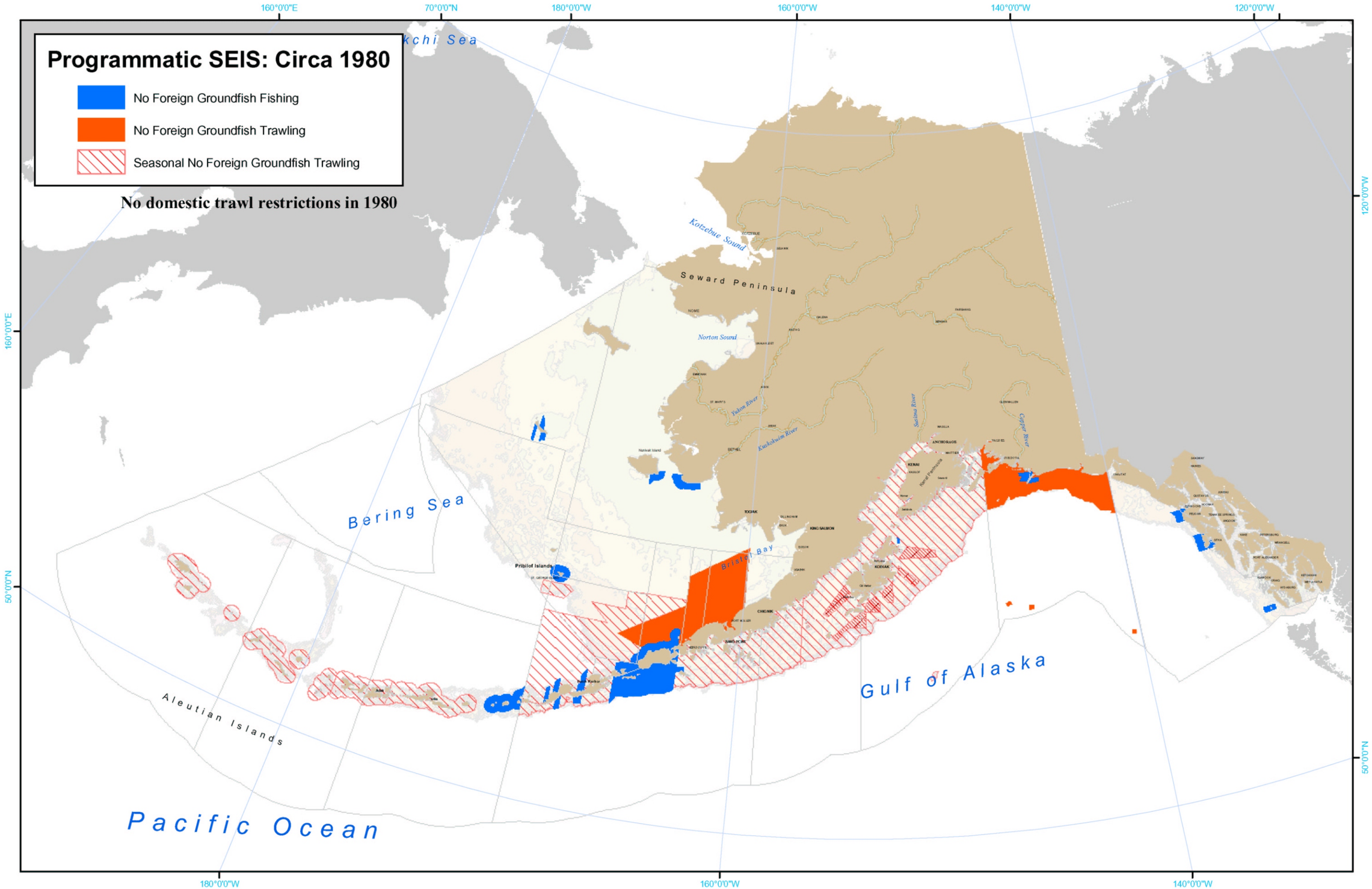


Figure 3.6-6. Groundfish no-trawl areas, Circa 1980

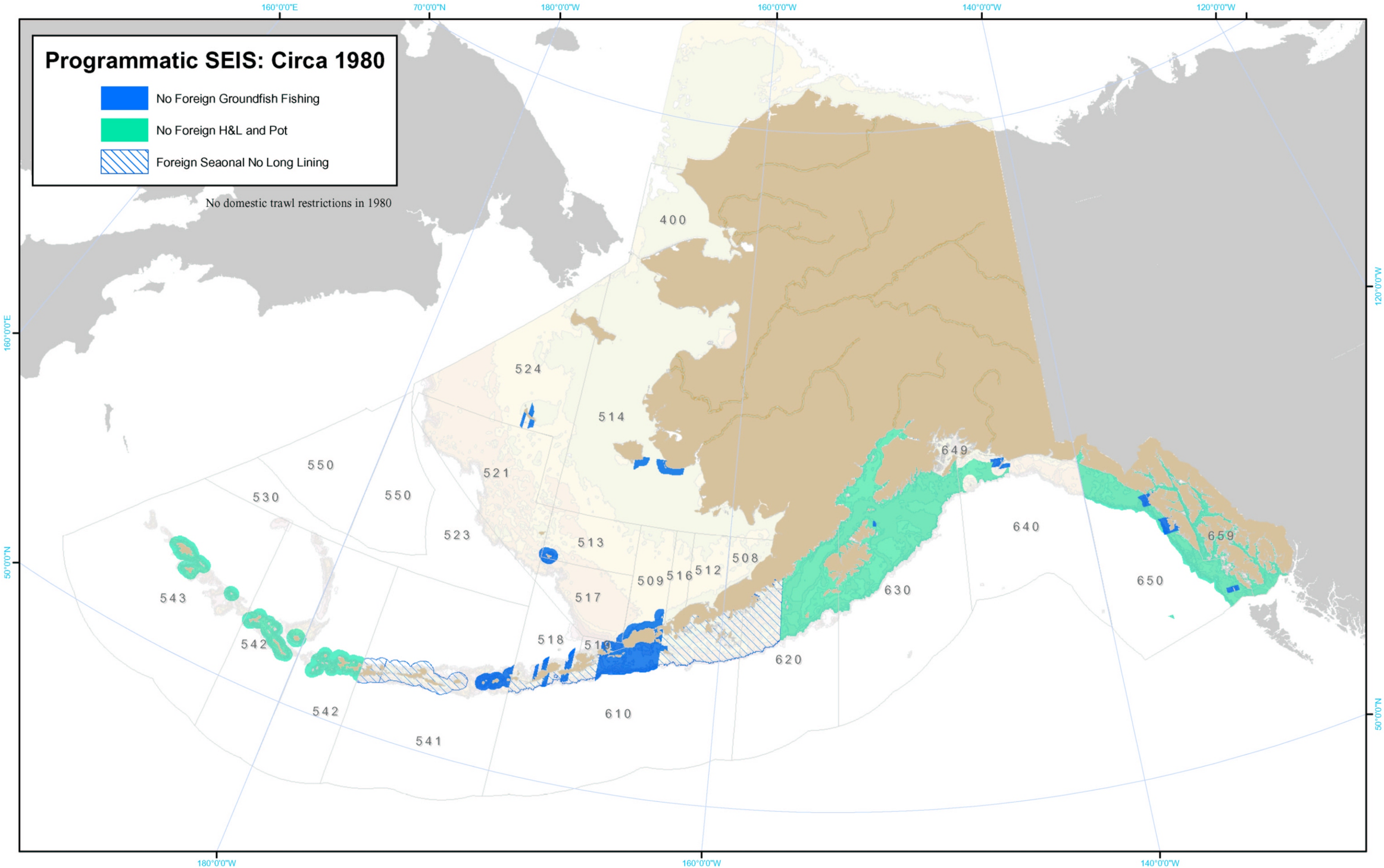


Figure 3.6-7. Groundfish areas closed to fixed gear, Circa 1980

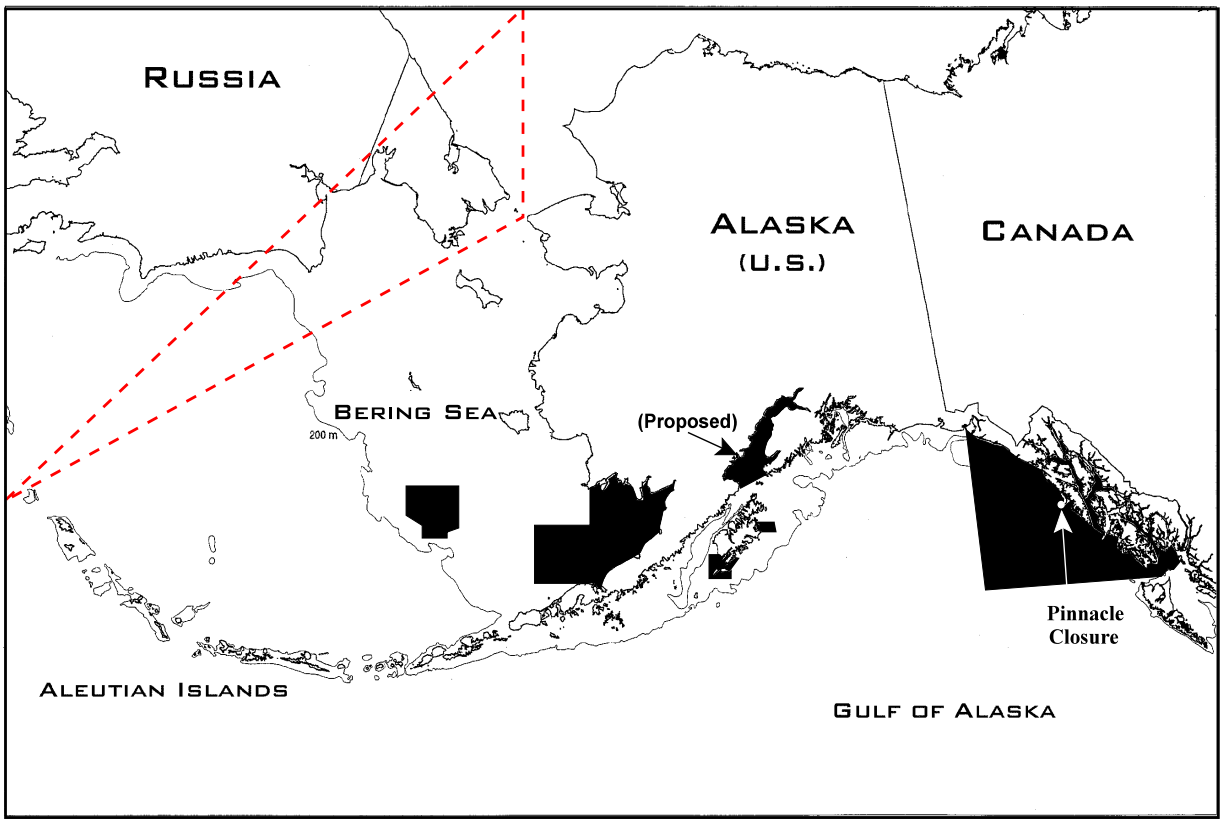


Figure 3.6-8. Marine protected areas off Alaska where trawling is prohibited year-round to protect habitat, reduce bycatch, and reduce competition with marine mammals.

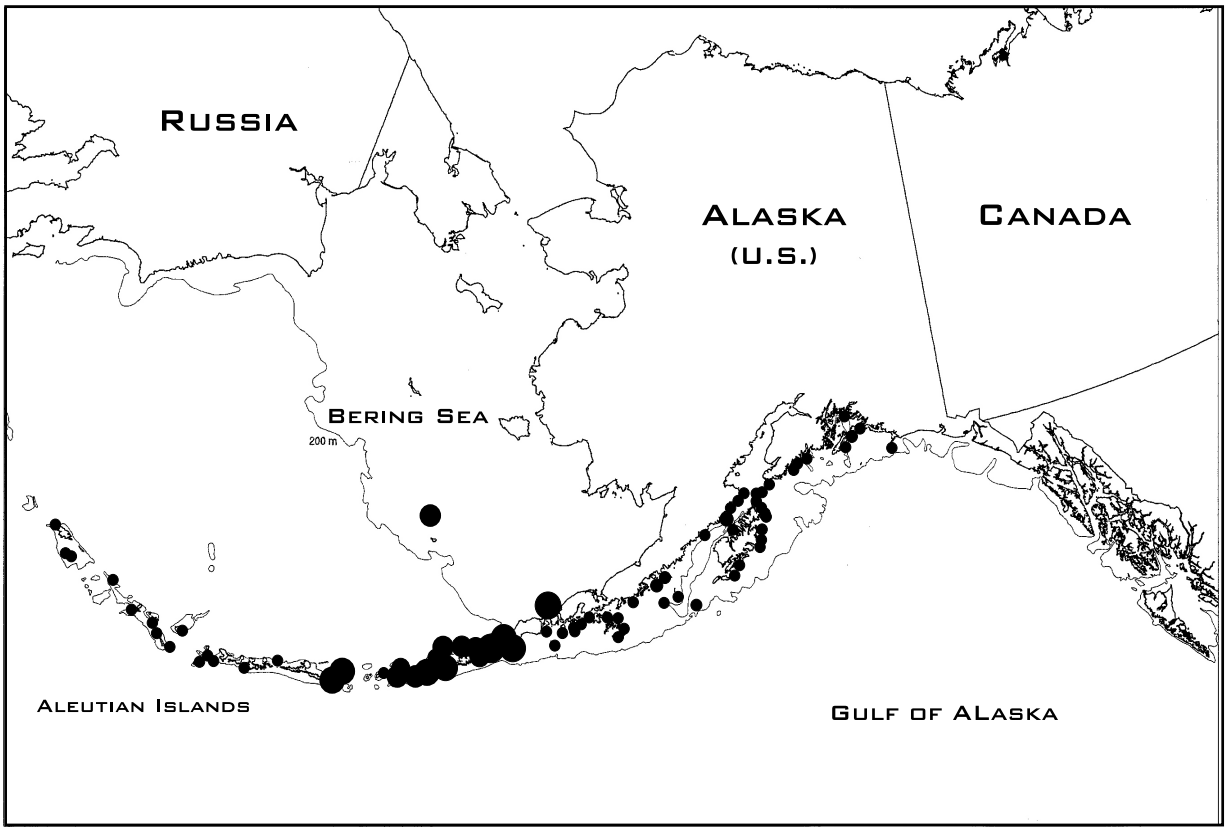


Figure 3.6-9. Zones around Steller sea lion rookeries and haulouts where pollock trawling is prohibited to reduce competition for prey. The no-trawling zones were temporarily extended under court order in August 2000. Source: NMFS.

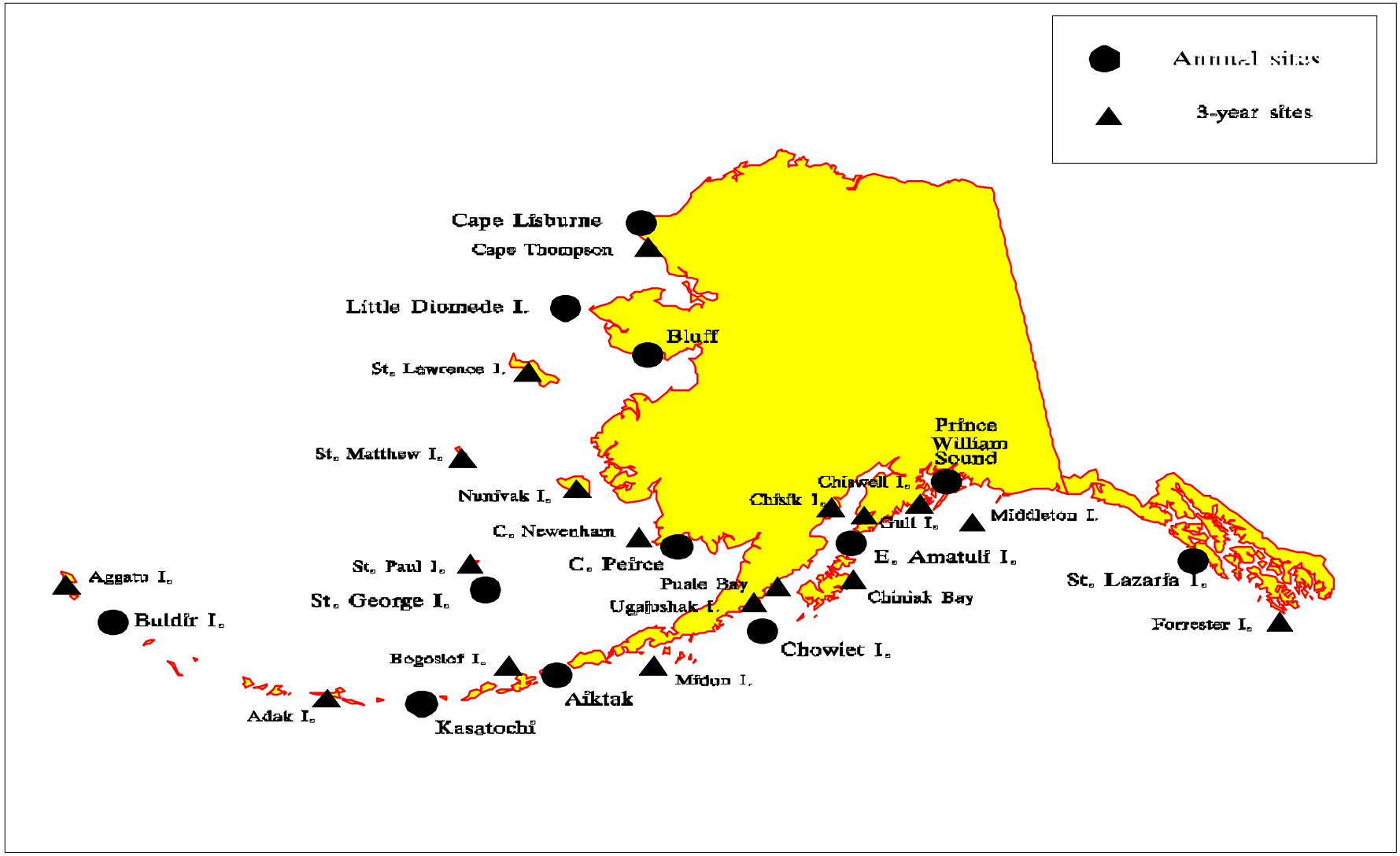


Figure 3.7-1. Location of seabird colony sites in Alaska monitored by the U.S. Fish and Wildlife Service and the U.S. Geological Survey Biological Research Division. Circles indicate sites monitored annually, triangles indicate sites monitored on a three-year rotation.

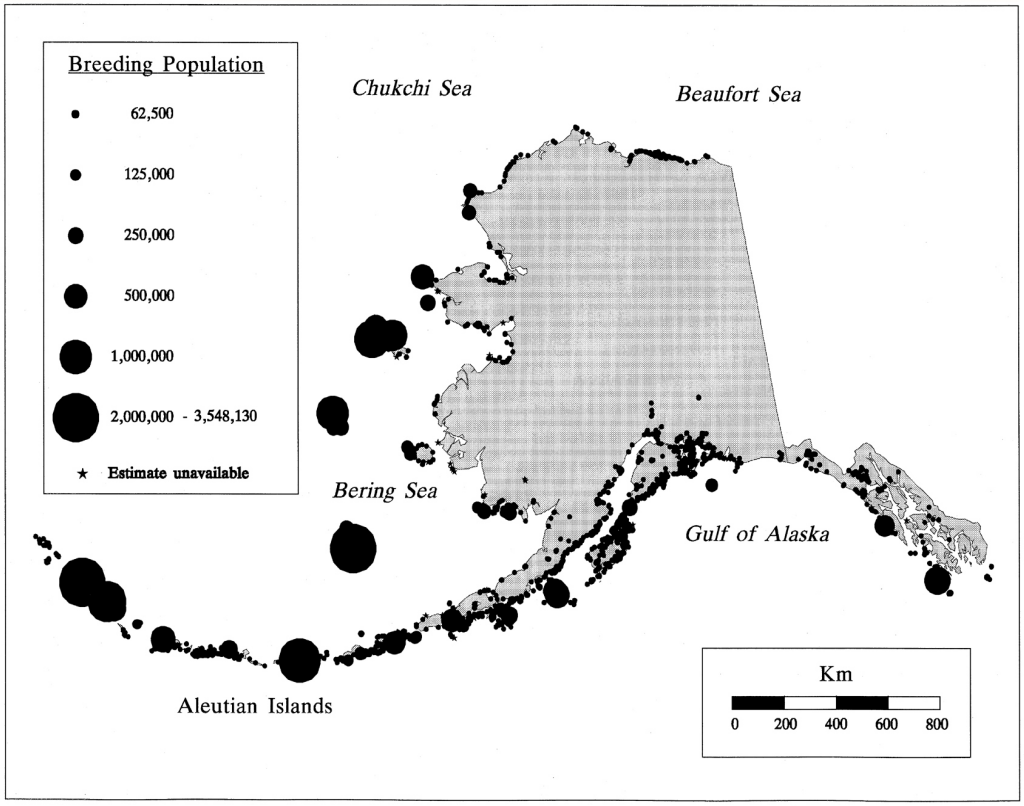


Figure 3.7-2. Seabird colonies of Alaska. Source: USFWS 2000.

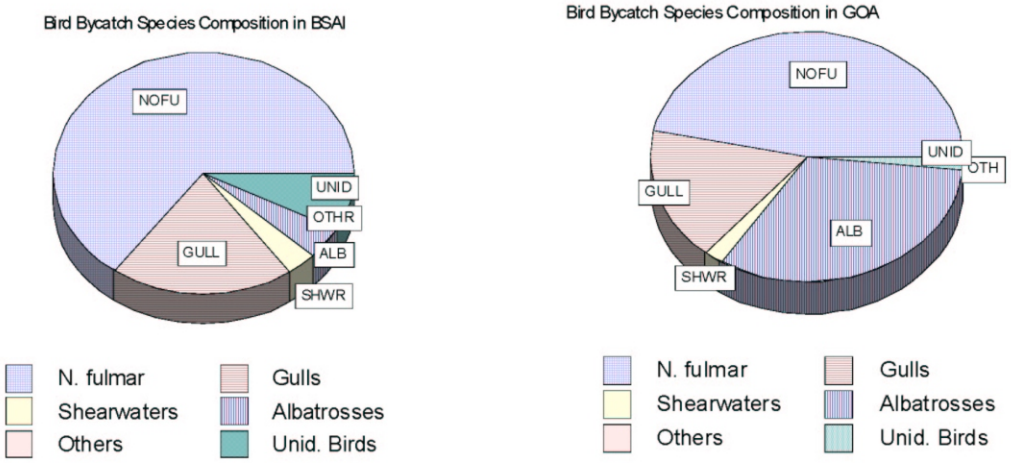


Figure 3.7-3. Relative species composition of seabird incidental catch in the longline fisheries, Bering Sea and Aleutian Islands (left) and Gulf of Alaska (right). Average annual estimates, 1997-2001.

Figure 3.7-4. Average annual estimate of number of seabirds taken by gear type, 1997-2001. Estimates differ based on trawl sampling methodology used.

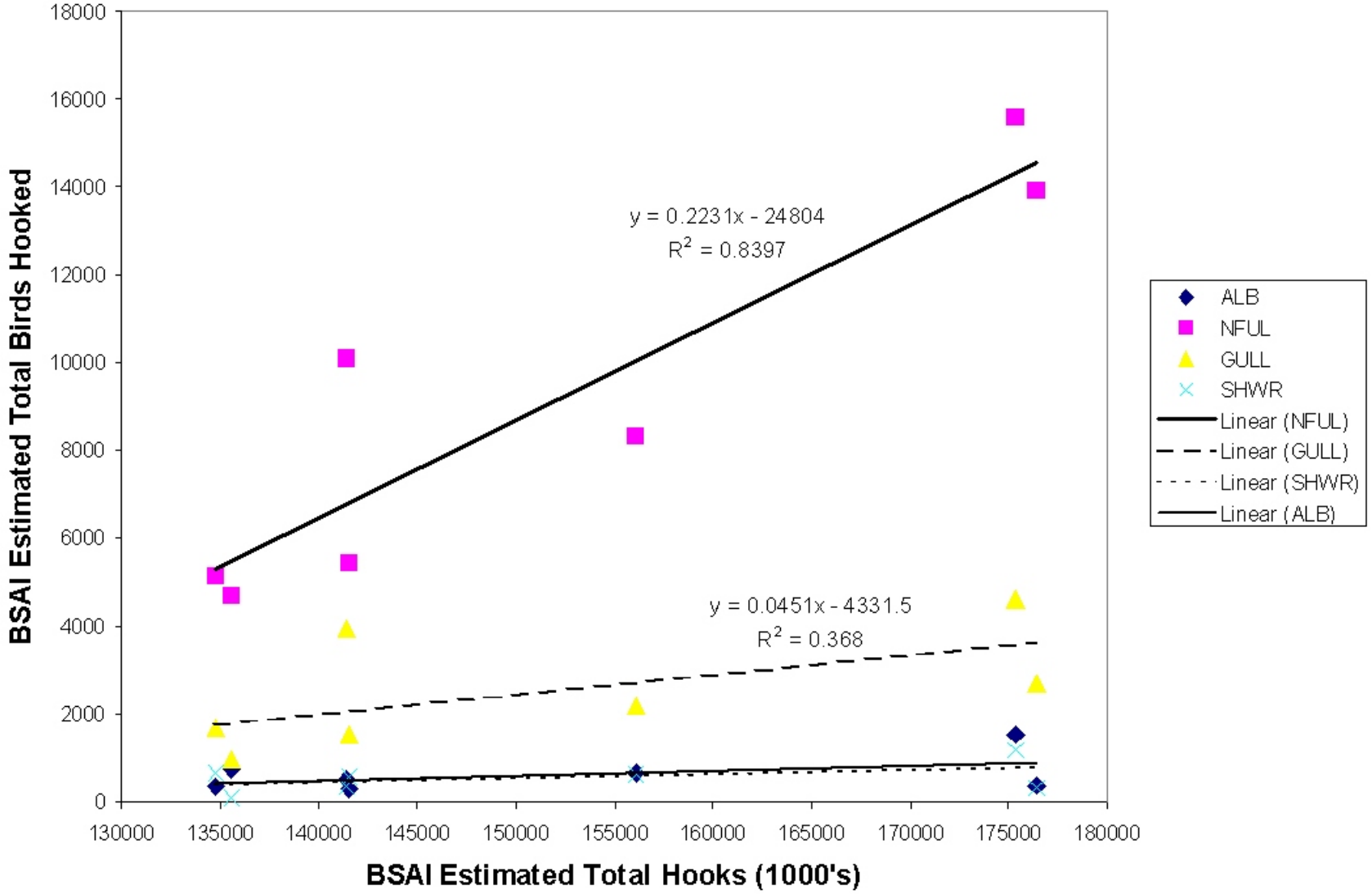


Figure 3.7-5. Relationship between fishing effort and number of birds hooked in the Bering Sea and Aleutian Islands, 1993-1994.

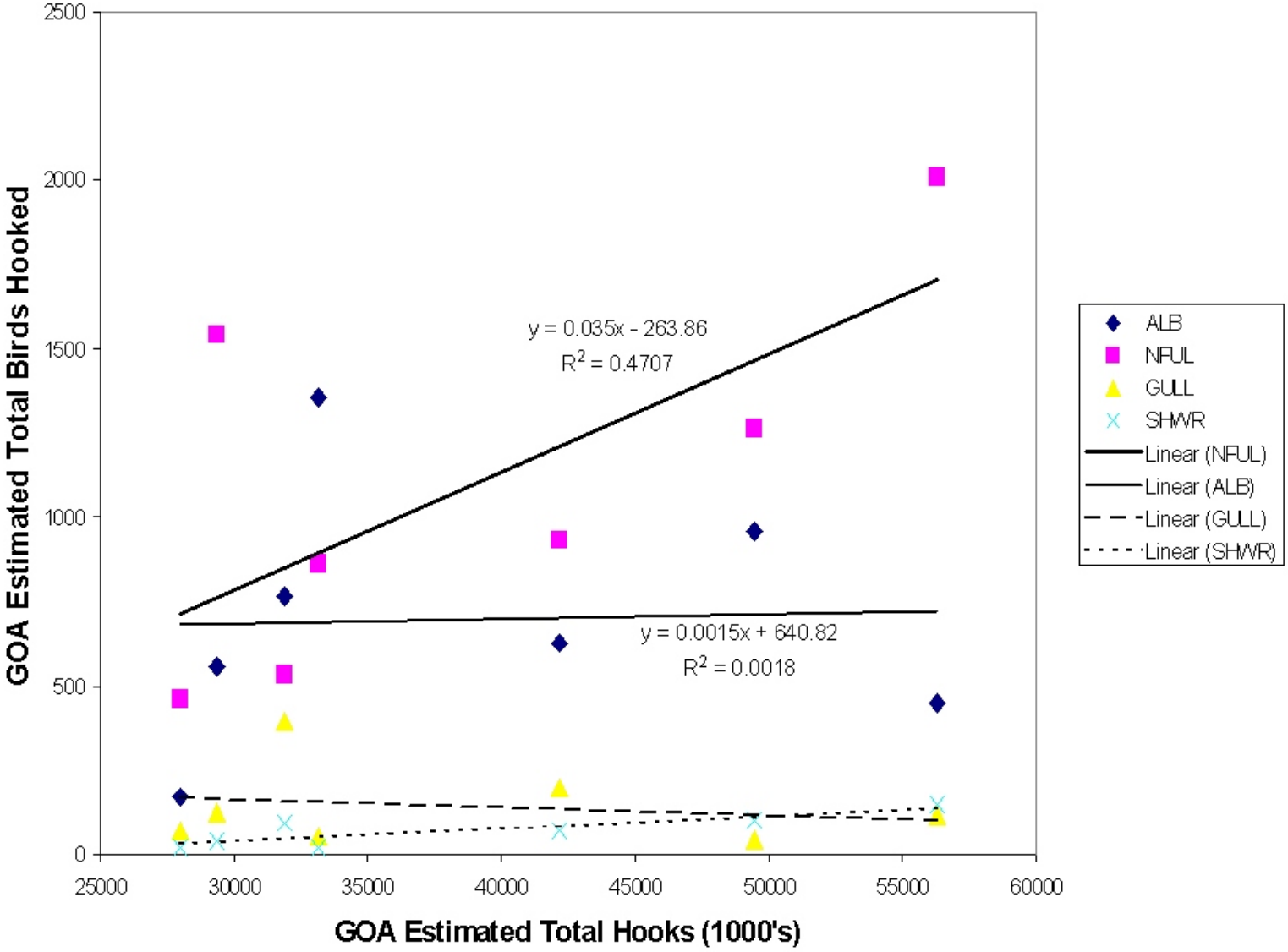


Figure 3.7-6. Relationship between fishing effort and number of birds hooked in the Gulf of Alaska, 1993-1999.

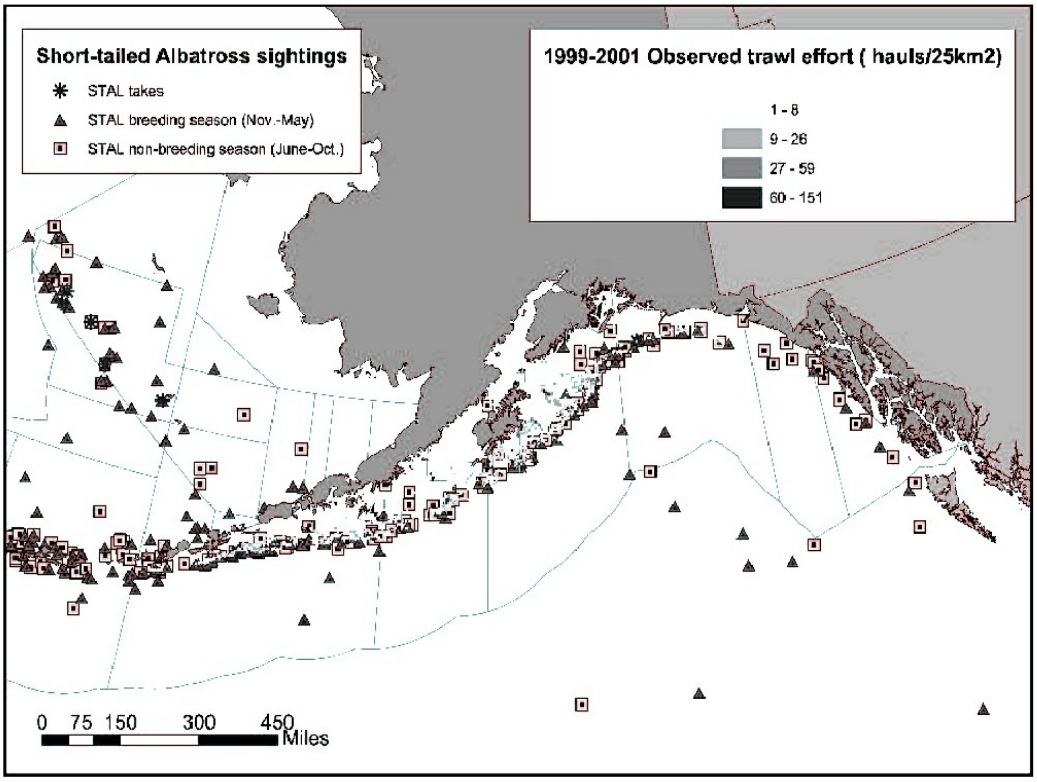


Figure 3.7-7. Distribution of short-tailed albatross in Alaskan waters.

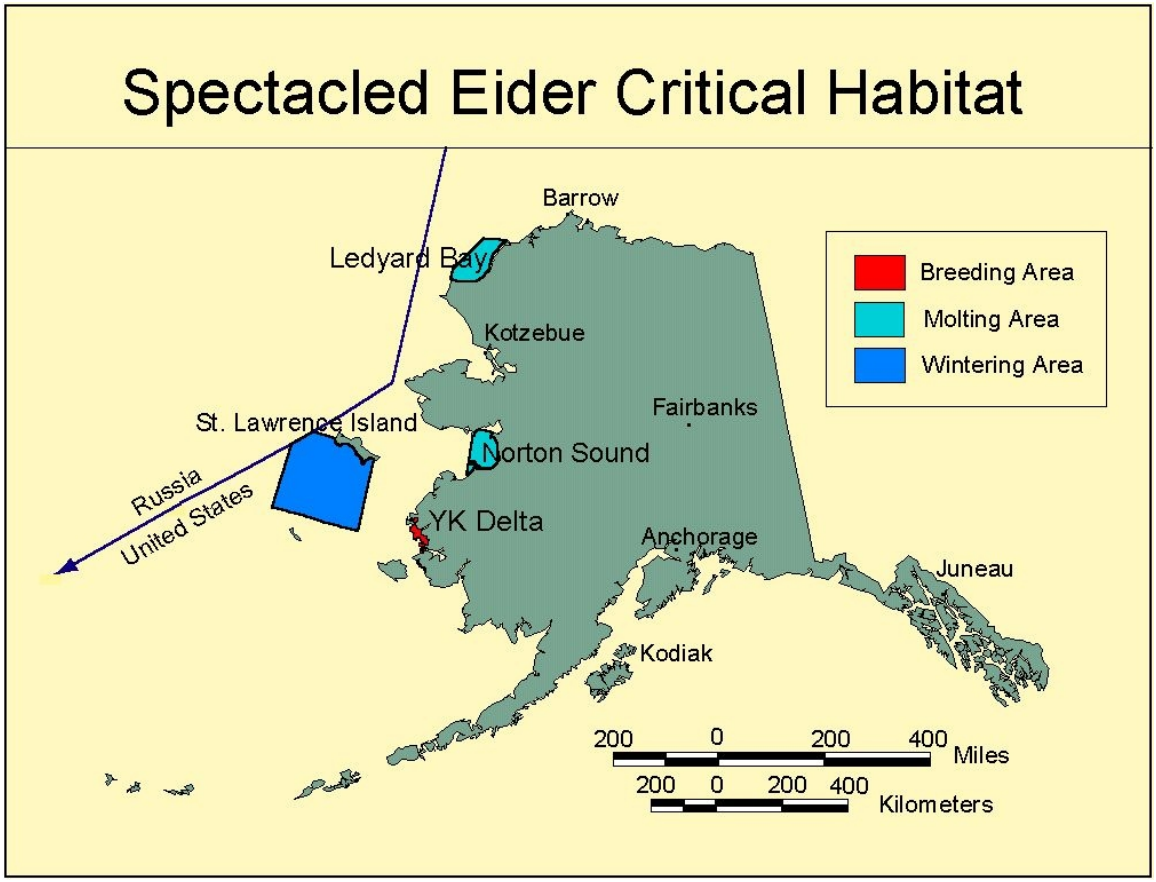


Figure 3.7-8. Spectacled eider critical habitat area map as per 66 FR 9146, Final rule February 6, 2001. Source: USFWS.

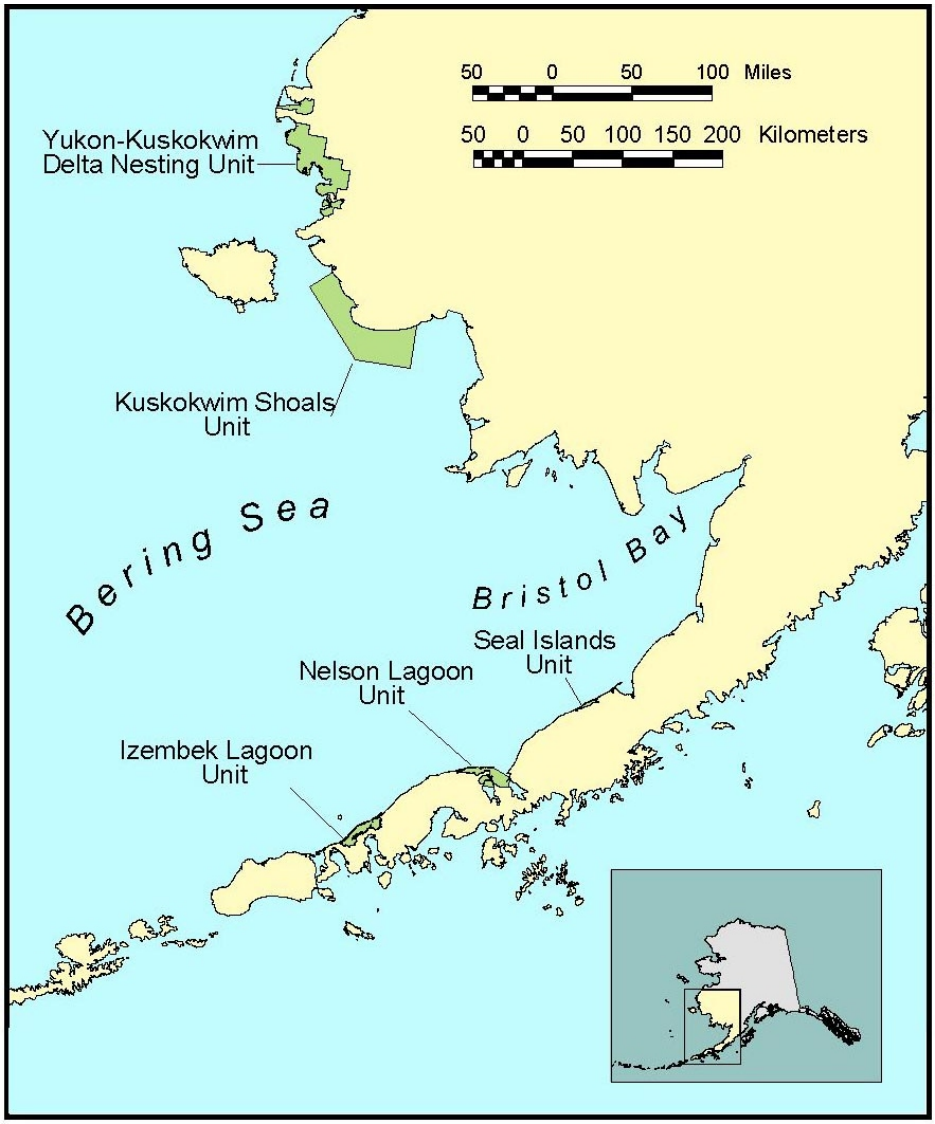


Figure 3.7-9. Steller's eider critical habitat area map as per 66 FR 8849, Final rule February 2, 2001. Source: USFWS.

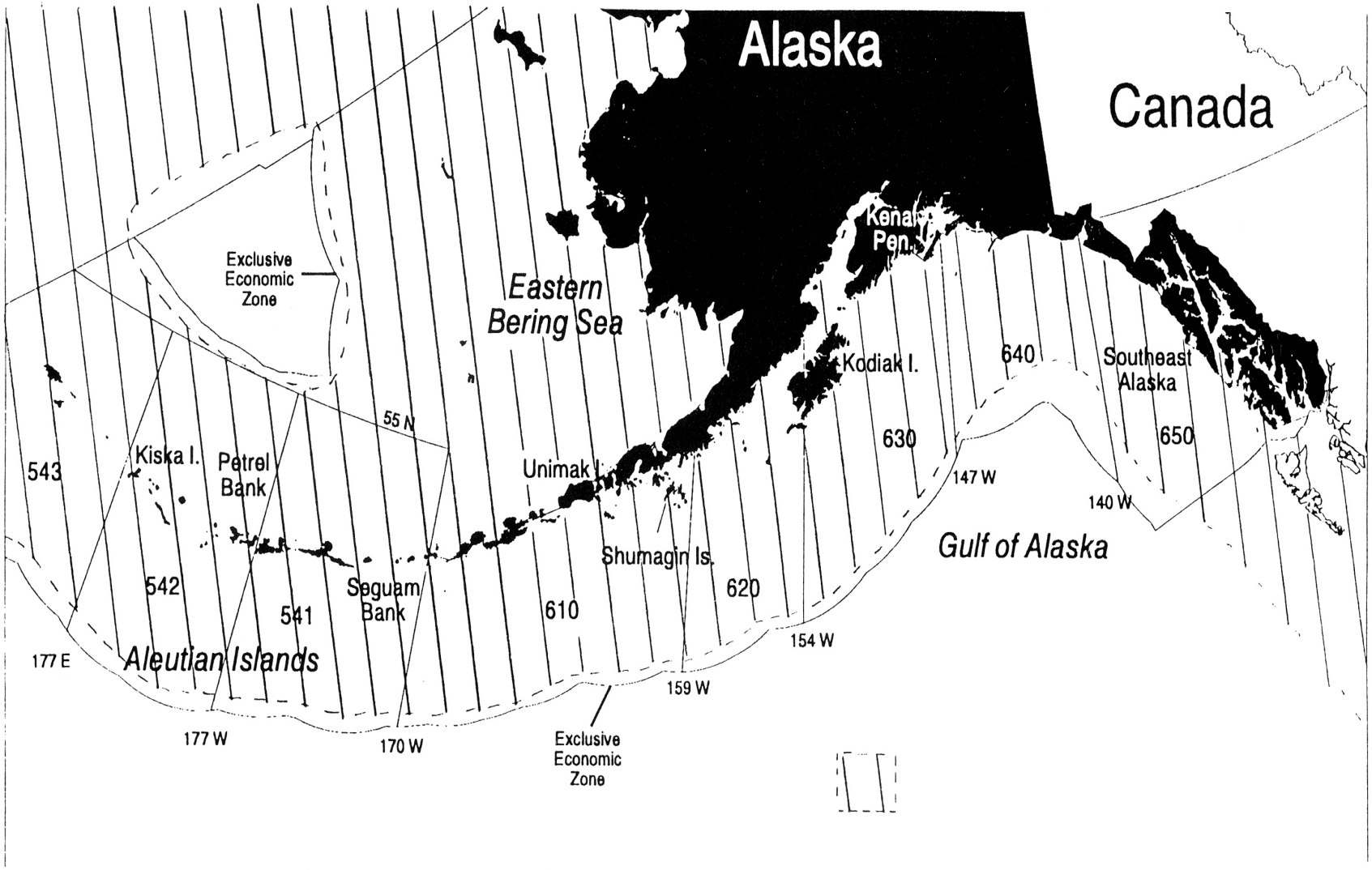


Figure 3.8-1. Steller sea lion range. The population is most abundant in the core region from the Kenai Peninsula to Kiska Island. Source: NMFS.

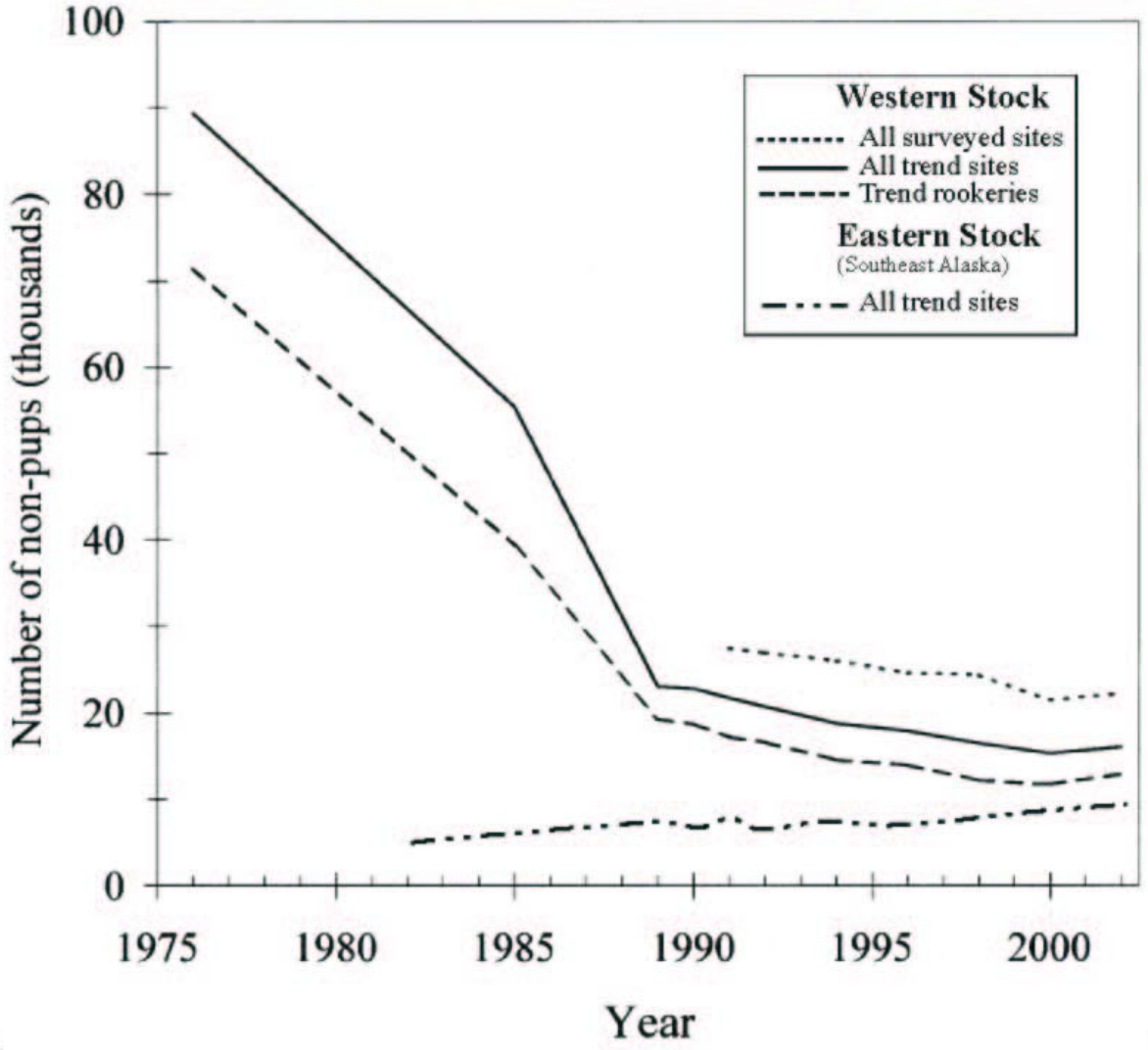


Figure 3.8-2. Steller sea lion western and eastern stock population trends, 1976-2002.

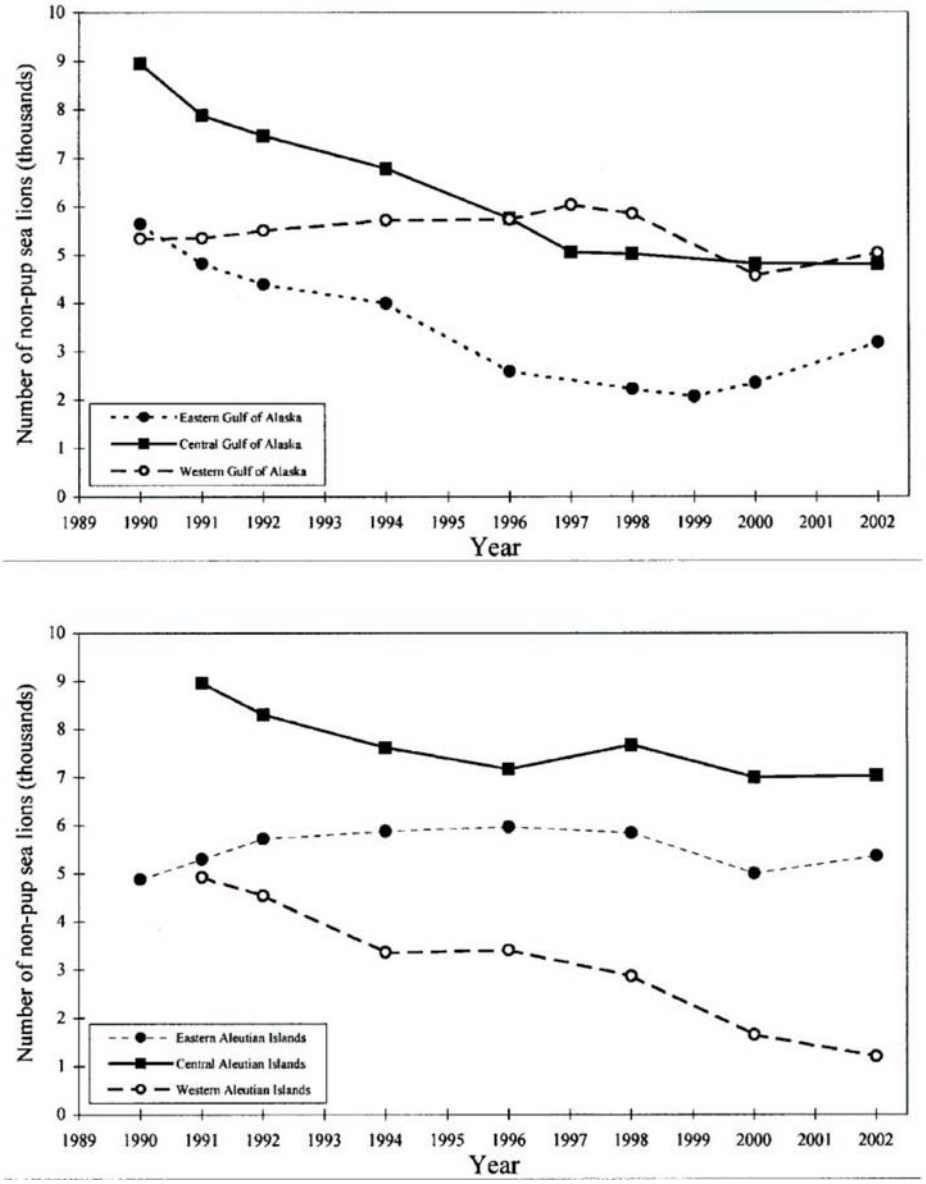


Figure 3.8-3. Counts of adults and juveniles at rookeries and haulouts by year and geographic area: Gulf of Alaska and Aleutian Islands, 1990-2002.

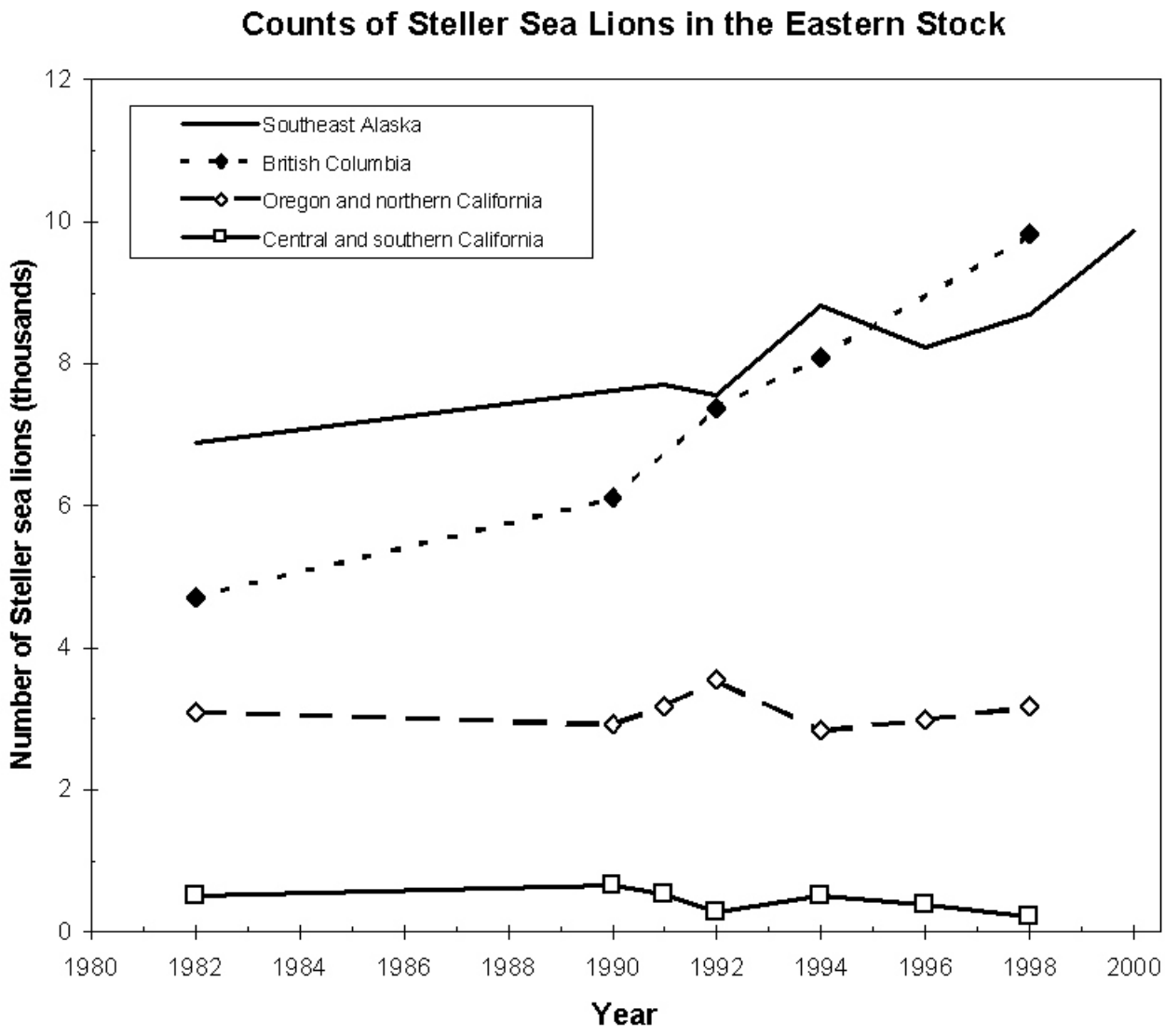


Figure 3.8-4 Counts of Steller Sea Lions in the Eastern Stock, 1982-1998. Source: Angliss et al. 2001.

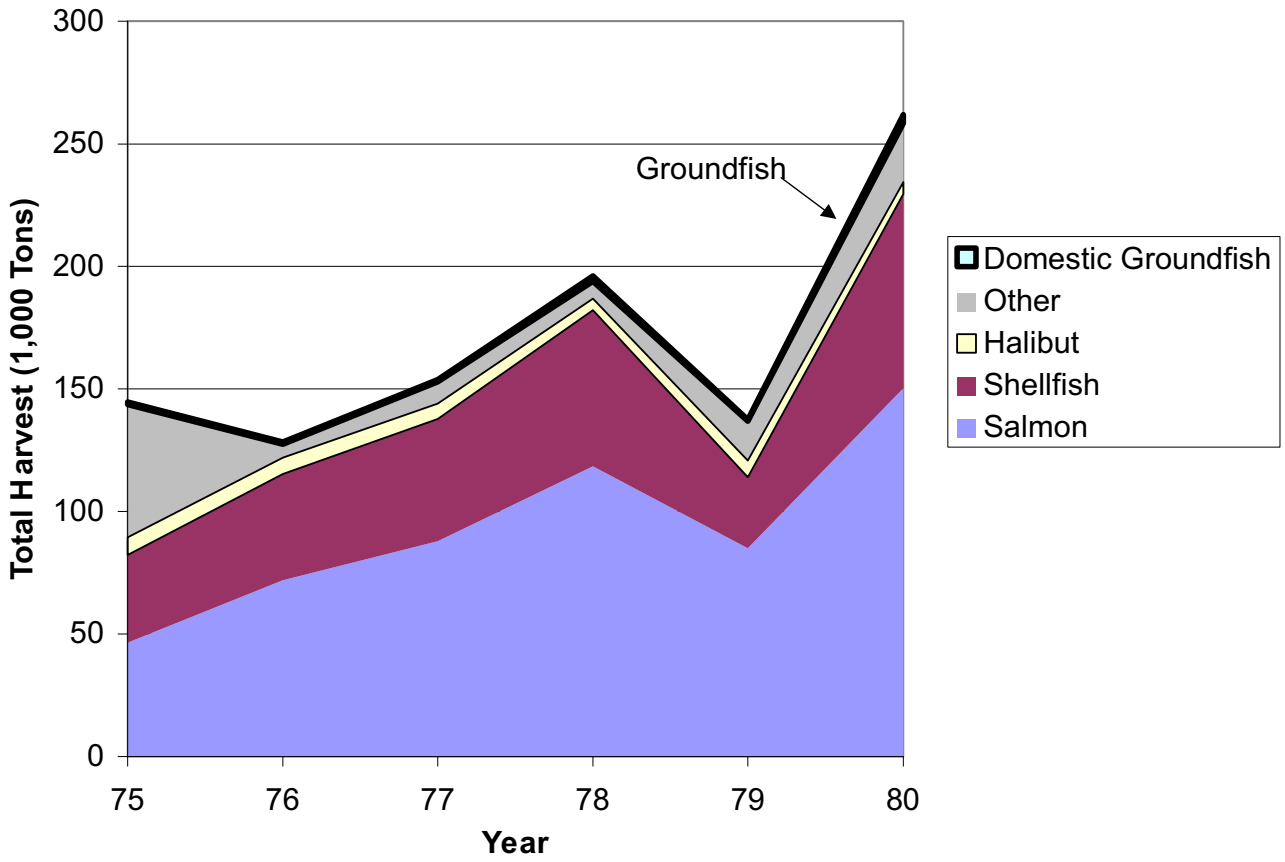


Figure 3.9-1. Domestic harvests in major Alaska fisheries, 1975-1980. Source: Commercial Operator Annual Reports.

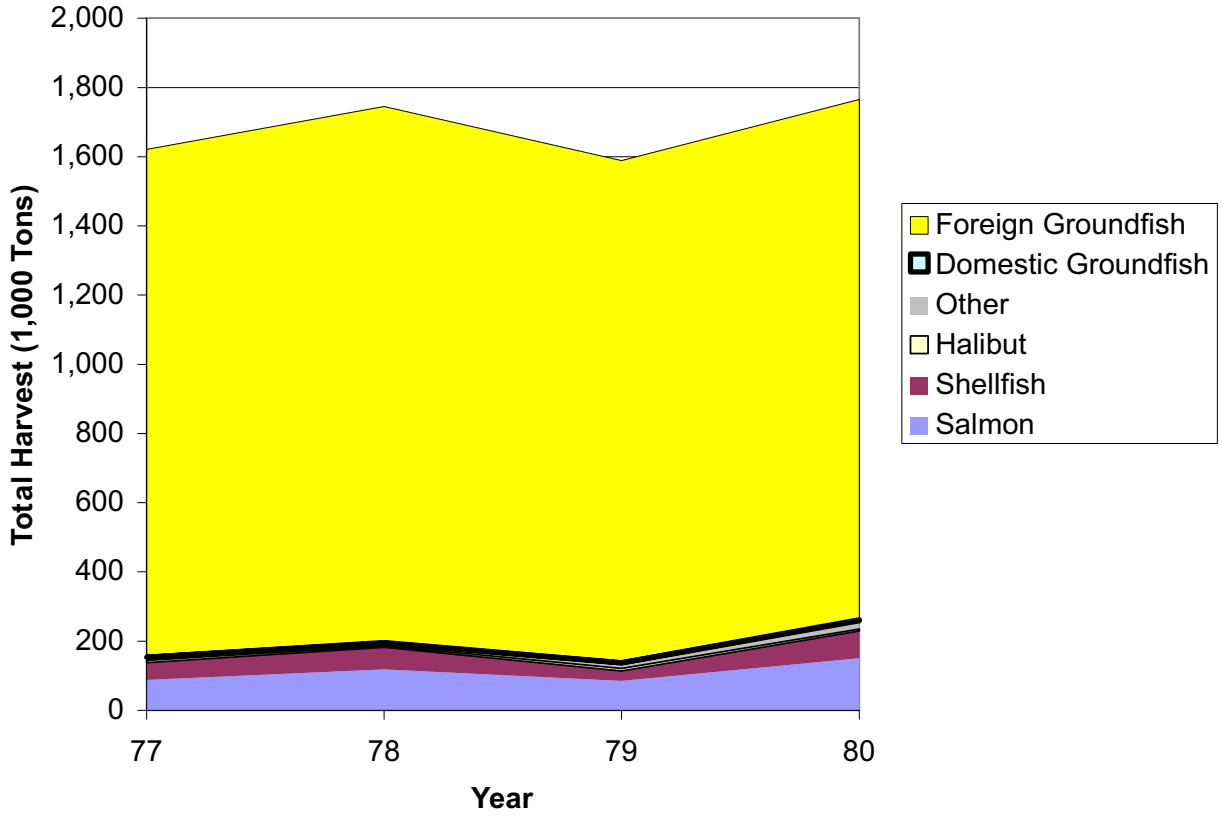


Figure 3.9-2. Foreign and domestic harvests in major Alaska fisheries, 1977-1980. Source: Commercial Operator Annual Reports and the North Pacific Groundfish Observer Program.

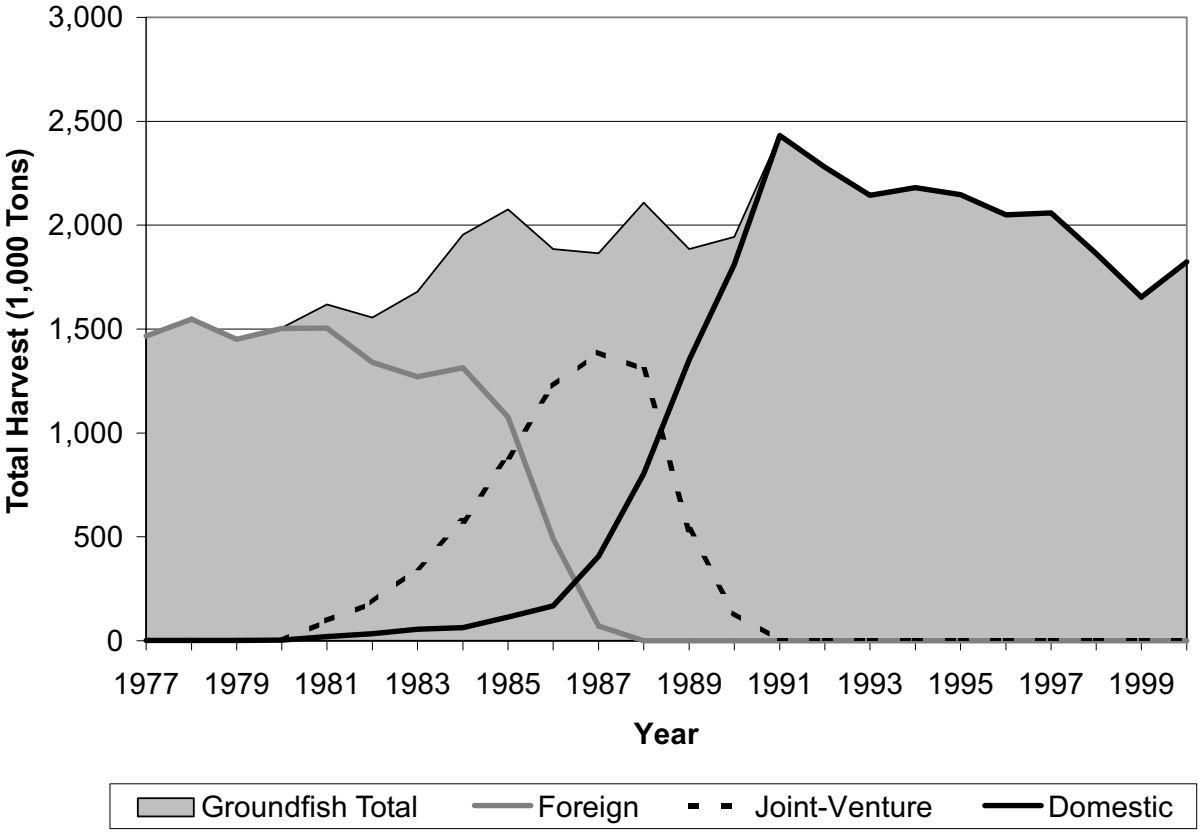


Figure 3.9-3. Foreign, joint venture, and domestic groundfish fishing and processing, 1977-2000. Source: Economic Status of the Groundfish Fisheries off Alaska and NOAA Fisheries blend data.

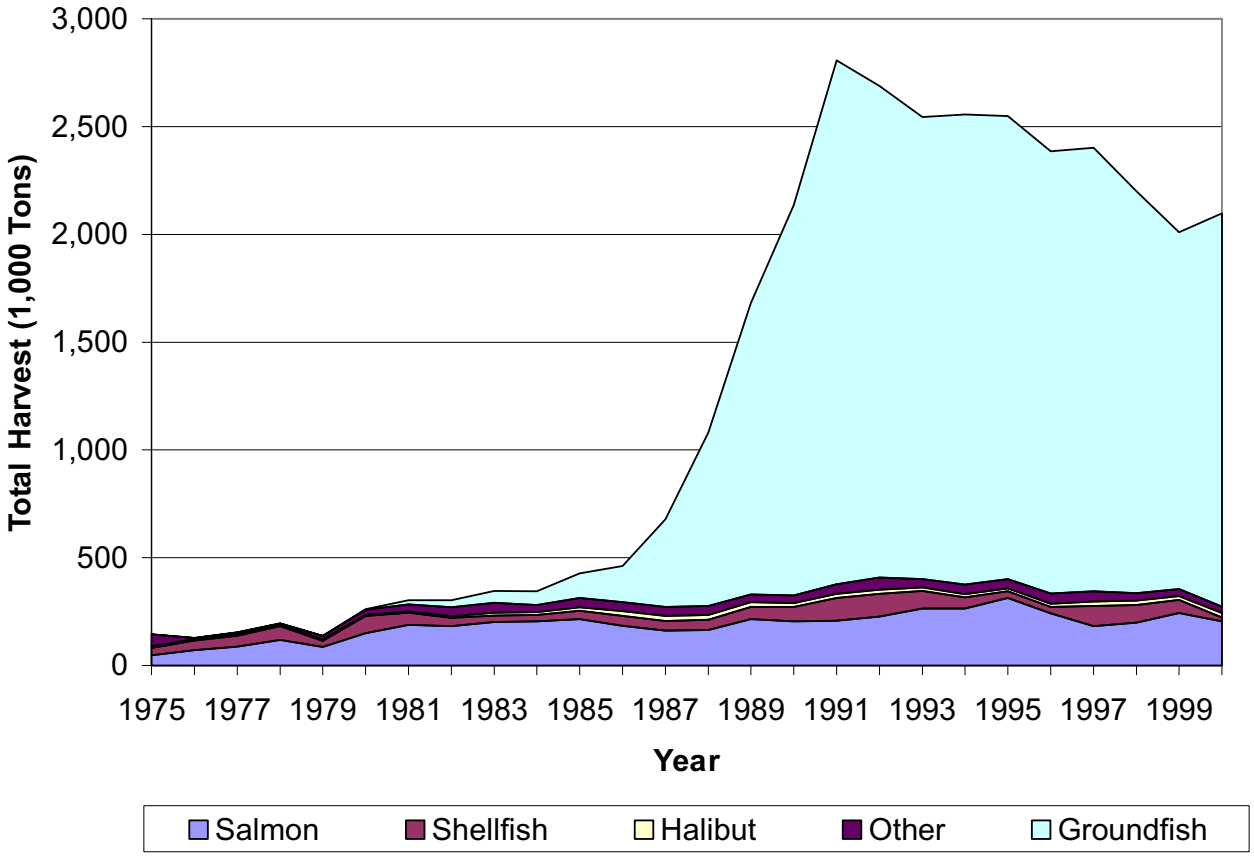


Figure 3.9-4. Volume of domestic processing of groundfish and non-groundfish species from Alaskan waters, 1975-2000. Sources: Commercial Operator Annual Reports and CFEC/ADFG fish ticket data.

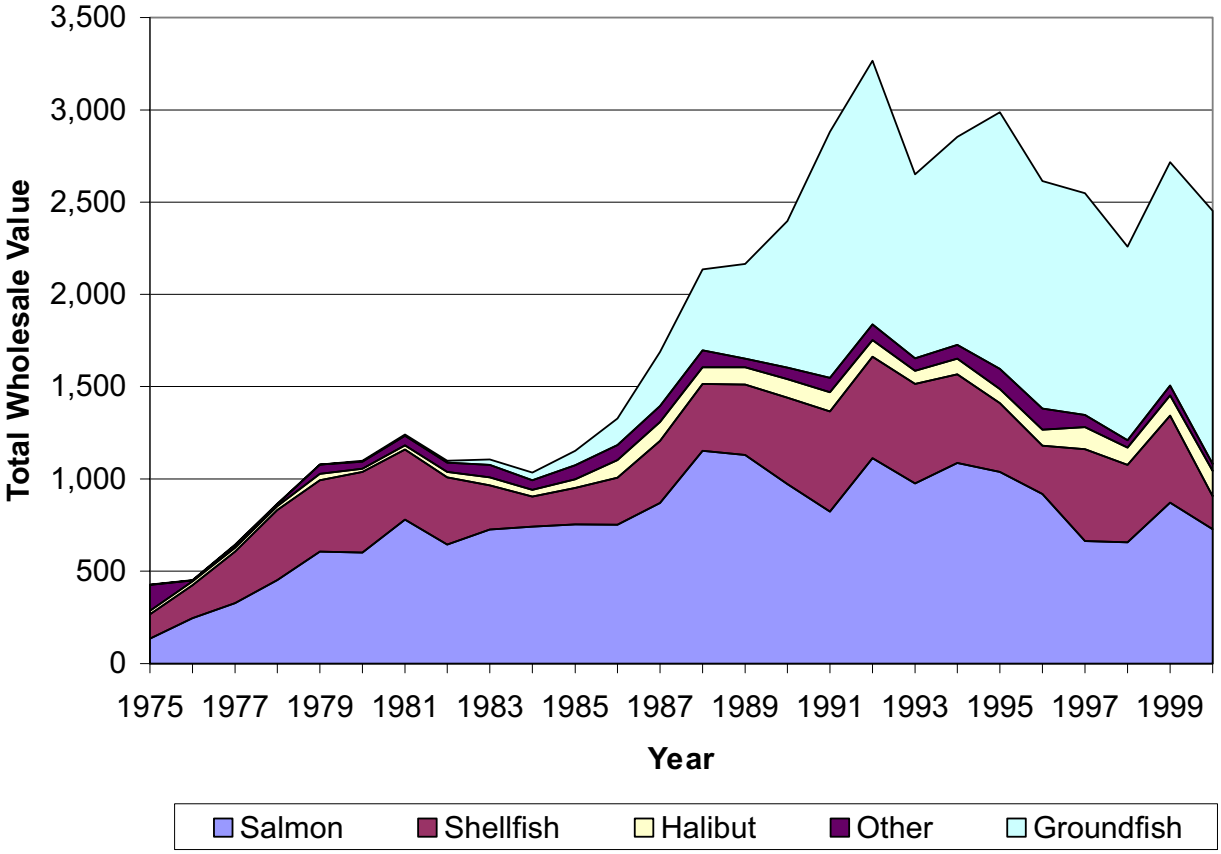


Figure 3.9-5. Value of domestic processing of groundfish and non-groundfish species from Alaskan waters, 1975-2000. Sources: Commercial Operator Annual Reports and CFEC/ADFG fish ticket data..

Source: ESRI, ProximityOne

300 0 300 Miles

Scale: 1" = 300 Miles

Figure 3.9-6. AK regions

Figure 3.9-7. Map of Pacific Northwest regions.

Figure 3.9-7. PNW regions

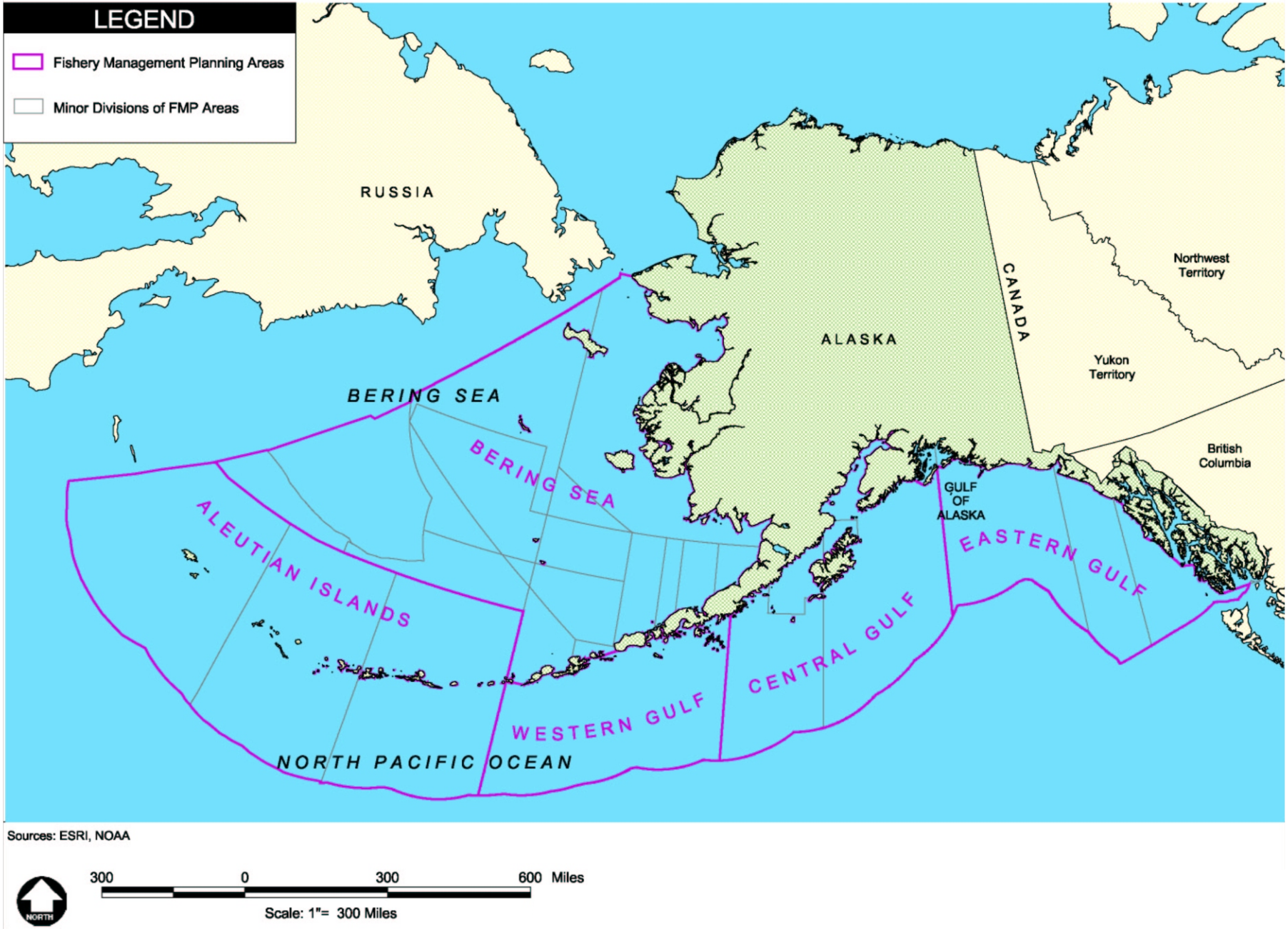


Figure 3.9-8. Fishery management planning areas of Alaska

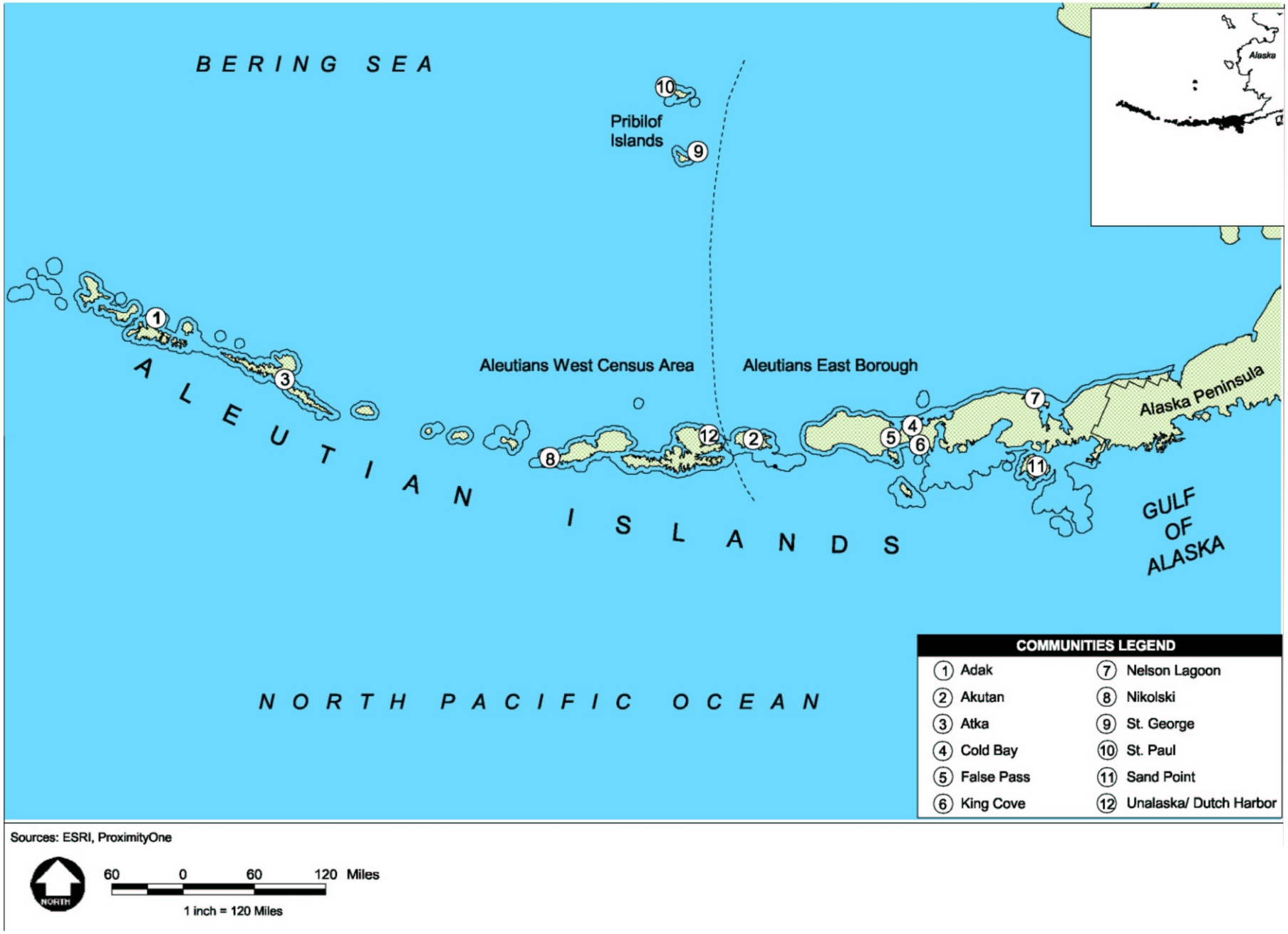


Figure 3.9-9. AK Peninsula/AI study region

Figure 3.9-10. Kodiak Island study region

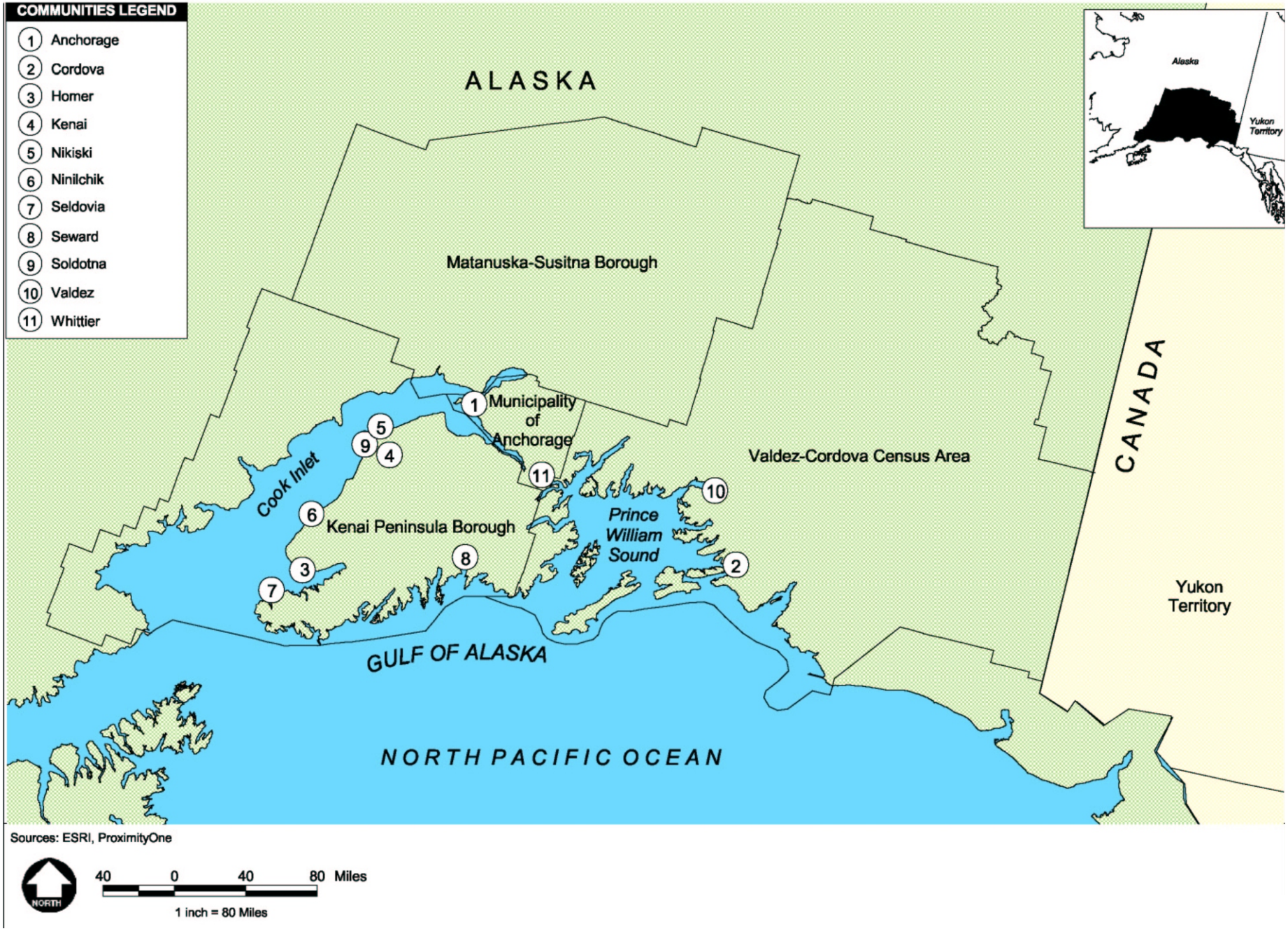


Figure 3.9-11. AK Southcentral study region

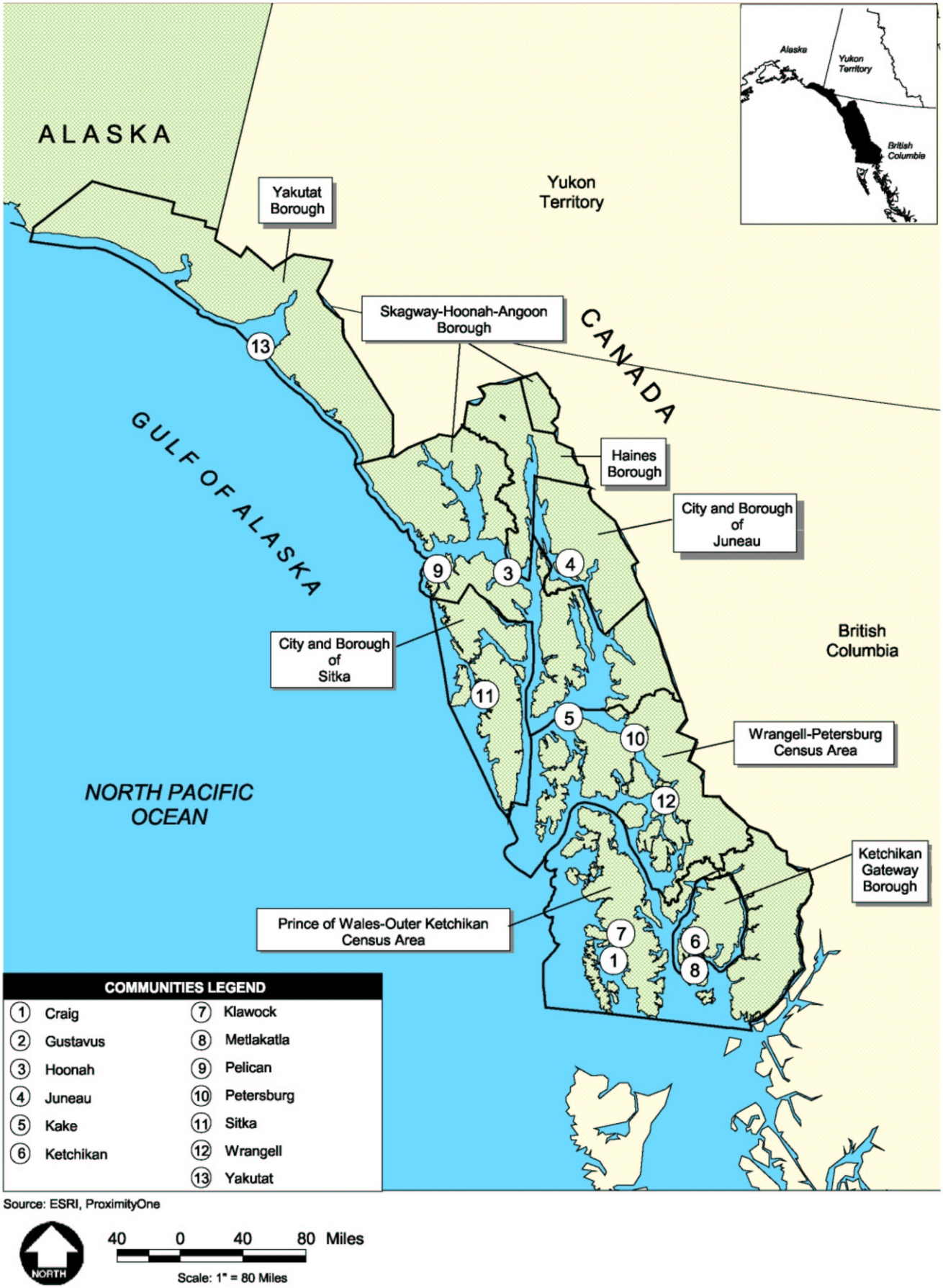


Figure 3.9-12. AK Southeast study region

Figure 3.9-13. Washington Inland Waters study region

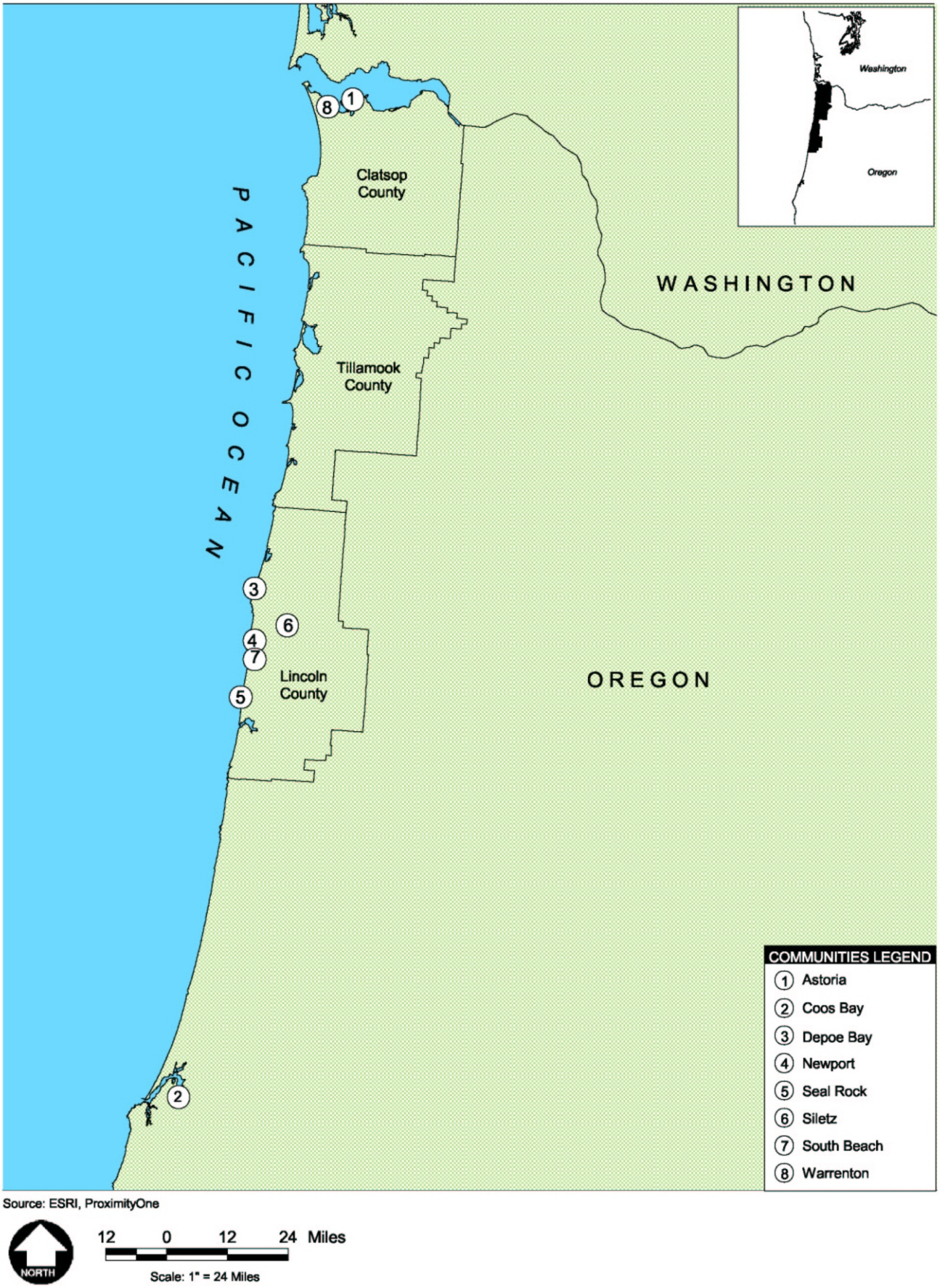
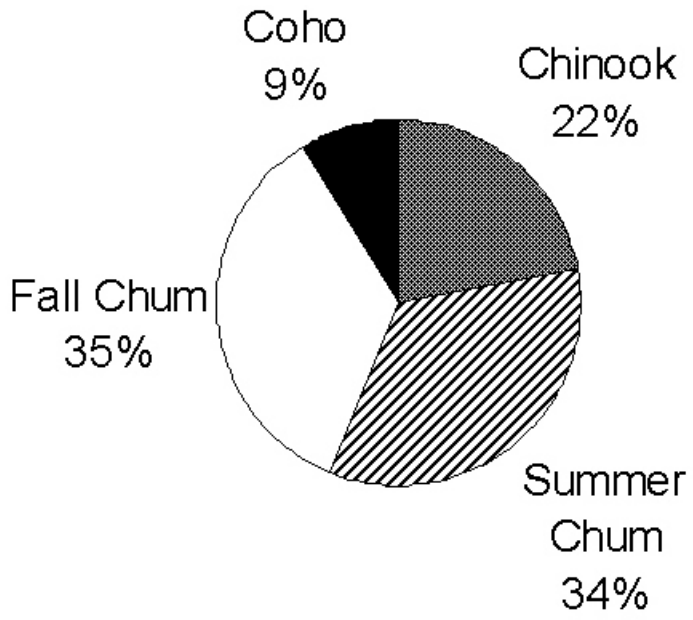


Figure 3.9-14. Oregon Coast study region

Source: Resource Data, 2000; NMFS

No Scale

Figure 3.9-15. CDQ group areas



N=233,169 salmon; based on annual harvest assessment program using permits, calendars, and household surveys.

Figure 3.9-16. Yukon Area subsistence salmon harvests, 1999.

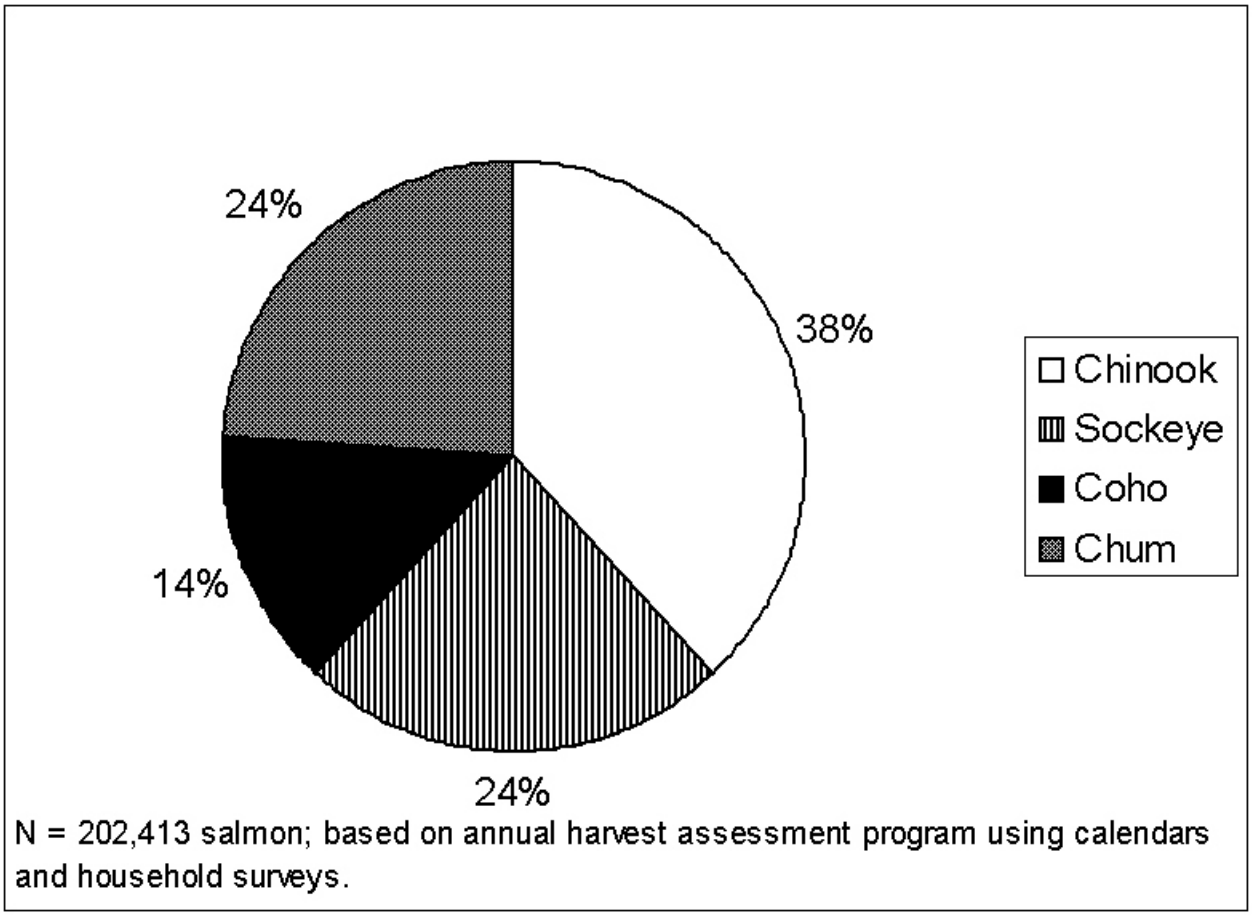
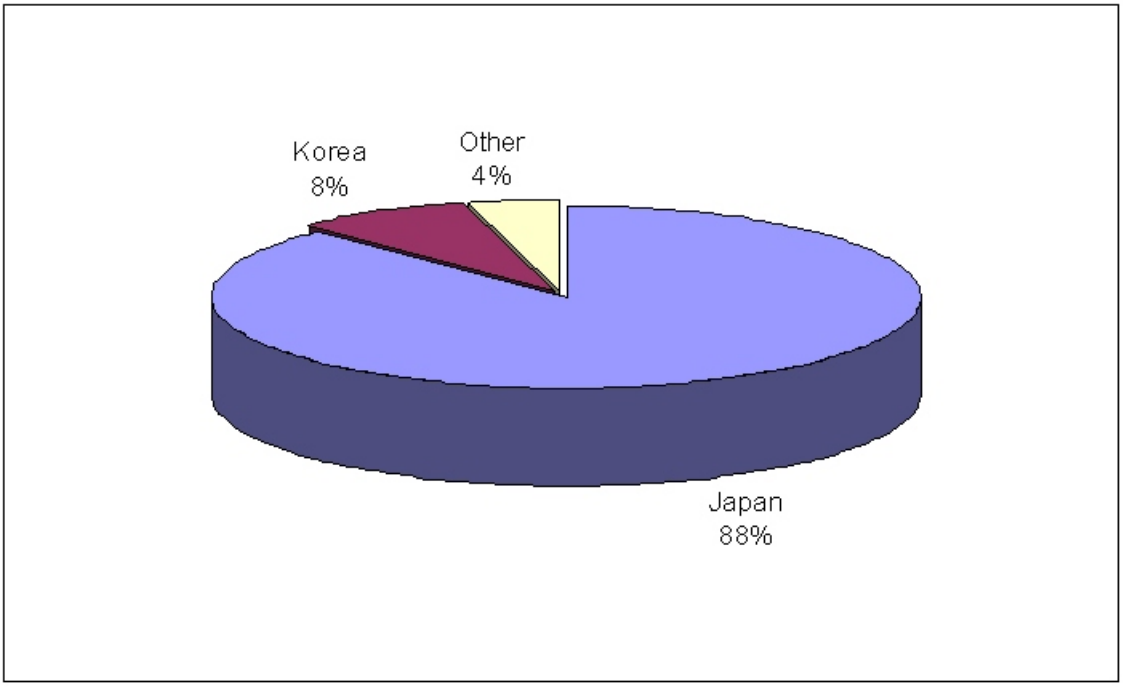


Figure 3.9-17. Composition of subsistence harvest by species, Kuskokwim Area, 1999.

1995



2001

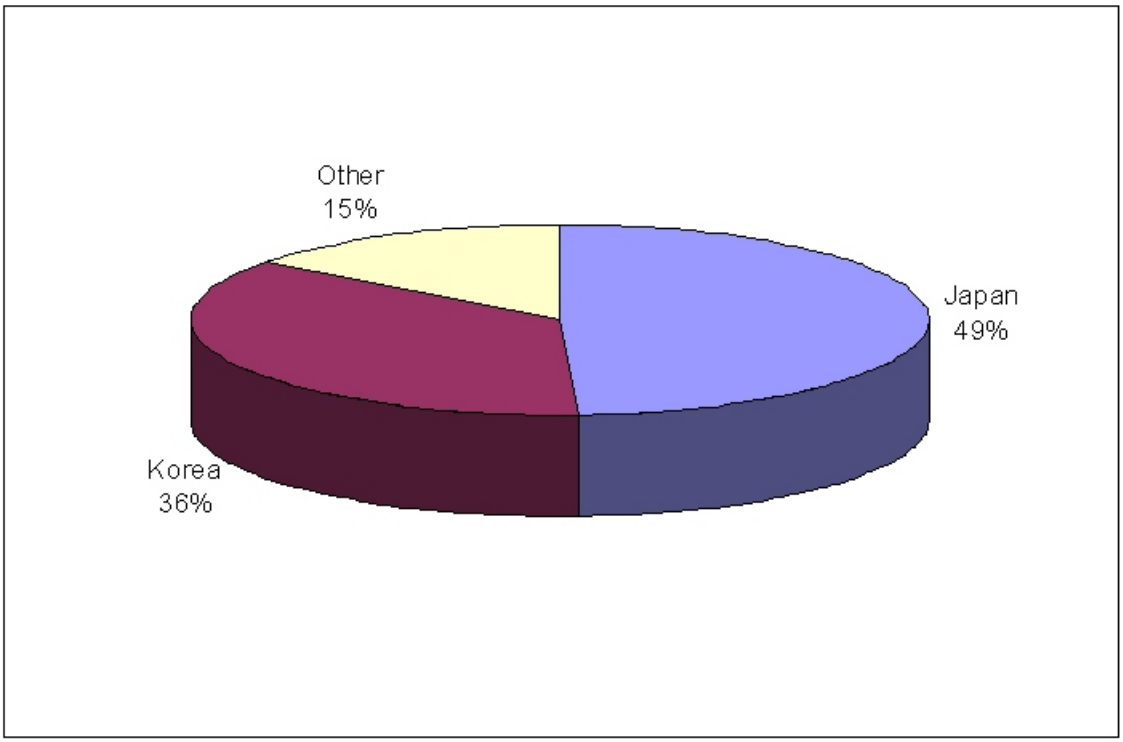
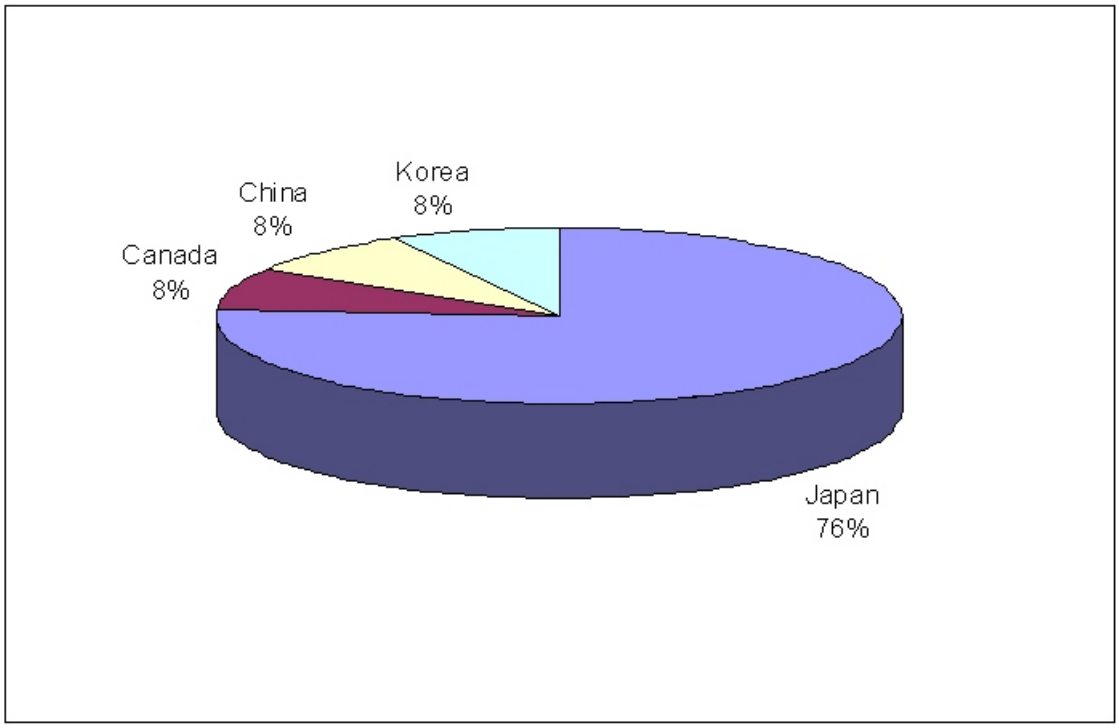


Figure 3.9-18. Destination of exported pollock surimi, 1995 and 2001. Source: U.S. Seafood Trade Report for 1995 and 2001.

1995



2001

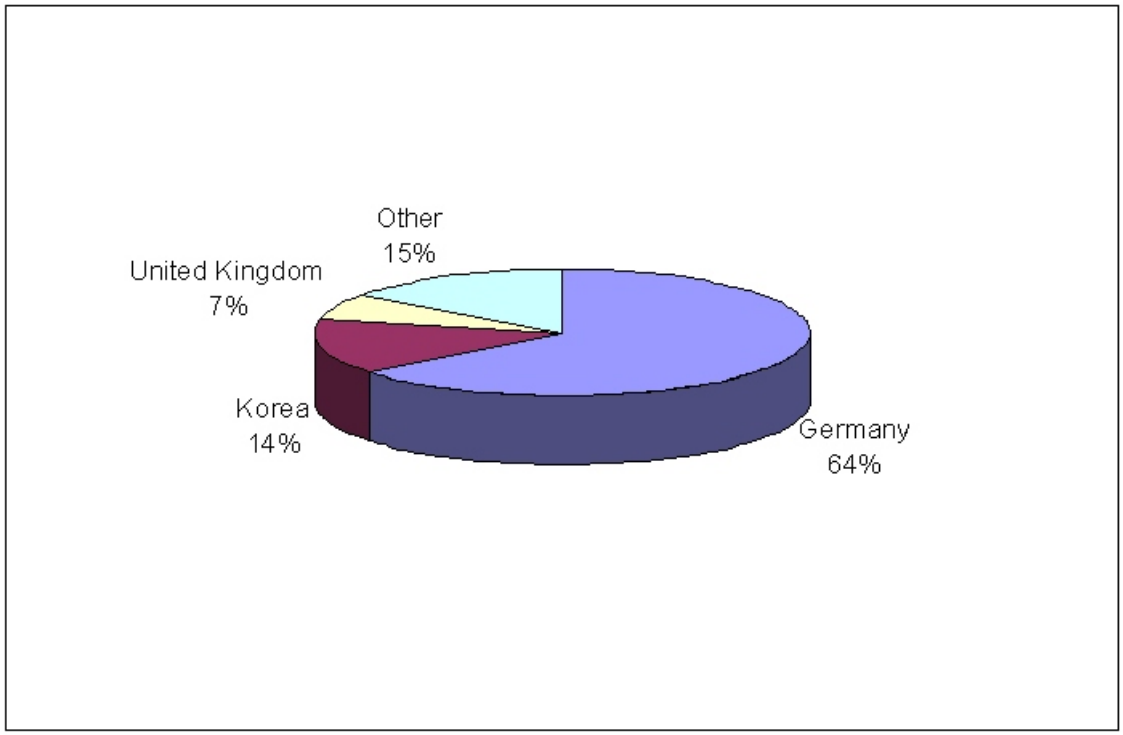


Figure 3.9-19. Destination of exported pollock fillets, 1995 and 2001. Source: U.S. Seafood Trade Report for 1995 and 2001.

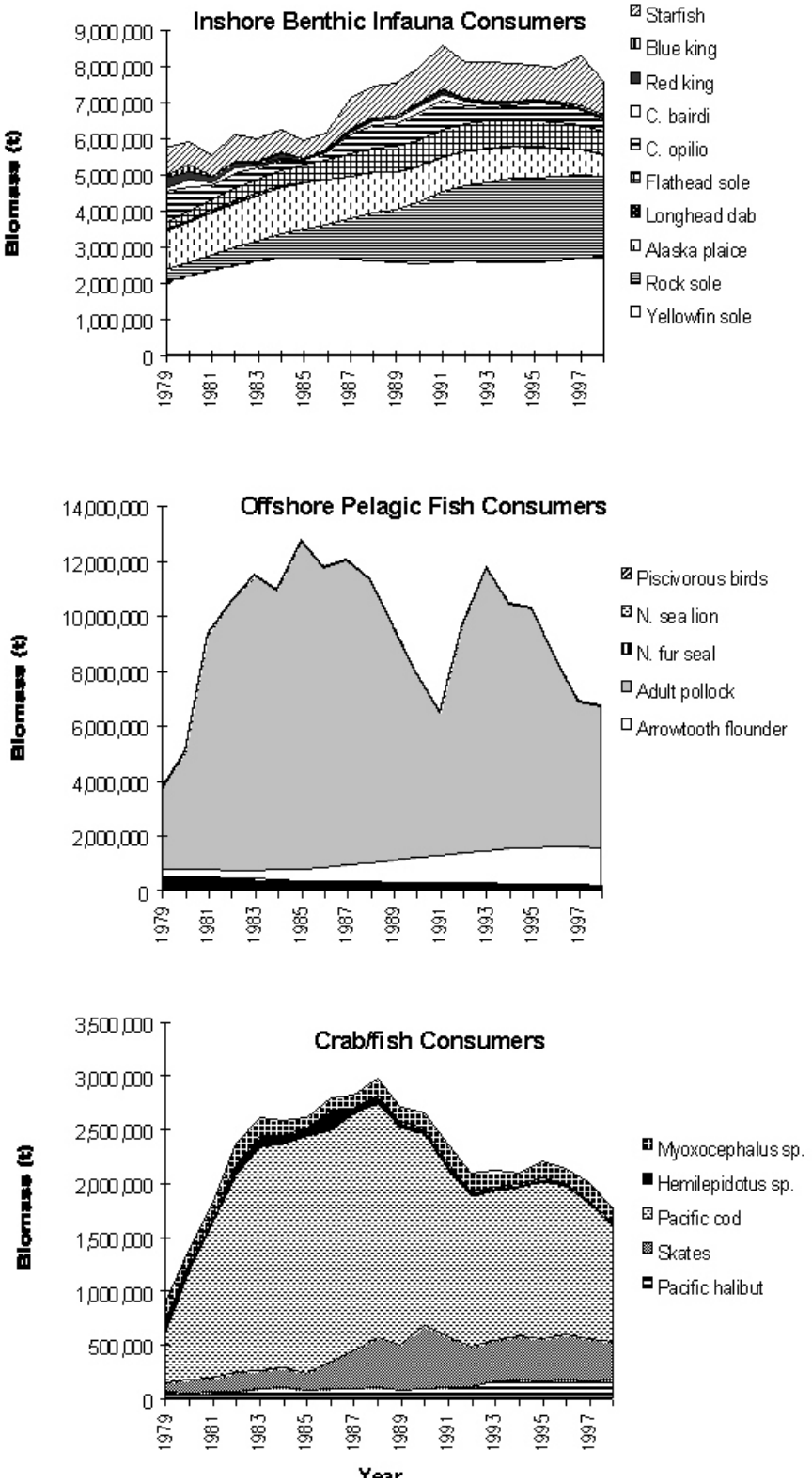


Figure 3.10-1. Biomass trends in Bering Sea trophic guilds, 1979-1998.

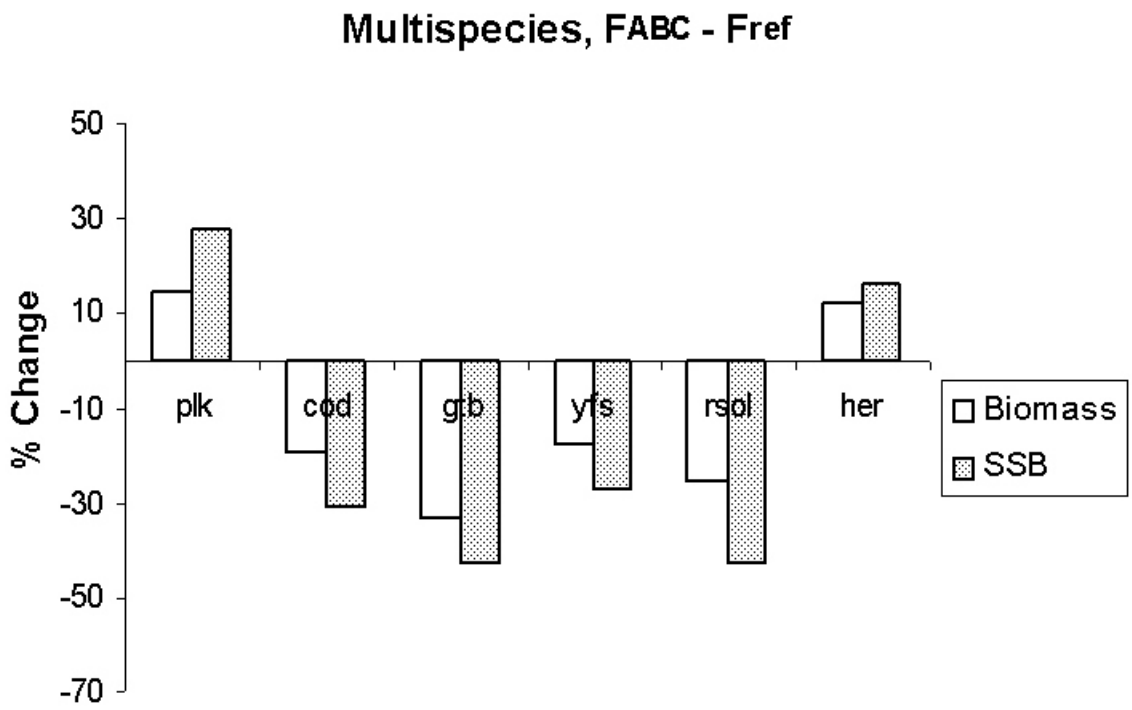


Figure 3.10-2. Results from the multispecies and single-species models for change in equilibrium biomass between the present fishing rates (F_{ref}) and more even harvesting of all species (F_{abc}).

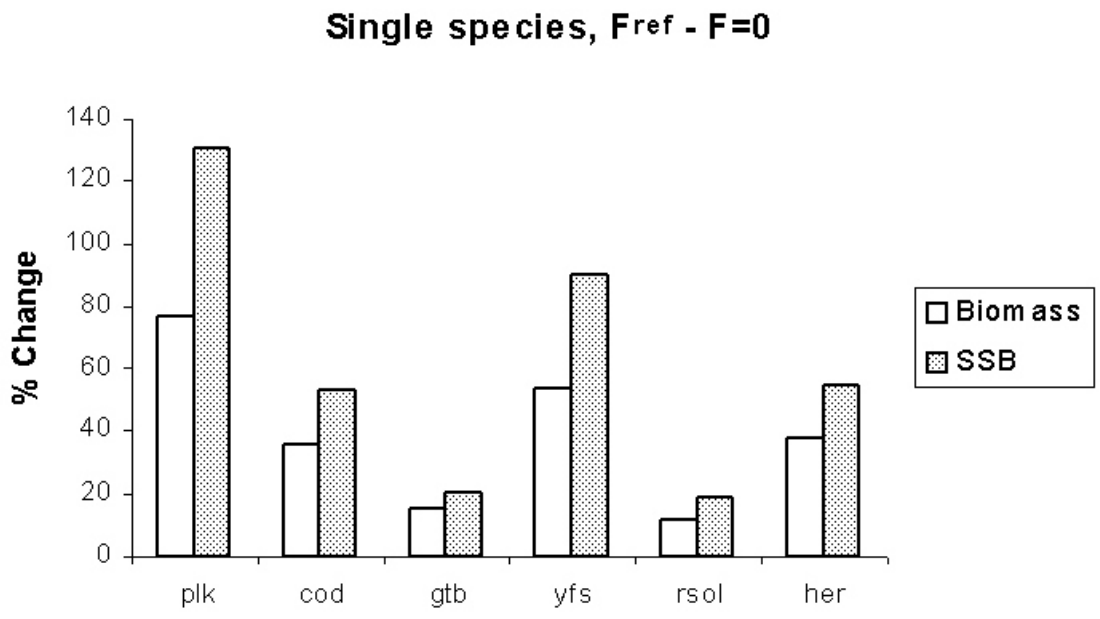


Figure 3.10-3. Percent change in single-species and multispecies model predictions of biomass between the present fishing strategy (F_{ref}) and a no-fishing scenario.

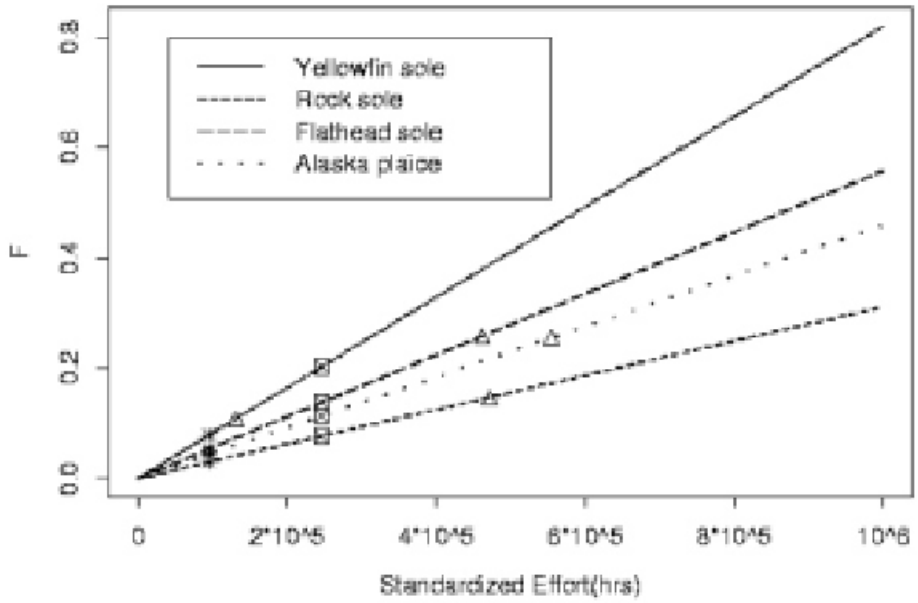


Figure 3.10-4. Eastern Bering Sea flatfish instantaneous fishing mortality rates as a function of total standardized trawling effort. Results were obtained from a multispecies yield per recruit model, and each species incorporates the contribution of all eastern Bering Sea trawl fisheries. Triangles indicate the $F_{40\%}$ single-species reference points, asterisks indicate the recent average *Fs* and total trawl standardized effort, and squares indicate the $F_{40\%}$ multi-species reference point for the flatfish complex as a whole. Source: NMFS.

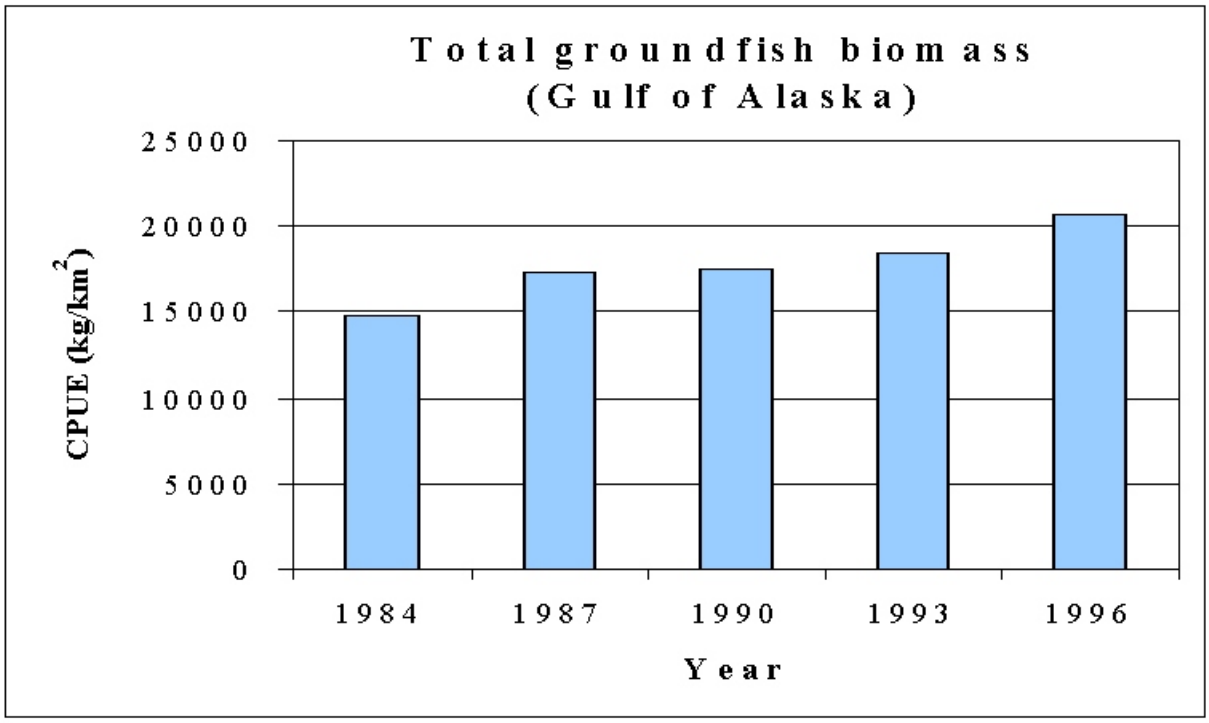


Figure 3.10-5. Estimated trend in the combined catch per unit of effort of 72 groundfish taxa from 1984-1996, averaged over Gulf of Alaska shelf and upper slope to 500 meters.

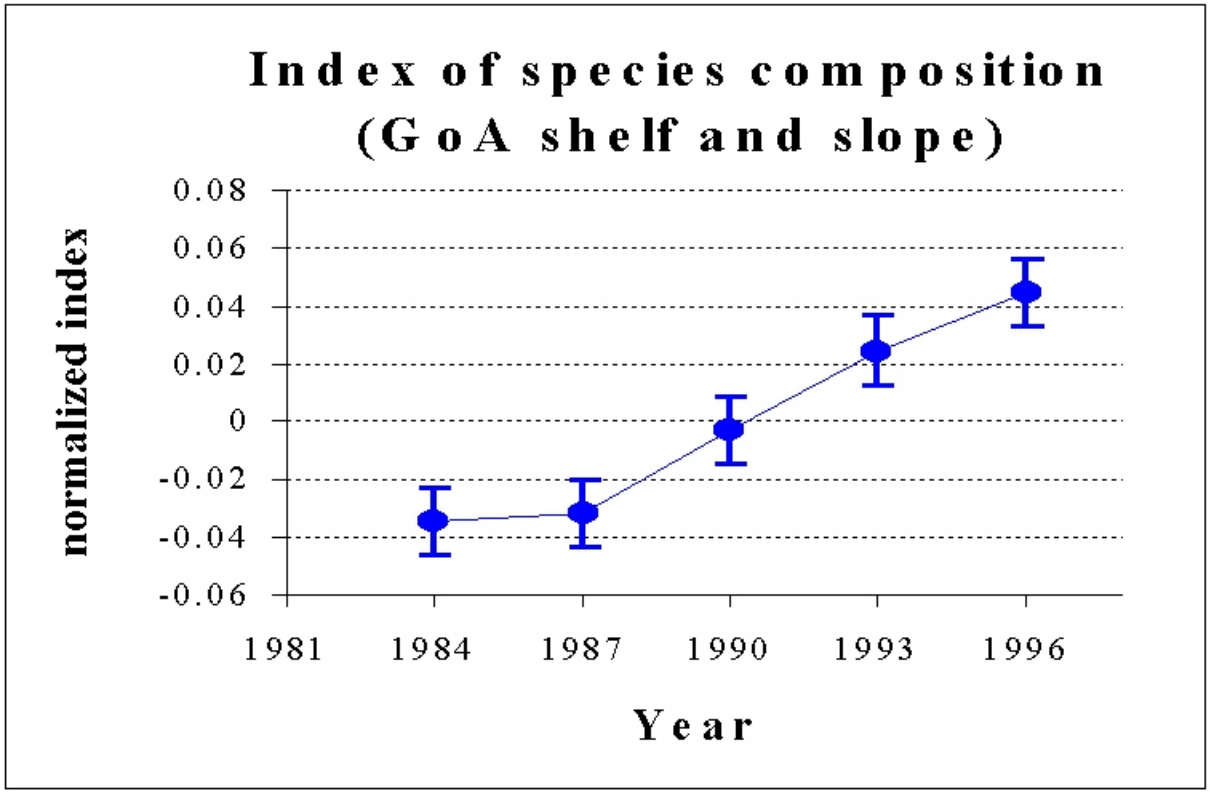


Figure 3.10-6. Trend index of species composition based on ordination of species abundance data from five triennial surveys on Gulf of Alaska shelf and slope with approximate 95 percent confidence interval. Source: NMFS.

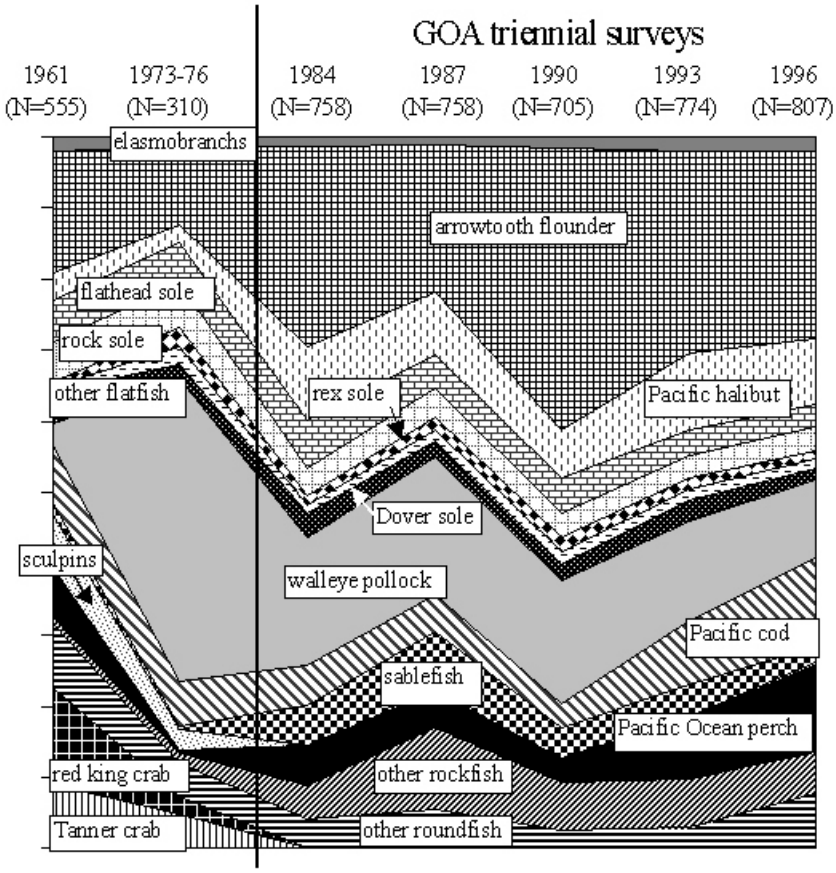


Figure 3.10-7. Relative species composition for major groundfish taxa in the Gulf of Alaska from 1961 through 1996. Source: NMFS.

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Chapter 4
Figures

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COMPARISON OF FMP FRAMEWORKS FOR SECOND DRAFT ALTERNATIVES

	Alt 1	Alt 2		Alt 3		Alt 4	
	1	2.1	2.2	3.1	3.2	4.1	4.2
TAC-setting Process	- Set ABC = OFL - Sum of TAC has to be within OY range - OY specified as range for BSAI: 1.4 - 2.0 mill MT and OY specified as range for GOA: 116,000 - 800,000 MT; BSAI OY cap: if the sum of TAC > 2 mill MT then TAC will be adjusted down	- Set ABC = OFL - Sum of TAC has to be within OY range (No changes from Alt 1) - OY specified as range; OY cap = sum of OFL	- Set ABC < OFL (No changes from Alt 1) - No changes from Alt 1 - OY specified as range; OY cap = sum of ABCs	- Set ABC < OFL (No changes from Alt 1) - Set TAC =< ABC for all targets and "other spp." category - OY specified as range for BSAI: 1.4 - 2.0 mill MT and OY specified as range for GOA: 116,000 - 800,000 MT; BSAI OY cap: if the sum of TAC > 2 mill mt then TAC will be adjusted down (No changes from Alt 1)	- No changes from Alt 1 - Same as 3.1 - No OY range in plan; OY = TAC which is =< ABC - TAC is fishery specific	- Set ABC < OFL (No changes from Alt 1) - No changes from Alt 1 - No OY range in plan; OY = TAC which is =< ABC - TAC is fishery specific	- No changes from Alt 1 - TAC = 0 for all species unless fisheries are proven to have no adverse effect on the environment - OY = 0; No fishery
	- B_{20} rule for prey species (pollock, P. cod, Atka mackerel) - ABC tier system (Amendment 56)	- No changes from Alt 1 - OFL management (Amendment 56 OFL definitions with inflection points removed in tiers 1-3)	- No changes from Alt 1 - No changes from Alt 1	- B_{20} rule for prey species (pollock, P.cod, Atka mackerel) (No changes from Alt 1) - Review F_{40} and adapt ABC tier system where F_{40} is maximum permissible for stocks without estimate of MSY	- Revise harvest control rule by incorporating a constant buffer for prey species (pollock, P. cod, Atka mackerel) - When possible, biological reference points based on species specific production patterns and ecosystem considerations (will use F_{50} for rockfish as proxy for analysis)	- Set F_{75} for prey species (pollock, P. cod, Atka mackerel) - Set F_{50-60} for vulnerable (e.g., long-life, slow-growing) species (will use F_{75} for rockfish as proxy)	- TAC = 0 for all species - TAC = 0 for all species
	- No directed fishery for forage fish (forage fish ban; Amendment 36/39) - Specify MSSTs for Tier 1-3 stocks	- No forage fish ban - No changes from Alt 1	- No changes from Alt 1 - No changes from Alt 1	- No directed fishery for forage fish (forage fish ban, Amendment 36/39; No changes from Alt 1) - Identify minimum required elements, resources, cost and a realistic time frame necessary to establish MSSTs for additional stocks and prioritize a list of candidate stocks	- No changes from Alt 1 - Initiate analysis of MSSTs for priority stocks based on the timeframe determined by additional availability of required resources	- No directed fishery for forage fish (forage fish ban, Amendment 36/39; No changes from Alt 1) - Adopt MSSTs appropriate to the harvest policy for each stock, with B_{50} as the limit (rather than the target)	- Same as 4.1 - No changes from Alt 1
	- Set group TAC for 'other species'	- No changes from Alt 1	- No changes from Alt 1	- Break sharks and skates out of "other species" group for TAC setting (Amendment 63/63) - Develop criteria for breaking out a species from a species complex	- Break sharks and skates and additional groups out of "other species" group for TAC setting - Develop criteria to bring a non-specified species into a managed category	- Least Abundant Species Aggregate TAC: e.g., TAC of species complex is based on the TAC of the least abundant member of the group - where possible, break species out of the complex	- TAC = 0 for all species
	- Precautionary adjustments exist, but vary with uncertainty only in Tier 1 - Develop ecosystem indicators for future use in TAC-setting	- OFL management only - No ecosystem indicators	- No changes from Alt 1 - No changes from Alt 1	- Conduct F_{40} review and adopt appropriate measures - Develop criteria for using key ecosystem indicators in TAC-setting	- Develop, implement and update as necessary, procedures to account for uncertainty in estimating ABC - Adopt, update as necessary, and use ecosystem indicators in TAC-setting	- Incorporate survey variance and uncertainty in ABC by a survey coefficient of variation for each stock - Evaluate a range of ABCs using the lower bound of a confidence limit to address uncertainties in stock assessment advice	- In the face of uncertainty, set ABC = 0 for all species unless fisheries are proven to have no adverse effect on the environment
	- Target [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	- Maximum limit = 0
Spatial/ Temporal Mgmt of TAC	- Species TAC distributed spatially for all BSAI and GOA species except "other spp."	- No changes from Alt 1	- No changes from Alt 1	- No changes from Alt 1	- Species TAC distributed spatially for all BSAI and GOA species except "other spp." (No changes from alt 1) - Develop objectives and criteria for allocating TAC in space and time	- Distribute TAC spatially for all species except "other spp.", and distribute on smaller scales for all possible species (for analytical purposes, use BS pollock as proxy)	- TAC = 0 for all species
MPAs and EFH	- [illegible] description and evaluation of potential MPA areas - Maintain current closed/restricted areas such as: Walrus Island closures, RKC savings area, Bogoslof area, Pribilof Island closure, Nearshore Bristol Bay closures, Kodiak Type I-III areas, eastern GOA trawl closures - Sitka Pinnacles marine reserve	- No MPAs - Repeal current closed/restricted areas such as: Walrus Island closures, RKC savings area, Bogoslof area, Pribilof Island closure, Nearshore Bristol Bay closures, Kodiak Type I-III areas, eastern GOA trawl closures (except those included in SSL measures) - Repeal Sitka Pinnacles marine reserve	- No changes from Alt 1 - No changes from Alt 1 - No changes from Alt 1	- Develop MPA efficacy methodology including program goals, objectives and criteria for establishing MPAs and no take marine reserves - MPAs may include no take areas - Review existing closures such as Sitka Pinnacles to see if these areas qualify for MPAs under established criteria -Could include restrictions of specific gear types or fisheries	- 0-20% of BS, AI, GOA as MPAs and no-take marine reserves (e.g., 5% = no take, 15% = MPA) across a range of habitat types - no take areas allow no fishing and serve as research control areas - could encompass existing closures - GOA selected sites for slope rockfish closures - BS EFH closures - No bottom contact MPA BSAI/GOA	- Establish 20-50% of the management area as no take MPAs covering the full range of marine habitats Example areas in BSAI include: Submarine canyons: Unimak Pass, old Crab Pot sanctuary (into area 512), near Pribilof Islands, AI (SSL CH), SW of St. George, Misty Moon, RKC savings area Example areas in GOA include: Davidson Bank, Shumagin Islands, and region around Kodiak Island (previous crab closure areas), Gulf Shelf breaks, Sitka Pinnacles	- [illegible] closure areas
	- Identify and designate EFH and HAPC	- No changes from Alt 1	- No changes from Alt 1	- Identify and designate EFH and HAPC (No changes from Alt 1)	- Identify and designate EFH and HAPC (No changes from Alt 1) - EFH mitigation measures listed above	- Establish AI Special Management Area to protect coral/live bottom habitats - Establish 20-50% of the spawning areas as spawning area reserves for exploited species that are fished intensively at spawning time [may be same areas as for MPAs identified above]	- 100% closure areas - 100% closure areas
SSL Measures	- 2002 SSL closures: no fishing in Seguam Pass, 3nm no transit zones around rookeries; trawl and fixed gear closures in nearshore and critical habitat areas - Aleutian Islands (AI) Closures until 2003	- No changes from Alt 1	- No changes from Alt 1	- 2002 SSL closures: no fishing in Seguam Pass; 3nm no transit zones around rookeries; trawl and fixed gear closures in nearshore and critical habitat areas (No changes from Alt 1) - AI Closures (same as Alt 1)	- Continue 2002 SSL closures except establish frameworked buffer zones that are based on distance from shore using existing telemetry data; as new data becomes available, buffer zones would be modified accordingly; for purposes of analysis, a 15 mile buffer zone will be used - Extend AI Closures	- Comprehensive trawl exclusion zones to protect all designated SSL critical habitat	- 100% [illegible]
	- B_{20} rule for prey species (pollock, P. cod, Atka mackerel)	- No changes from Alt 1	- No changes from Alt 1	- B_{20} rule for prey species (pollock, P. cod, Atka mackerel) (No changes from Alt 1)	- Revise harvest control rule by incorporating a constant buffer for prey species (pollock, P. cod, Atka mackerel)	- Set F_{75} for prey species (pollock, P. cod, Atka mackerel)	- TAC = 0 for all species
Bycatch and Incidental Catch Restrictions	- PSC limits for herring, crab, halibut and salmon in BSAI, and for halibut in GOA	- Eliminate PSC limits	- PSC limits as for Alt 1. - Where sufficient stock status information is available, adjustable PSC limits established based on a percentage of the annual stock status	- BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (0-10%) (for purposes of analysis will use 10%)	- BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (10-30%) (for purposes of analysis will use 30%)	- BSAI: Reduce PSC limits for herring, crab, salmon, halibut by 30-50% (for purposes of analysis will use 50%)	- PSC limit = 0; [illegible]

Figure 4.0-1. Comparison of FMP frameworks for second draft alternatives; the row look.

COMPARISON OF FMP FRAMEWORKS FOR SECOND DRAFT ALTERNATIVES

	Alt 1	Alt 2		Alt 3		Alt 4	
	1	2A	2	3A	3	4A	4
TAC-setting Process	- Set ABC < OFL - Sum of TAC has to be within OY range - OY specified as range for BSAI: 1.4 - 2.0 mill MT and GOA OY specified as range for GOA: 116,000 - 800,000 MT; BSAI OY cap: if the sum of TAC > 2 mill MT then TAC will be adjusted down	- Set ABC = OFL - Sum of TAC has to be within OY range (No changes from Alt 1) - OY specified as range; OY cap = sum of OFL	↔ - Set ABC < OFL (No changes from Alt 1) ↔ - No changes from Alt 1 ↔ - OY specified as range; OY cap = sum of ABCs	- Set ABC < OFL (No changes from Alt 1) - Set TAC =< ABC for all targets and "other spp." category - OY specified as range for BSAI: 1.4 - 2.0 mill MT and GOY specified as range for GOA: 116,000 - 800,000 MT; BSAI OY cap: if the sum of TAC > 2 mill mt then TAC will be adjusted down (No changes from Alt 1)	↔ - No changes from Alt ↔ - Same as 3.1 ↔ - No OY range in plan; OY = TAC which is =< ABC - TAC is fishery specific	- Set ABC < OFL (No changes from Alt 1) - No changes from Alt 1 - No OY range in plan; OY = TAC which is =< ABC - TAC is fishery specific	↔ - No changes from Alt ↔ - TAC = 0 for all species unless fisheries are proven to have no adverse effect on the environment ↔ - OY = 0; No fishery
	- B_{35} rule for prey species (pollock, P. cod, Atka mackerel) - ABC tier system (Amendment 56)	- No changes from Alt 1 - OFL management (Amendment 56 OFL definitions with inflection points removed in tiers 4-6)	- No changes from Alt 1 ↔ - No changes from Alt 1	- B_{35} rule for prey species (pollock, P.cod, Atka mackerel) (No changes from Alt 1) - Review F_{40} and adapt ABC tier system where F_{40} is maximum permissible for stocks without estimate of MSY	- Revise harvest control rule by incorporating a constant buffer for prey species (pollock, P. cod, Atka mackerel) ↔ - When possible, biological reference points based on species specific production patterns and ecosystem considerations (will use F_{40} for rockfish as proxy for analysis)	- Set F_{35} for prey species (pollock, P. cod, Atka mackerel) - Set F_{40} for vulnerable (e.g., long-life, slow-growing) species (will use F_{75} for rockfish as proxy)	- TAC = 0 for all species ↔ - TAC = 0 for all species
	- No directed fishery for forage fish (forage fish ban; Amendment 36/39) - Specify MSSTs for Tier 1-3 stocks	- No forage fish ban - No changes from Alt 1	↔ - No changes from Alt 1 ↔ - No changes from Alt 1	- No directed fishery for forage fish (forage fish ban, Amendment 36/39; No changes from Alt 1) - Identify minimum required elements, resources, cost and a realistic time frame necessary to establish MSSTs for additional stocks and prioritize a list of candidate stocks	↔ - No changes from Alt 1 ↔ - Initiate analysis of MSSTs for priority stocks based on the timeframe determined by additional availability of required resources	- No directed fishery for forage fish (forage fish ban, Amendment 36/39; No changes from Alt 1) - Adopt MSSTs appropriate to the harvest policy for each stock, with B_{40} as the limit (other than the target)	↔ - Same as 4.1 ↔ - No changes from Alt 1
	Set group TAC for 'other species'	- No changes from Alt 1	↔ - No changes from Alt 1	- Break sharks and skates out of "other species" group for TAC setting (Amendment 63/63) - Develop criteria for breaking out a species from a species complex	↔ - Break sharks and skates and additional groups out of "other species" group for TAC setting ↔ - Develop criteria to bring a non-specified species into a managed category	- Least Abundant Species Aggregate TAC: e.g., TAC of species complex is based on the TAC of the least abundant member of the group - where possible, break species out of the complex	↔ - TAC = 0 for all species
	Precautionary adjustments exist, but vary with uncertainty only in Tier 1 Develop ecosystem indicators for future use in TAC-setting	OFL management only No ecosystem indicators	↔ - No changes from Alt 1 ↔ - No changes from Alt 1	Conduct F_{40} review and adopt appropriate measures - Develop criteria for using key ecosystem indicators in TAC-setting	↔ - Develop, implement and update as necessary, procedures to account for uncertainty in estimating ABC ↔ - Adopt, update as necessary, and use ecosystem indicators in TAC-setting	Incorporate survey variance and uncertainty in ABC by a survey coefficient of variation for each stock - Evaluate a range of ABCs using the lower bound of a confidence limit to address uncertainties in stock assessment advice	↔ - In the face of uncertainty, set TAC = 0 for all species unless fisheries are proven to have no adverse effect on the environment
	Target species closures when harvest limit reached	No changes from Alt 1	- No changes from Alt 1	- No changes from Alt 1	- No changes from Alt 1	No changes from Alt 1	- Harvest limit = 0
Spatial/ Temporal Mgmt of TAC	Species TAC distributed spatially for all BSAI and GOA species except "other spp."	No changes from Alt 1	↔ - No changes from Alt 1	- No changes from Alt 1	↔ - Species TAC distributed spatially for all BSAI and GOA species except "other spp." (No changes from alt 1) - Develop objectives and criteria for allocating TAC in space and time	Distribute TAC spatially for all species except "other spp.", and distribute on smaller scales for all possible species (for analytical purposes, use BS pollock as proxy)	↔ - TAC = 0 for all species
MPAs and EFH	EO13158 description and evaluation of potential MPA areas - Maintain current closed/restricted areas such as: Walrus Island closures, RKC savings area, Bogoslof area, Pribilof Island closure, Nearshore Bristol Bay closures, Kodiak Type I-III areas, eastern GOA trawl closures - Sitka Pinnacles marine reserve	- No MPAs - Repeal current closed/restricted areas such as: Walrus Island closures, RKC savings area, Bogoslof area, Pribilof Island closure, Nearshore Bristol Bay closures, Kodiak Type I-III areas, eastern GOA trawl closures (except those included in SSL measures) - Repeal Sitka Pinnacles marine reserve	↔ - No changes from Alt 1 ↔ - No changes from Alt 1 ↔ - No changes from Alt 1	- Develop MPA efficacy methodology including program goals, objectives and criteria for establishing MPAs and no take marine reserves - MPAs may include no take areas - Review existing closures such as Sitka Pinnacles to see if these areas qualify for MPAs under established criteria -Could include restrictions of specific gear types or fisheries	↔ - 0-20% of BS, AI, GOA as MPAs and no-take marine reserves (e.g., 5% = no take, 15% = MPA) across a range of habitat types - no take areas allow no fishing and serve as research control areas - could encompass existing closures - GOA selected sites for slope rockfish closures - BS EFH closures - No bottom contact MPA BSAI/GOA	- Establish 20-50% of the management area as no take MPAs covering the full range of marine habitats - Example areas in BSAI include: Submarine canyons: Unimak Pass, old Crab Pot sanctuary (into area 512), near Pribilof Islands, AI (SSL CH), SW of St. George, Misty Moon, RKC savings area - Example areas in GOA include: Davidson Bank, Shumagin Islands, and region around Kodiak Island (previous crab closure areas), Gulf Shelf breaks, Sitka Pinnacles	↔ - 100% closure areas
	- Identify and designate EFH and HAPC	- No changes from Alt 1	- No changes from Alt 1	- Identify and designate EFH and HAPC (No changes from Alt 1)	↔ - Identify and designate EFH and HAPC (No changes from Alt 1) - EFH mitigation measures listed above	- Establish AI Special Management Area to protect coral/live bottom habitats - Establish 20-50% of the spawning areas as spawning area reserves for exploited species that are fished intensively at spawning time [may be same areas as for MPA identified above]	↔ - 100% closure areas ↔ - 100% closure areas
SSL Measures	- 2002 SSL closures: no fishing in Seguam Pass, 3nm no transit zones around rookeries; trawl and fixed gear closures in nearshore and critical habitat areas - Aleutian Islands (AI) Closures until 2003	- No changes from Alt 1	↔ - No changes from Alt 1	- 2002 SSL closures: no fishing in Seguam Pass; 3nm no transit zones around rookeries; trawl and fixed gear closures in nearshore and critical habitat areas (No changes from Alt 1) - AI Closures (same as Alt 1)	↔ - Continue 2002 SSL closures except establish frameworked buffer zones that are based on distance from shore using existing telemetry data; as new data becomes available, buffer zones should be modified accordingly; for purposes of analysis, a 15 mile buffer zone will be used ↔ - Extend AI Closures	- Comprehensive trawl exclusion zones to protect all designated SSL critical habitat	↔ - 100% closure areas
	- B_{35} Rule for prey species (pollock, P. cod, Atka mackerel)	- No changes from Alt 1	↔ - No changes from Alt 1	- B_{35} rule for prey species (pollock, P. cod, Atka mackerel) (No changes from Alt 1)	↔ - Revise harvest control rule by incorporating a constant buffer for prey species (pollock, P. cod, Atka mackerel)	- Set F_{35} for prey species (pollock, P. cod, Atka mackerel)	↔ - TAC = 0 for all species
Bycatch and Incidental Catch Restrictions	- PSC limits for herring, crab, halibut and salmon in BSAI, and for halibut in GOA	- Eliminate PSC limits	↔ - PSC limits as for Alt 1. - Where sufficient stock status information is available, adjustable PSC limits established based on a percentage of the annual stock status	- BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (0-10%) (for purposes of analysis will use 10%)	↔ - BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (10-30%) (for purposes of analysis will use 30%)	- BSAI: Reduce PSC limits for herring, crab, salmon, halibut by 30-50% (for purposes of analysis will use 50%)	↔ - PSC limit = 0; No fishery

Figure 4.0-2. Comparison of FMP frameworks for second draft alternatives; the column look.

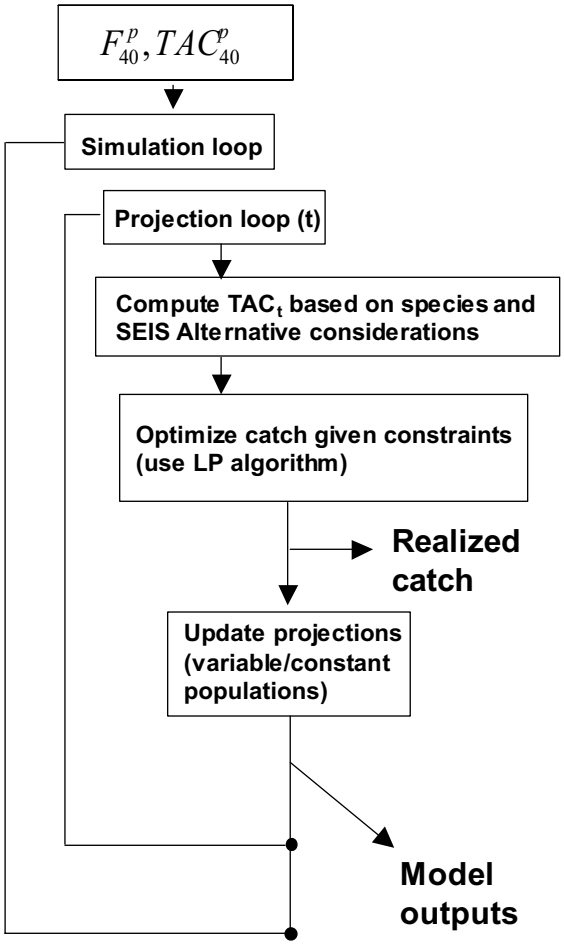

Figure 4.1-1. General description of the PSEIS simulation model that optimizes catch for different fisheries subject to a set of linear constraints based on historical catch-composition datasets.

Figure 4.1-2. Map showing the definition of areas defined as eastern (E), central (C), and western (W) Gulf of Alaska.

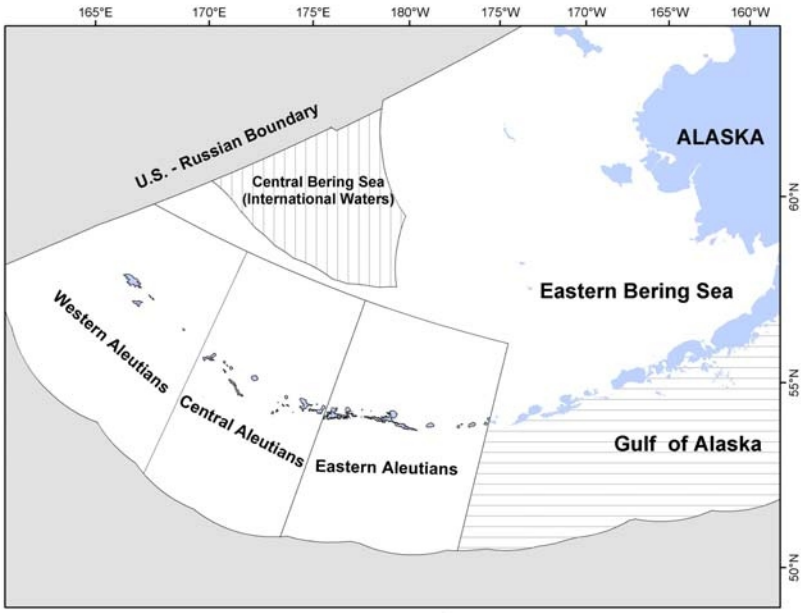

Figure 4.1-3. Map showing the definition of areas defined as eastern (E), central (C), and western (W) Aleutian Islands Region and the Eastern Bering Sea (B).

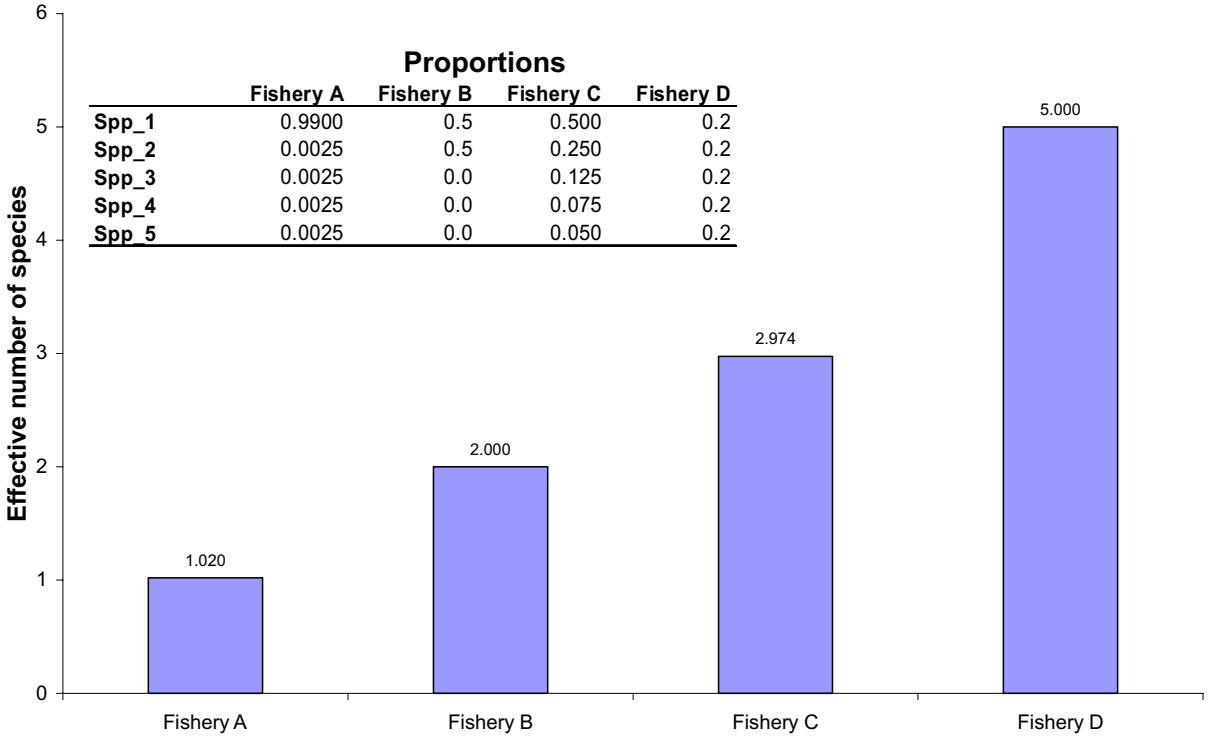

Figure 4.1-4. Results showing the "effective number of species" exemplified in 4 hypothetical fisheries (Fisheries A-D) catching different proportions of 5 hypothetical species.

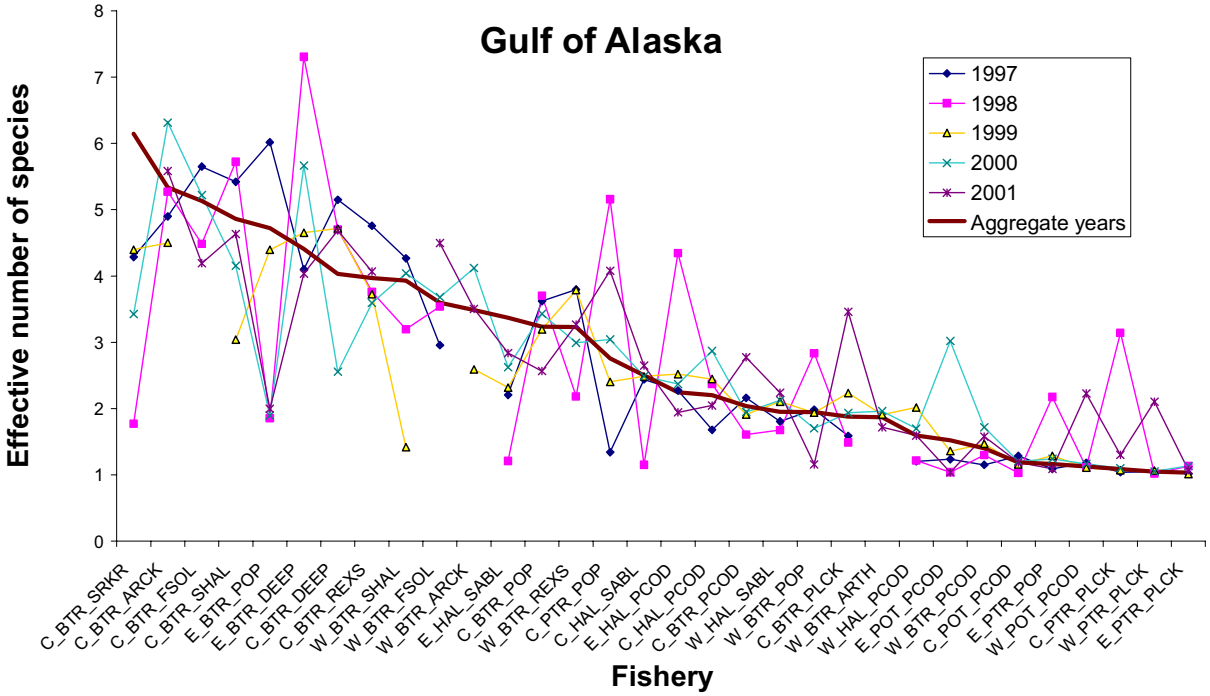

Figure 4.1-5. Relative effective number of species for the GOA fisheries sorted by the aggregate data (1997-2001 data as used in the model) compared with annual estimates of effective number of species (i.e., species diversity in the catch).

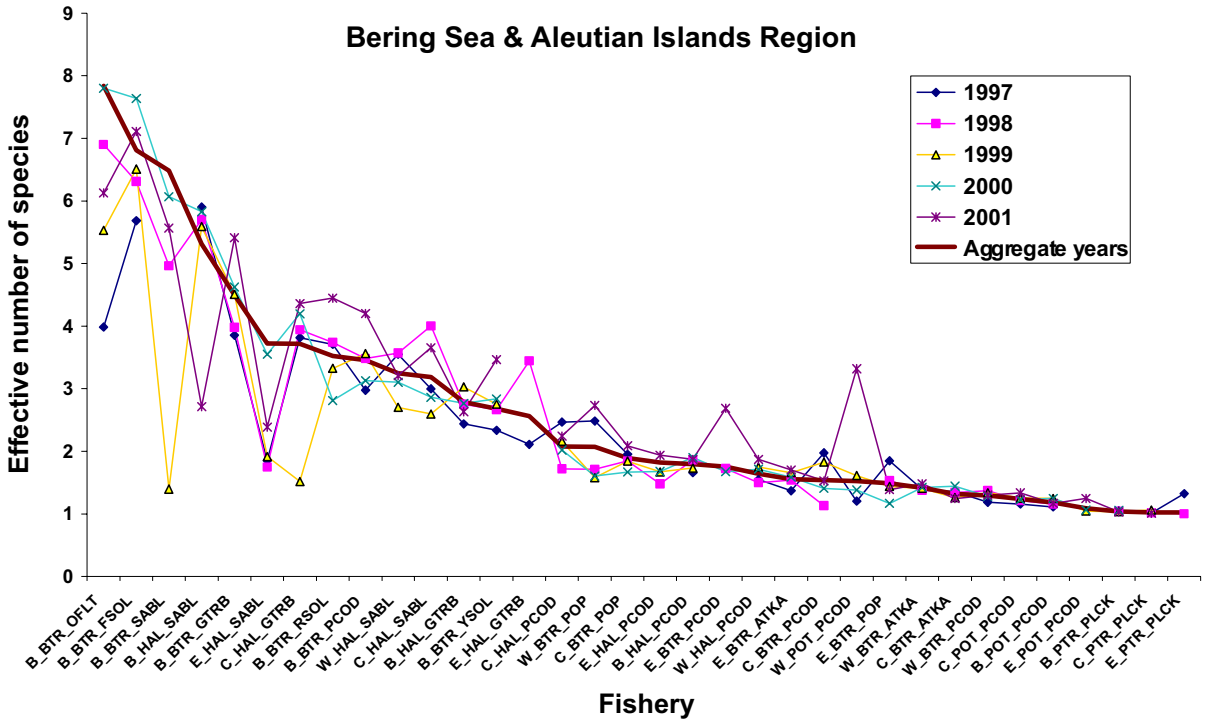

Figure 4.1-6. Relative effective number of species for the BSAI fisheries sorted by the aggregate data (1997-2001 data as used in the model) compared with annual estimates of effective number of species (i.e., species diversity in the catch).

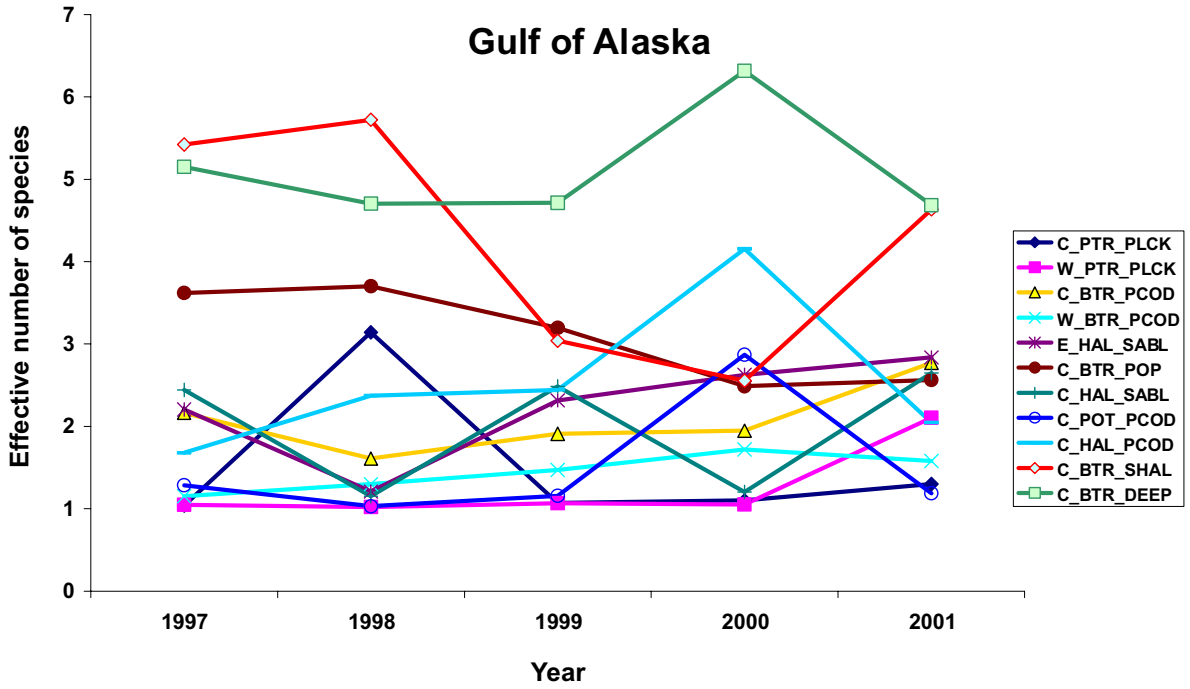

Figure 4.1-7. Relative effective number of species over time for the GOA fisheries that caught 80% of the total from 1997-2001.

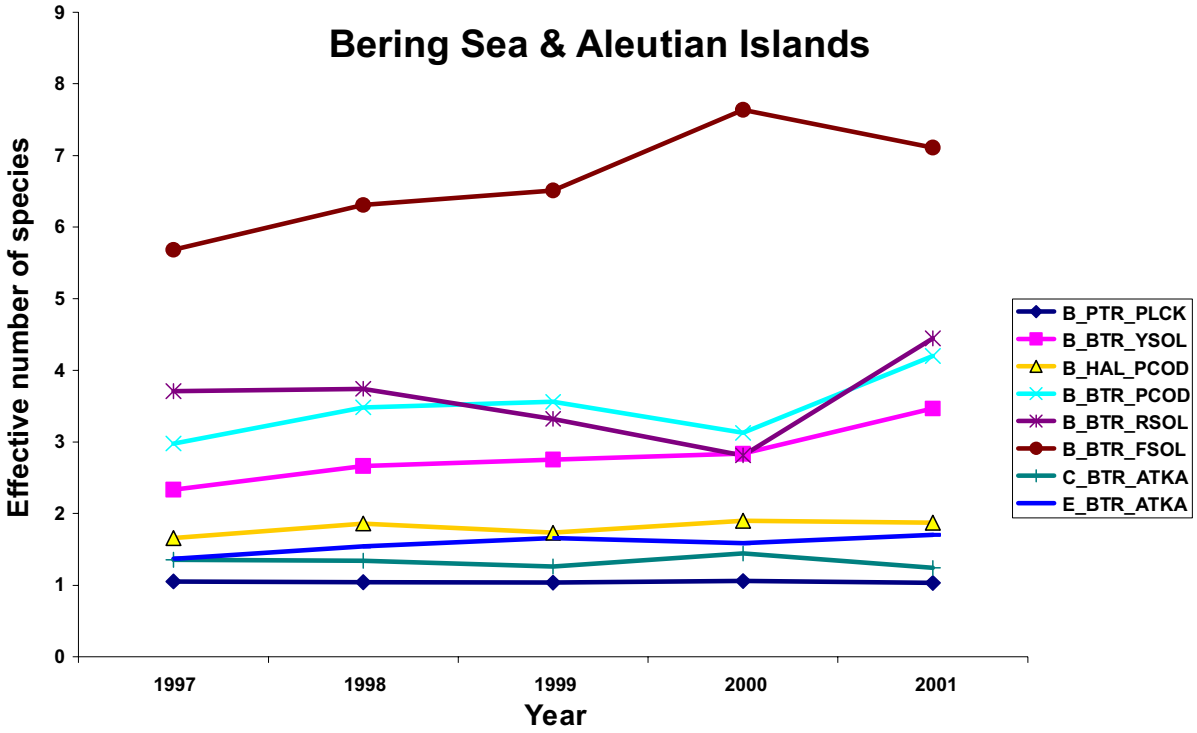

Figure 4.1-8. Relative effective number of species over time for the BSAI fisheries that caught 91% of the total from 1997-2001.

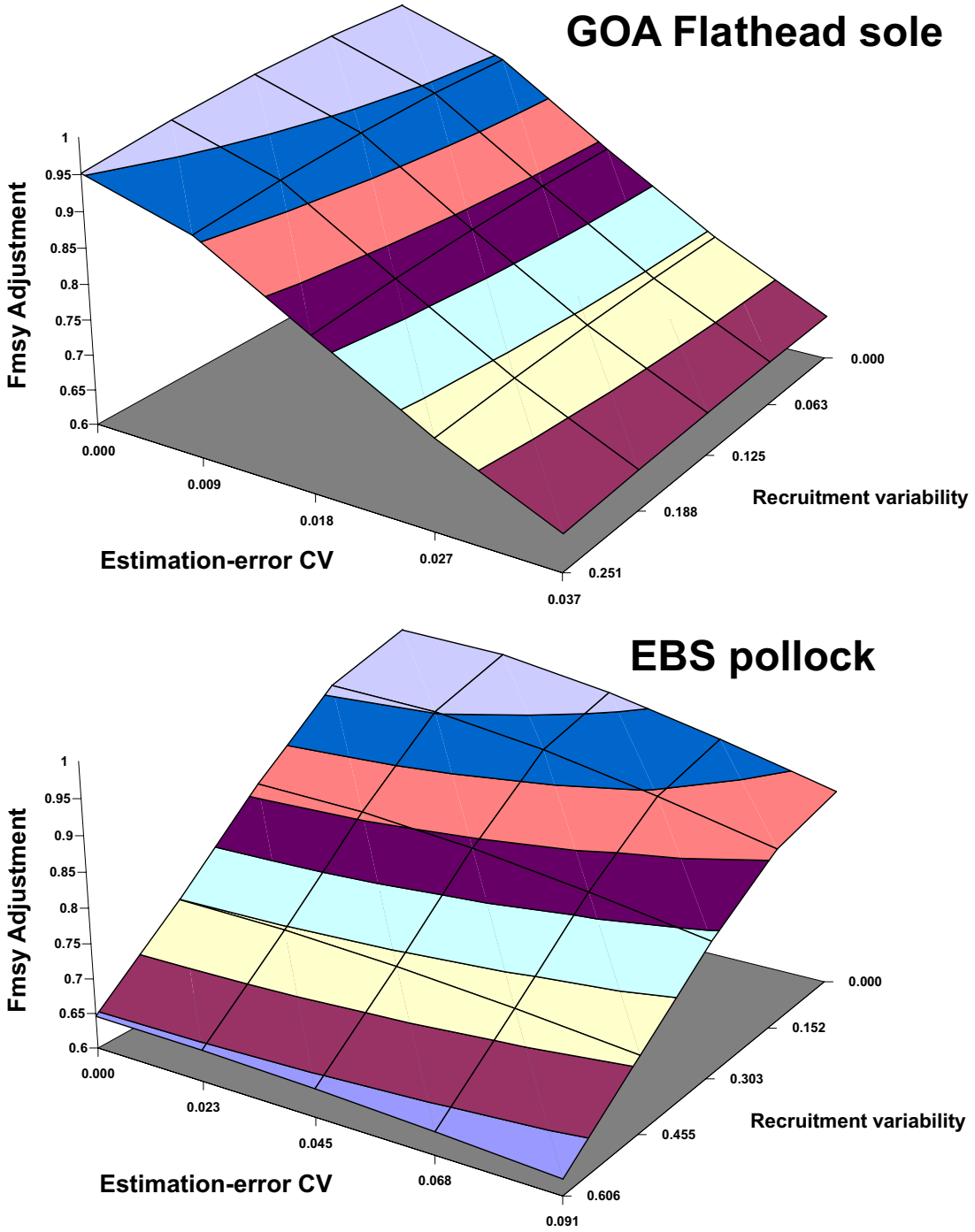

Figure 4.1-9. Two example sensitivity analyses contrasting the effect of different levels of variability in estimation error (left axis) and recruitment variability (right axis). Note that as recruitment variability and estimate error are zero, the risk-averse harvest rate is equal to Fmsy. Note also that the relationship between growth, maturation, and age-specific vulnerability additionally affects these patterns.

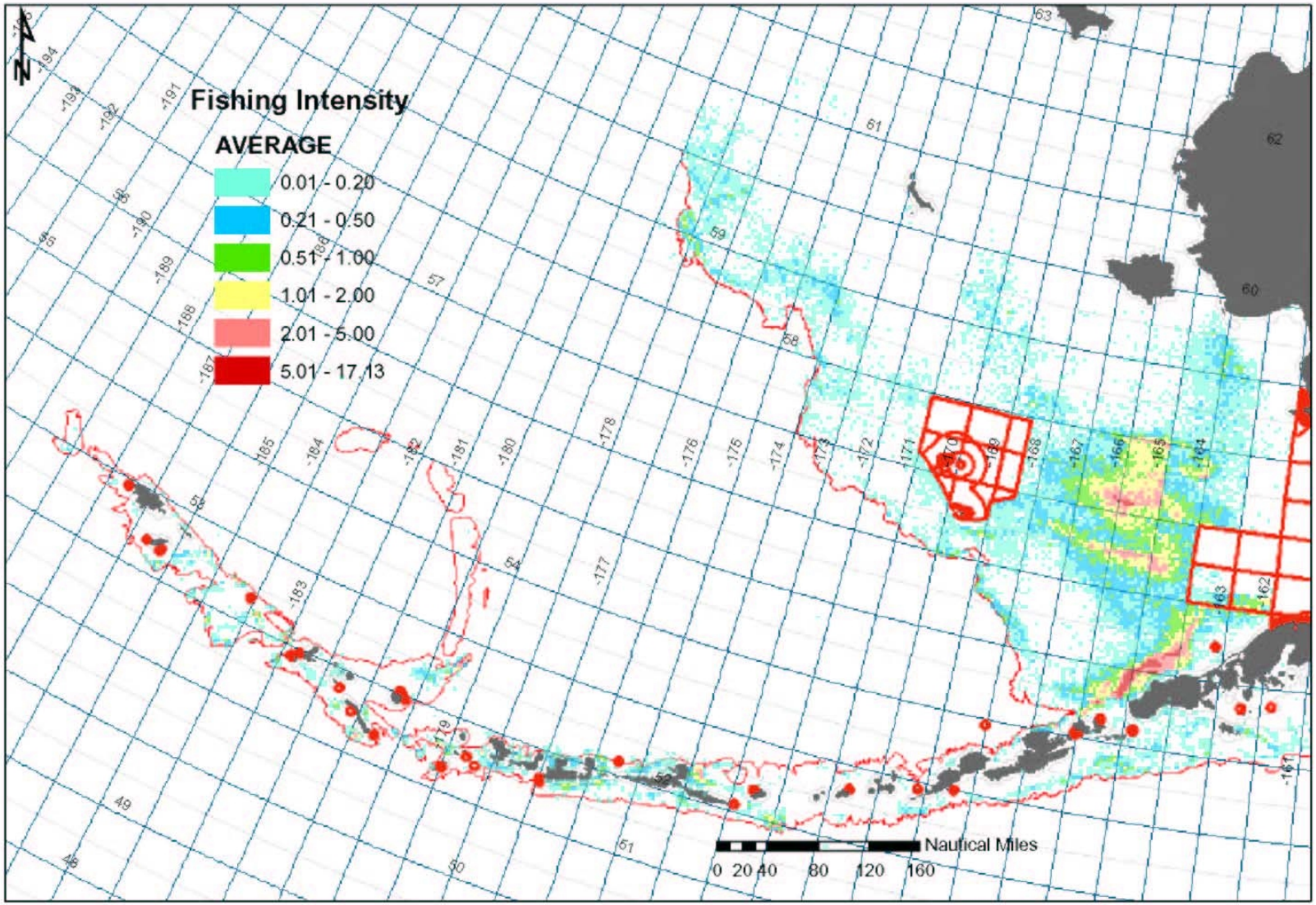

Figure 4.1-10 Bottom Trawl Fishing Intensity and all species closures under example FMPs 1, 2.2 and 3.1 in BSAI.

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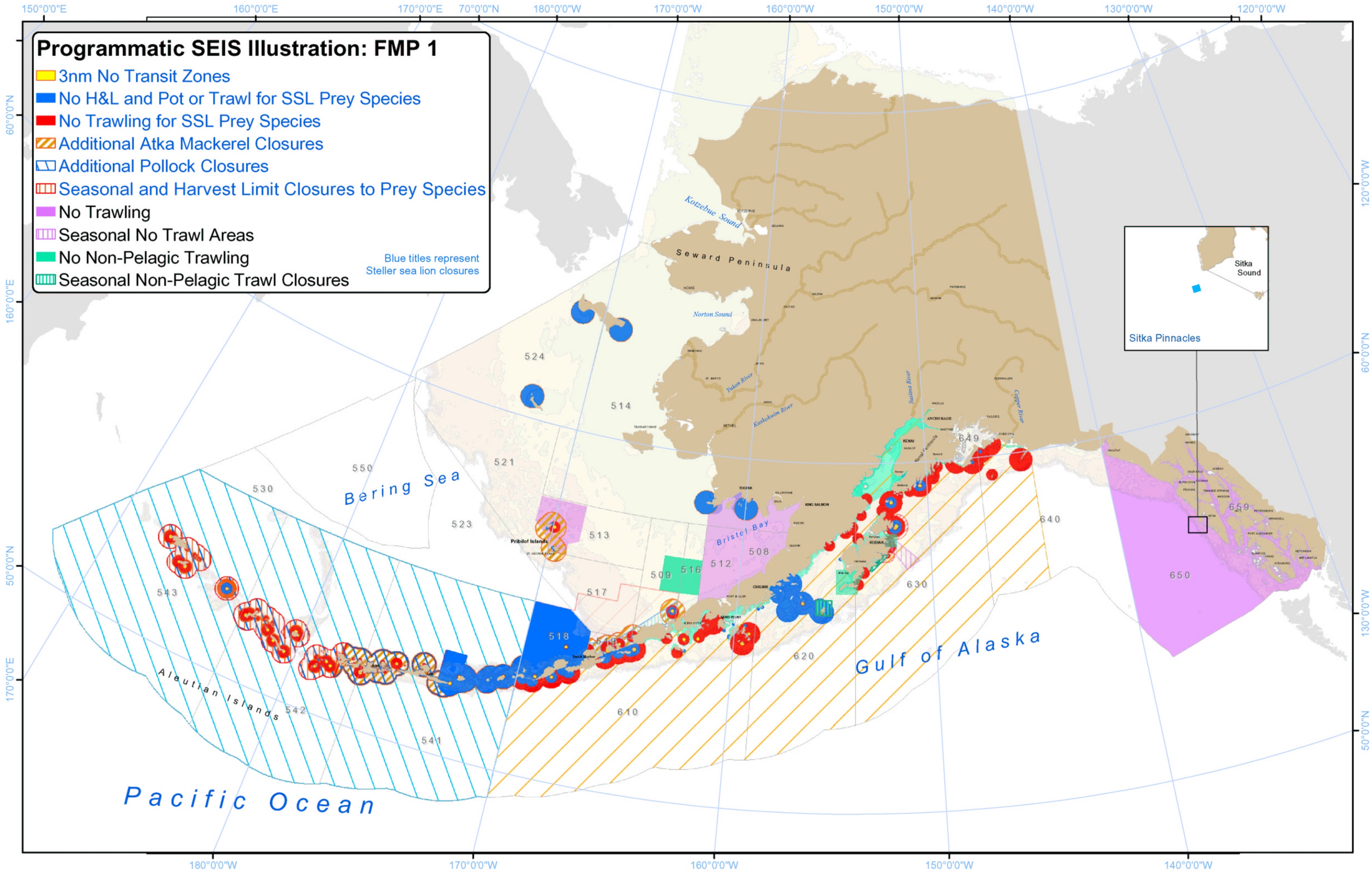


Figure 4.2-1. Programmatic SEIS Illustration of closure areas included in FMP 1

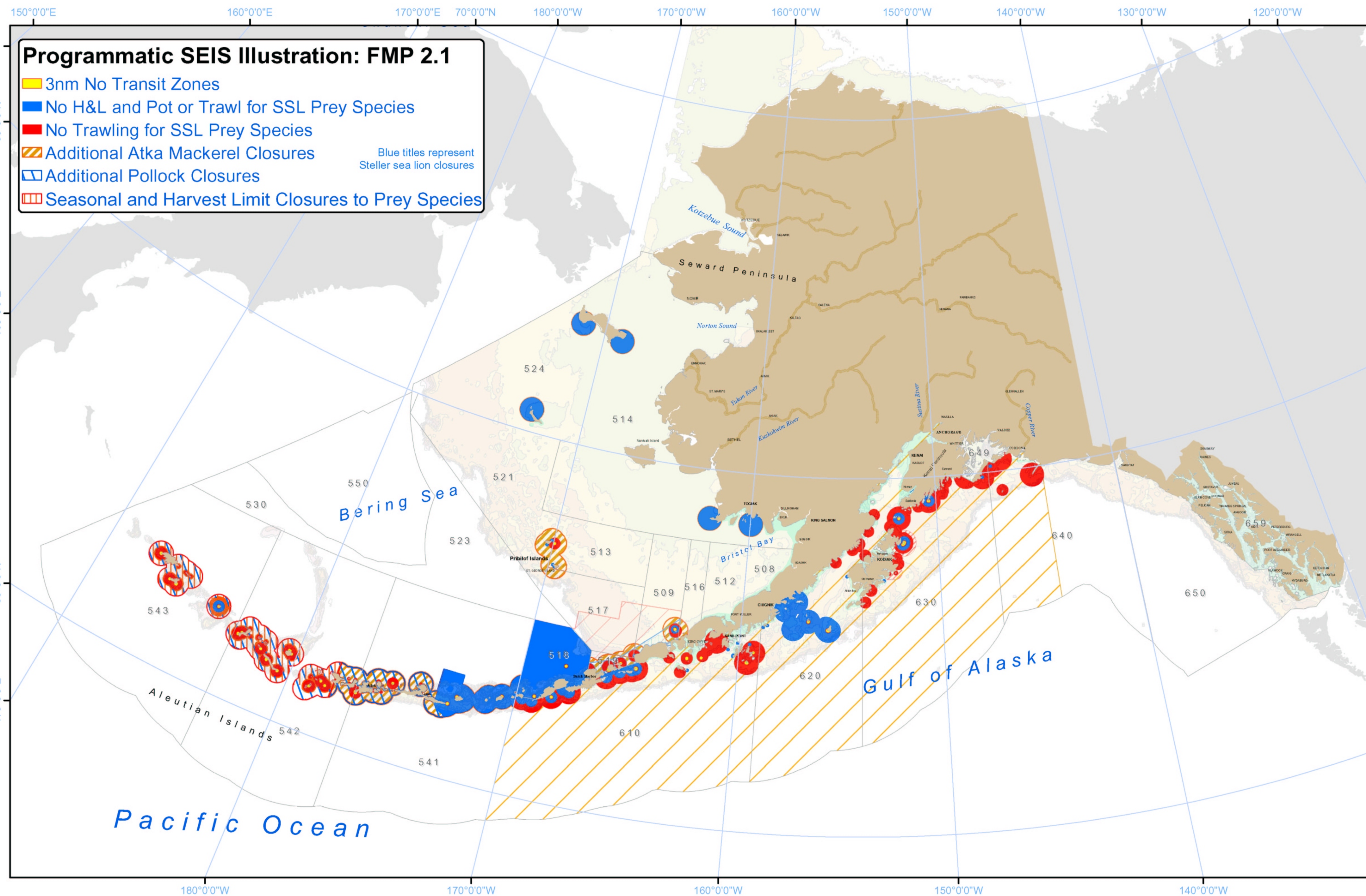


Figure 4.2-2. Programmatic SEIS Illustration of closure areas included in FMP 2.1

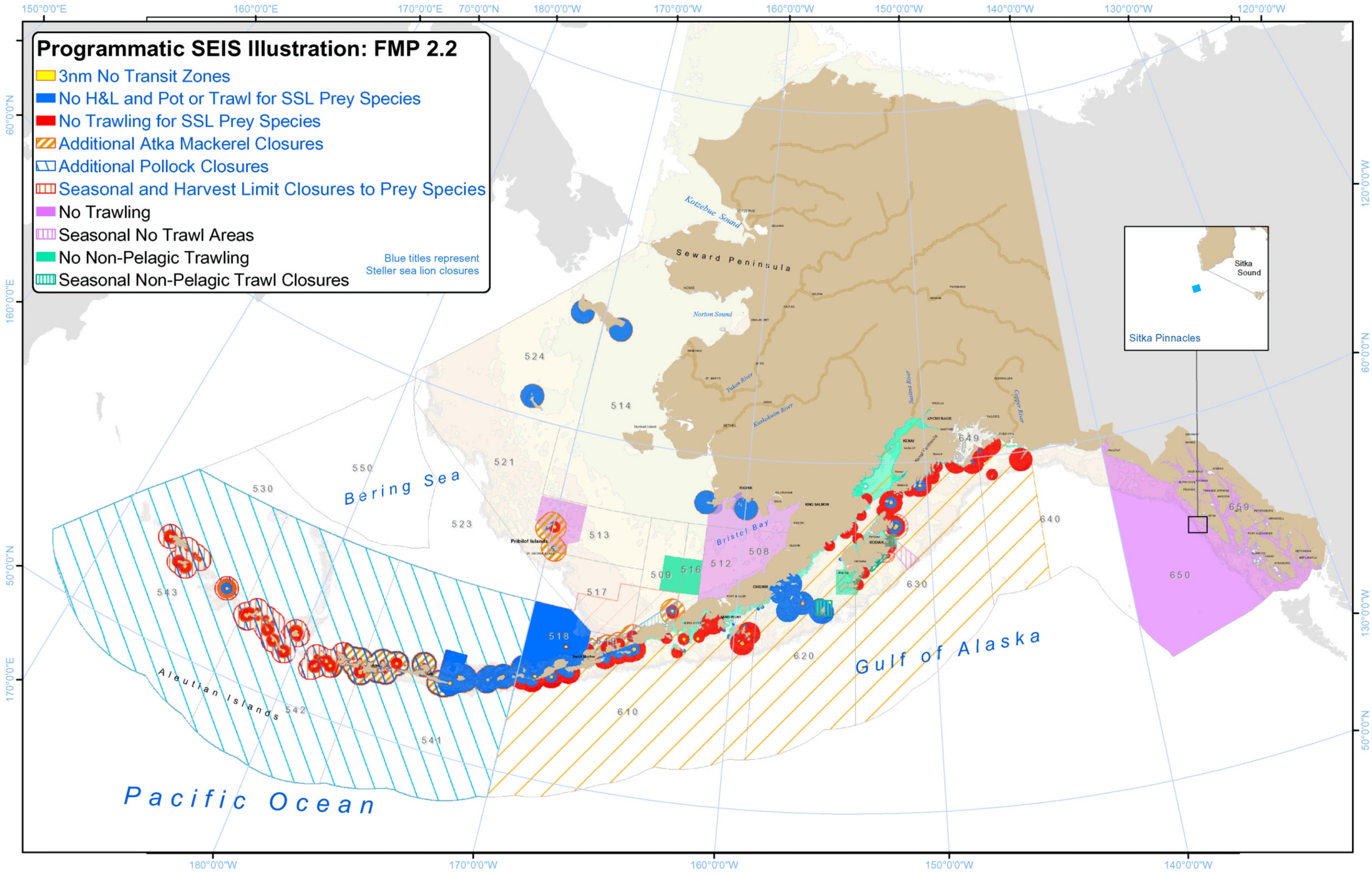


Figure 4.2-3. Programmatic SEIS Illustration of closure areas included in FMP 2.2

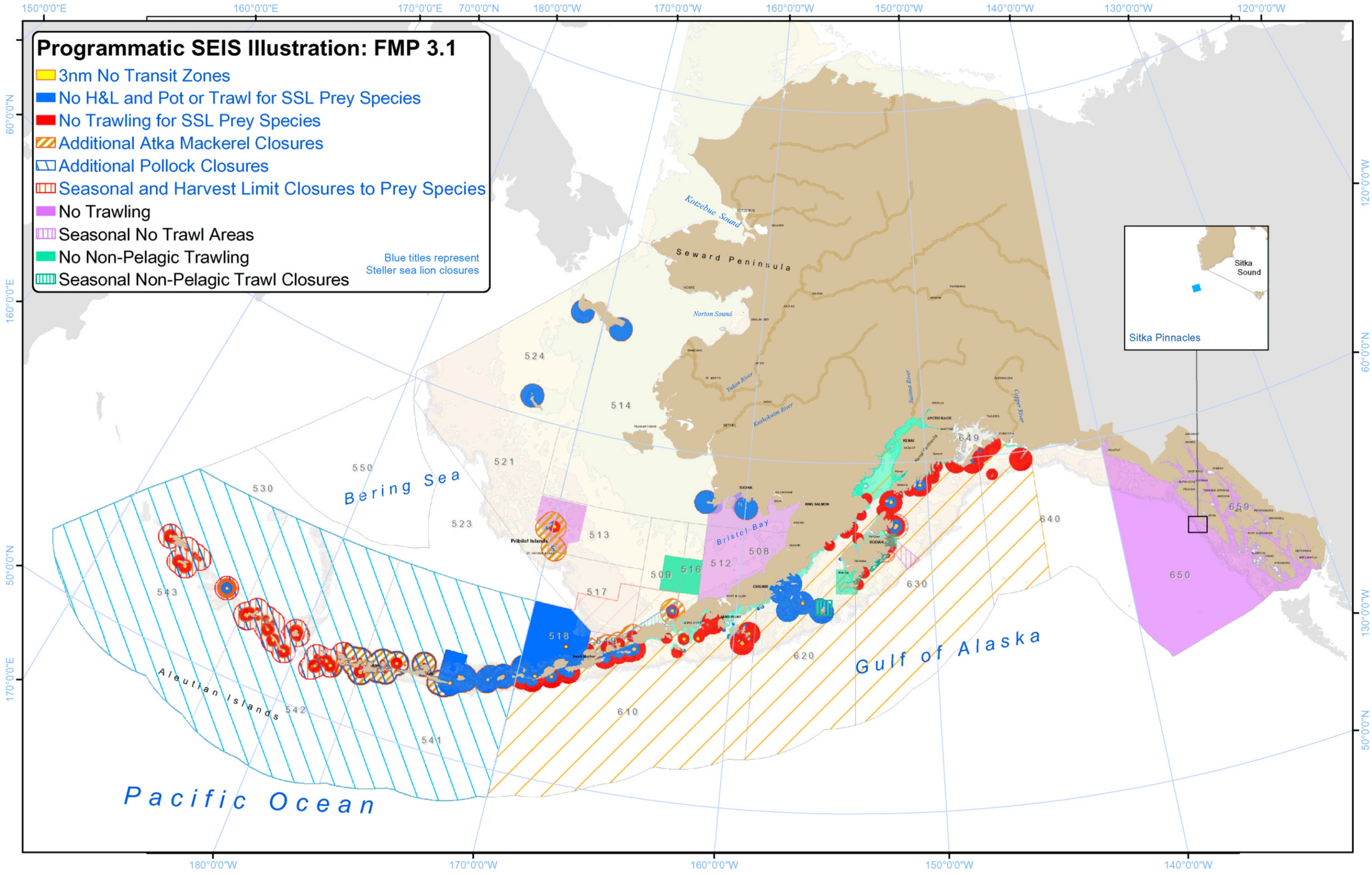


Figure 4.2-4. Programmatic SEIS Illustration of closure areas included in FMP 3.1

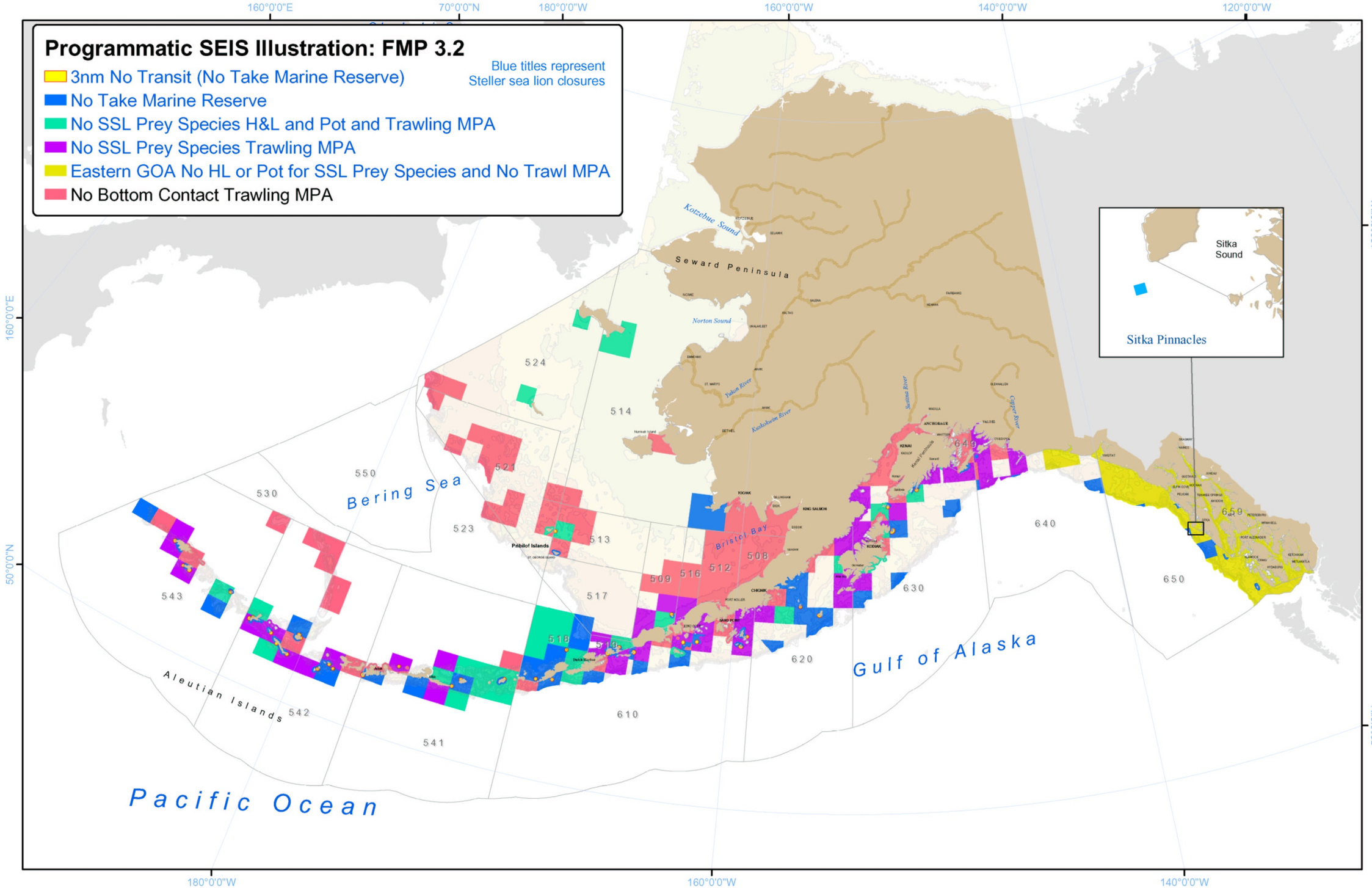
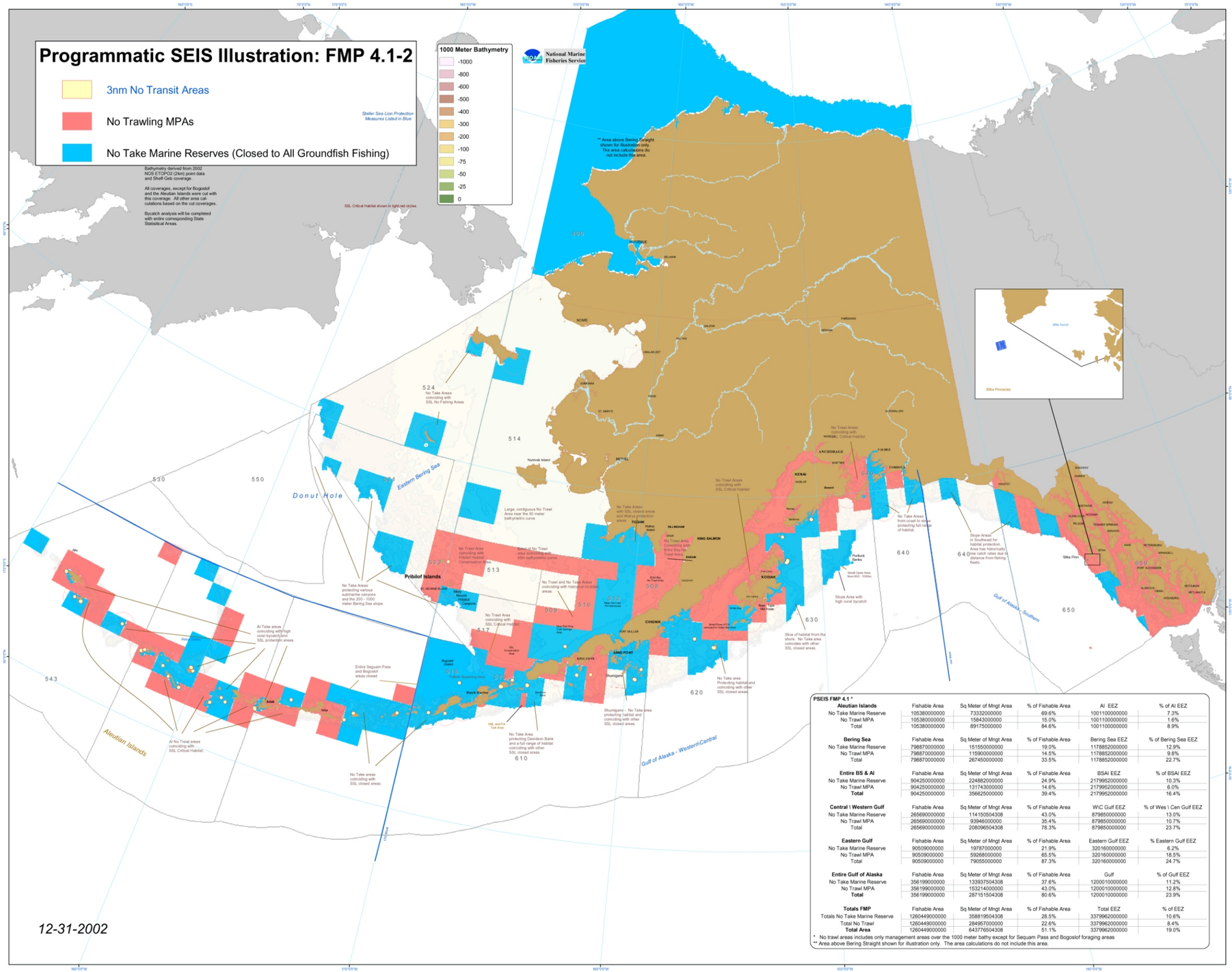


Figure 4.2-5. Programmatic SEIS Illustration of closure areas included in FMP 3.2



PSEIS FMP 4.1 *					
Aleutian Islands	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	AI EEZ	% of AI EEZ
No Take Marine Reserve	105380000000	73332000000	69.6%	1001100000000	7.3%
No Trawl MPA	105380000000	15843000000	15.0%	1001100000000	1.6%
Total	105380000000	89175000000	84.6%	1001100000000	8.9%
Bering Sea	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Bering Sea EEZ	% of Bering Sea EEZ
No Take Marine Reserve	798870000000	151550000000	19.0%	1178852000000	12.9%
No Trawl MPA	798870000000	115900000000	14.5%	1178852000000	9.8%
Total	798870000000	267450000000	33.5%	1178852000000	22.7%
Entire BS & AI	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	BSAI EEZ	% of BSAI EEZ
No Take Marine Reserve	904250000000	224882000000	24.9%	2179952000000	10.3%
No Trawl MPA	904250000000	131743000000	14.6%	2179952000000	6.0%
Total	904250000000	356625000000	39.4%	2179952000000	16.4%
Central \ Western Gulf	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	WC Gulf EEZ	% of Wes \ Cen Gulf EEZ
No Take Marine Reserve	265690000000	114150504308	43.0%	879850000000	13.0%
No Trawl MPA	265690000000	93946000000	35.4%	879850000000	10.7%
Total	265690000000	208096504308	78.3%	879850000000	23.7%
Eastern Gulf	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Eastern Gulf EEZ	% Eastern Gulf EEZ
No Take Marine Reserve	90509000000	19787000000	21.9%	320160000000	6.2%
No Trawl MPA	90509000000	59268000000	65.5%	320160000000	18.5%
Total	90509000000	79055000000	87.3%	320160000000	24.7%
Entire Gulf of Alaska	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Gulf	% of Gulf EEZ
No Take Marine Reserve	356199000000	133937504308	37.6%	1200010000000	11.2%
No Trawl MPA	356199000000	153214000000	43.0%	1200010000000	12.8%
Total	356199000000	287151504308	80.6%	1200010000000	23.9%
Totals FMP	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Total EEZ	% of EEZ
Totals No Take Marine Reserve	1260449000000	358819504308	28.5%	3379962000000	10.6%
Total No Trawl	1260449000000	284957000000	22.6%	3379962000000	8.4%
Total Area	1260449000000	643776504308	51.1%	3379962000000	19.0%

* No trawl areas includes only management areas over the 1000 meter bathy except for Sequam Pass and Bogoslof foraging areas
** Area above Bering Straight shown for illustration only. The area calculations do not include this area.

Figure 4.2-6. Programmatic SEIS Illustration of closure areas included in FMP 4.1 all colors used

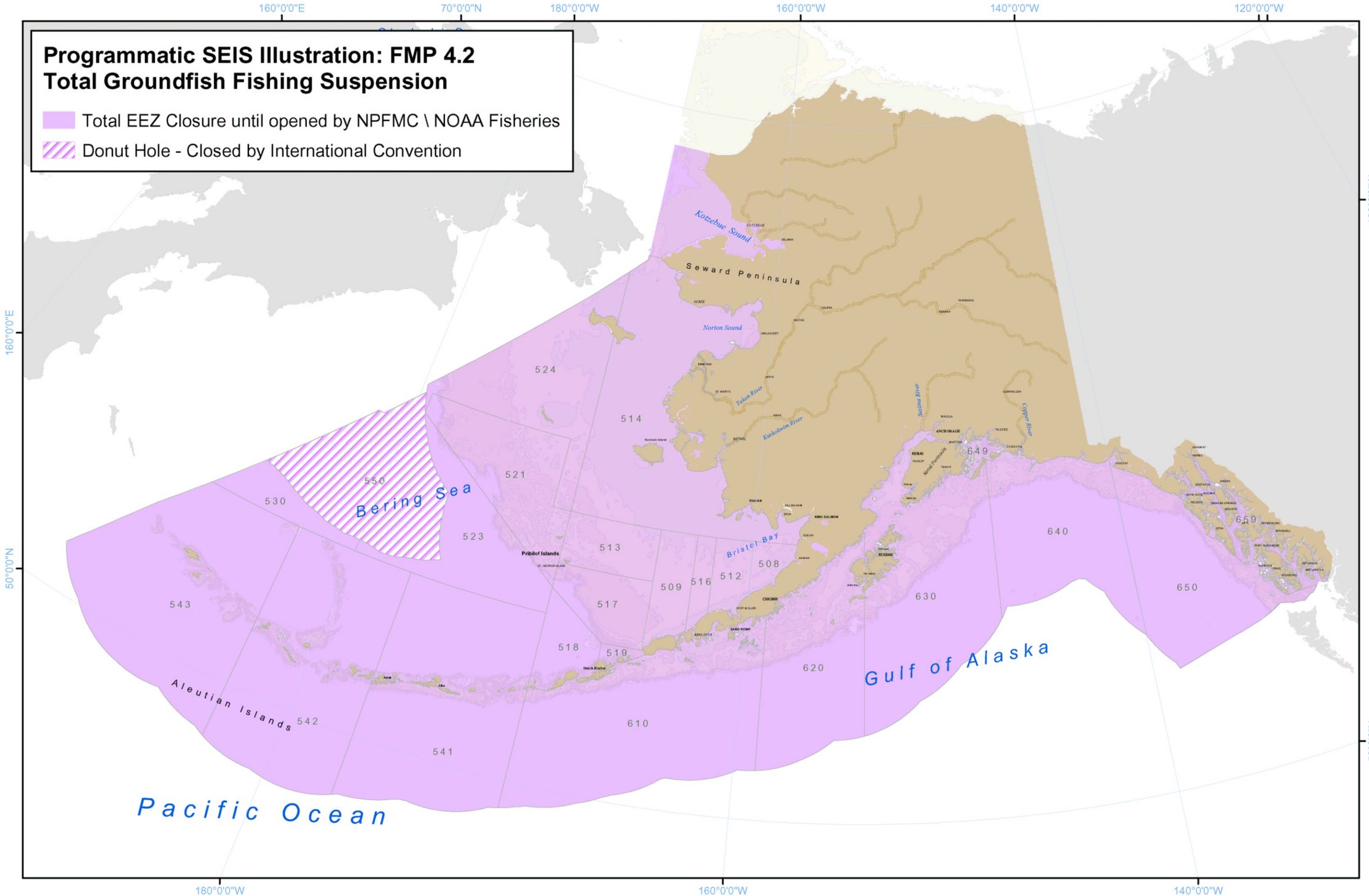


Figure 4.2-7. Programmatic SEIS Illustration of closure areas included in FMP 4.2

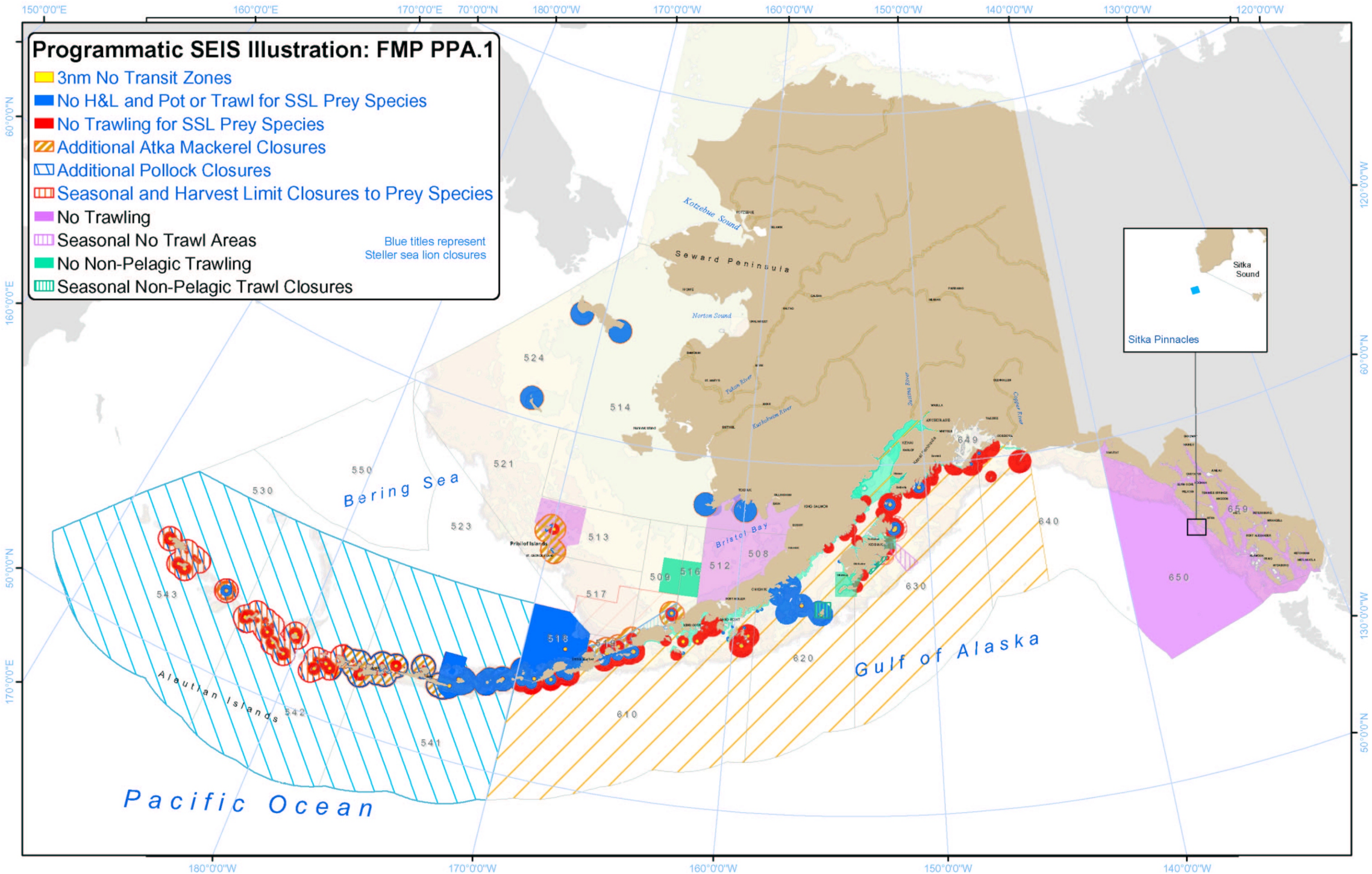


Figure 4.2-8. Programmatic SEIS Illustration of closure areas included in PPA.1

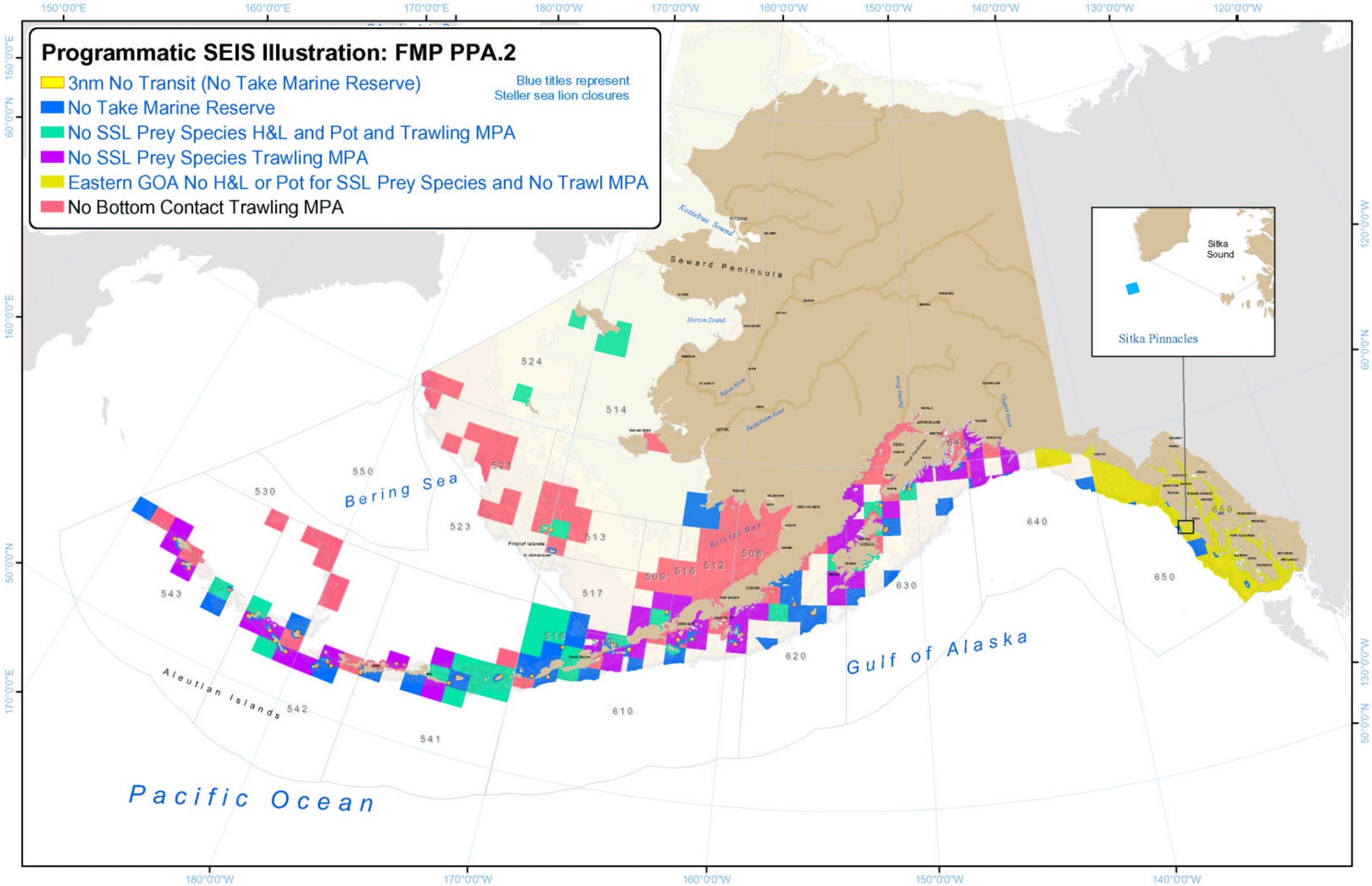


Figure 4.2-9. Programmatic SEIS Illustration of closure areas included in PPA.2

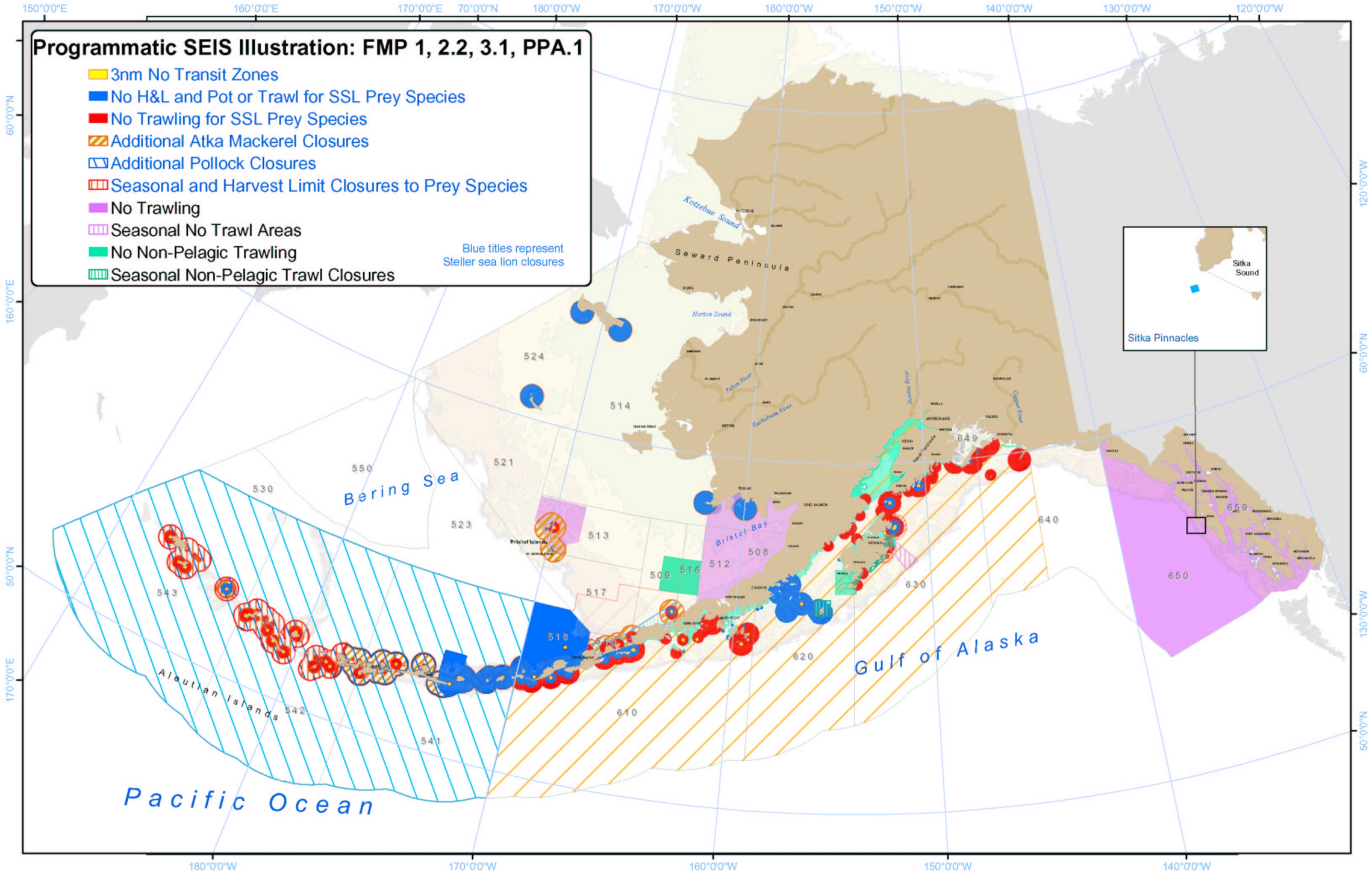
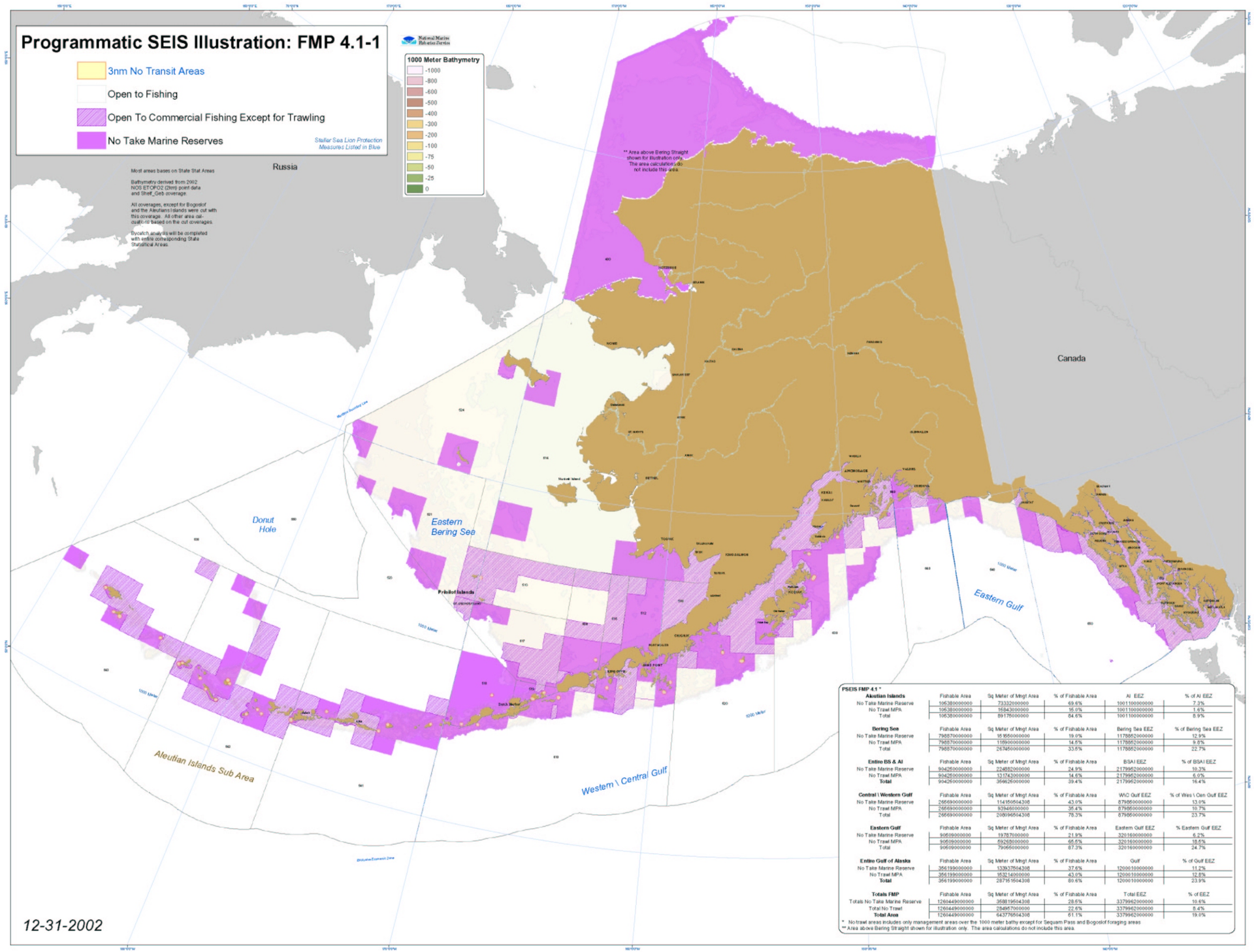


Figure 4.2-10. Programmatic SEIS Illustration of closure areas included in FMPs 1, 2.2, and 3.1.



PSEIS FMP 4.1 *					
Aleutian Islands	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	AI EEZ	% of AI EEZ
No Take Marine Reserve	106380000000	73332000000	69.6%	1001100000000	7.3%
No Trawl MPA	106380000000	16843000000	15.0%	1001100000000	1.6%
Total	106380000000	89175000000	84.6%	1001100000000	8.9%
Bering Sea	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Bering Sea EEZ	% of Bering Sea EEZ
No Take Marine Reserve	796870000000	151950000000	19.0%	1178852000000	12.9%
No Trawl MPA	796870000000	116900000000	14.6%	1178852000000	9.8%
Total	796870000000	267450000000	33.6%	1178852000000	22.7%
Entire BS & AI	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	BSAI EEZ	% of BSAI EEZ
No Take Marine Reserve	904250000000	224882000000	24.9%	2179952000000	10.3%
No Trawl MPA	904250000000	131743000000	14.6%	2179952000000	6.0%
Total	904250000000	356625000000	39.4%	2179952000000	16.4%
Central \ Western Gulf	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	WC Gulf EEZ	% of Wes \ Cen Gulf EEZ
No Take Marine Reserve	266690000000	114156504308	43.0%	879860000000	13.0%
No Trawl MPA	266690000000	93546000000	35.4%	879860000000	10.7%
Total	266690000000	208096504308	78.3%	879860000000	23.7%
Eastern Gulf	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Eastern Gulf EEZ	% Eastern Gulf EEZ
No Take Marine Reserve	90609000000	19787000000	21.9%	329160000000	6.2%
No Trawl MPA	90609000000	59268000000	65.5%	329160000000	18.5%
Total	90609000000	79055000000	87.3%	329160000000	24.7%
Entire Gulf of Alaska	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Gulf	% of Gulf EEZ
No Take Marine Reserve	356199000000	133937504308	37.6%	1200010000000	11.2%
No Trawl MPA	356199000000	153214000000	43.0%	1200010000000	12.8%
Total	356199000000	287151504308	80.6%	1200010000000	23.9%
Totals FMP	Fishable Area	Sq Meter of Mngt Area	% of Fishable Area	Total EEZ	% of EEZ
Totals No Take Marine Reserve	1260449000000	358819504308	28.5%	3379962000000	10.6%
Total No Trawl	1260449000000	284957000000	22.6%	3379962000000	8.4%
Total Area	1260449000000	643776504308	51.1%	3379962000000	19.0%

* No trawl areas includes only management areas over the 1000 meter bathy except for Sequam Pass and Bogoslof foraging areas
** Area above Bering Straight shown for illustration only. The area calculations do not include this area.

Figure 4.2-11. Programmatic SEIS Illustration of closure areas included in FMP 4.1 all colors used

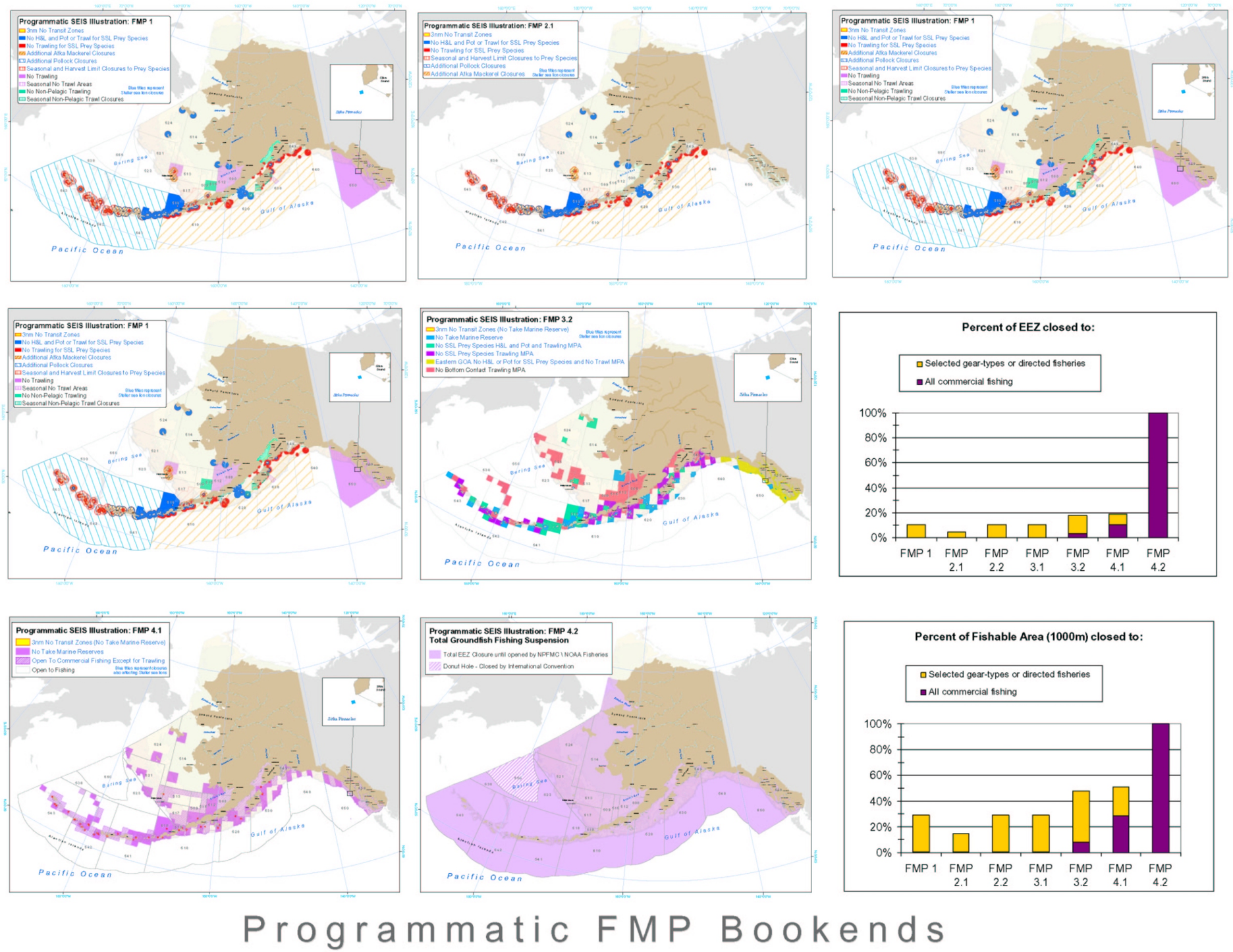


Figure 4.2-12. Programmatic SEIS Illustration of closure areas in all FMP Bookends; depictions of percent EEZ closed and fishable areas.

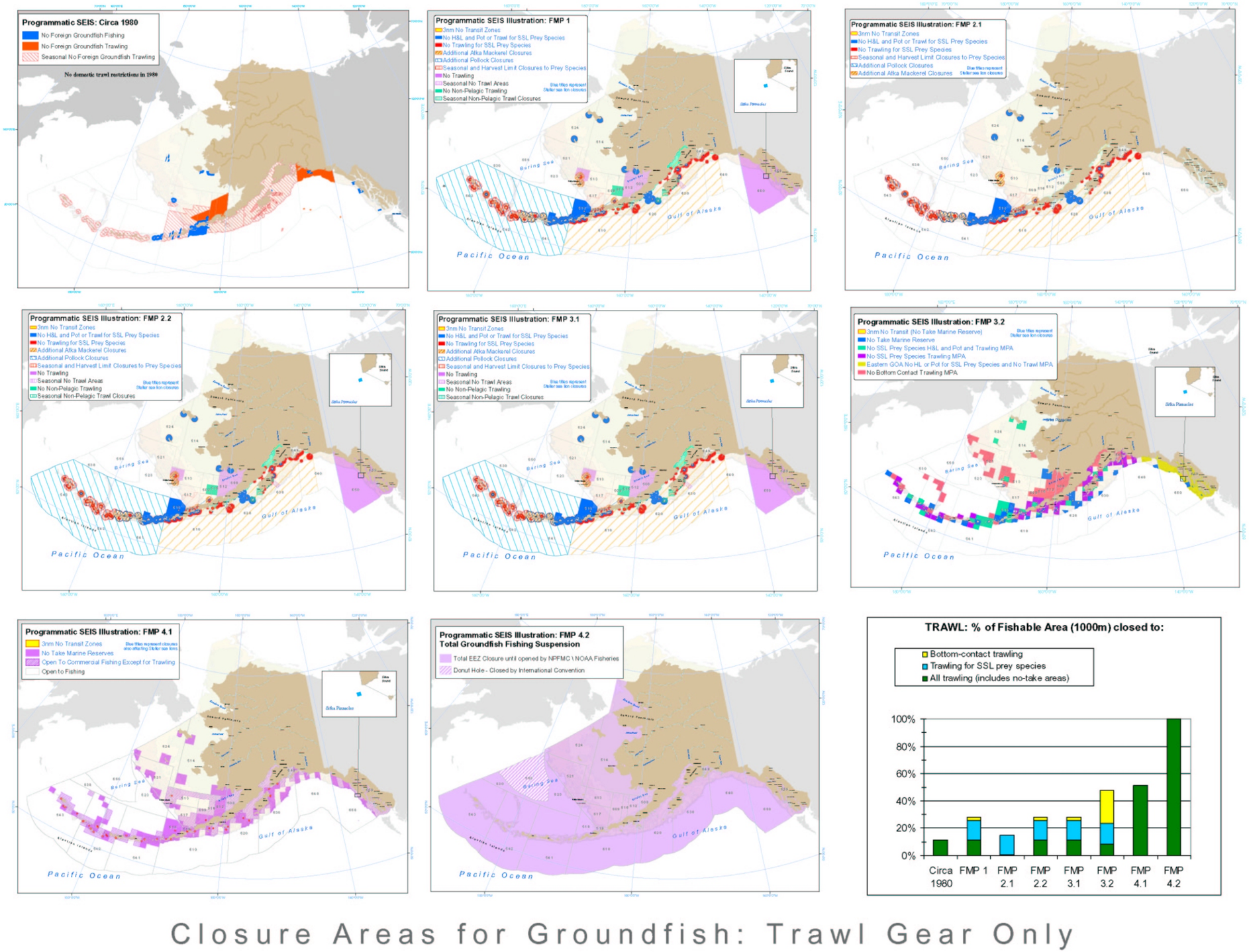


Figure 4.2-13. Programmatic SEIS Illustration of closure areas in all FMP Bookends (contains 1980 Circa map); depictions of percent fishable areas closed to trawl.

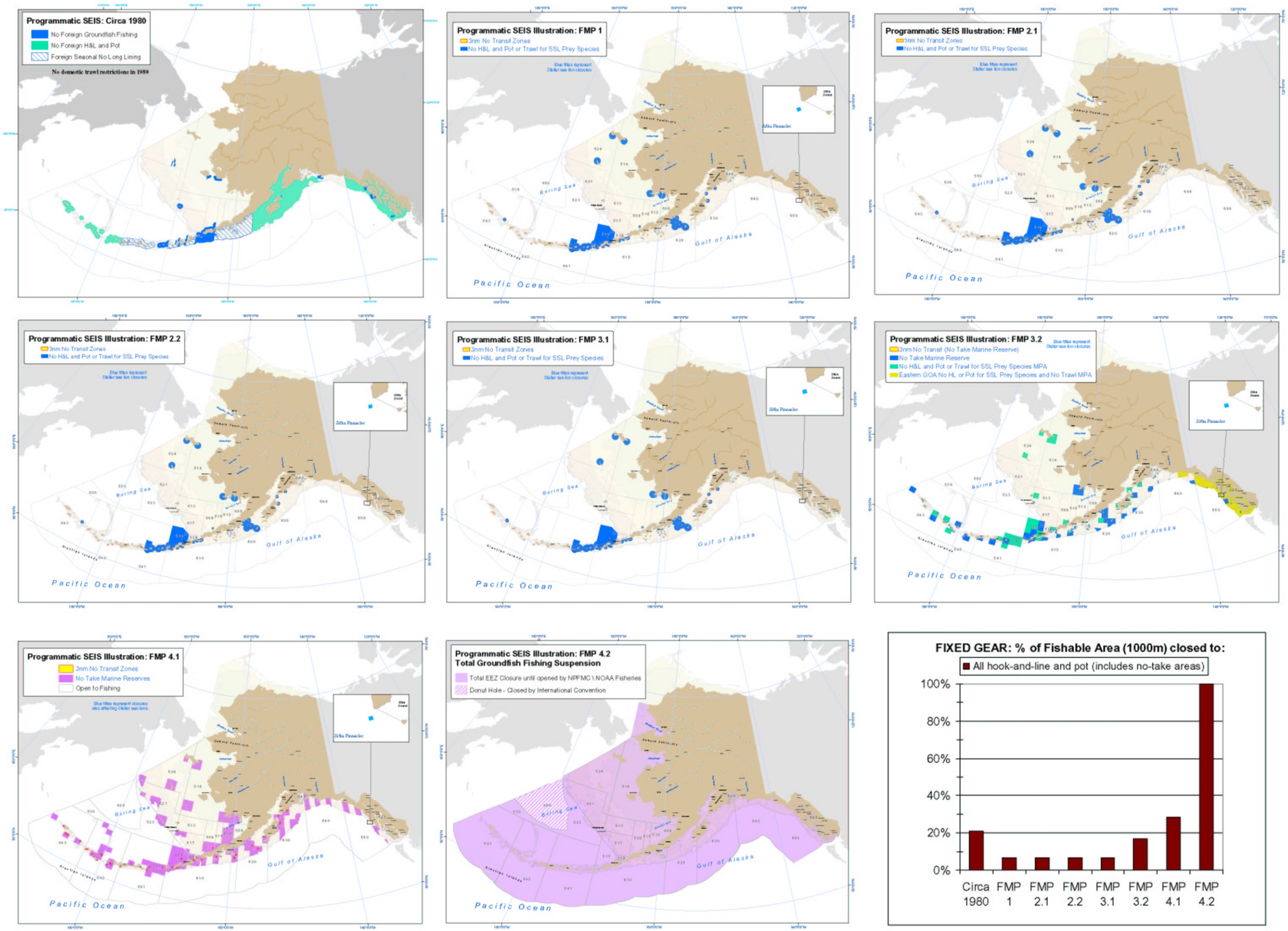


Figure 4.2-14. Programmatic SEIS Illustrations of closure areas in all FMP Bookends (contains Circa 1980 map); depictions of percent fishable areas closed to fixed gear (H&L and Pot).

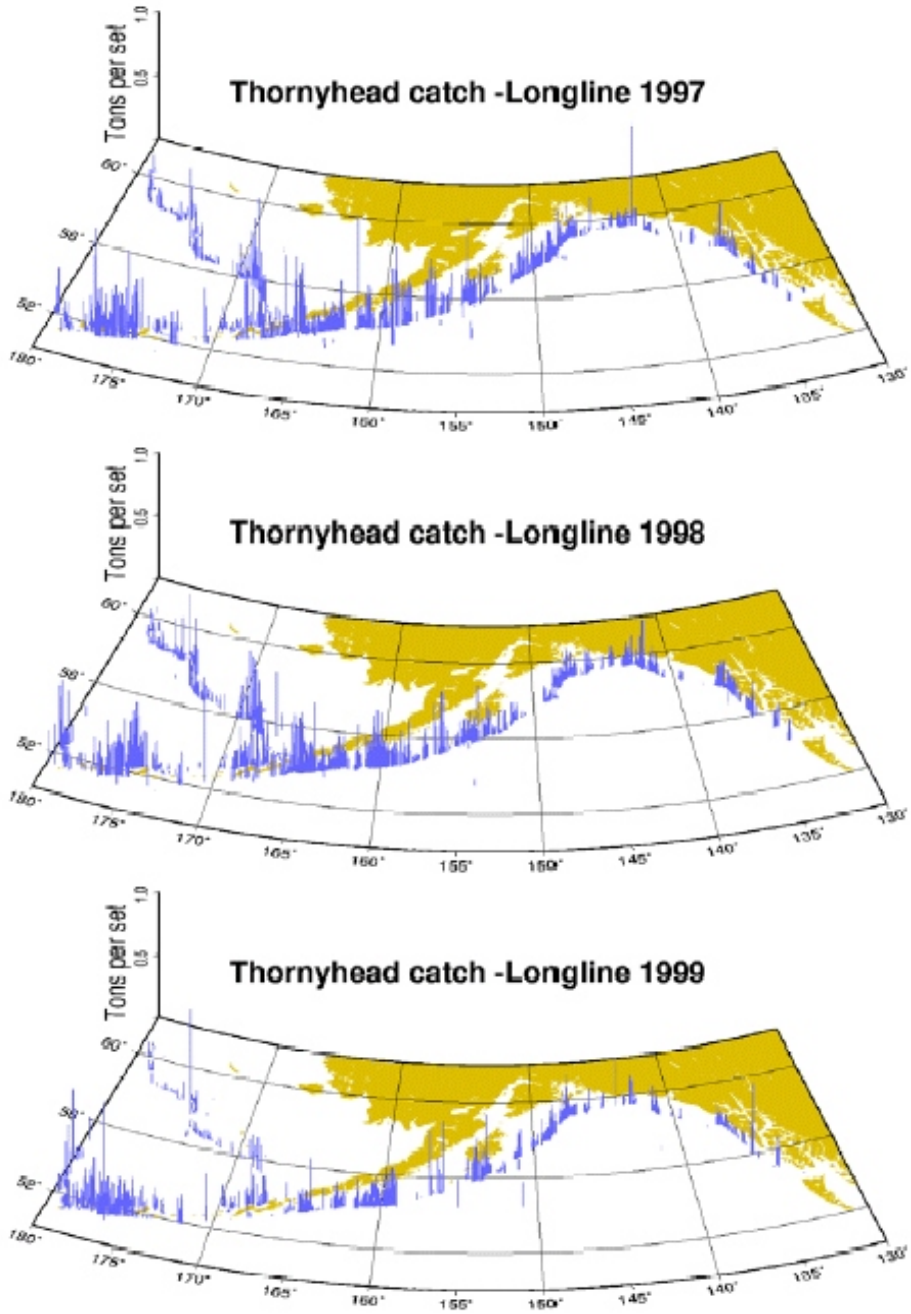


Figure 4.5-1. Distribution of thornyhead catches by commercial longline gear, 1997-1999. Source: Ianelli and Gaichas 2002

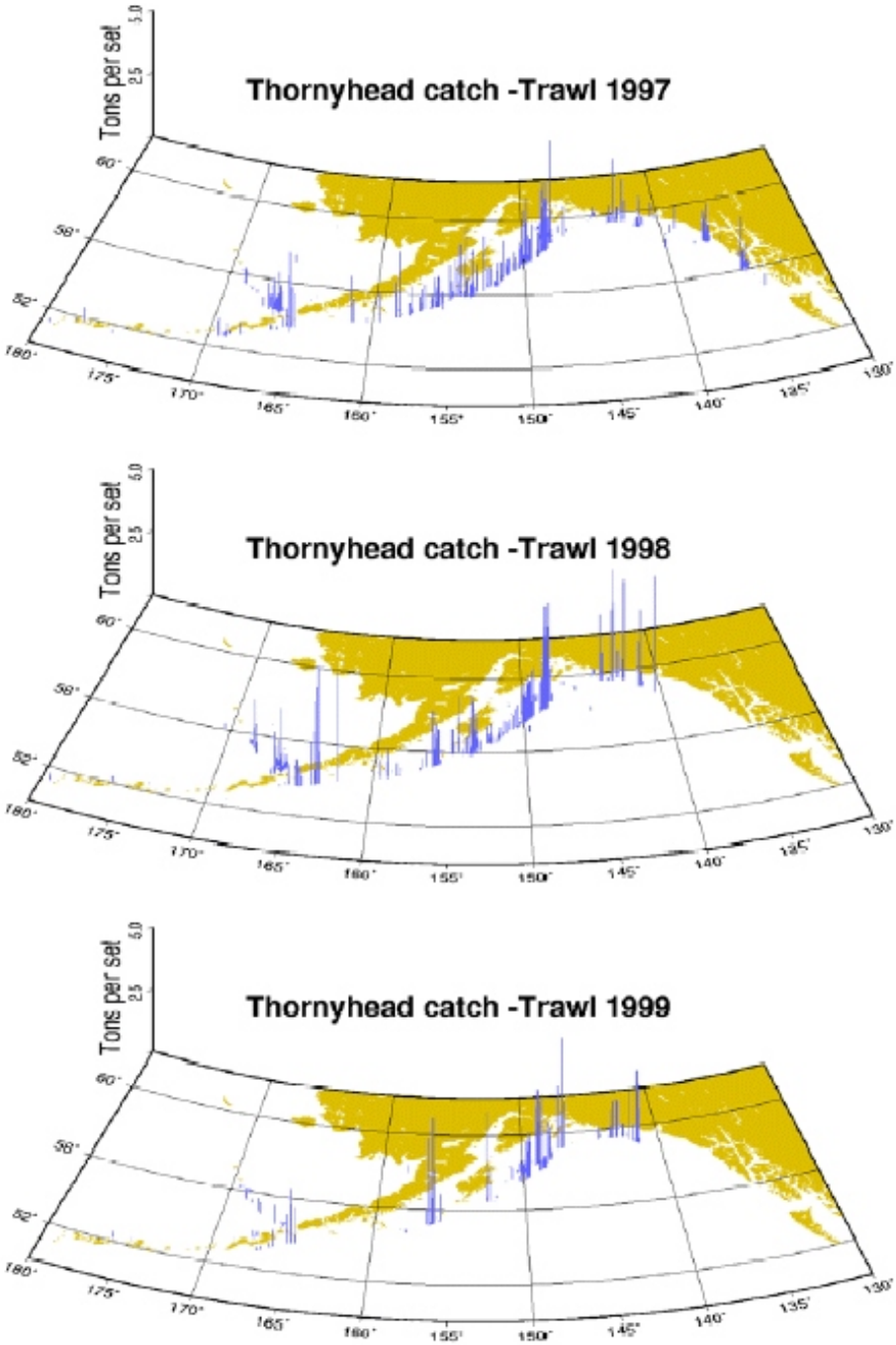
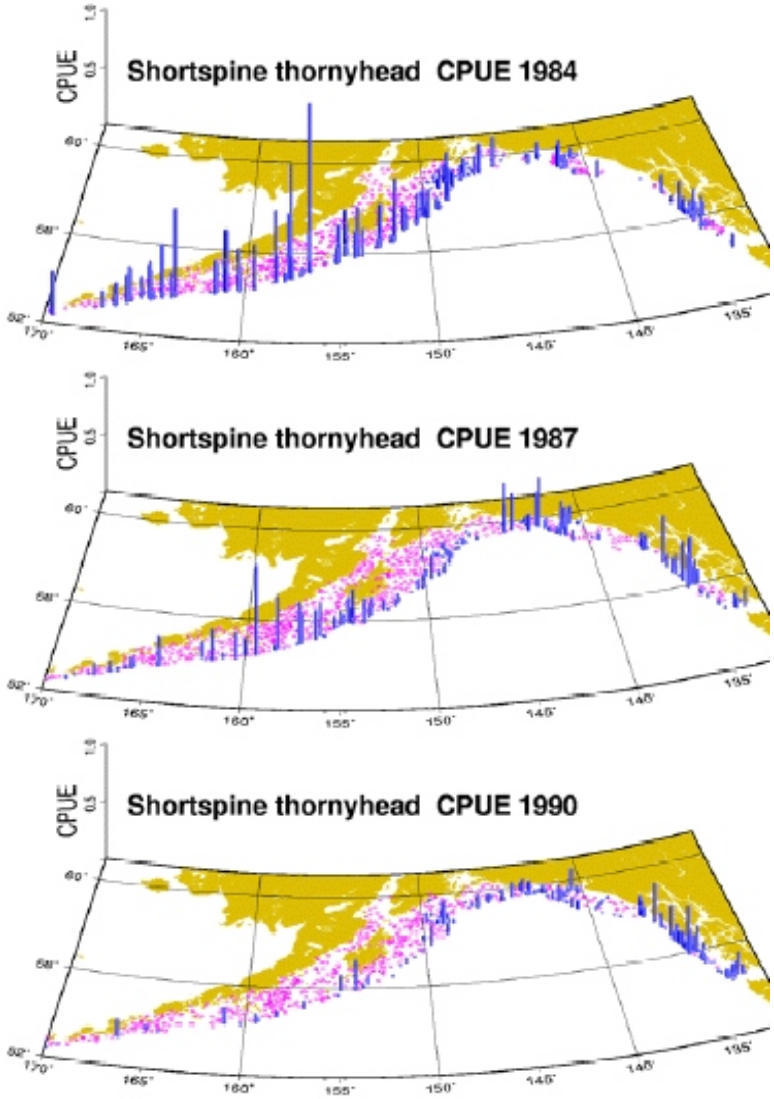


Figure 4.5-2. Distribution of thornyhead catches by commercial trawl gear, 1997-1999. Source: Ianelli and Gaichas 2002



Notes: Height of vertical bars is proportional to CPUE by weight. Circles represent stations where no shortspine thornyheads were captured.

Figure 4.5-3. Distribution of thornyhead CPUE from recent triennial trawl surveys. Source: Ianelli and Gaichas 2002

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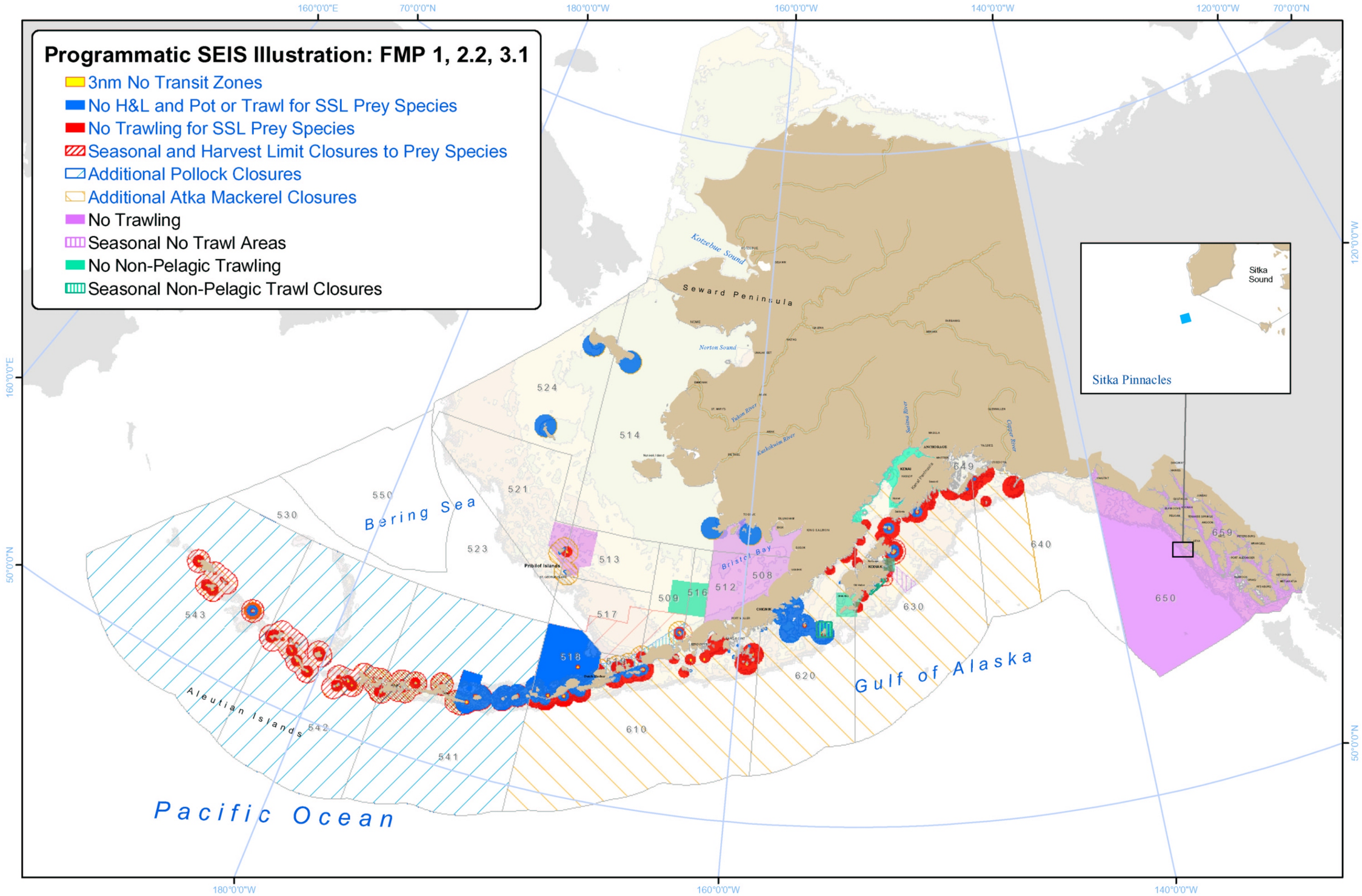

Figure 4.5-4. Areas closed to trawling only at various times of the year FMPs 1, 2.2, and 3.1.

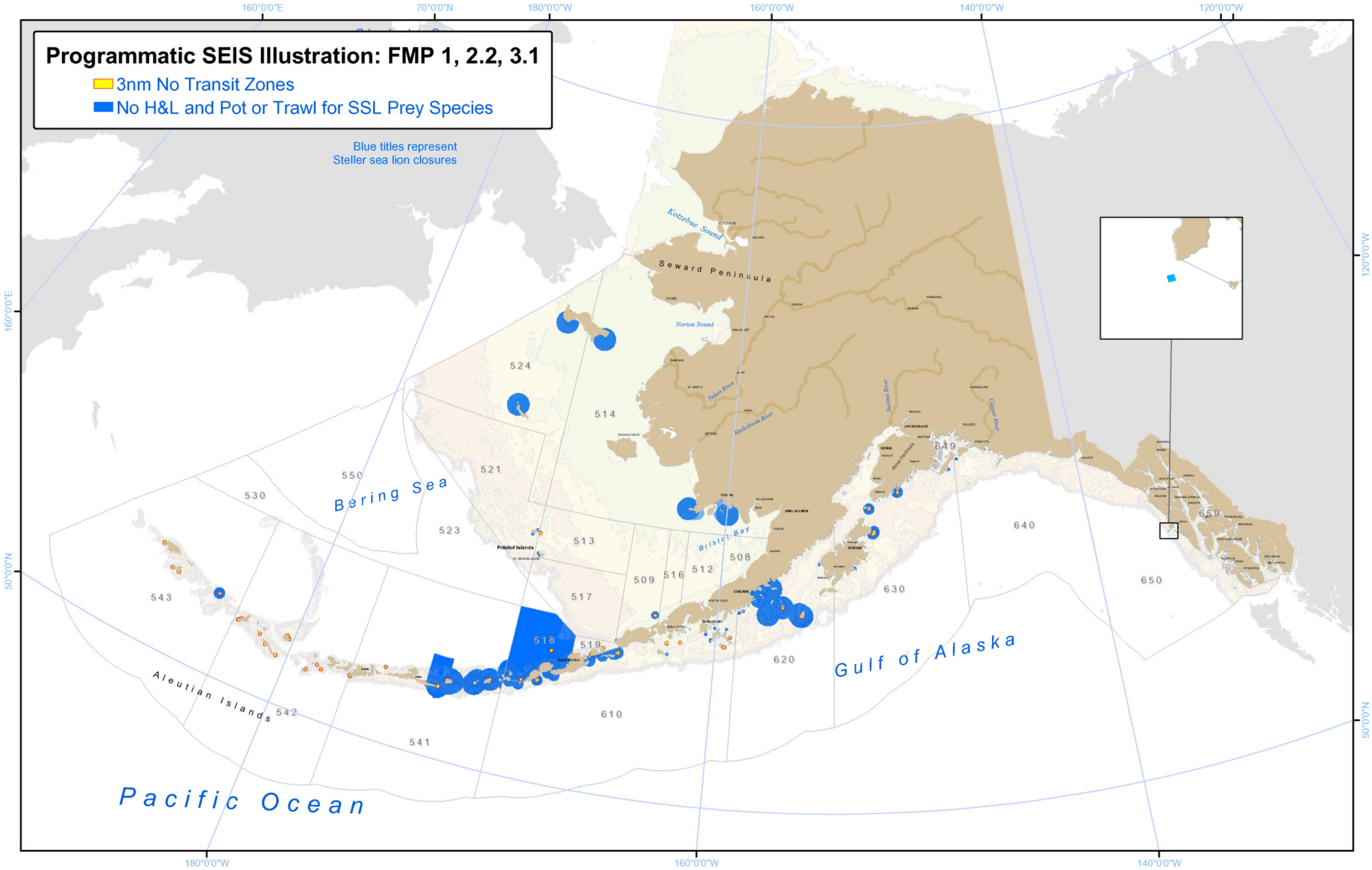

Figure 4.5-5. Areas closed to fixed gear at various times of the year FMPs 1, 2.2, and 3.1.

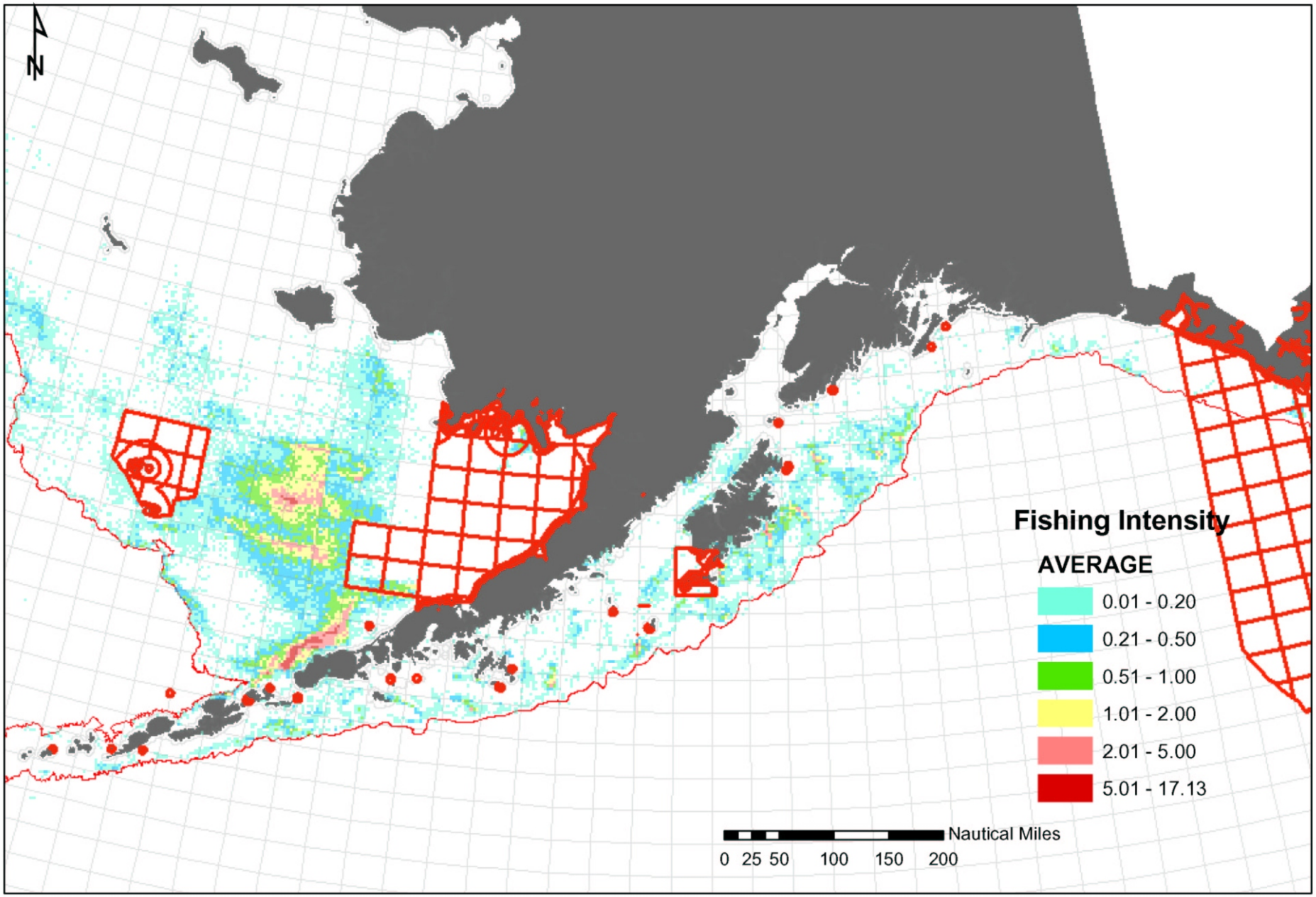

Figure 4.5-6. Bottom trawl fishing intensity and all spp closures under Alts 1, 2.2, and 3.1 in GOA and Bering Sea

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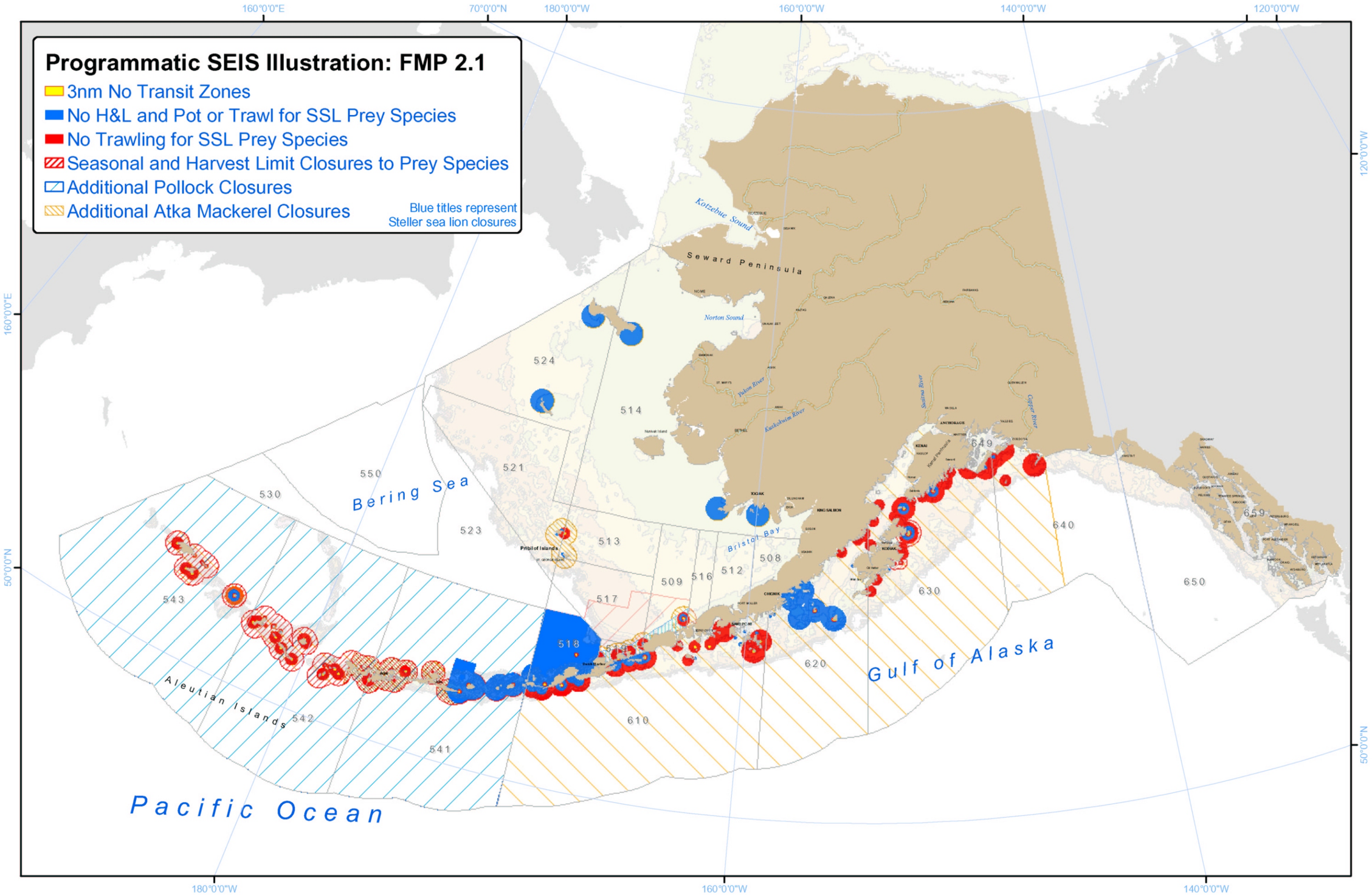

Figure 4.6-1. Areas closed to trawling only at various times of the year under FMP 2.1.

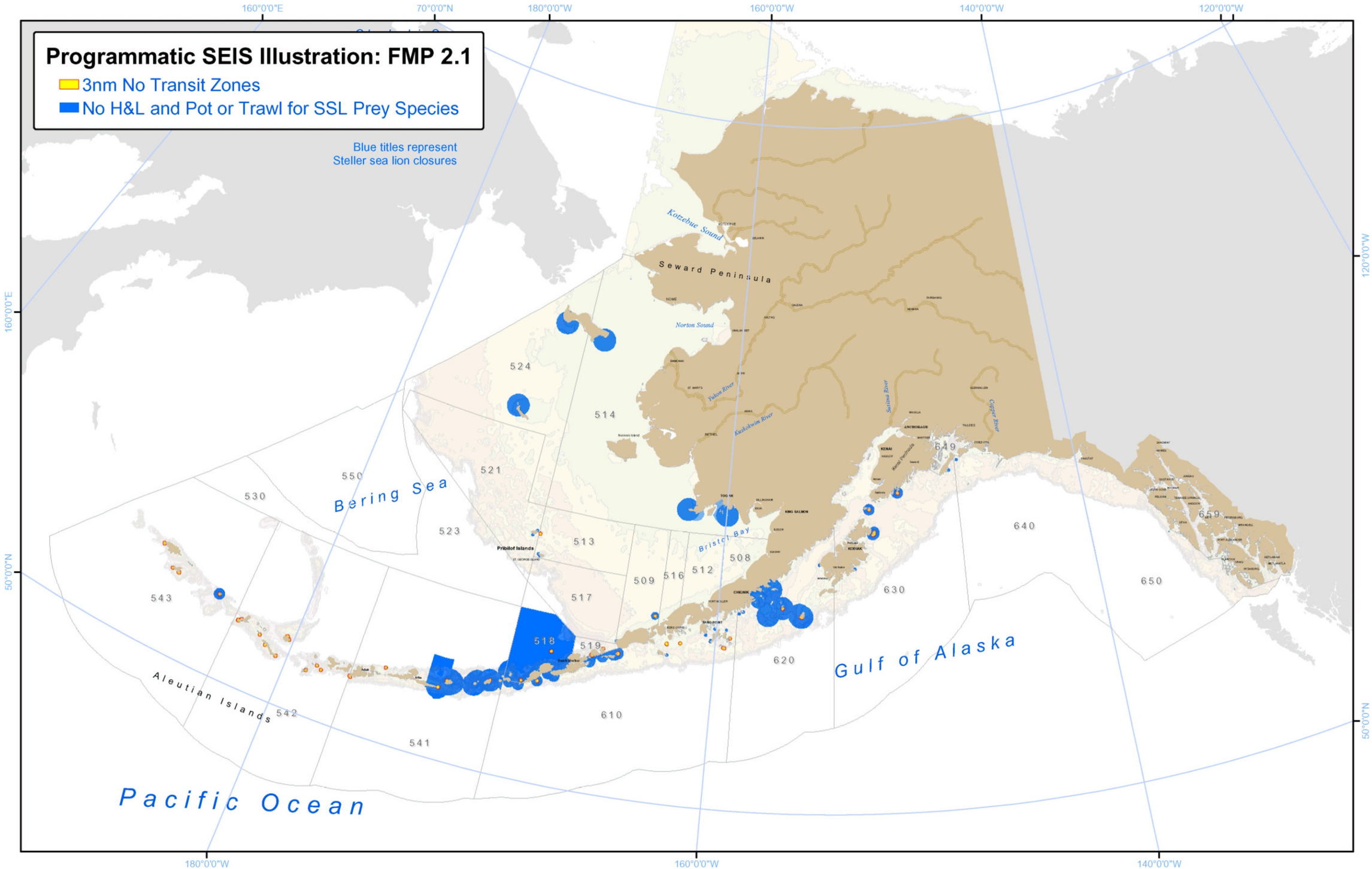

Figure 4.6-2. Areas closed to fixed gear only at various times of the year under FMP 2.1.

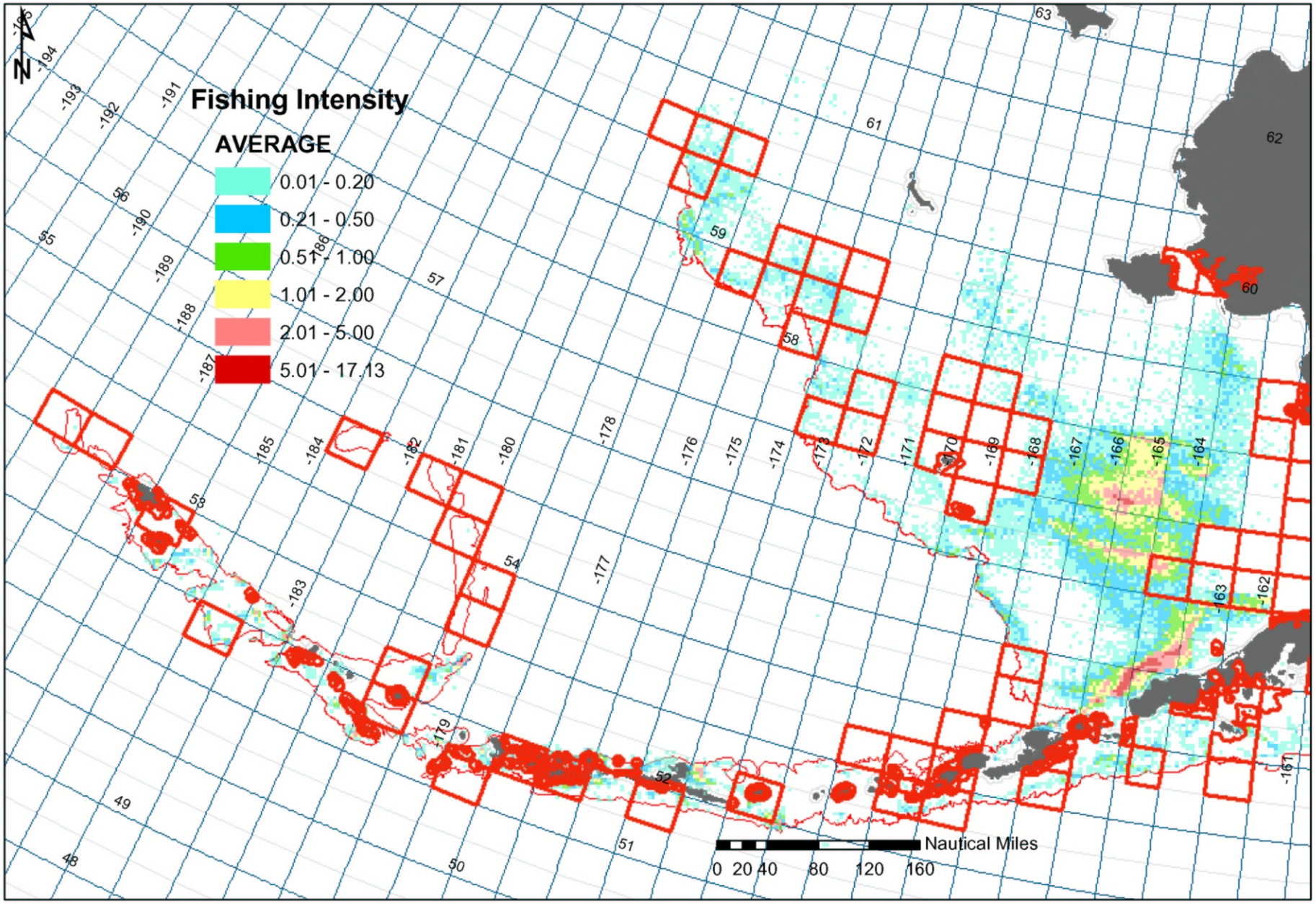

Figure 4.7-1. Bottom trawl fishing intensity and all spp closures under Alt 3.2 in BSAI

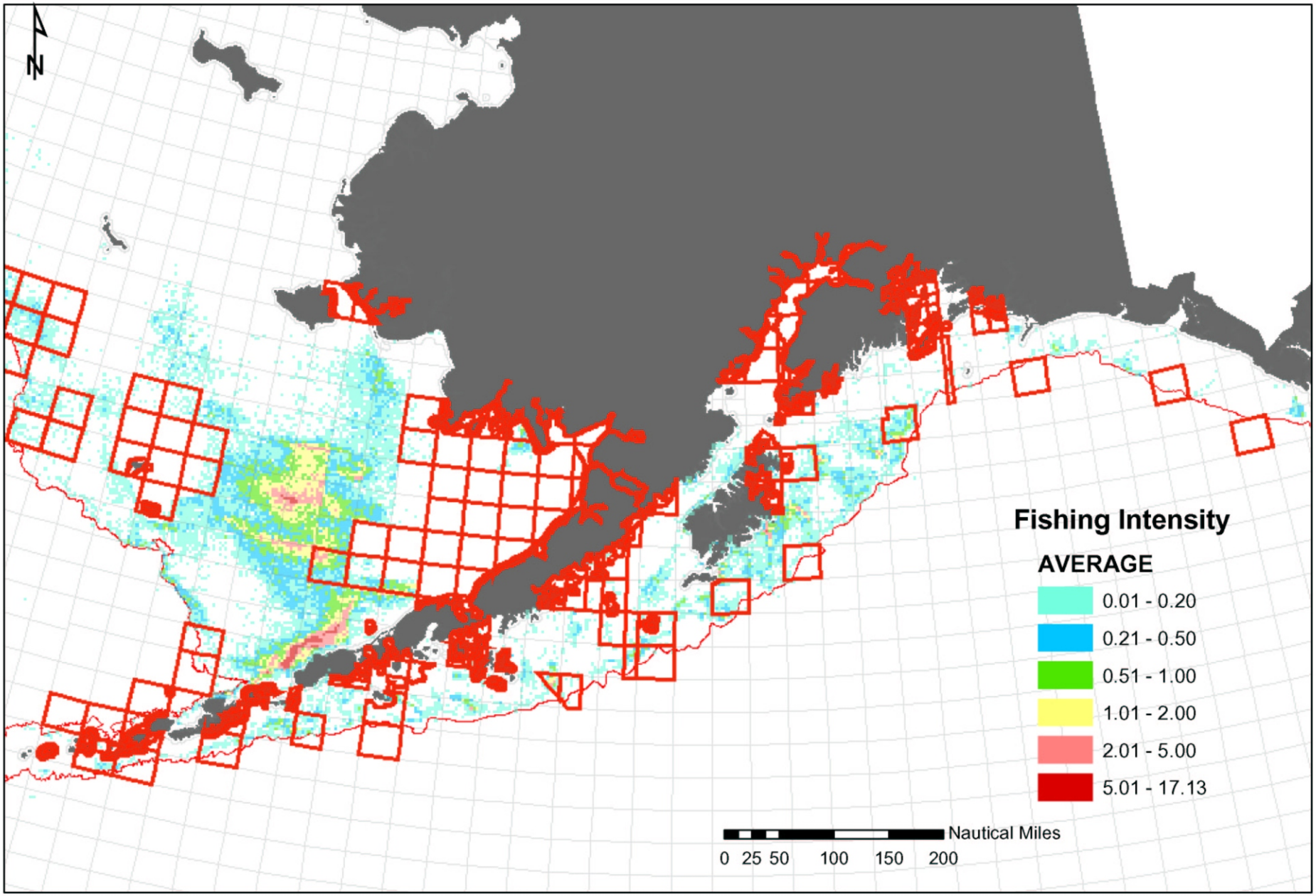

Figure 4.7-2. Bottom trawl fishing intensity and all spp closures under Alt 3.2 in GOA and Bering Sea

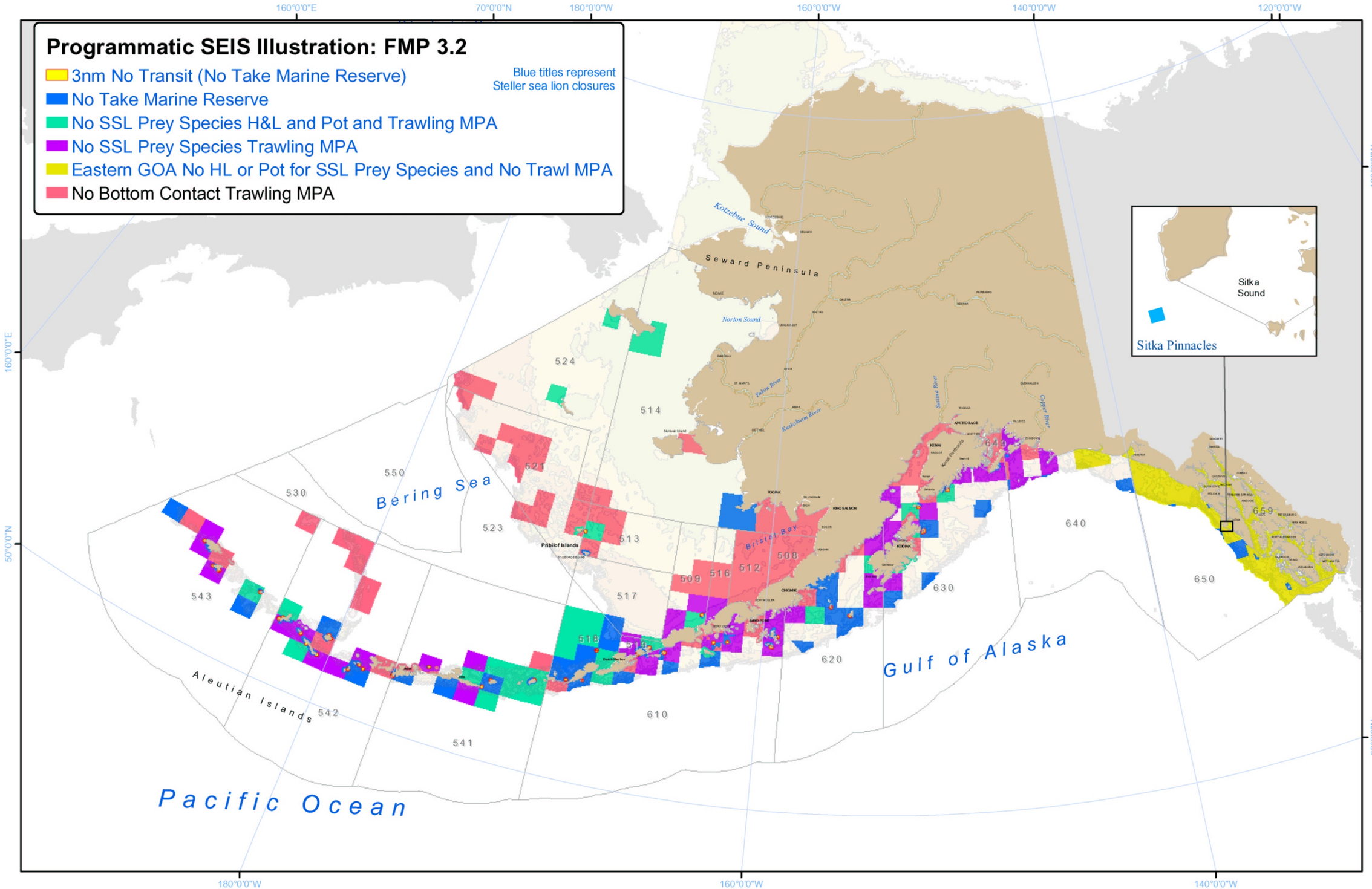

Figure 4.7-3. Areas closed to trawling only at various times of the year under FMP 3.2

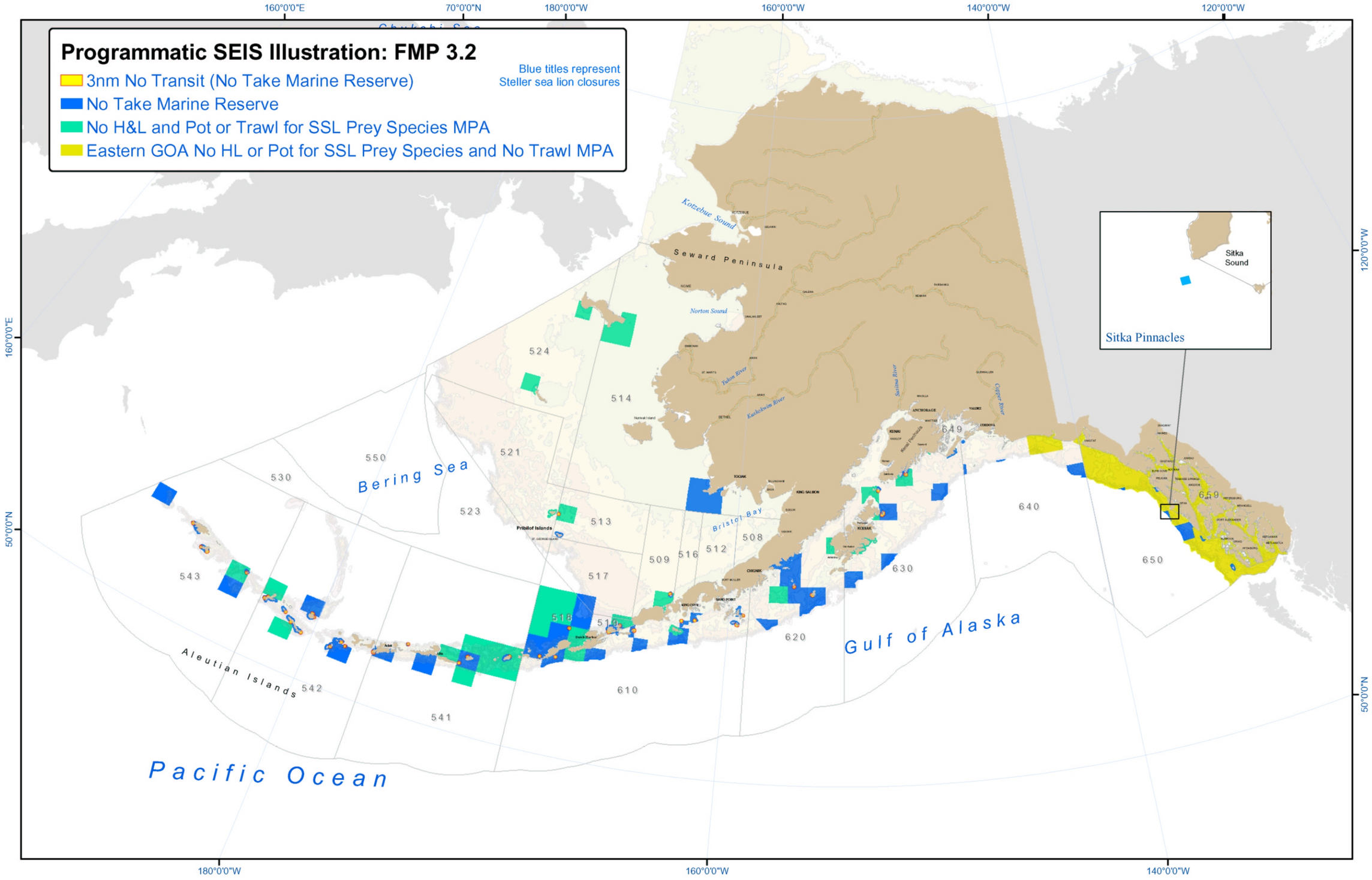

Figure 4.7-4. Areas closed to fixed gear only at various times of the year under FMP 3.2

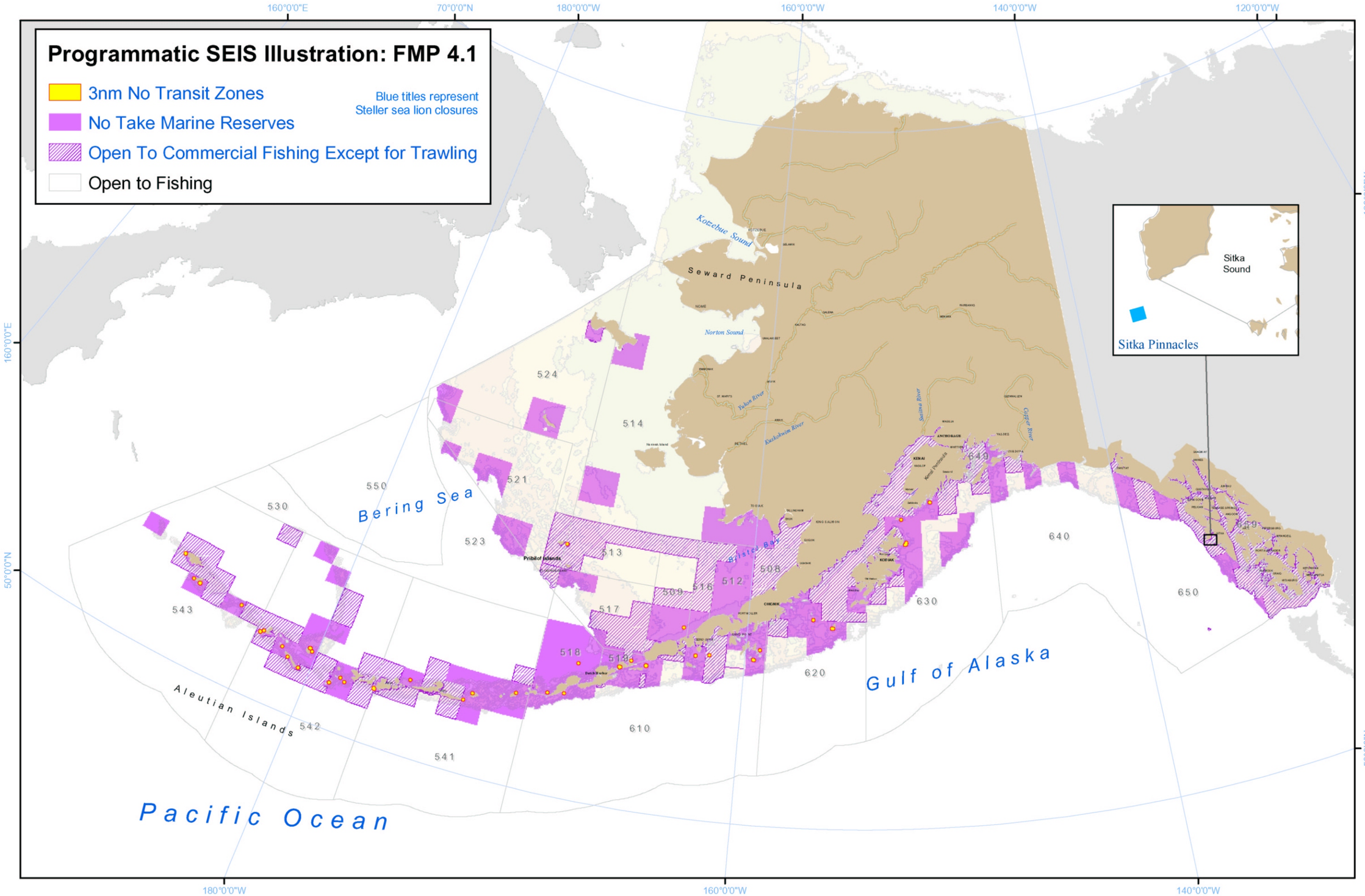

Figure 4.8-1. Areas closed to trawling only at various times of the year under FMP 4.1

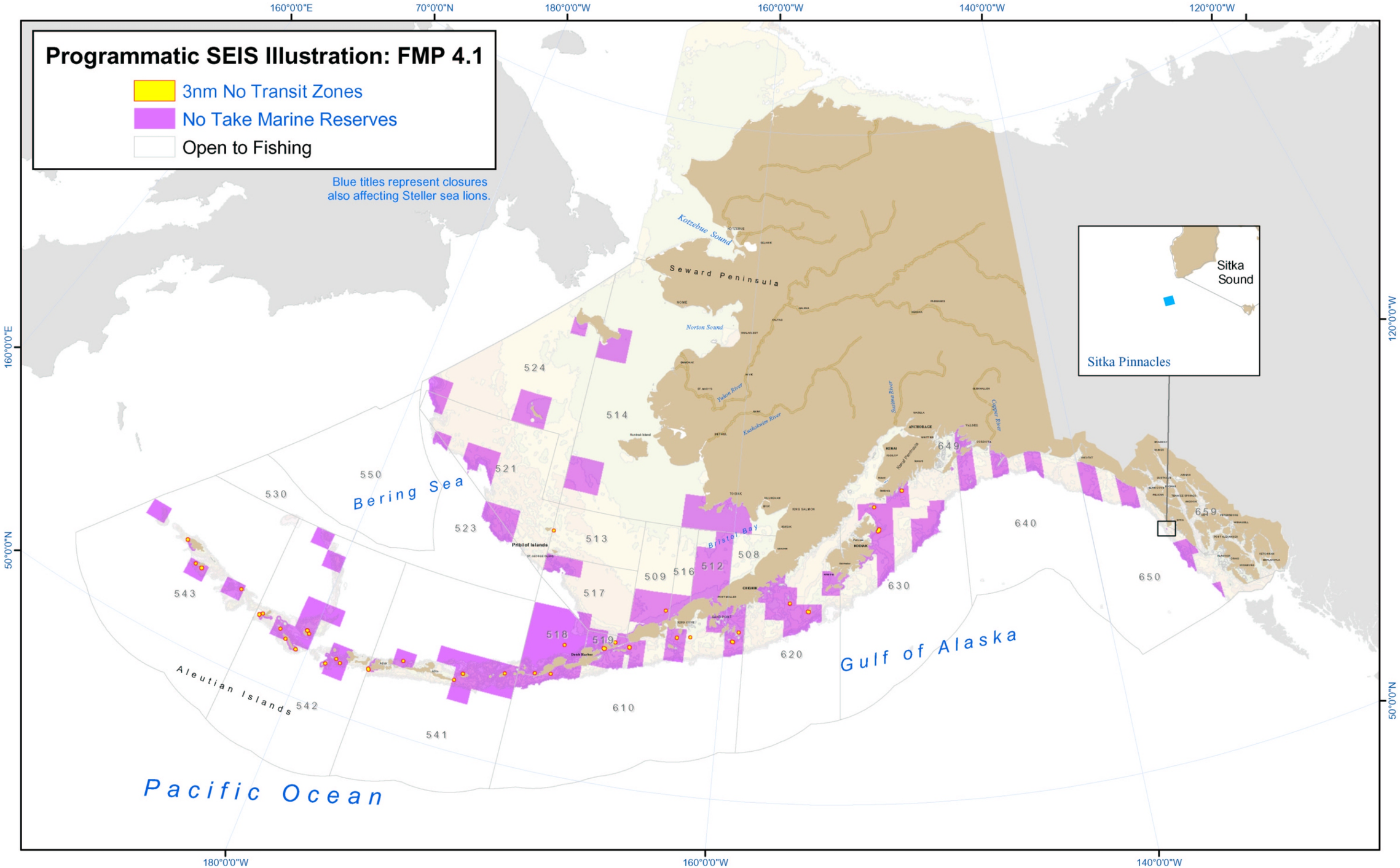

Figure 4.8-2. Areas closed to fixed gear only at various times of the year under FMP 4.1

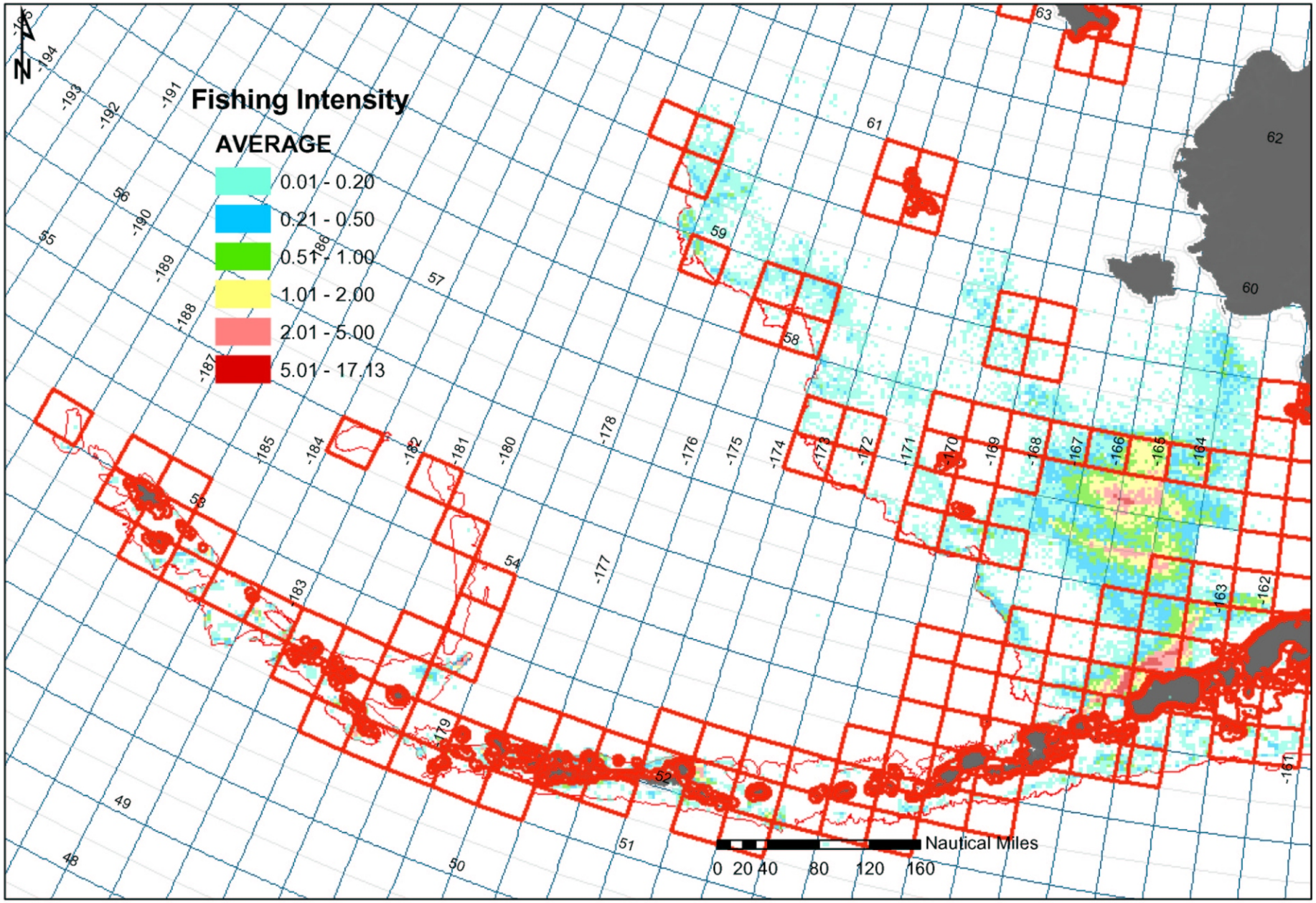

Figure 4.8-3. Bottom trawl fishing intensity and all spp closures under Alt 4.1 in BSAI

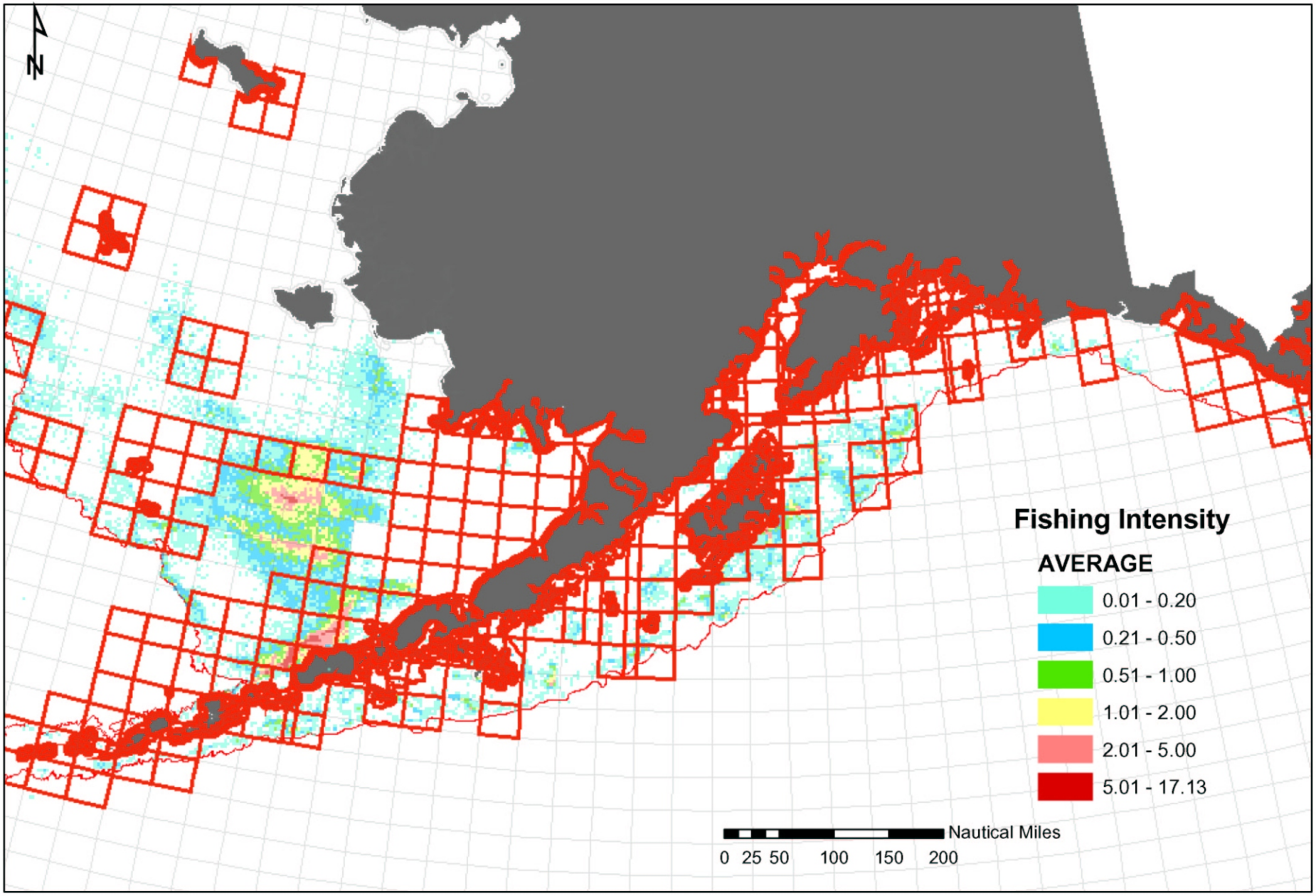

Figure 4.8-4. Bottom trawl fishing intensity and all spp closures under Alt 4.1 in GOA and Bering Sea

Chapter 5
Figures

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Chapter 2
Tables

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Table 2.5-1. Stock assessment survey strategy for the Bering Sea and Aleutian Islands and Gulf of Alaska groundfish resources based on the 1999–2000 biennial cycle.

Survey	Season	Frequency	No. of Vessels	Area (km^2)	No. of Stations or Trackline (km)	Days at Sea
Bottom Trawl Surveys						
Bering Sea shelf	Summer	Annual	2	463,000	400	135
Bering Sea slope	Summer	Biennial	1	25,000	100	35
Aleutian Islands shelf	Summer	Biennial	2	66,900	476	140
Gulf of Alaska shelf and slope	Summer	Biennial	3	320,000	870	220
Longline Surveys						
Gulf of Alaska slope	Summer	Annual	1	55,500	74	83
Bering Sea slope	Summer	Biennial	1	17,400	16	18
Aleutian Islands slope	Summer	Biennial	1	24,600	14	18
Acoustic Surveys						
Bering Sea pollock	Summer	Annual	1	340,000	10,200	60
Bogoslof pollock	Winter	Annual	1	31,000	2,300	11
Shelikof pollock	Winter	Annual	1	38,000	1,700	15

Notes: km – kilometers
km^2 – square kilometers

Table 2.5-2. Methods used to update annual stock assessments for Alaska groundfish, 1999.

Species	Area	Assessment Method
Pollock	Bering Sea	AD Model Builder
	Aleutian Islands	Survey Index
	Bogoslof	Survey Index
	Gulf of Alaska	AD Model Builder
	Southeast	Survey Index
Pacific cod	Bering Sea and Aleutian Islands	Stock Synthesis
	Gulf of Alaska	Stock Synthesis
Sablefish	Gulf of Alaska and Bering Sea and Aleutian Islands	AD Model Builder
Atka mackerel	Aleutian Islands	Stock Synthesis
Yellowfin sole	Bering Sea and Aleutian Islands	AD Model Builder
Rock sole	Bering Sea and Aleutian Islands	AD Model Builder
Greenland turbot	Bering Sea and Aleutian Islands	Stock Synthesis
Arrowtooth flounder	Bering Sea and Aleutian Islands	Stock Synthesis
	Gulf of Alaska	AD Model Builder
Flathead sole	Bering Sea and Aleutian Islands	Stock Synthesis
	Gulf of Alaska	AD Model Builder
Alaska plaice	Bering Sea and Aleutian Islands	AD Model Builders
Other flatfish	Bering Sea and Aleutian Islands	Stock Index
Pacific ocean perch	Bering Sea	Stock Synthesis
	Aleutian Islands	Stock Synthesis
	Gulf of Alaska	Stock Synthesis
Other red rockfish	Bering Sea	Survey Index
Sharpchin/northern	Aleutian Islands	Survey Index
Northern rockfish	Gulf of Alaska	Survey Index
Shortraker/rougheye	Aleutian Islands	Survey Index
	Gulf of Alaska	Survey Index
Other rockfish	Bering Sea	Survey Index
	Aleutian Islands	Survey Index
	Gulf of Alaska	Survey Index
Squid	Bering Sea and Aleutian Islands	Survey Index
Other species	Bering Sea and Aleutian Islands	Survey Index
Deep water flatfish	Gulf of Alaska	Survey Index
Rex sole	Gulf of Alaska	Survey Index
Shallow water flatfish	Gulf of Alaska	Survey Index
Pelagic shelf rockfish	Gulf of Alaska	Survey Index
Thornyhead rockfish	Gulf of Alaska	AD Model Builder
Demersal shelf rockfish	Gulf of Alaska	Survey Index
Total by assessment method		
Stock Synthesis	9	
AD Model Builder	9	
Survey Index	19	

Chapter 3
Tables

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Table 3.2-1. Summary of Bering Sea and Aleutian Islands FMP and amendment measures.

BSAI	FMP Amendment Measures	
Management and Monitoring	*- administrative measures* *- monitoring and reporting measures* *- measures to increase flexible, responsive management*	
	FMP	• Reporting requirements for foreign and domestic
	1	• Authorize field orders to prevent gear conflict
		• Authorize field orders for time/area closures for conservation reasons
	4	• Establish SoC authority to issue field orders adjusting time and/or area closures for conservation reasons (to protect jeopardized stocks)
	9	• At-sea processing weekly catch reporting and check-in/check-out
	10	• Observer requirements for domestic Bristol Bay closed area exemption
		• C/P requirements for weekly reporting (also includes definition of fish processing)
		• RD discretionary authority for managing PSC limit closures
		• RD authority to reallocate TAC from DAP to JVP inseason
		• Improved authority to the RD to make inseason time/area adjustments to the fishery based on conservation reasons
	11a	• Large floating processor vessels required to record product transfer information and cargo log
	12	• Federal Permit Requirements
		• Remove Resource Assessment Document Deadline
	13	• Establish procedure to set annual fishing seasons by regulatory amendment
		• Establish a new recordkeeping and data reporting system
		• Establish a new frameworked observer program of up to 100% coverage of domestic industry
	16	• Define overfishing
		• Interim groundfish specifications
		• Specify legal fishing gear
		• New definition of pelagic trawl gear
	16a	• Authorize RD to temporarily close limited area inseason due to high bycatch (hotspot)
	17	• Experimental fishing permits
	19	• Authority to use time/area closures to reduce PSC bycatch rates (hotspot)
		• Redefine directed fishing standards for groundfish in the pelagic pollock trawl fishery and for rockfish
		• Consolidate target fishery definitions
	21	• Update FMP to allow trawl and non-trawl PSC limits to be changed by regulatory amendment
		• Authorize RD to apportion non-trawl PSC limit by specified fishery category; to apportion seasonally; to exempt some non-trawl fisheries
		• Update FMP so that the halibut trawl limit is also in terms of halibut bycatch mortality
	22	• Establish gear test areas
	24	• RD authority to allocate seasonally by trimester
	27	• Establish North Pacific Fisheries Research Plan and system of user fees to cover the costs of observer requirements
	44	• Redefine ABC and OFL
	56	• Redefine OFL
Groundfish Yield/Sustainability	*- groundfish harvest levels* *- management categories* *- protection against localized depletion and sustainability concerns*	
	FMP	• Establish groundfish harvest levels
		• Exceeding foreign allocation in a mgmt unit (or sub-area where specific quotas apply) triggers closure
	1	• Establish multi-year, multispecies OY for BSAI groundfish complex
	4	• Increase ABC, OY and TALFF for Pacific cod
	12	• Rock Sole TAC
	14	• Implement a seasonal allowance schedule for pollock
	17	• Establish Bogoslof District in BS
	28	• Divide the AI management area into three districts for the purpose of spatially allocating TACs

Table 3.2-1 (cont.). Summary of Bering Sea and Aleutian Islands FMP and amendment measures.

BSAI	FMP Amendment Measures	
Bycatch and Incidental Catch	*- measures to minimize bycatch and incidental catch of prohibited species, non-target species and undersized target* *- measures to minimize waste* *- measures to encourage full utilization*	
	FMP	• Establish Bristol Bay Pot Sanctuary (BBPS) (foreign and domestic)
		• Establish Winter Halibut Savings Area (WHSA) (foreign and domestic)
		• Other foreign trawl closures
		• Require off-bottom trawl gear
	1	• Exempt domestic trawl from BBPS, and also WHSA subject to 1% PSC halibut limit
		• Delete 'Misty Moon' area from WHSA
	1a	• Foreign fleet PSC limits for Chinook salmon
	3	• Specification of foreign PSC limits that trigger area closures
	4	• Allow foreign fishing in areas of AI (alleviate restrictive measures placed on foreign fishery in areas not heavily utilized by US fisheries)
	7	• Relax restrictions on foreign longlines in the winter halibut savings area up to an incidental take cap
	8	• PSC salmon limits for foreign trawl fishery for 1984, 1985
	10	• Domestic (and foreign) trawl prohibited in Bristol Bay Pot Sanctuary
		• Bycatch limitation zones and corresponding PSC limits
	11	• Split-season apportionment of JV pollock (40/60)
	12	• PSC Limits for Fully-Utilized Groundfish
	12a	• Revise PSC limits for crab and halibut
		• Extension of Bristol Bay Crab and Halibut Protection Zone westward during March 15-June 15
	14	• Prohibit roe stripping
	16	• Revise PSC limits for crab and halibut
		• Provides for the imposition of sanctions on vessels with excessively high bycatch rates (VIP)
		• Require biodegradable panels on groundfish pots
		• Require halibut exclusion devices on groundfish pots
	16a	• Specify allocation of pollock TAC to bottom trawl
		• Establish frameworked PSC limit for herring, establish two summer (Alaska Peninsula) and one winter (central BS) savings areas
	19	• Expand VIP program
		• Delay start of BSAI fisheries
		• Establish halibut PSC limits for non-trawl fisheries
		• Specify PSC limit allocations by more specific trawl fisheries and groups
	21a	• Pribilof Islands Blue King Crab Habitat Conservation Area
	21b	• Chinook Salmon Savings Area
	25	• Eliminate primary halibut PSC limit that closes Zones 1 and 2H
	26	• Salmon Donation Program
	35	• Establish a Chum Salmon Savings Area during the pollock B season
	37	• Bristol Bay Red King Crab Savings Area year-round closure to non-pelagic trawl
		• Modify red king crab PSC limits in Zone 1 to establish a stairstep approach
		• Nearshore BB Trawl Closure Area prohibits year-round trawling, except small seasonal open area for bottom trawling with 100% observer coverage
	40	• Establishment of C. opilio PSC limits, CO Bycatch Limitation Zone
	41	• Modify PSC limits for bairdi Tanner crab in Zones 1 and 2
	49	• Establish IR/IU Program: improved retention
		• Establish IR/IU Program: improved utilization
	50	• Establish Halibut donation program
	57	• Prohibit non-pelagic trawl gear for pollock
		• Reduce PSC limit for halibut, red king, opilio, bairdi crab
	58	• Reduce chinook salmon bycatch cap
		• Non-pollock fisheries exempt from closure and those fisheries' chinook PSC bycatch would not be counted toward the PSC limit
		• Modify CHSSA closure area
	75	• Repeal of IR/IU for flatfish

Table 3.2-1 (cont.). Summary of Bering Sea and Aleutian Islands FMP and amendment measures.

BSAI	FMP Amendment Measures	
Habitat	*- measures to protect and conserve habitat*	
	9	• Implementation of NMFS Habitat Conservation Policy
	55	• Define Essential Fish Habitat
		• Define HAPC
Seabirds and Marine Mammals	- measures to reduce incidental take of or injury to seabirds and marine mammals - measures to protect the prey base	
	13	• Close 3-12 miles around the Walrus Islands and Cape Peirce
	17	• Renew Walrus Islands 12 mile buffer zone
	20	• SSL 10 nm buffer zones around rookeries
		• SSL 20 nm buffer zones during pollock A season around 5 rookeries
	36	• Establish a forage fish category, as bycatch only
Socioeconomic Issues	*- allocation between foreign and domestic fleets, between fleet sectors* *- gear conflict issues* *- vessel safety measures*	
	FMP	• establish longline sanctuary for foreign and domestic in AI
	2	• increase DAH for yellowfin sole and other flatfish, apportion to JVP, and decrease TALFF accordingly
	4	• increase groundfish DAH and decrease TALFF
	9	• prohibit foreign trawling within 20 miles of the AI
	13	• Allocate sablefish by gear in BS and AI
	15	• Implement an Individual Fishing Quota (IFQ) program for sablefish
		• Establish Western Alaska Community Development Quota (CDQ) Program
	18	• Formula for pollock allocation in BSAI
		• Establish the Bering Sea Catcher Vessel Operational Area (CVOA)
		• Designate Western Alaska Community Quota for BSAI pollock
	22	• Establish gear test areas
	23	• Moratorium
	24	• Pacific cod allocation by gear type; 3 year sunset
	30	• Sablefish CDQ program increased allocation
	31	• Sablefish IFQ modified block proposal
	32	• Sablefish IFQ modification of transfer restrictions on CDQ compensation QS
	33	• Allow limited processing of non-IFQ species by IFQ sablefish qualified freezer vessels
	34	• Allocate up to 2% of EAI Atka mackerel TAC to jig gear
	38	• Extend inshore/offshore pollock allocations
		• Reauthorize the pollock CDQ program
		• Adjustments to the CVOA
	39	• Establish the License Limitation Program
		• Establish a multi-species CDQ program
	42	• IFQ QS buydown
	43	• Increase IFQ sweep-up levels
	45	• Permanently extend pollock CDQ program at 7.5% of TAC
	46	• Pacific cod Allocation
	51	• Extend the CVOA
	53	• Allocate shortraker/ rougheye rockfish between trawl/ non-trawl gear in AI
	54	• IFQ indirect ownership and use caps
	59	• Extension of Vessel Moratorium Program
	60	• Adjustments to the LLP
	61	• Establish sector and co-op allocations of pollock
		• Define vessel/processor co-op linkages
		• Define AFA sideboards for BSAI fisheries
	64	• P. cod fixed gear allocations
	66	• Remove squid from CDQ
	67	• P. cod species and gear endorsements
	69	• AFA co-op leasing
	72	• IFQ vessel clearance

Table 3.2-2. Summary of Gulf of Alaska FMP and amendment measures.

GOA	FMP Amendment Meaures	
Management and Monitoring	*- administrative measures*	
	- monitoring and reporting measures	
	- measures to increase flexible, responsive management	
	- plan extensions	
	FMP	• develop observer program aboard US trawlers; continue foreign observer program
		• Provision for inseason adjustment of time and area, issuance of field orders
	1	• Extension of FMP time period until 1979
	4	• Relax domestic fish ticket delivery deadlines
	7	• Renew FMP 11/1979 to 10/1980
	8	• Change plan year and eliminate expiration date
		• Give AKR Reg Dir authority to resolve foreign/domestic gear conflicts
	14	• Catcher-processor reporting system
		• Framework for establishing halibut PSC limits in domestic and JV fisheries
		• Define directed fishing
	15	• Revised goals and objectives for GOA FMP
		• Adopt framework approach to setting target quotas as is done in BSAI FMP; allow procedure for setting PSC limits for fully utilized US groundfish species
		• Catcher-processor requirements for weekly reporting (also includes definition of fish processing)
		• Improved authority to the RD to make inseason time/area adjustments to the fishery based on conservation reasons
	16	• Define prohibited species (only 'unallocated spp' def in FMP)
		• Redefine 'target species'
		• Specify legal GOA gear
		• Update FMP
		• Large floating processor vessels required to record product transfer information and cargo log
	17	• Federal Permit Requirements
	18	• Establish procedure to set annual fishing seasons by regulatory amendment
		• Establish a new recordkeeping and data reporting system
		• Establish a new frameworked observer program of up to 100% coverage of domestic industry
	21	• Define overfishing
		• Interim groundfish specifications
		• Update FMP to specify legal fishing gear
		• New definition of pelagic trawl gear
	22	• Experimental fishing permits
	24	• Consolidate target fishery definitions
		• Redefine directed fishing standards groundfish in the pelagic pollock trawl fishery and for rockfish
	30	• Establish North Pacific Fisheries Research Plan and system of user fees to cover the costs of observer requirements
	34	• Removes inadvertent inclusion fo the CDQ program in the FMP
	44	• Redefine ABC and OFL
	56	• Redefine OFL

Table 3.2-2 (cont.). Summary of Gulf of Alaska FMP and amendment measures.

GOA	FMP Amendment Meaures	
Groundfish Yield/Sustainability	*- groundfish harvest levels* *- management categories* *- protection against localized depletion and sustainability concerns*	
	FMP	• Determination of OY for each species • Apportion Gulf-wide OY over five INPFC statistical subareas (applies to foreign and domestic fishermen) • Exceeding of foreign allocation in a stat area triggers closure
	4	• Increase squid OY from 2000 to 5000 mt
		• Increase Atka mackerel OY by 2000mt
		• Reduce regulatory areas from 5 to 3
	5	• Establish species category for rattails and grenadiers
	7	• Increase in Pacific cod and Atka mackerel OY
		• New category for idiot rockfish
	8	• Divide eastern Gulf into 3 districts for sablefish
		• Redistribute other species Gulf-wide and establish non-specified species category
	10	• Reduce POP ABC, OY, DAH, TALFF and reserve
	11	• Increase pollock OY in central GOA
		• Reduce sablefish OY in Gulf
		• Divide Yakutat district of eastern GOA into two for sablefish
	13	• Increase W/C pollock OY
		• Combine pollock OY in Western and Central Regulatory areas
	14	• Reduce OY for W/C pollock, POP, Atka, 'other rockfish', 'other species'
		• New regulatory district for 'other rockfish'; recognition of State of AK DSR mgmt areas for State of AK registered vessels
		• Authority of the SoC to split or combine species within the target species category
	18	• Establish Shelikof District in the Central Regulatory area
	19	• Implement a seasonal allowance schedule for pollock
	21	• Modify Authorization Language for DSR management
	22	• Rescind GOA Statistical area 68
	31	• Establish Atka mackerel as separate target species category
	32	• Policy for rebuilding POP
	38	• Amend POP Rebuilding Plan so that recommended TAC becomes upper-bound limit
	46	• Remove Black and Blue Rockfishes from FMP

Table 3.2-2 (cont.). Summary of Gulf of Alaska FMP and amendment measures.

GOA	FMP Amendment Meaures	
Bycatch and Incidental Catch	*- measures to minimize bycatch and incidental catch of prohibited species, non-target species and undersized target species* *- measures to minimize waste* *- measures to encourage full utilization*	
	FMP	• US trawl closure triggered in each stat area when incidental catch of halibut reaches given point
		• Foreign trawl closures to protect halibut
		• Restrictions, during winter, on the use of bottom trawls for domestic and foreign
		• Prohibit retention of certain kinds of animals
	4	• Remove domestic off bottom and tow restrictions on trawlers
	8	• Require biodegradable panels for sablefish pots
	9	• Close a contiguous Kodiak Gear Area to foreign trawling during the domestic crab season
	10	• Foreign fishery closure and pelagic trawl only area in eastern Gulf
	15	• Time/area closures around Kodiak for non-pelagic trawl
	18	• Renew bottom trawl closures around Kodiak
		• Institute fixed PSC limits for 1990 fishing year
	19	• Prohibit roe stripping
	21	• Require biodegradable panels on groundfish pots
		• Require halibut exclusion devices on groundfish pots
		• Clarify PSC halibut framework to specifically apportion halibut PSC limits by season
		• Clarify PSC halibut framework to set halibut PSC limits by longline and pot gear groups
		• Implement a program to identify and penalize vessels with excessive rates of halibut bycatch (VIP)
	24	• Delay start of GOA fisheries
		• Establish VIP program
	26	• Permanent Kodiak Crab Protection Zone
	29	• Salmon Donation Program
	45	• Combining of GOA pollock 3rd/4th seasonal allowances
	49	• Establish IR/IU Program: improved retention
		• Establish IR/IU Program: improved utilization
	50	• Establish Halibut donation program
	60	• Prohibit use of non-pelagic trawl in Federal waters of Cook Inlet
Habitat	*- measures to protect and conserve habitat*	
	14	• incorporate NMFS habitat conservation policy
	55	• Increase IFQ sweep-up levels
	59	• Establish Sitka Pinnacles Marine Reserve
Seabirds and Marine Mammals	*- measures to reduce incidental take of or injury to seabirds and marine mammals* *- measures to protect the prey base*	
	25	• SSL 10 nm buffer zones around rookeries
		• Division of W/C Regulatory area into 3 pollock management districts, rescinsion of Shelikof Strait mgmt district
	39	• Establish a forage fish category, as bycatch only

Table 3.2-2 (cont.). Summary of Gulf of Alaska FMP and amendment measures.

GOA	FMP Amendment Meaures	
Socioeconomic Issues	*- allocation between foreign and domestic fleets, between fleet sectors* *- gear conflict issues* *- vessel safety measures*	
	FMP	• 20% reserve of the various OYs to be allocated between US and foreign fishermen as season progresses and US needs become more clearly known
		• base DAH on the estimated catch by US fishermen to be delivered to US processors
		• formula for amount of each species to be available to foreign fishermen
		• Davidson Bank closure to all foreign fishing to provide sanctuary for domestic fishery development
		• Close the GOA E of 140W to all foreign longlining
		• prohibit foreign longlining landward of 500m isobath
		• establish 3 no-trawl areas for foreign fishermen off SE AK
		• foreign trawl closures to prevent gear conflict
	2	• reduce foreign pollock catch and increase the domestic reserve accordingly
	3	• change foreign P. cod apportionment in Chirikof
	4	• Remove foreign area and season restrictions: adjust longline area restrictions, allow >25% TALFF between Dec and May
		• separate foreign longliners from trawlers for quota closures
	6	• adjust DAH down and TALFF up
	7	• incorporation of processor preference amendment
	8	• set schedule for release of reserves and DAH to TALFF
	11	• DAP/JVP Framework adjustments
	14	• allocate sablefish OY by gear type and regulatory area
		• new start date for sablefish
	16	• incorporate vessel safety considerations as per MSA in FMP
	20	• Implement an Individual Fishing Quota (IFQ) program for sablefish
	23	• Formula for inshore/offshore pollock and P. cod allocations
	27	• Establish gear test areas
	28	• Moratorium
	35	• Sablefish IFQ modified block proposal
	36	• Sablefish IFQ modification of transfer restrictions on CDQ compensation QS
	37	• Allow limited processing of non-IFQ species by IFQ sablefish qualified freezer vessels
	40	• Extend pollock and P. cod inshore/offshore allocations
	41	• Establish the Licence Limitation Program
	42	• IFQ QS buydown
	43	• Increase IFQ sweep-up levels
	51	• Extend pollock and P. cod inshore/offshore allocations
	54	• IFQ indirect ownership and use caps
	57	• Extension of Vessel Moratorium Program
	58	• Adjustments to the LLP
	61	• Extend inshore/offshore allocations for pollock and P. cod
		• Institute AFA sideboards in GOA fisheries
	64	• IFQ Vessel Clearance

Table 3.3-1. Physical properties of Gulf of Alaska waters.

Properties	Deep Sea		
	Surface Waters	Intermediate Waters	Deep Water
	<30 m	30 - 200 m	200 - 1500 m
Temperature	3° - 12°	3° - 5°	<3° - 2.5°
Salinity (psu)	≤ 32.0	32.0 - 33.8	>33.8 - 34.4
Density (σ_t)	25	25 - 26.8	26.8 - 27.7

Source: Reed 1984

Table 3.3-2. Properties of four oceanographic domains of the Eastern Bering Sea shelf, summer 1978.

Properties	Deep Bering	Outer Domain	Middle	Inner Domain
Salinity (psu)	32.66 - 33.35	32.45 - 33.03	31.53 - 31.91	29.18 - 31.09
Temperature (°C)	2.85 - 8.50	2.88 - 8.60	-0.13 - 7.80	4.72 - 11.0
Phosphate (µg at/L)	0.82 - 2.57	0.46 - 2.22	0.11 - 1.72	0.10 - 0.29
Nitrate (µg at/L)	2.5 - 32.2	0.05 - 28.4	0.0 - 8.9	0.0 - 0.07
Silicic acid (µg)	11.0 - 83.7	5.2 - 69.0	5.6 - 36.2	3.2 - 24.4

Source: Hattori and Goering 1986, Reed 1995.

Table 3.3-3. Atmosphere-ocean variability time scales and forcing mechanisms[1].

Period	Forcing Mechanism
Diurnal/Semidiurnal	Lunar and Solar Tides
3 – 10 days	Atmospheric Storms
Seasonal	Solar Declination
Interannual (years) 0.5 – 1+ 3 – 7 6 – 7 10+ 11 18.6 22	 Mesoscale ocean eddies El Niño – Southern Oscillation events Mid-latitude atmospheric events “Regime shift” Sunspots Lunar declination Sunspots

Notes: [1]After National Research Council 1996. The Bering Sea Ecosystem

Table 3.4-1. Species listed as endangered or threatened under the Endangered Species Act and occurring in the Gulf of Alaska and/or Bering Sea and Aleutian Islands groundfish management areas, 2002.

Listed Species	Population or DPS[1]	Latin Name	Latin Name
Blue whale	North Pacific	*Balaenoptera musculus*	Endangered
Bowhead whale	Western Arctic	*Balaena mysticetus*	Endangered
Fin whale	Northeast Pacific	*Balaenoptera physalus*	Endangered
Humpback whale	Western and Central North Pacific	*Megaptera novaeangliae*	Endangered
Right whale	North Pacific	*Eubalaena japonica*	Endangered
Sei whale	North Pacific	*Balaenoptera borealis*	Endangered
Sperm whale	North Pacific	*Physeter macrocephalus*	Endangered
Gray whale	Eastern Pacific	*Eschrichtius robustus*	Delisted
Steller sea lion	Western Alaska DPS	*Eumetopias jubatus*	Endangered
Steller sea lion	Eastern Alaska DPS	*Eumetopias jubatus*	Threatened
Chinook salmon	Puget Sound	*Oncorhynchus tshawytscha*	Threatened
	Lower Columbia River		Threatened
	Upper Columbia River Spring		Endangered
	Upper Willamette River		Threatened
	Snake River Spring/Summer		Threatened
	Snake River Fall		Threatened
Sockeye salmon	Snake River	*Oncorhynchus nerka*	Endangered
Steelhead	Upper Columbia River	*Oncorhynchus mykiss*	Endangered
	Middle Columbia River		Threatened
	Lower Columbia River		Threatened
	Upper Willamette River		Threatened
	Snake River Basin		Threatened
Leatherback sea turtle[2]		*Dermochelys coriacea*	Endangered
Short-tailed Albatross*		*Phoebastria albatrus*	Endangered

Table 3.4-1 (cont.). **Species listed as endangered or threatened under the Endangered Species Act and occurring in the Gulf of Alaska and/or Bering Sea and Aleutian Islands groundfish management areas, 2002.**

Listed Species	Population or DPS[1]	Latin Name	Latin Name
Stellers Eider*		*Polysticta stelleri*	Threatened
Spectacled Eider*		*Somateria fischeri*	Threatened

Notes: DPS - distinct population segment
[1]In this definition of species, the Endangered Species Act of 1973, as amended, includes the traditional biological species concept of the biological sciences and "any subspecies of fish or wildlife or plants, and any DPS of any species of vertebrate fish or wildlife which interbreeds when mature" (16 USC 1532). For purposes of section 7 consultations, these are all "species."
[2]Green, Pacific Ridley, and loggerhead turtles are recorded to occur in Alaska, but are considered extralimital.
*The northern sea otter, Arctic peregrine falcon, Aleutian Canada goose, short-tailed albatross, Steller's eider, and the Spectacled eider are under the jurisdiction of the U.S. Fish & Wildlife Service at 907-786-3542.

Source: NOAA Protected Resources Division website: http://fakr.noaa.gov/protectedresources/esakspecies.pdf, accessed on 16 Jun 03 (Table 1).

Table 3.4-2. Salmon species, stocks, or evolutionary significant units listed or pending under the Endangered Species Act.

Species	Evolutionarily Significant Unit[a]	Present Status	Federal Register Notice	
Chinook salmon (*Oncarhynchus tshawytscha*)	Sacramento River Winter run	Endangered	54 FR 32085	8/1/89
	Snake River fall	Threatened	57 FR 14653	4/22/92
	Snake River spring/summer	Threatened	57 FR 14653	4/22/92
	Puget Sound	Threatened	64 FR 14308	3/24/99
	Lower Columbia River	Threatened	64 FR 14308	3/24/99
	Upper Willamette River	Threatened	64 FR 14308	3/24/99
	Upper Columbia River spring	Endangered	64 FR 14308	3/24/99
	Central Valley spring run	Threatened	64 FR 50393	9/16/99
	California coast	Threatened	64 FR 50393	9/16/99
Chum salmon (*O. keta*)	Hood Canal summer run	Threatened	64 FR 14570	3/25/99
	Columbia River	Threatened	64 FR 14570	3/25/99
Coho salmon (*O. kisutch*)	Central California coast	Threatened	61 FR 56138	10/31/96
	Southern Oregon/Northern California coast	Threatened	62 FR 24588	5/6/97
	Oregon coast	Threatened	63 FR 42587	8/10/98
Sockeye salmon (*O. nerka*)	**Snake River**	Endangered	56 FR 58619	11/20/91
	Lake Ozette	Threatened	64 FR 14528	3/25/99
Steelhead (*O. mykiss*)	Southern California	Endangered	62 FR 43937	8/18/97
	South-Central California	Threatened	62 FR 43937	8/18/97
	Central California Coast	Threatened	62 FR 43937	8/18/97
	Upper Columbia River	Endangered	62 FR 43937	8/18/97
	Snake River basin	Threatened	62 FR 43937	8/18/97
	Lower Columbia River	Threatened	63 FR 13347	3/19/98
	Central Valley California	Threatened	63 FR 13347	3/19/98
	Upper Willamette River	Threatened	64 FR 14517	3/25/99
	Middle Columbia River	Threatened	64 FR 14517	3/25/99
Cutthroat trout Sea-run (*O. clarki clarki*)	Umpqua River	Endangered	61 FR 41514	8/9/96
	Southwest Washington/Columbia River	Proposed Threatened	64 FR 16397	4/5/99

Notes: a – Names in bold represent those likely ranging into Alaskan waters.

Table 3.5-1. Biological and reproductive attributes of walleye pollock in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Biological/Reproductive Attributes													
	Feeding Type		Movements	Social Behavior		Longevity of Life Stages				Age at Maturity		Fertilization and Spawning Behavior		Spawning Season
	Carnivore	Planktivore	Drift with Ocean	Schooling	Not Known	1-30 Days	1-12 Months	1-5 Years	5-20 Years	50% Female (years)	50% Male (years)	External	Broadcast Spawner	
A	X		X	X					X	4	4	X	X	Early Spring
J	X		X	X				X						
L		X	X		X		X							
E			X			X								

Notes: A - adult
E - egg
J - juvenile
L - larvae

Source: NPFMC 1999b.

Table 3.5-2. Habitat associations of walleye pollock in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Habitat Associations																
	Location										Pelagic Domain		Oceanography				
	Inner Shelf (1-50m)	Middle Shelf (50-100m)	Outer Shelf (100-200m)	Upper Slope (200-1000m)	Basin (>3000m)	Bay/Estuaries	Island Pass	Depths of high availability (winter) (of fishable stock)[1]	Depths of high availability (summer) (of fishable stock)[1]	Bottom depths of common occurrence (of fishable stock)[1]	Pelagic	Semi-demersal/Semi-pelagic	Upwelling Zone	Gyres	Thermo/pycnocline	Fronts	Edges (ice, bathymetric)
A			X		X			100-200m	50-150m	30-200m	X	X	X	X		X	X
J	X	X	X				X				X	X		X	X	X	
L			X								X			X		X	
E			X	X	X						X			X			

Notes: A - adult
E - egg
J - juvenile
L - larvae

Source: NPFMC 1999b.

[1]Source: NPFMC 2002a and 2002b; Table 20 and Table 57, respectively.

Table 3.5-3. Listing of Bering Sea and Aleutian Islands and Gulf of Alaska target species or species complexes and their groundfish tier designations under Amendments 56/56.

Species or Species Complex	Area	Tier	Species or Species Complex	Area	Tier
Walleye pollock	Eastern Bering Sea	1a	Walleye pollock	GOA	3b
Walleye pollock	Aleutian Islands	5	Pacific cod	GOA	3b
Walleye pollock	Bogoslof	5	Deep water flatfish	GOA	5,6
Pacific cod	BSAI	3b	Dover sole		5
Yellowfin sole	BSAI	3a	Other deep water flatfish		6
Greenland turbot	BSAI	3a	Rex sole	GOA	5
Arrowtooth flounder	BSAI	3a	Flathead sole	GOA	3a
Rock sole	BSAI	3a	Shallow water flatfish	GOA	4,5
Flathead sole	BSAI	3a	Rock sole		4
Alaska plaice	BSAI	3a	Other shallow water flatfish		5
Other flatfish	BSAI	5	Arrowtooth flounder	GOA	3a
Sablefish	Eastern Bering Sea	3b	Sablefish	GOA	3b
Sablefish	Aleutian Islands	3b	Pacific ocean perch	GOA	3a
Pacific ocean perch	Eastern Bering Sea	3b	Shortraker rougheye rockfish	GOA	4,5
Pacific ocean perch	Aleutian Islands	3b	Shortraker rockfish		5
Other red rockfish	Eastern Bering Sea	5	Rougheye rockfish		4
Sharpchin/northern rockfish	Aleutian Islands	5	Northern rockfish	GOA	3a
Shortraker/Rougheye rockfish	Aleutian Islands	5	Other slope rockfish	GOA	4,5
Other rockfish	Eastern Bering Sea	5	Sharpchin rockfish		4
Other rockfish	Aleutian Islands	5	Other slope rockfish		5
Atka mackerel	BSAI	3a	Pelagic shelf rockfish	GOA	4
Squid	BSAI	6	Demersal shelf rockfish	GOA	4
Other species		5	Thornyhead rockfish	GOA	3a
			Atka mackerel	GOA	6

Notes: BSAI – Bering Sea and Aleutian Islands
GOA – Gulf of Alaska
TAC – total allowable catch

Table 3.5-4. Status and catch specifications (mt) of walleye pollock in the Bering Sea and Aleutian Islands in recent years.

Area	Year	Age-3+ Biomass[1]	OFL[2]	ABC[2]	TAC	Catch[3]
EBS	2001	10,500,000	2,350,000	1,842,000	1,400,000	1,388,276
	2002	9,800,000	3,530,000	2,110,000	1,485,000	1,484,927
	2003	11,100,000	3,530,000	2,330,000	NA	NA
AI	2001	106,000	31,700	23,800	2,000	824
	2002	106,000	31,700	23,800	1,000	1,079
	2003	175,000	52,600	39,400	NA	NA
Bogoslof	2001	300,000	60,200	8,470	1,000	29
	2002	232,000	46,400	4,310	100	38
	2003	227,000	45,300	34,000	NA	NA

Notes: ABC - acceptable biological catch
AI - Aleutian Islands
EBS - eastern Bering Sea
mt - metric tons
NA - data not available
TAC - total allowable catch
[1]Biomass for each year corresponds to the projection given in the BSAI SAFE report issued in the preceding year.
[2]The OFL and ABC for 2003 are those recommended by the Plan Team.
[3]Catch data are current through November 2, 2002.

Source: NPFMC 2002d.

Table 3.5-5. Bering Sea and Aleutian Islands pollock past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign pollock fishery pre-MSA (1958-1976) • Russian pollock fishery (1967-present) • Marine pollutants and oil spills	• Foreign pollock fisheries (1976-1991) • JV pollock fishery (1980-1991) • Domestic pollock (1988-present) • Marine pollutants and oils spills	• Bilateral agreement with Japan and USSR (1973): Self-monitoring of foreign fishery in EBS and pollock catch limits • Convention on the Conservation and Management of the Pollock Resources in the central Bering Sea • Russian fishery management actions • Industry self-imposed actions: catch restrictions • International, federal and state laws regarding marine pollutants • OPA 90 • Clean Water Act	• 1977 BSAI Preliminary FMP - established observers in foreign fisheries Annual ABC/TAC limits • Annual TAC/ABC limits • BSAI FMP Amendment 14 – prohibited roe stripping • BSAI FMP Amendment 17 – established the Bogoslof District and enacted moratorium on Donut Hole pollock • Steller sea lion conservation areas reduced pollock fishing mortality
Change in Reproductive Success	• Foreign pollock fisheries (1958-1976) bycatch of juvenile pollock • Russia pollock fishery (1967-present) bycatch of juvenile pollock • Commercial whaling and seal harvests • Cannibalism • Climate changes and regime shifts	• Foreign, JV and domestic pollock fisheries (1976-present) fishery selectivity • Foreign, JV and domestic pollock fisheries (1976-present) spatial/temporal concentration of catch • Foreign, JV and domestic pollock roe stripping (1976-1991)	• Convention on the Conservation and Management of the Pollock Resources in the central Bering Sea • IWC ban on commercial whaling • MMPA of 1972 • Industry self-imposed actions: gear modifications to avoid bycatch of juveniles	• BSAI FMP Amendment 13 – Established observer program • BSAI FMP Amendment 14 – prohibited roe stripping • BSAI FMP Amendment 17 – established the Bogoslof District (spawning populations) • BSAI FMP Amendment 49 – IR/IU, reduced pollock bycatch • Steller sea lion conservation measures

Table 3.5-5 (cont.). Bering Sea and Aleutian Islands pollock past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Change in Prey Availability	• Foreign pollock fishery (1958-1976) reduction of adult pollock biomass • Foreign groundfish fishery pre-MSA catch/bycatch of forage fish • State of Alaska groundfish fisheries bycatch of forage fish • State of Alaska herring fisheries catch • Subsistence and personal use fisheries that target forage fish • Introduction of exotic species • Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills	• Foreign, JV and domestic pollock fisheries (1976-present) reduction of adult pollock biomass • Foreign groundfish fishery post-MSA bycatch of forage fish • JV groundfish fishery bycatch of forage fish • Domestic groundfish fishery bycatch of forage fish • Introduction of exotic species • Marine pollution and oil spills	• Industry self-imposed actions: gear modifications to avoid bycatch of juveniles • International, federal and state laws regarding marine pollutants • OPA 90 • Clean Water Act	• BSAI FMP Amendment 13 – established Observer Program • BSAI FMP Amendment 36 - protection of forage fish
Change in Important Habitat	• Foreign groundfish fishery pre-MSA bottom trawl impacts • Marine pollutants/oil spills • Introduction of exotic species • Climate changes and regime shifts	• Foreign groundfish fishery bottom trawls (1976-1985) • JV groundfish fishery bottom trawls (1980-1988) • Domestic groundfish fishery bottom trawls (1988-1996) • Introduction of exotic species • Marine pollution and oil spills	• 1977 BSAI Preliminary FMP - banned bottom trawling in pollock spawning grounds • International, federal and state laws regarding marine pollutants • OPA 90 • Clean Water Act • Industry self-imposed actions: gear modifications to avoid habitat degradation	• BSAI 13, 15, and 46 – decrease in bottom trawls provided for habitat protection • BSAI FMP Amendment 17 – protect pollock spawning population • BSAI FMP 55/65 – EFH/HAPC designed to protect habitat • BSAI FMP Amendment 57 – banned non-pelagic gear • Conversion to pelagic fishery (1996) • Steller sea lion conservation areas indirectly protected habitat

Table 3.5-5 (cont.). Bering Sea and Aleutian Islands pollock past/present effects.

Comparative Baseline:

- The eastern Bering Sea pollock stock is healthy.
- The Central Bering Sea-Bogoslof Island stock is increasing and rebuilding.
- The Aleutian Islands stock is increasing in biomass.
- FMP management takes into account all catch and bycatch in EEZ and State waters when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-6. Catches (mt) of eastern Bering Sea and Aleutian Islands pollock, 1979-2002.

Year[1]	Eastern Bering Sea	Aleutian Islands
1979	935,714	9,504
1980	958,280	58,156
1981	973,502	55,516
1982	955,964	57,978
1983	981,450	59,026
1984	1,092,055	263,034[2]
1985	1,139,676	422,130[2]
1986	1,141,993	1,086,441[2]
1987	859,416	1,732,456[2,3]
1988	1,228,721	1,513,713[2,3]
1989	1,229,600	1,499,204[2,3]
1990	1,455,193	1,148,097[2,3]
1991	1,217,301	636,809[2,3]
1992	1,164,440	58,905[2,3]
1993	1,326,601	59,975[2,3]
1994	1,363,458	59,203[3]
1995	1,262,766	64,693[3]
1996	1,192,778	29,449[3]
1997	1,124,593	26,108[3]
1998	1,101,165	23,958[3]
1999	988,674	994[3]
2000	1,132,707	1,272[3]
2001	1,387,194	1,082[3]
2002	1,485,000[4]	1,040[4]

Notes: mt - metric tons
[1]1979-1989 data from Pacfin; 1990-2001 data from NMFS Alaska Regional Office, includes discards.
[2]Includes catch from the Donut Hole.
[3]Includes catch from Bogoslof Island.
[4]2002 values are set equal to TAC; AI catch data current through October 19, 2002.
Source: Ianelli et al. 2002b.

Table 3.5-7. Status and catch specifications (mt) of walleye pollock in the Gulf of Alaska in recent years.

Year	Age-3+ Biomass[1]	ABC[2,3]		Total	Catch[4]
		W/C/WYK	EYK/SEO		
2001	699,000	99,350	6,460	105,810	72,076
2002	726,600	51,7901	6,460	58,250	50,390[5]
2003	699,120	47,8901	6,460	54,350	NA

Notes: ABC - acceptable biological catch
C - Central Gulf of Alaska
EYK - East Yakutat District
mt - metric tons
NA - data not available
SEO - Southeast Gulf of Alaska
W - West Gulf of Alaska
WYK - West Yakutat District
[1]Biomass for each year corresponds to the projection given in the GOA SAFE report issued in the preceding year.
[2]ABC has been reduced by 1,700 metric tons to accommodate the Prince William Sound guideline harvest level.
[3]2002 ABC is recommended by the Plan Team.
[4]Current through November 2, 2002.
[5]Catch data are current through November 15, 2001.

Source: NPFMC 2002e.

Table 3.5-8. Gulf of Alaska pollock past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign pollock fishery (1964-1976) • State shrimp fishery pollock bycatch/bait fishery • State of Alaska PWS directed pollock fishery • State of Alaska crab bait fishery • IPHC halibut bait fishery • Exxon Valdez oil spill	• Foreign pollock fisheries post-MSA (1976-1985) • JV pollock fishery (1979-1991) • Domestic pollock fishery (1976-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973): Self-monitoring of foreign fishery in EBS and pollock catch limits • Preliminary FMPs - banned bottom trawling in pollock spawning grounds, established observers in foreign fisheries • Industry self-imposed actions; catch restrictions • International, federal and state laws regarding marine pollutants • OPA 90 • Clean Water Act	• Annual TAC/ABC limits • GOA FMP Amendments 8 and 21 –address ghost fishing • GOA FMP Amendments 18 and 30 established domestic observers • GOA FMP Amendment 11 – increase pollock OY and eliminate bait fishery • GOA FMP Amendment 19 – prohibited pollock roe stripping • GOA FMP Amendment 23 – final phase-out of foreign and JV pollock fisheries • GOA FMP Amendment 25 – Steller sea lion buffer zones, reduce pollock fishing mortality • 1993 Steller sea lion buffer zone extension reduce pollock fishing mortality • GOA FMP Amendment 45 – subdivided pollock areas, reduce fishing mortality • 1999 Steller sea lion buffer zone extension reduce pollock fishing mortality

Table 3.5-8 (cont.). Gulf of Alaska pollock past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Change in Reproductive Success	• Foreign pollock fisheries pre-MSA (1964-1976) • Commercial whaling and seal harvests • Climate changes and regime shifts	• Foreign, JV and domestic pollock fishery (post-MSA) spatial temporal concentration of pollock catch • Foreign, JV and domestic pollock fishery (post-MSA) fisheries selectivity of juveniles • Foreign, JV and domestic pollock fishery (post-MSA) roe stripping	• Bilateral agreement with Japan and USSR (1973); catch restrictions on Pacific Ocean perch indirectly benefit pollock recruitment • IWC ban on commercial whaling • MMPA of 1972 • Preliminary FMPs - established observers in foreign fisheries; banned bottom trawling in pollock spawning habitat • Industry self-imposed actions; gear modifications, catch restrictions	• GOA FMP Amendment 18 – established the Shelikof Strait area as a management district containing spawning populations and Observer Program • GOA FMP Amendment 19 – prohibited roe stripping • GOA FMP Amendments 10, 32, 38 – Pacific Ocean Perch closures and rebuilding plans; indirectly positively affect pollock recruitment • GOA FMP Amendment 45 – subdivided pollock areas, reduce spatial concentration of fishery
Change in Prey Availability	• Foreign groundfish fishery pre-MSA catch/bycatch of forage fish • Foreign POP fisheries • Exxon Valdez oil spill • Climate change or regime shifts (1988/89-present) • Introduction of exotic species	• Foreign groundfish fishery post-MSA bycatch of prey species • JV groundfish fishery bycatch of prey species • Domestic groundfish fishery bycatch of prey species • Foreign, JV and domestic POP fisheries (post-MSA) • Marine pollution and oil spills	• Industry self-imposed actions; catch restrictions • International, federal and state laws regarding marine pollutants • OPA 90 • Clean Water Act	• GOA FMP Amendment 18 – established the Shelikof Strait area as a management district containing spawning populations and Observer Program • GOA FMP Amendment 39 afforded protection for forage fish
Change in Important Habitat	• Foreign fishery bottom trawling (pre-MSA) • Exxon Valdez oil spill • Climate change or regime shifts (1988/89-present) • Introduction of exotic species	• Foreign, JV and domestic fisheries bottom trawling (post-MSA) • Introduction of exotic species • Marine pollution and oil spills	• International Laws regarding marine pollutants • OPA 90 • Clean Water Act • Industry self-imposed actions; gear modifications	• GOA FMP Amendments 3 and 20 – decrease bottom trawls and provided for habitat protection • GOA FMP Amendments 14, 55, and 65 – established habitat protection • GOA FMP Amendment 15 – Kodiak trawl closures, provide habitat protection • GOA FMP Amendment 18 – established the Shelikof Strait area as a management district containing spawning populations and Observer Program • GOA FMP Amendment 23 –

Table 3.5-8 (cont.). Gulf of Alaska pollock past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
				banned bottom trawling, protect habitat • GOA FMP Amendment 25 – Steller sea lion buffer zones • Steller sea lion conservation areas indirectly protected habitat

Comparative Baseline:

- The GOA stock is at an all-time low and is projected to decline into 2002.
- Recent year classes appear to be weak.
- Spawner biomass is expected to decline through at least 2003.
- Management takes into account all catch and bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.

Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-9. Catch and estimated biomass (mt) of Gulf of Alaska pollock, 1964-2002.

Year	Catch[1]	EIT Shelikof Strait survey[2,3]		AFSC Bottom Trawl[4,6]	ADF&G Coastal Trawl Survey
		Biosonics	Simrad EK500		
1964	1,126	--	--	--	--
1965	2,749	--	--	--	--
1966	8,932	--	--	--	--
1967	6,276	--	--	--	--
1968	6,164	--	--	--	--
1969	17,553	--	--	--	--
1970	9,343	--	--	--	--
1971	9,458	--	--	--	--
1972	34,081	--	--	--	--
1973	36,836	--	--	--	--
1974	61,880	--	--	--	--
1975	59,512	--	--	--	--
1976	86,527	--	--	--	--
1977	118,356	--	--	--	--
1978	96,935	--	--	--	--
1979	105,748	--	--	--	--
1980	114,622		--	--	--
1981	147,744	2,785,755	--	--	--
1982	168,740	--	--	--	--
1983	215,608	2,278,172	--	--	--
1984	307,401	1,757,168	--	723,087	--
1985	284,826	1,175,823	--	--	--
1986	87,809	585,755	--	--	--
1987	69,751	--	--	735,746	--
1988	65,739	301,709	--	--	--
1989	78,392	290,461	--	--	214,434
1990	90,744	374,731	--	825,535	114,451
1991	100,488	380,331	--	--	--
1992	90,857	580,000	681,400	--	127,359
1993	108,908	295,785	408,200	754,337	132,849
1994	107,335	--	467,300	--	103,420
1995	72,618	--	618,300	--	--

Table 3.5-9 (cont). Catch and estimated biomass (mt) of Gulf of Alaska pollock, 1964-2002.

Year	Catch[1]	EIT Shelikof Strait survey[2,3]		AFSC Bottom Trawl[4,6]	ADF&G Coastal Trawl Survey
		Biosonics	Simrad EK500		
1996	51,263	--	745,400	665,699	122,477
1997	90,130	--	570,100	--	93,728
1998	125,098	--	489,900	--	81,215
1999	95,590	--	--	611,210	53,587
2000	73,080	--	334,900	--	102,871
2001[5]	72,076	--	369,600	216,761	86,967
2002	NA	--	229,100	--	96,237

Notes: ADF&G - Alaska Department of Fish & Game
AFSC - Alaska Fisheries Science Center
mt - metric tons
NA - data not available
[1]Includes catches from foreign, joint venture, and domestic fisheries.
[2]Biomass estimates are from NMFS echo integration trawl surveys in Shelikof Strait, NMFS bottom trawl surveys of the Gulf of Alaska (west of 140°W), and ADF&G crab/groundfish trawl surveys.
[3]The biomass of age-1 fish is not included in Shelikof Strait EIT survey estimates in 1995 and 2000 (106,900 and 54,400 mt, respectively).
[4]An adjustment of +1.05 percent was made to the AFSC bottom trawl biomass time series to account for unsurveyed biomass in Prince William Sound.
[5]In 2001, when the NMFS survey did not extend east of 147°W, an expansion factor of 2.7 percent derived from previous surveys was used for West Yakutat.
[6]AFSC bottom trawl west of 140°W.

Source: Dorn et al. 2002.

Table 3.5-10 Biological and reproductive attributes of Pacific cod in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Biological/Reproductive Attributes																
	Feeding Type		Movements			Social Behavior		Longevity of Life Stage					Age at Maturity		Fertilization and Spawning Behavior		Spawning Season
	Carnivore	Planktivore	Drift with Ocean	Reside in Nursery	Not known	Schooling	Not Known	1-30 Days	1-12 Months	1-5 Years	>50 Years	Not Known	50% Female (years)	50% Male (years)	External	Batch Spawner	
A	X				X	X					X		5	5	X	X	Early Winter - Early Spring
LJ	X		X				X			X							
EJ	X		X				X		X								
L		X	X				X					X					
E				X				X									

Notes: A - adult
E - egg
EJ - early juveniles
L - larvae
LJ - late juvenile

Source: NPFMC 1999b.

Table 3.5-11. Habitat associations of Pacific cod in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Habitat Associations											
	Location							Substrate			Pelagic Domain	
	Inner Shelf (1-50m)	Middle Shelf (50-100m)	Outer Shelf (100-200m)	Not Known	Depths of high availability (winter) (of fishable stock)[1]	Depths of high availability (summer) (of fishable stock)[1]	Bottom depths of common occurrence (of fishable stock)[1]	Mud/Clay/Silt	Sand/Granule	Not Applicable	Near Surface	Demersal
A	X	X	X		50-150m	< 100m	10-150m	X	X			X
LJ	X	X	X					X	X			X
EJ	X	X						X	X			X
L				X						X	X	
E	X	X	X					X	X			X

Notes: A - adult
E - egg
EJ - early juvenile
L - larvae
LJ - late juvenile

Source: NPFMC 1999b.

[1]Source: NPFMC 2002a and 2002b; Table 20 and Table 57, respectively.

Table 3.5-12. Status and catch specifications (mt) of Pacific cod in the Bering Sea and Aleutian Islands in recent years.

Area	Year	Age 3+ Biomass[1]	OFL[2]	ABC[2]	TAC	Catch[3]
BSAI	2001	1,320,000	248,000	188,000	188,000	176,659
	2002	1,540,000	294,000	223,000	200,000	184,937
	2003	1,680,000	324,000	223,000	NA	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
OFL - overfishing level
TAC - total allowable catch
[1]Biomass for each year corresponds to the projection give in the SAFE report issued in the preceding year.
[2]OFL and ABC for 2002 are those recommended by the Plan Team.
[3]Catch data are current through November 12, 2002.

Source: NPFMC 2002d.

Table 3.5-13. Status and catch specifications (mt) of Pacific cod in the Gulf of Alaska in recent years.

Year	ABC[1,2]	Age 3+ Biomass[3]	Catch[4]
2001	67,800	468,000	41,613
2002	57,600	428,000	40,524
2003	52,800	452,000	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not yet available
[1]Includes State management fisheries.
[2]ABC for 2002 is recommended by the Plan Team.
[3]Biomass for each year corresponds to the projection give in the SAFE report issued in the preceding year.
[4]Catch data current through November 2, 2002.

Source: NPFMC 2002e.

Table 3.5-14. Bering Sea and Aleutian Islands Pacific cod past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Subsistence and personal use • Foreign groundfish fisheries (1964-1976) • Marine pollutants and oil spills	• Foreign Fisheries post MSA (1976-1985) • JV fisheries (1988-1991) • Domestic fisheries (1864-1950; 1981-present) • Marine pollutants and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • Clean Water Act • OPA 90	• Annual ABC/TAC limits • BSAI FMP Amendments 9, 11a, 12, 13, 27, and 37 addressed domestic and foreign observer programs • BSAI FMP Amendments16 and 24 – TAC allocations, reduce bycatch, address ghost fishing • BSAI FMP Amendment 46, 64, 67, 68 – Pacific cod gear allocations
Change in Reproductive Success	• Foreign groundfish fisheries (1964-1976) fishery selecitivity • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (post-MSA) fishery selectivity • Foreign, JV and domestic groundfish fisheries (post-MSA) spatial/temporal concentration of catch/bycatch	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas, observers in foreign fisheries	• BSAI FMP Amendment 4 addressed localized depletion
Change in Prey Availability	• Foreign groundfish fishery pre-MSA catch/bycatch of prey species • Introduction of exotic species • Marine pollution and oil spills • Climate change or regime shifts (1988/89-present)	• Foreign, JV and domestic groundfish fisheries prey species bycatch • Foreign, JV and domestic pollock fisheries **– pollock is an important prey item for adult Pacific cod** • Marine pollution and oil spills • Introduction of exotic species	• Bilateral agreement with Japan and USSR (1973): Self-monitoring of foreign fishery in EBS and catch limits • Industry self-imposed actions; catch restrictions • International laws regarding marine pollutants • Clean Water Act • OPA 90	• BSAI Amendment 36 - protection of forage fish • Annual ABC/TAC limits for pollock
Change in Important Habitat	• Foreign groundfish fishery (1976-1985) fishery gear impacts • Introduction of exotic species • Marine pollutants and oil spills • Climate changes and regime shifts	• Foreign, JV and domestic (post-MSA) fishery gear impacts • Introduction of exotic species • Marine pollutants and oil spills • Climate changes and regime shifts	• Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas. • Industry self-imposed modifications – gear restrictions. • International laws regarding marine pollutants • Clean Water Act • OPA 90	• BSAI FMP Amendment 46, 64, 67, 68 – Pacific cod gear allocations • BSAI FMP Amendment 9 – defined habitat requirements • BSAI FMP amendments 13, 15, and 46 – decrease in bottom trawls • BSAI FMP amendments 55/56 – protection for EFH and HAPC.

Table 3.5-14 (cont.). Bering Sea and Aleutian Islands Pacific cod past/present effects.

Comparative Baseline:

- The Bering Sea Pacific cod stock is not overfished.
- Stock is below target biomass.
- Stock is decreasing in abundance.
- Management takes into account all catch and bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-15. Catches and estimated biomass (mt) of Pacific cod in the eastern Bering Sea and Aleutian Islands regions.

Year	EBS Catch[1]	EBS Shelf Estimated Biomass[2, 5]	S. Bering Sea Estimated Biomass[3]	AI Catch[1]	AI Estimated Biomass[3]
1978	42,543	--	--	0	--
1979	33,761	754,314	--	0	--
1980	45,861	905,344	74,373	86	126,443
1981	56,507	1,034,629	--	7,434	--
1982	61,104	1,020,550	--	8,397	--
1983	94,801	1,176,305	45,624	8,430	158,772
1984	125,103	1,001,940	--	7,981	--
1985	143,447	961,050	--	6,937	--
1986	135,605	1,134,106	42,298	6,906	214,923
1987	149,903	1,142,450	--	13,207	--
1988	203,071	959,544	--	5,165	--
1989[4]	178,323	960,436	--	4,542	--
1990[4]	172,067	708,551	--	7,541	--
1991[4]	209,469	532,590	8,286	9,797	189,190
1992[4]	164,972	546,707	--	43,068	--
1993	133,155	690,524	--	35,037	--
1994	172,261	1,368,109	31,084	21,539	184,109
1995	228,496	1,003,046	--	16,534	--
1996	209,064	890,793	--	31,609	--
1997	232,598	604,881	10,742	25,164	83,416
1998	160,684	534,141	--	34,964	--
1999	145,865	583,259	--	28,130	--
2000	151,372	528,466	9,157	39,684	134,075
2001	142,452	830,479	--	34,207	--
2002	119,447	616,923	9,601	30,009	82,853

Table 3.5-15 (cont.). Catches and estimated biomass (mt) of Pacific cod in the eastern Bering Sea and Aleutian Islands regions.

Notes: AI - Aleutian Islands
EBS - eastern Bering Sea
mt - metric tons
[1]All catch since 1980 includes discards. 2002 catch data current through August.
[2]EBS Shelf biomass estimates are from NMFS' annual bottom trawl survey.
[3]Southern Bering Sea and Aleutian Island biomass estimates are from U.S.-Japan cooperative trawl surveys.
[4]During the 1992 field season, 18 stations were omitted from the standard survey grid due to severe weather and vessel problems. In 1989, 1990, and 1991, these 18 stations represented, on average, 2.2 percent of the total Pacific cod biomass.
[5]For standard error and confidence intervals associated with the eastern Bering Sea shelf estimated biomass, see Table 2.12 of the 2001 BSAI SAFE Report.
Source: Thompson and Dorn 2002.

Table 3.5-16. Gulf of Alaska Pacific cod past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Subsistence and personal use • Foreign fisheries (1962-1976) • State of Alaska groundfish fisheries • State of Alaska crab fisheries • Marine pollutants and oil spills	• Foreign groundfish fisheries (1976-1985) • Domestic groundfish fisheries (1867-present) • JV groundfish fisheries (1978-1988) • Marine pollutants and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • OPA 90 • Clean Water Act	• Annual ABC/TAC limits • Foreign and domestic observer programs • GOA GFMP amendment 11 – eliminate bait fishery • GOA FMP amendment 21 – TAC setting • GOA FMP Amendments 4, 8, and 22 – regulatory districts • GOA FMP Amendments 8 and 21 address ghost fishing • GOA FMP Amendment 25 – Steller sea lion buffer zones, reduce P. Cod fishing mortality • 1993 Steller sea lion buffer zone extension reduce P. cod fishing mortality • 1999 Steller sea lion buffer zone extension reduce P. cod fishing mortality
Change in Reproductive Success	• Foreign groundfish fisheries (pre-MSA) fishery selectivity • State of Alaska groundfish fisheries fishery selectivity • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (post-MSA) fishery selectivity • Foreign, JV and domestic groundfish fisheries (post-MSA) spatial/temporal concentration of catch	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • Preliminary FMPs – banned bottom trawling in some areas, observers in foreign fisheries	• GOA FMP Amendment 49 – IR/RU program

Table 3.5-16 (cont.). **Gulf of Alaska Pacific cod past/present effects.**

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Change in Prey Availability	• Foreign groundfish fishery pre-MSA catch/bycatch of prey species • Marine pollution and oil spills • Introduction of exotic species • Climate change or regime shifts (1988/89-present)	• Foreign, JV and domestic fisheries (post-MSA) prey species bycatch • Domestic pollock fishery - **Pollock is an important prey item for adult P. cod** • Introduction of exotic species • Marine pollution and oil spills	• Industry self-imposed actions; catch restrictions • International Laws regarding marine pollutants • OPA 90 • Clean Water Act	• GOA FMP Amendment 39 afforded protection for forage fish
Change in Important Habitat	• Foreign groundfish fishery (pre-MSA) gear impacts • Marine pollutants and oil spills • Introduction of exotic species • Climate change or regime shifts (1988/89-present)	• Foreign, JV and domestic fisheries (post-MSA) gear impacts • Marine pollutants and oil spills • Introduction of exotic species	• International Laws regarding marine pollutants • OPA 90 • Clean Water Act • Industry self-imposed actions; gear modifications	• GOA FMP Amendments 3 and 20 – decrease bottom trawls and provided for habitat protection • GOA FMP Amendments 14, 55, and 65 – established habitat protection • GOA FMP Amendment 15 – Kodiak trawl closures, provide habitat protection • GOA FMP Amendment 23 – banned bottom trawling, protect habitat • Steller sea lion conservation areas indirectly protected habitat • GOA FMP amendment 55/56 EFH and HAPC protection

Table 3.5-16 (cont.). Gulf of Alaska Pacific cod past/present effects.

Comparative Baseline:

- The Gulf of Alaska Pacific cod stock is not overfished.
- Stock is below target biomass.
- Stock is decreasing in abundance.
- Management takes into account all catch and bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-17. Catch and estimated biomass (mt) of Pacific cod in the Gulf of Alaska, 1978-2002.

Year	Catch[1]	Biomass estimates[2]
1978	12,190	--
1979	14,904	--
1980	35,345	--
1981	36,131	--
1982	29,465	--
1983	36,540	--
1984	23,898	571,188
1985	14,428	--
1986	25,012	--
1987	32,939	558,662
1988	33,802	--
1989	43,293	--
1990	72,517	379,494
1991	76,328	--
1992	80,746	--
1993	56,487	409,848
1994	47,484	--
1995	68,985	--
1996	68,280	538,154
1997	68,474	--
1998	62,102	--
1999	68,613	306,413
2000	65,905	--

Table 3.5-17 (cont.). Catch and estimated biomass (mt) of Pacific cod in the Gulf of Alaska, 1978-2002.

Year	Catch[1]	Biomass estimates[2]
2001[3]	51,060	277,743
2002	44,734	--

Notes: mt - metric tons
[1]Catch for 2002 are through August.
[2]For standard error and confidence intervals associated with the estimated biomass, see the 2001 Gulf of Alaska SAFE report.
[3]The 2001 survey did not cover the eastern Gulf of Alaska. To account for the missing stations, the 1999 survey estimates for biomass and numbers for the eastern Gulf of Alaska were added to the respective 2001 values to produce the figure shown in this Table.
Source: Thompson et al. 2002.

Table 3.5-18. Biological and reproductive attributes of sablefish in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Biological/Reproductive Attributes															
	Feeding Type		Movements			Social Behavior	Longevity of Life Stage					Age at Maturity		Fertilization/ Spawning Behavior		Spawning Season
	Carnivore	Planktivore	Drift with Ocean	Inshore/Offshore Migrations	Highly migratory	Not Known	1 Day	1-30 Days	1-12 Months	1-5 Years	20-50 Years	50% Female (years)	50% Male (years)	External	Broadcast Spawner	
A	X				X	X					X	6.5	5.0	X	X	Late Winter - Early Spring
LJ	X				X	X				X						
EJ	X			X		X				X						
L		X	X			X			X							
E			X			X		X								

Notes: A - adult
E - eggs
EJ - early juvenile
L - larvae
LJ - Late juvenile

Source: NPFMC 1999b.

Table 3.5-19. Habitat associations of sablefish in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Habitat Associations															
	Location											Pelagic Domain				Oceanography
	Inner Shelf (1-50m)	Middle Shelf (50-100m)	Outer Shelf (100-200m)	Upper Slope (200-1000m)	Lower Slope	Basin	Bay/Estuaries	Island	Depths of high availability (winter) (of fishable stock)[1]	Depths of high availability (summer) (of fishable stock)[1]	Bottom depths of common occurrence (of fishable stock)[1]	Near Surface	Pelagic	Semi-demersal/Semi-pelagic	Demersal	Upwelling Zone
A				X	X				300-800m	300-800m	200-1,000m				X	X
LJ				X	X										X	X
EJ	X	X	X				X	X					X	X	X	X
L		X	X	X	X	X						X				X
E				X	X	X							X			X

Notes: A - adult
E - eggs
EJ - early juvenile
L - larvae
LJ - late juvenile

Source: NPFMC 1999b.

[1]Source: NPFMC 2002a and 2002b; Table 20 and Table 57, respectively.

Table 3.5-20. Status and catch specifications (mt) of sablefish in the eastern Bering Sea, Aleutian Islands, and Gulf of Alaska in recent years.

Area	Year	Age-4+ Biomass	OFL	ABC	Catch[1]
EBS	2001	20,000	1,910	1,560	842
	2002	28,000	2,900	1,930	893
	2003	31,000	4,290	2,900	NA
AI	2001	38,000	3,070	2,500	1,033
	2002	39,000	3,850	2,550	994
	2003	39,000	4,590	3,110	NA
GOA	2001	188,000	15,270	12,840	12,047
	2002	188,000	19,350	12,820	12,246
	2003	182,000	22,020	14,890	NA

Notes: ABC - acceptable biological catch
AI - Aleutian Islands
EBS - eastern Bering Sea
GOA - Gulf of Alaska
mt - metric tons
NA - data not available
OFL - overfishing level
[1]Catch data current through November 2, 2002.

Source: NPFMC 2002d and 2002e.

Table 3.5-21. Bering Sea and Aleutian Islands and Gulf of Alaska sablefish past/present effects (BSAI and GOA analysis is combined since they are assessed as a single stock).

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	· Foreign groundfish fishery (BSAI: 1958-1976; GOA: 1963-1976) · IPHC longline fishery · State of Alaska groundfish fisheries · Exxon Valdez oil spill	· Foreign groundfish fisheries post-MSA (1976-1985) · JV groundfish fishery (BSAI: 1980-1991; GOA: 1979-1991) · GOA Domestic (US Nationals fishery) Pacific cod fishery (1800s-1976) · BSAI domestic groundfish fisheries (BSAI: 1980-present, GOA: 1979-present)	· Bilateral agreement with Japan and USSR (1973) · Industry self-imposed actions; catch restrictions · International laws regarding marine pollutants · Clean Water Act · OPA 90	· Foreign and domestic observers · Annual TAC/ABC limits · BSAI/GOA Amendments 16/8 and 21 – addressed ghost fishing · GOA FMP Amendment 11 – lowered sablefish quotas · BSAI/GOA FMP Amendments 20/15 – created IFQ program · GOA FMP Amendment 65 – revised IFQ program
Change in Reproductive Success	· BSAI and GOA Foreign fisheries (1958-1976) fishery selectivity · IPHC halibut longline · State of Alaska groundfish fishery spatial/temporal concentration · Exxon Valdez oil spill · Climate change or regime shifts	· Foreign, JV and domestic (post-MSA) fisheries fishery selectivity · Foreign, JV and domestic (post-MSA) fisheries spatial/temporal concentration	· Bilateral agreement with Japan and USSR (1973) · Preliminary FMPs banned bottom trawling; observers in foreign fisheries · Industry self-imposed actions; catch restrictions	· Foreign and domestic observers · Annual TAC/ABC limits · BSAI FMP Amendment 4 addressed localized · BSAI/GOA FMP Amendments 20/15 – created IFQ program · GOA FMP Amendment 65 – revised IFQ program depletion · GOA FMP Amendment 8 – defined management areas
Change in Prey Availability	· BSAI and GOA foreign groundfish fishery (pre-MSA) catch/bycatch of prey species · State of Alaska groundfish fisheries catch/bycatch of prey species · Exxon Valdez oil spill · Introduction of exotic species	· Foreign, JV and domestic (post-MSA) fisheries prey species catch/bycatch · Introduction of exotic species · Marine pollution and oil spills	· Bilateral agreement with Japan and USSR (1973): Self-monitoring of foreign fishery in EBS and catch limits · Foreign fisheries management actions · Industry self-imposed actions; catch restrictions · International Laws regarding marine pollutants · OPA 90	· BSAI/GOA FMP Amendments 36/39 - protection of forage fish · Annual ABC/TAC limits for pollock · BSAI and GOA FMP Amendments regulating pollock catch

Table 3.5-21 (cont.). **Bering Sea and Aleutian Islands and Gulf of Alaska sablefish past/present effects (BSAI and GOA analysis is combined since they are assessed as a single stock).**

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
	· Climate change or regime shifts (1988/89-present)		· Clean Water Act	

Table 3.5-21 (cont.). **Bering Sea and Aleutian Islands and Gulf of Alaska sablefish past/present effects (BSAI and GOA analysis is combined since they are assessed as a single stock).**

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Change in Important Habitat	· BSAI and GOA foreign groundfish fisheries (pre-MSA) gear impacts · State of Alaska groundfish fisheries gear impacts · Exxon Valdez oil spill · Introduction of exotic species · Climate changes and regime shifts	· Foreign, JV and domestic groundfish fisheries (post-MSA) gear impacts · Marine pollutants and oil spills · Introduction of exotic species	· International Laws regarding marine pollutants · OPA 90 · Clean Water Act · Industry self-imposed actions; gear modifications	· 1977 BSAI Preliminary FMP - banned bottom trawling in pollock spawning grounds · BSAI FMP Amendments 13, 15, and 46 – decrease in bottom trawls and created Walrus Is. Closures, provided for habitat protection · GOA FMP Amendments 3 and 20 decreased bottom trawling · GOA FMP Amendments 14 and 55 established habitat protection measures · BSAI/ GOA FMP amendments 55/65 – EFH/HAPC designed to protect habitat

Comparative Baseline:

- **The BSAI/GOA sablefish stock is not overfished.**
- **This stock is below target biomass, however it is a stable stock.**
- **Management takes into account all catch and bycatch when setting annual harvest levels.**

Table 3.5-22. Catch and biomass estimates (mt) for sablefish in the Bering Sea and Aleutian Islands and Gulf of Alaska, 1956-2002.

Year	Catch			Sablefish Biomass[2] (mt)		
	EBS	AI	GOA[1]	BS	AI	GOA[1]
1956	0	0	773	--	--	--
1957	0	0	2,059	--	--	--
1958	6	0	471	--	--	--
1959	289	0	621	--	--	--
1960	1,861	0	1,193	--	--	--
1961	15,627	0	451	--	--	--
1962	25,989	0	390	--	--	--
1963	13,706	664	2,531	--	--	--
1964	3,545	1,541	2,187	--	--	--
1965	4,838	1,249	2,646	--	--	--
1966	9,505	1,341	4,737	--	--	--
1967	11,698	1,652	5,846	--	--	--
1968	14,374	1,673	14,893	--	--	--
1969	16,009	1,673	19,149	--	--	--
1970	11,737	1,248	24,873	--	--	--
1971	15,106	2,936	25,425	--	--	--
1972	12,758	3,531	36,776	--	--	--
1973	5,957	2,902	28,030	--	--	--
1974	4,258	2,477	27,803	--	--	--
1975	2,766	1,747	25,465	--	--	--
1976	2,923	1,659	27,098	--	--	--
1977	2,718	1,897	16,781	--	--	--
1978	1,193	821	8,379	--	--	--
1979	1,376	782	9,579	35,000	38,000	125,000
1980	2,205	275	7,938	33,000	36,000	116,000
1981	2,605	533	9,445	53,000	74,000	186,000
1982	3,238	964	7,831	61,000	80,000	214,000

Table 3.5-22 (cont). Catch and biomass estimates (mt) for sablefish in the Bering Sea and Aleutian Islands and Gulf of Alaska, 1956-2002.

Year	Catch			Sablefish Biomass[2] (mt)		
	EBS	AI	GOA[1]	BS	AI	GOA[1]
1983	2,712	684	8,284	60,000	71,000	221,000
1984	3,336	1,061	9,407	78,000	89,000	270,000
1985	2,454	1,551	10,459	87,000	104,000	286,000
1986	4,184	3,285	21,347	88,000	97,000	274,000
1987	4,904	4,112	26,146	85,000	85,000	259,000
1988	4,006	3,616	30,767	61,000	88,000	266,000
1989	1,516	3,704	29,609	46,000	69,000	256,000
1990	2,606	2,412	27,067	45,000	65,000	222,000
1991	1,318	2,168	23,497	39,000	49,000	205,000
1992	586	1,497	22,707	27,000	43,000	213,000
1993	668	2,080	22,685	22,000	36,000	201,000
1994	694	1,726	21,340	15,000	36,000	215,000
1995	990	1,333	18,631	18,000	35,000	203,000
1996	697	905	15,975	19,000	34,000	193,000
1997	728	929	13,264	20,000	26,000	184,000
1998	614	734	12,760	20,000	24,000	191,000
1999	677	671	12,227	21,000	33,000	189,000
2000	753	1,071	13,777	20,000	35,000	182,000
2001	878	1,092	12,127	23,000	44,000	215,000
2002	989	1,038	12,246	29,000	41,000	195,000

Notes: AI - Aleutian Islands
EBS - eastern Bering Sea
mt - metric tons
[1]Catch data current through November 2, 2002; GOA catch equals Western, Central and Eastern GOA catch (Eastern GOA catch equals West Yakutat plus East Yakutat/Southeast catch.
[2]Biomass data is regional estimates of sablefish age-4+. Age 4+ biomass was estimated by year and region by applying only survey-based weights, similar to the method used to allocate the ABC.
Source: Sigler et al. 2002

Table 3.5-23. Biological and reproductive attributes of Atka mackerel in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Biological/Reproductive Attributes														
	Feeding Type		Movements		Social Behavior		Longevity of Life Stage			Age at Maturity		Fertilization/ Spawning Behavior			Spawning Season
	Carnivore	Planktivore	Inshore/Offshore Migrations	Not known	Schooling	Not Known	1-30 Days	1-12 Months	1-5 Years	50% Female (years)	50% Male (years)	External	Nest	Egg/Young Tender	
A	X		X		X				X	3.6	3.6	X	X	X	Early Summer - Late Summer
J	X			X		X			X						
L	X			X		X		X							
E		X		X		X	X								

Notes: A - adult
J - juvenile
L - larvae
E - eggs

Source: NPFMC 1999b

Table 3.5-24. Habitat associations of Atka mackerel in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Habitat Association																	
	Locations								Substrate				Pelagic Domain				Oceanography	
	Inner Shelf (1-50m)	Middle Shelf (50-100m)	Outer Shelf (100-200m)	Island Pass	Not Known	Depths of high availability (winter) (of fishable stock)[1]	Depths of high availability (summer) (of fishable stock)[1]	Bottom depths of common occurrence (of fishable stock)[1]	Gravel	Pebble	Cobble	Kelp Forest	Near Surface	Semi-demersal/Semi-pelagic	Demersal	Not Known	Fronts	Edges (ice, bathymetric)
A	X	X	X	X		Offshore	Inshore	Coastal and open sea	X	X	X	X		X			X	X
J					X											X		
L					X								X					
E	X			X					X	X	X	X			X			

Notes: A - adult
J - juvenile
L - larvae
E - eggs

Source: NPFMC 1999b.

[1]Source: NPFMC 2002a and 2002b; Table 20 and Table 57, respectively.

Table 3.5-25. Status and catch specifications (mt) for Atka mackerel in the Aleutian Islands region in recent years.

Year	OFL	ABC	TAC	Catch[1]
2001	138,000	58,700	58,700	56,521
2002	82,300	49,000	49,000	42,055
2003	99,700	63,000	60,000	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
OFL - overfishing level
TAC - total allowable catch
[1]Catch data current through November 2, 2002.
Source: NPFMC 2002d.

Table 3.5-26. Bering Sea and Aleutian Islands Atka mackerel past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1970-1976) • Marine pollution and oil spills	• Foreign Fisheries post MSA (1976-1985) • JV fisheries (1980-1991) • Domestic fisheries (1981-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • Clean Water Act • OPA 90	• Annual ABC/TAC limits • BSAI FMP Amendments 9, 11a, 12, 13, 27, and 37 addressed domestic and foreign observer programs • BSAI FMP Amendments16 and 24 – TAC allocations, reduce bycatch, address ghost fishing • BSAI FMP Amendment 34 – jig gear allocation • Steller sea lion conservation measures • BSAI FMP Amendment 70 – Steller sea lion 2002 measures
Change in Reproductive Success	• Foreign groundfish fisheries spatial/temporal concentration of fishery (1970-1976) • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (1981-present) spatial/temporal concentration of fishery	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas, observers in foreign fisheries	• Annual ABC/TAC limits • Foreign and domestic observer programs • BSAI FMP Amendment 28 Steller closures • BSAI FMP Amendment 70 – Steller sea lion 2002 measures
Change in Prey Availability	• Commercial whaling • Introduction of exotic species • Marine pollutants and oil spills • Climate change or regime shifts (1988/89-present)	• Introduction of exotic species • Marine pollutants and oil spills	• IWC ban on commercial whaling • MMPA of 1972 • International laws regarding marine pollutants • Clean Water Act • OPA 90	
Change in Important Habitat	• Foreign groundfish fishery (pre-MSA) gear impacts • Introduction of exotic species • Marine pollution and oil spills • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (post-MSA) gear impacts • Introduction of exotic species • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas. • Industry self-imposed modifications – gear restrictions. • Clean Water Act • OPA 90	• BSAI FMP Amendment 20 – Steller sea lion buffer • Steller sea lion conservation measures • BSAI FMP Amendment 9 – defined habitat requirements • BSAI FMP amendments 13, 15, and 46 – decrease in bottom trawls

Table 3.5-26 (cont.). Bering Sea and Aleutian Islands Atka mackerel past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
				• BSAI FMP amendments 55– protection for EFH and HAPC. • BSAI FMP Amendment 70 – Steller sea lion 2002 measures

Comparative Baseline:

- The BSAI Atka mackerel stock is not overfished.
- The BSAI Atka mackerel stock is above target biomass.
- The BSAI Atka mackerel stock is declining in stock size.
- Management takes into account all catch and bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-27. Catch and survey biomass estimates (mt) for Atka mackerel in the eastern Bering Sea and Aleutian Islands, 1977-2002.

Year	Catch[1]		
	EBS[2]	AI[2]	AI[2]
1977	a	21,763	--
1978	831	23,418	--
1979	1,985	21,279	--
1980	4,955	15,533	--
1981	3,027	16,661	--
1982	328	19,546	--
1983	141	11,585	--
1984	57	35,998	--
1985	4	37,856	--
1986	12	31,978	544,754
1987	12	30,049	--
1988	428	21,656	--
1989	3,126	14,868	--
1990	480	21,725	--
1991	2,596	24,144	723,918
1992	2,610	47,425	--
1993	213	65,524	--
1994	189	69,401	602,161
1995	a	81,554	--
1996	a	103,943	--
1997	a	65,845	366,314
1998	a	57,177	--
1999	a	53,643	--

Table 3.5-27 (cont.). Catch and survey biomass estimates (mt) for Atka mackerel in the eastern Bering Sea and Aleutian Islands, 1977-2002.

Year	Catch[1]		
	EBS[2]	AI[2]	AI[2]
2000	a	42,440	510,857
2001	a	56,634	--
2002	a	42,055	772,798

Notes: a - Eastern Bering Sea catches included with Aleutian Islands.
AI - Aleutian Islands
EBS - eastern Bering Sea
mt - metric tons
[1]Catch data current as of October 12, 2002 from NMFS Alaska Regional Home Page.
[2]Biomass estimates from the U.S.-Japan cooperative survey (1986) and domestic Aleutian Islands trawl surveys (1991, 1994, 1997, 2000, and 2002).
Source: Lowe et al. 2002.

Table 3.5-28. Status and catch specifications (mt) for Atka mackerel in the Gulf of Alaska in recent years.

Year	ABC	Catch[1]
2001	600	77
2002	600	84
2003	600	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
[1]Catch through November 2, 2002.

Source: NPFMC 2002e

Table 3.5-29. Gulf of Alaska Atka mackerel past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign fisheries (1973-1976) • Marine pollution and oil spills	• Foreign fisheries post MSA (1976-1986) • JV fisheries (1979-1985) • Domestic fisheries (1979-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • OPA 90 • Clean Water Act	• Annual ABC/TAC limits • Foreign and domestic observer programs • GOA GFMP amendment 16 – combined A.M. with other species • GOA FMP amendment 31 established Atka mackerel as a target species • GOA FMP Amendment 44 OFL definition established as bycatch only • GOA FMP Amendments 8 and 21 address ghost fishing • GOA FMP Amendment 25 – Steller sea lion buffer zones, reduce Atka Mackerel fishing mortality • 1993 Steller sea lion buffer zone extension • 1999 Steller sea lion buffer zone extension • GOA FMP Amendment 70 – Steller sea lion 2002 measures
Change in Reproductive Success	• Foreign groundfish fisheries (1973-1976) spatial/temporal concentration • Climate changes and regime shifts	• Foreign, JV and domestic (post-MSA) fisheries fishery selectivity • Foreign, JV and domestic (post-MSA) fisheries spatial/temporal concentration	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973)	• GOA FMP Amendment 49 – IR/RU program • Steller sea lion protection measures -Regulations to spatially/temporally disperse fishery • GOA FMP Amendment 70 – Steller sea lion 2002 measures
Change in Prey Availability *Mostly prey on invertebrates.*	• Commercial whaling • Introduction of exotic species • Marine pollutants and oil spills • Climate change or regime shifts (1988/89-present)	• Introduction of exotic species • Marine pollutants and oil spills	• IWC commercial ban of whaling • MMPA of 1972 • International laws regarding marine pollutants • OPA 90 • Clean Water Act	

Table 3.5-29 (cont.). Gulf of Alaska Atka mackerel past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Change in Important Habitat	• Foreign groundfish fishery (pre-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species • Climate change or regime shifts (1988/89-present)	• Foreign, JV and domestic groundfish fisheries (post-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species	• Preliminary FMPs – banned bottom trawling in some areas, observers in foreign fisheries • International Laws regarding marine pollutants • OPA 90 • Clean Water Act • Industry self-imposed actions; gear modifications	• GOA FMP Amendments 3 and 20 – decrease bottom trawls and provided for habitat protection • GOA FMP Amendments 14, 55, and 65 – established habitat protection • GOA FMP Amendment 15 –trawl closures, provide habitat protection • GOA FMP Amendment 23 – banned bottom trawling, protect habitat • Steller sea lion conservation areas indirectly protected habitat • GOA FMP amendment 56 EFH and HAPC protection • GOA FMP Amendment 70 – Steller sea lion 2002 measures

Comparative Baseline:

- The GOA Atka mackerel stock is at a low abundance and low exploitation.
- There may be some evidence of localized depletion of the GOA Atka mackerel stock.
- The GOA Atka mackerel fishery is a bycatch only fishery.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.

Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-30. Catch (mt) of Atka mackerel in the Gulf of Alaska, 1990-2002.

Year	Catch[3]
1990[1]	1,416
1991[2]	3,258
1992[2]	13,834
1993[2]	7,010
1994[2]	3,538
1995[2]	701
1996[2]	1,586
1997[2]	331
1998[2]	317
1999	262
2000	170
2001	66

Notes: mt - metric tons
[1]Actual observed catch
[2]NMFS blend data
[3]Catch data current through October 12, 2002, from NMFS Bulletin Board
Source: Lowe 2002.

Table 3.5-31. Biological and reproductive attributes of yellowfin sole in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Biological/Reproductive Attributes											
	Feeding Type		Movements		Longevity of Life Stage				Age at Maturity	Fertilization/ Spawning Behavior		Spawning Season
	Carnivore	Planktivore	Inshore/Offshore Migrations	Not known	1-12 Months	1-5 Years	5->20Years	Not Known	50% Female (years)	External	Broadcast Spawner	
A	X		X				X		10.5	X	X	Late Spring - Late Summer
LJ	X			X		X						
EJ	X			X		X						
L		X		X	X							
E				X				X				

Notes: A - adult
E - egg
EJ - early juvenile
L - larvae
LJ - late juvenile

Source: NPFMC 1999b.

Table 3.5-32. Habitat associations of yellowfin sole in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Habitat Associations												
	Location								Substrate		Pelagic Domain		Oceanography
	Beach (intertidal)	Inner Shelf (1-50m)	Middle Shelf (50-100m)	Outer Shelf (100-200m)	Bay/Estuaries	Depths of high availability (winter) (of fishable stock)[1]	Depths of high availability (summer) (of fishable stock)[1]	Bottom depths of common occurrence (of fishable stock)[1]	Sand/Granule	Not Applicable	Pelagic	Demersal	Edges (ice, bathymetric)
A	X	X	X	X	X	50-150m	20-50m	10-300m	X			X	X
LJ		X	X	X	X				X			X	
EJ		X	X	X	X				X			X	
L	X	X			X				X	X	X		
E	X	X			X					X	X		

Notes: A - adult
E - egg
EJ - early juvenile
L - larvae
LJ - late juvenile

Source: NPFMC 1999b.

[1]Source: NPFMC 2002a and 2002b; Table 20 and Table 57, respectively.

Table 3.5-33. Status and catch specifications (mt) of yellowfin sole in the Bering Sea and Aleutian Islands in recent years.

Area	Year	Age 2+ Biomass[1]	OFL[2]	ABC[2]	TAC	Catch[3]
BSAI	2001	2,380,000	209,000	176,000	113,000	63,578
	2002	1,597,000	136,000	115,000	86,000	74,861
	2003	1,550,000	136,000	114,000	83,750	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
OFL - overfishing level
TAC - total allowable catch
[1]Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year.
[2]OFL and ABC for 2003 are those recommended by the Plan Team.
[3]Catch data are current through November 2, 2002.
Source: NPFMC 2002e.

Table 3.5-34. Bering Sea and Aleutian Islands yellowfin sole past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1954-1976) • Marine pollution and oil spills	• Foreign groundfish fisheries (1976-1985) • JV groundfish fisheries (1980-1991) • Domestic groundfish fisheries (1987-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • Clean Water Act • OPA 90	• Annual ABC/TAC limits • PSC Limits (crab and halibut) • BSAI FMP Amendments 9, 11a, 12, 13, 27, and 37 addressed domestic and foreign observer programs • BSAI FMP Amendments16 and 24 – TAC allocations, reduce bycatch, address ghost fishing
Change in Reproductive Success	• Foreign groundfish fisheries (1954-1976) • Climate changes and regime shifts	• Foreign groundfish fisheries (1976-1985) • JV groundfish fisheries (1980-1991) • Domestic groundfish fisheries (1987-present)		• Observer programs • Annual ABC/TAC limits
Change in Prey Availability	• Foreign groundfish fisheries (1954-1976) prey species bycatch • State of Alaska crab fisheries bycatch of juvenile crabs • Introduction of exotic species • Marine pollution and oil spills • Climate change or regime shifts (1988/89-present)	• Foreign, JV and domestic groundfish (post-MSA) prey species bycatch • Introduction of exotic species • Marine pollution and oil spills	• Industry self imposed actions – gear modifications • International laws regarding marine pollutants • Clean Water Act • OPA 90	• PSC Limits for crab
Change in Important Habitat	• Foreign groundfish fishery (pre-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species • Climate changes and regime shifts	• Foreign, JV and domestic groundfish (post-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species	• Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas. • Industry self-imposed modifications – gear restrictions. • International laws regarding marine pollutants • Clean Water Act • OPA 90	• BSAI FMP Amendment 9 – defined habitat requirements • BSAI FMP amendments 13, 15, and 46 – decrease in bottom trawls • BSAI FMP amendments 55– protection for EFH and HAPC.

Table 3.5-34 (cont.). Bering Sea and Aleutian Islands yellowfin sole past/present effects.

Comparative Baseline:

- The BSAI yellowfin sole stock is not overfished.
- The BSAI yellowfin sole biomass is above target biomass.
- The yellowfin sole stock is decreasing in size.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-35. Catch and biomass estimates (mt) for yellowfin sole in the Bering Sea and Aleutian Islands, 1964-2002.

Year	Catch[1]	Biomass Estimates[2]
1964	NA	--
1965	NA	--
1966	NA	--
1967	NA	--
1968	NA	--
1969	NA	--
1970	NA	--
1971	NA	--
1972	NA	--
1973	NA	--
1974	NA	--
1975	NA	972,500
1976	NA	--
1977	58,373	--
1978	138,433	--
1979	99,019	1,586,000
1980	87,391	1,842,400
1981	97,301	2,394,700
1982	95,712	3,377,800
1983	108,385	3,535,300
1984	159,526	3,141,200
1985	227,107	2,443,700
1986	208,597	1,909,900
1987	181,428	2,613,100

Table 3.5-35 (cont). Catch and biomass estimates (mt) for yellowfin sole in the Bering Sea and Aleutian Islands, 1964-2002.

Year	Catch[1]	Biomass Estimates[2]
1988	223,156	2,402,400
1989	153,165	2,316,300
1990	83,970	2,183,800
1991	115,842	2,393,300
1992	149,569	2,172,900
1993	106,101	2,465,400
1994	144,544	2,610,500
1995	124,740	2,009,700
1996	129,659	2,298,600
1997	181,389	2,163,400
1998	101,201	2,329,600
1999	67,320	1,306,470
2000	83,850	1,581,900
2001	63,395	1,855,200
2002	55,385	2,003,400

Notes: mt - metric tons
NA - data not available
[1]Catch data current through September 14, 2002.
[2]Survey biomass estimates in eastern Bering Sea from 20-200 m from the Alaska Peninsula north to a latitude of St. Matthew and Nunivak Islands. See Wilderbuer and Nichol 2002 for 95% confidence intervals.
Source: Wilderbuer and Nichol 2002.

Table 3.5-36. Status and catch specifications (mt) for shallow water flatfish assemblage in the Gulf of Alaska in recent years.

Year	ABC[1]	Exploitable Biomass[2]	Catch[3]
2001	37,860	299,100	6,162
2002	49,550	349,992	6,842
2003	49,340	349,992	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
[1]The ABC for 2003 is recommended by the Plan Team.
[2]Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year.
[3]Catch data are current through November 2, 2002.
Source: NPFMC 2002e.

Table 3.5-37. Gulf of Alaska shallow water flatfish past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1960s-1976) • State of Alaska crab fisheries • Marine pollution and oil spills	• Foreign groundfish fisheries (1976-1985) • JV groundfish fisheries (1968-1988) • Domestic groundfish fisheries (1968-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • OPA 90 • Clean Water Act	• Annual ABC/TAC limits • Foreign and domestic observer programs • GOA FMP Amendments 8 and 21 address ghost fishing • Flatfish assemblage division (1990) • Rex sole division (1993) • Rock sole species split into northern and southern (1996) • PSC Limits (crab and halibut)
Change in Reproductive Success	• Foreign groundfish fisheries (1960s-1976) spatial/temporal distribution of catch/bycatch • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (1968-present) spatial/temporal distribution of catch/bycatch	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • Preliminary FMPs – banned bottom trawling in some areas, observers in foreign fisheries	• Annual ABC/TAC limits • Foreign and domestic observer programs
Change in Prey Availability	• Foreign groundfish fisheries (pre-MSA) prey bycatch • Marine pollution and oil spills • Introduction of exotic species • Climate changes and regime shifts	• Foreign, JV, and domestic groundfish fisheries (post-MSA) prey bycatch • Introduction of exotic specie • Marine pollution and oil spills	• Industry self imposed actions – gear modifications • International laws regarding marine pollutants • OPA 90 • Clean Water Act	• PSC Limits for crab
Change in Important Habitat	• Foreign groundfish fisheries (post-MSA) gear impacts • State of Alaska scallop fishery gear impacts • Marine pollutants and oil spills • Introduction of exotic species • Climate change or regime shifts (1988/89-present)	• Foreign, JV and domestic groundfish fisheries (post-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species • Climate changes and regime shifts	• International Laws regarding marine pollutants • OPA 90 • Clean Water Act • Industry self-imposed actions; gear modifications	• Trawl prohibition (1998) Area east of 140°W • GOA FMP Amendments 3 and 20 – decrease bottom trawls and provided for habitat protection • GOA FMP Amendments 14, 55, and 65 – established habitat protection • GOA FMP Amendment 15 –trawl closures, provide habitat protection • GOA FMP Amendment 23 – banned bottom trawling, protect habitat

Table 3.5-37 (cont.). Gulf of Alaska shallow water flatfish past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
				• GOA FMP amendment 56 EFH and HAPC protection

Comparative Baseline:

- The shallow water flatfish stock is not overfished.
- The shallow water flatfish stock has been lightly to moderately harvested.
- The yellowfin sole survey biomass has increased in recent years.
- The Northern rock sole survey biomass has decreased in recent years.
- The Southern rock sole survey biomass has increased in recent years.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.

Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-38. Catch and biomass estimates (mt) for the shallow water flatfish assemblage, 1984-2002.

Species	Year[1]	Catch	Estimated Biomass[2]
Rock sole	1984	--	137,472
	1987	--	123,221
	1990	--	159,452
	1991	4,296	--
	1992	7,206	--
	1993	7,987	173,361
	1994	2,442	--
	1995	4,181	--
	1996	6,175	206,343
	1997	5,924	--
	1998	2,154	--
	1999	1,823	166,603
	2000	5,041	--
	2001	5,173[3]	190,297
	2002	5,154[3]	--
Alaska plaice	1984	--	1,912
	1987	--	4,830
	1990	--	--
	1991	7	--
	1992	5	--
	1993	5	2,583
	1994	1	--
	1995	7	--
	1996	65	4,870
	1997	51	--
	1998	19	--
	1999	5	8,680
	2000	12	--
	2001	14	3,639
	2002	4	--

Table 3.5-38 (cont). **Catch and biomass estimates (mt) for the shallow water flatfish assemblage, 1984-2002.**

Species	Year[1]	Catch	Estimated Biomass[2]
English sole	1984	--	3,202
	1987	--	7,243
	1990	--	--
	1991	73	--
	1992	48	--
	1993	83	8,403
	1994	46	--
	1995	45	--
	1996	116	7,946
	1997	131	--
	1998	158	--
	1999	15	14,432
	2000	72	--
	2001	50	14,166
	2002	22	--
Butter sole	1984	--	22,504
	1987	--	19,273
	1990	--	17,307
	1991	570	--
	1992	1,366	--
	1993	1,437	29,809
	1994	1,057	--
	1995	917	--
	1996	2,353	20,916
	1997	994	--
	1998	542	--
	1999	429	14,188
	2000	1,263	--
	2001	705	9,812
	2002	864	--

Table 3.5-38 (cont). **Catch and biomass estimates (mt) for the shallow water flatfish assemblage, 1984-2002.**

Species	Year[1]	Catch	Estimated Biomass[2]
Sand sole	1984	--	1,216
	1987	--	82
	1990	--	--
	1991	28	--
	1992	1	--
	1993	12	479
	1994	0	--
	1995	1	--
	1996	19	940
	1997	79	--
	1998	168	--
	1999	7	234
	2000	34	--
	2001	66	357
	2002	5	--
Yellowfin sole	1984	--	91,341
	1987	--	56,135
	1990	--	61,290
	1991	55	--
	1992	57	--
	1993	37	81,329
	1994	152	--
	1995	65	--
	1996	67	47,789
	1997	198	--
	1998	141	--
	1999	91	48,309
	2000	64	--
	2001	10	55,303
	2002	16	--

Table 3.5-38 (cont). **Catch and biomass estimates (mt) for the shallow water flatfish assemblage, 1984-2002.**

Species	Year[1]	Catch	Estimated Biomass[2]
Starry flounder	1984	--	14,293
	1987	--	14,141
	1990	--	10,907
	1991	269	--
	1992	100	--
	1993	154	40,288
	1994	92	--
	1995	180	--
	1996	577	27,309
	1997	401	--
	1998	382	--
	1999	207	46,652
	2000	442	--
	2001[4]	144	76,418
	2002	130	–

Notes: mt - metric tons
[1]1994, 1987, and 1999 depths were surveyed to 1000m; 1990, 1993, and 1996 depths were surveyed to 500 m.
[2]Biomass estimates from the triennial trawl survey from 1984 to 2001.
[3]Catch of Northern and Southern rock sole combined.
[4]Catch data is current through November 3, 2002.
Source: Turnock et al. 2002b

Table 3.5-39. Biological and reproductive attributes of rock sole in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life stage/activity	BIOLOGICAL/REPRODUCTIVE ATTRIBUTES											
	Feeding Type		Movements		Longevity of Life Stage				Age at Maturity	Fertilization/ Spawning Behavior		Spawning Season
	Carnivore	Planktivore	Inshore/offshore migrations	Not known	1-12 Months	1-5 Years	5-30 Years	Not Known	50% female (years)	External	Batch spawner	
A	X		X				X		9	X	X	Late Winter - Early Spring
LJ	X			X			X					
EJ	X			X		X						
L		X		X	X							
E				X				X				

Notes: A - adult
E - eggs
EJ - early juvenile
L - larvae
LJ - late juvenile

Source: NPFMC 1999b

Table 3.5-40. Status and catch specifications (mt) of rock sole in the Bering Sea and Aleutian Islands in recent years.

Year	Age-2+ Biomass[1] Estimate	OFL	ABC	TAC	Catch[2]
2001	1,940,000	271,000	228,000	75,000	29,475
2002	1,850,000	268,000	225,000	54,000	41,621
2003	877,000	132,000	110,000	44,000	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
OFL - overfishing level
TAC - total allowable catch
[2]Catch data are current through November 2, 2002.
[1]Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year.

Source: NPFMC 2002d.

Table 3.5-41. Bering Sea and Aleutian Islands rock sole past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1954-1976) • Marine pollution and oil spills	• Foreign Fisheries post MSA (1976-1985) • JV fisheries (1980-1990) • Domestic fisheries (1987-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • End of Russian Flounder Fishery (political 1973) • Clean Water Act • OPA 90	• Annual ABC/TAC limits • PSC Limits (crab and halibut) • BSAI FMP Amendments 9, 11a, 12, 13, 27, and 37 addressed domestic and foreign observer programs • BSAI FMP Amendments16 and 24 – TAC allocations, reduce bycatch, address ghost fishing
Change in Reproductive Success	• Foreign groundfish fisheries (1954-1976) spatial/temporal concentration • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (post-MSA) fishery selectivity • Foreign, JV and domestic groundfish fisheries (post-MSA) spatial/temporal concentration • Foreign, JV and domestic groundfish fisheries (post-MSA) roe fishery	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas, observers in foreign fisheries	• Annual ABC/TAC limits • Foreign and domestic observer programs • BSAI FMP Amendment 36 forage fish protection
Change in Prey Availability	• Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills • Introduction of exotic species	• Marine pollution and oil spills • Introduction of exotic species	• International laws regarding marine pollutants • Clean Water Act • OPA 90	
Change in Important Habitat	• Foreign groundfish fishery (pre-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (post-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species • Climate changes and regime shifts	• Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas. • Industry self-imposed modifications – gear restrictions. • International laws regarding marine pollutants • Clean Water Act • OPA 90	• BSAI FMP Amendment 9 – defined habitat requirements • BSAI FMP amendments 13, 15, and 46 – decrease in bottom trawls • BSAI FMP amendments 55– protection for EFH and HAPC.

Table 3.5-41 (cont.). Bering Sea and Aleutian Islands rock sole past/present effects.

Comparative Baseline:

- The BSAI rock sole stock is not overfished.
- The BSAI rock sole stock is above target biomass.
- The BSAI rock sole is declining in size.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-42. Total catch and trawl survey biomass estimates (mt) for rock sole in the Bering Sea and Aleutian Islands, 1975-2002.

Year	Catch[2,3]	Estimated Biomass[1]	
		Eastern Bering Sea	Aleutian Islands
1975	--	175,000	--
1976	--	--	--
1977	5,319	--	--
1978	7,038	--	--
1979	5,874	194,700	--
1980	8,798	283,800	28,500
1981	9,021	302,400	--
1982	11,844	578,800	--
1983	13,618	713,000	23,300
1984	18,750	799,300	--
1985	37,678	700,100	--
1986	23,486	1,031,400	26,900
1987	40,046	1,269,700	--
1988	86,366	1,480,000	--
1989	68,912	1,138,600	--
1990	35,253	1,381,300	--
1991	60,587	1,588,300	37,325
1992	56,998	1,543,900	--
1993	63,953	2,123,500	--
1994	60,544	2,894,200	54,785
1995	58,870	2,175,040	--
1996	46,928	2,183,000	--
1997	67,564	2,710,900	56,154
1998	33,645	2,168,700	--
1999	40,510	1,689,100	--
2000	49,264	2,127,700	45,949
2001	29,255	2,415,000	–
2002	40,317	1,901,800	57,700

Notes: mt - metric tons
[1]Biomass estimated from AFSC surveys using stratified area-swept expansion of the CPUE data.
[2]Catch data current through September 15, 2002.
[3]Total catch data includes foreign, joint-venture and domestic values.

Source: Wilderbuer and Walters 2002.

Table 3.5-43. Status and catch specifications (mt) of northern and southern rock sole in the Gulf of Alaska in recent years.

Year	Biomass[1] Estimate		OFL		ABC		Catch[2]	
	Northern Rock Sole	Southern Rock Sole	Northern Rock Sole	Southern Rock Sole	Northern Rock Sole	Southern Rock Sole	Northern Rock Sole	Southern Rock Sole
2001	64,420	126,057	8,610	14,875	7,731	13,355	2,711	2,462
2002	--	--	11,550	22,664	9,571	18,780	3,031	2,123
2003	--	--	11,550	22,664	10,778	16,476	NA	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
OFL - overfishing level
[1]Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year.
[2]Catch data are current through November 3, 2002.

Source: NPFMC 2002e.

Table 3.5-44. Catch and estimated biomass (mt) for rock sole in the Gulf of Alaska, 1984-2002.

Year	Catch[1]	Biomass Estimates[2]		
		Total Rock Sole	Northern	Southern
1984[3]	--	137,472	--	--
1985	--	--	--	--
1986	--	--	--	--
1987[3]	--	123,221	--	--
1988	--	--	--	--
1989	--	--	--	--
1990[4]	--	159,453	--	--
1991	4,296	--	--	--
1992	7,206	--	--	--
1993[4]	7,987	173,361	--	--
1994	2,442	--	--	--
1995	4,181	--	--	--
1996[4]	6,175	206,343	78,845	127,390
1997	5,924	--	--	--
1998	2,154	--	--	--
1999[3]	1,823	166,603	61,081	105,522
2000	5,041	--	--	--
2001	5,173[5]	190,297	64,240	126,057
2002	5,154[5]	--	--	--

Notes: mt - metric tons

[1]Catch data current through November 3, 2002.

[2]From the triennial trawl survey from 1984-2001.

[3]Depths surveyed were to 1000m.

[4]Depths surveyed were to 500m.

[5]Northern and Southern rock sole combined catch.

Source: Turnock et al. 2002b.

Table 3.5-45. Biological and reproductive attributes of flathead sole in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Biological/Reproductive Attributes						
	Feeding Type		Movements			Fertilization/ Egg Development	Spawning Season
	Carnivore	Planktivore	Drift with Ocean	Inshore/Offshore Migrations	Not known	External	
A	X			X		X	Late Winter/ Early Spring
LJ	X				X		
EJ	X				X		
L		X	X				
E					X		

Notes: A - adult
E - eggs
EJ - early juvenile
L - larvae
LJ - late juvenile

Source: NPFMC 1999b.

Table 3.5-46. Habitat associations of flathead sole in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Habitat Associations											
	Location						Substrate			Pelagic Domain		Oceanography
	Inner Shelf (1-50m)	Middle Shelf (50-100m)	Outer Shelf (100-200m)	Depths of high availability (winter) of fishable stock)[1]	Depths of high availability (summer) of fishable stock)[1]	Bottom depths of common occurrence of fishable stock)[1]	Mud/Clay/Silt	Sand/Granule	Not Applicable	Pelagic	Demersal	Edges (ice, bathymetric)
A		X	X	100-200m	50-150m	50-200m	X	X			X	X
LJ	X	X	X				X	X			X	
EJ	X	X					X	X			X	
L	X	X	X						X	X		
E	X	X	X						X	X		

Notes: A - adult
E - eggs
EJ - early juvenile
L - larvae
LJ - late juvenile

Source: NPFMC 1999b.

[1]Source: NPFMC 2002a and 2002b; Table 20 and Table 57, respectively.

Table 3.5-47. Status and catch specifications (mt) of flathead sole in the Bering Sea and Aleutian Islands in recent years.

Year	Age 3+ Biomass[1]	OFL[2]	ABC[2]	TAC	Catch[3]
2001	618,000	102,000	84,000	40,000	17,087
2002	695,000	101,000	82,600	25,000	15,419
2003	550,000	81,000	66,000	20,000	NA

Notes: ABC - acceptable biological catch
mt - metric tons
OFL - overfishing level
TAC - total allowable catch
[1]Biomass for each year corresponds to the projection given in the SAFE report issued the preceding year.
[2]OFL and ABC for 2003 are those recommended by the Plan Team.
[3]Catch data current through November 2, 2002.

Source: NPFMC 2002d.

Table 3.5-48. Bering Sea and Aleutian Islands flathead sole past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1954-1976) • Marine pollution and oil spills	• Foreign groundfish fisheries (1976-1985) • JV groundfish fisheries (1980-1990) • Domestic groundfish fisheries (1987-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • End of Russian Flounder Fishery (political 1973) • International laws regarding marine pollutants • Clean Water Act • OPA 90	• Annual ABC/TAC limits • PSC Limits (crab and halibut) • BSAI FMP Amendments 9, 11a, 12, 13, 27, and 37 addressed domestic and foreign observer programs • BSAI FMP Amendments16 and 24 – TAC allocations, reduce bycatch, address ghost fishing
Change in Reproductive Success	• Foreign groundfish fisheries (1954-1976) spatial/temporal distribution of fishery • Climate changes and regime shifts	• Foreign, JV, and domestic groundfish fisheries (post-MSA) spatial/temporal distribution of fishery • Foreign, JV, and domestic groundfish fisheries (post-MSA) fishery selectivity	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas, observers in foreign fisheries (halibut closures)	• Annual ABC/TAC limits • Foreign and domestic observer programs
Change in Prey Availability	• Foreign groundfish fisheries (1954-1976) prey species bycatch • State of Alaska crab fisheries • Introduction of exotic species • Climate changes and regime shifts • Marine pollution and oil spills	• Foreign, JV and domestic fisheries prey species bycatch • Introduction of exotic species • Marine pollution and oil spills	• International laws regarding marine pollutants • Clean Water Act • OPA 90	
Change in Important Habitat	• Foreign groundfish fisheries (pre-MSA) fishery gear impacts • Introduction of exotic species • Marine pollution and oil spills • Climate changes and regime shifts	• Foreign, JV, and domestic groundfish fisheries (post-MSA) fishery gear impacts • Introduction of exotic species • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas. • Industry self-imposed modifications –gear restrictions. • Clean Water Act • International laws regarding marine	• BSAI FMP Amendment 9 – defined habitat requirements • BSAI FMP amendments 13, 15, and 46 – decrease in bottom trawls • BSAI FMP amendments 55– protection for EFH and HAPC.

Table 3.5-48 (cont.). Bering Sea and Aleutian Islands flathead sole past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
			pollutants • OPA 90	

Comparative Baseline:

- The BSAI flathed sole stock is not overfished.
- The BSAI flathead sole stock is above target biomass.
- The BSAI flathead sole is declining in size.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-49. Catch and biomass estimates (mt) of flathead sole in the Bering Sea and Aleutian Islands, 1975-2002[1].

Year	Catch	Biomass Estimates[2]	
		Eastern Bering Sea	Aleutian Islands
1975	--	100,700	--
1976	--	--	--
1977	7,909	--	--
1978	6,957	--	--
1979	4,351	104,900	--
1980	5,247	117,500	3,300
1981	5,218	162,900	--
1982	4,509	191,988	--
1983	5,240	269,419	1,500
1984	4,458	341,697	--
1985	5,636	276,350	--
1986	5,208	357,951	9,000
1987	3,595	394,758	--
1988	6,783	572,805	--
1989	3,604	536,433	--
1990	20,245	628,235	--
1991	15,602	544,893	6,885
1992	14,239	651,384	--
1993	13,664	610,259	--
1994	18,455	726,212	9,917
1995	14,707	593,412	--
1996	17,344	616,373	--
1997	20,704	807,825	11,540
1998	24,397	692,234	--
1999	17,842	394,822	--
2000	19,983	399,298	8,970
2001	17,586	514,023	--
2002	13,873	574,946	9,894

Notes: mt - metric tons
[1]Data current through September 21, 2002, from NMFS Regional Office Report.
[2]Estimated biomass from the eastern Bering Sea and Aleutian Islands trawl survey.
Source: Spencer et al. 2002a.

Table 3.5-50. Status and catch specifications (mt) of flathead sole in the Gulf of Alaska in recent years.

Year	Exploitable Biomass[1]	OFL[2]	ABC[2]	Catch[3]
2001	207,520	34,208	26,270	1,910
2002	170,915	29,532	22,690	2,108
2003	132,260	51,556	41,390	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
OFL - overfishing level
[1]Biomass for each year corresponds to the projection given in the SAFE report issued the preceding year.
[2]OFL and ABC for 2003 are those recommended by the Plan Team.
[3]Catch data current through November 2, 2002.

Source: NPFMC 2002e

Table 3.5-51. Catch and biomass estimates for flathead sole in the Gulf of Alaska, 1984-2002.

Year[3,4]	Catch[1]	Biomass Estimates[2]
1984	--	249,335
1985	--	--
1986	--	--
1987	--	179,821
1988	--	--
1989	--	--
1990	--	247,247
1991	--	--
1992	--	--
1993	--	188,690
1994	2,580	--
1995	2,181	--
1996	3,107	205,521
1997	2,446	--
1998	1,742	--
1999	900	207,520
2000	1,547	--
2001	1,911	170,915
2002	2,029	--

Notes: [1]Catch data current through October 5, 2002.
[2]Biomass estimates from the triennial trawl survey from 1984 to 2001.
[3]In 1984, 1987, and 1999, depths surveyed were to 1000 m.
[4]In 1990, 1993, and 1996, depths were surveyed to 500 m.

Source: Turnock et al. 2002c.

Table 3.5-52. Biological and reproductive attributes of arrowtooth flounder in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Biological/Reproductive Attributes											
	Feeding Type		Movements			Longevity of Life Stage				Age at Maturity		Fertilization/Egg Development
	Carnivore	Planktivore	Inshore/Offshore Migrations	Advection from physical forcing	Not known	1-12 Months	1-5 Years	5-20 Years	Not Known	50% Female (years)	50% Male (years)	External
A	X		X					X		5	4	X
LJ	X				X		X					
EJ	X				X		X					
L		X		X		X						
E					X				X			

Notes: A - adult
LJ - late juvenile
EJ - early juvenile
L - larvae
E - eggs

Source: NPFMC 1999b

Table 3.5-53. Habitat associations of arrowtooth flounder in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life stage/activity	Habitat Association													
	Location								Substrate			Pelagic Domain		Oceanography
	Inner shelf (1-50m)	Middle shelf (50-100m)	Outer shelf (100-200m)	Upper slope (200-1000m)	Bay/estuaries	Depths of high availability (winter) (of fishable stock)[1]	Depths of high availability (summer) (of fishable stock)[1]	Bottom depths of common occurrence (of fishable stock)[1]	Mud/clay/silt	Sand/granule	Gravel	Pelagic	Demersal	Edges (ice, bathymetric)
A	X	X	X	X	X	150-300m	80-200m	30-300m	X	X	X		X	X
LJ	X	X	X	X					X	X	X		X	
EJ	X	X	X						X	X	X		X	
L	X	X	X		X							X		

Notes: A - adult
LJ - late juvenile
EJ - early juvenile
L - larvae

Source: NPFMC 1999b

[1]Source: NPFMC 2002a and 2002b; Table 20 and Table 57, respectively.

Table 3.5-54. Status and catch specifications (mt) of arrowtooth flounder in the Bering Sea and Aleutian Islands in recent years.

Year	Age 1+ Biomass[1] Estimate	OFL[2]	ABC[2]	TAC	Catch[3]
2001	701,000	141,500	117,000	22,011	14,056
2002	671,000	137,000	113,000	16,000	11,443
2003	597,000	139,000	112,000	12,000	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
OFL - overfishing level
[1]Biomass for each year corresponds to the projection given in the SAFE report in the preceding year.
[2]The OFL and ABC for 2003 are those recommended by the Plan Team.
[3]Catch data are current through November 2, 2002.

Source: NPFMC 2002d.

Table 3.5-55. Bering Sea and Aleutians Islands arrowtooth flounder past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• F oreign groundfish fisheries (1954-1976) • Marine pollution and oil spills	• Foreign groundfish fisheries (1976-1985) • JV froundfish fisheries (1980-1990) • Domestic groundfish fisheries (1986-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • End of Russian Flounder Fishery (political 1973) • Clean Water Act • OPA 90	• Annual ABC/TAC limits • PSC Limits (crab and halibut) • BSAI FMP Amendments 9, 11a, 12, 13, 27, and 37 addressed domestic and foreign observer programs • BSAI FMP Amendments16 and 24 – TAC allocations, reduce bycatch, address ghost fishing • Separation from Greenland Turbot species complex (1986)
Change in Reproductive Success	• Foreign groundfish fisheries (1964-1976) spatial/temporal concentration • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (post-MSA) spatial/temporal concentration	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas, observers in foreign fisheries • SE Bering Sea wintertime halibut closures (pre MSA)	• Annual ABC/TAC limits • Foreign and domestic observer programs
Change in Prey Availability	• Foreign groundfish fishery (pre-MSA) prey species bycatch • State of Alaska groundfish fisheries prey species bycatch • State of Alaska herring fisheries catch • Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills • Introduction of exotic species	• Foreign, JV and domestic post-MSA prey species bycatch • Marine pollution and oil spills • Introduction of exotic species	• Industry self imposed actions – gear modifications • Clean Water Act • OPA 90 • International laws regarding marine pollutants	• BSAI Amendment 36 - protection of forage fish • Annual ABC/TAC limits for pollock • BSAI FMP Amendments regulating pollock catch
Change in Important Habitat	• Foreign groundfish fishery (pre-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species • Climate changes and regime	• Foreign, JV and foreign (post-MSA) groundfish fisheries gear impacts • Marine pollution and oil spills • Introduction of exotic species • Climate changes and regime	• Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas. • Industry self-imposed modifications – gear restrictions.	• BSAI FMP Amendment 9 – defined habitat requirements • BSAI FMP amendments 13, 15, and 46 – decrease in bottom trawls • BSAI FMP amendments 55– protection for EFH and HAPC.

Table 3.5-55 (cont.). Bering Sea and Aleutians Islands arrowtooth flounder past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
	shifts	shifts	• Clean Water Act • OPA 90 • International laws regarding marine pollutants	

Comparative Baseline:

- The BSAI arrowtooth flounder stock is not overfished.
- The BSAI arrowtooth flounder stock is above target biomass.
- The BSAI arrowtooth flounder stock is decreasing in stock size.
- The BSAI arrowtooth flounder stock is currently of low economic value and is lightly harvested.
- Commercial interest in the BSAI arrowtooth flounder is growing and is expected to improve retention rates in the future.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-56. Catch and estimated biomass (mt) of arrowtooth flounder in the Bering Sea and Aleutian Islands, 1970-2002.

Year	Bering Sea		Aleutian Islands		BSAI
	Catch[1]	Estimated Biomass[2]	Catch[1]	Estimated Biomass[2]	Total Catch
1970	12,598	--	274	--	12,872
1971	18,792	--	581	--	19,373
1972	13,123	--	1,323	--	14,446
1973	9,217	--	3,705	--	12,922
1974	21,473	--	3,195	--	24,668
1975	20,832	28,000[3]	784	--	21,616
1976	17,806	--	1,370	--	19,176
1977	9,454	--	2,035	--	11,489
1978	8,358	--	1,782	--	10,140
1979	7,921	71,700	6,436	--	14,357
1980	13,761	47,800[3]	4,603	40,400	18,364
1981	13,473	84,400	3,640	--	17,113
1982	9,103	92,100	2,415	--	11,518
1983	10,216	149,300[3]	3,753	45,100	13,969
1984	7,980	182,900[3]	1,472	--	9,452
1985	7,288	234,000	159	--	7,447
1986	6,766	232,100[3]	415	125,700	7,181
1987	4,508	290,600[3]	351	--	4,859
1988	17,947	337,100[4]	2,043	--	19,990
1989	6,264	410,700[3]	1,042	--	7,306
1990	7,975	459,200[3]	5,083	--	13,058
1991	--	357,200[4]	--	37,294	22,052
1992	--	414,000[3]	--	--	10,382
1993	--	543,600[3]	--	--	9,338
1994	--	570,600[3]	--	107,019	14,366
1995	--	480,800[3]	--	--	9,280
1996	--	556,400[3]	--	--	14,652
1997	--	478,600[3]	--	111,557	10,054
1998	--	344,900[3]	--	--	15,241

Table 3.5-56 (cont). **Catch and estimated biomass (mt) of arrowtooth flounder in the Bering Sea and Aleutian Islands, 1970-2002.**

Year	Bering Sea		Aleutian Islands		BSAI
	Catch[1]	Estimated Biomass[2]	Catch[1]	Estimated Biomass[2]	Total Catch
1999	--	243,800[3]	--	--	10,573
2000	--	340,400[3]	--	93,515	12,929
2001	--	408,800[3]	--	--	13,908
2002	--	416,300[5]	--	88,700	9,131

Notes: BSAI - Bering Sea and Aleutian Islands
mt - metric tons
[1]Catch data current through September 14, 2002.
[2]Biomass estimates are from U.S.-Japanese cooperative trawl surveys.
[3]Eastern Bering Sea shelf only.
[4]The 1988 and 1991 slope estimates were from the depth ranges of 200-800 m while earlier slope estimates were from 200-1000 m.
[5]The 2002 slope estimates were conducted at depths from 200-1200m, however > 90percent of arrowtooth biomass were found < 800 m.

Source: Wilderbuer and Sample 2002.

Table 3.5-57. Status and catch specifications (mt) of arrowtooth flounder in the Gulf of Alaska in recent years.

Year	ABC[1]	Exploitable Biomass[2]	Catch[3]
2001	148,150	1,586,530	19,964
2002	146,260	1,760,000	20,941
2003	155,140	1,302,000	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
[1]The ABC for 2003 is recommended by the Plan Team.
[2]Biomass for each year corresponds to the projection given in the SAFE report in the preceding year.
[3]Catch through November 2, 2002.

Source: NPFMC 2002e.

Table 3.5-58. Gulf of Alaska arrowtooth flounder past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1960s-1976) • IPHC halibut longline fishery • State of Alaska crab fisheries • Marine pollution and oil spills	• Foreign Fisheries post MSA (1976-1985) • JV fisheries (1968-1990) • Domestic fisheries (1968-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • OPA 90 • Clean Water Act	• Annual ABC/TAC limits • Foreign and domestic observer programs • GOA FMP Amendments 8 and 21 address ghost fishing • Flatfish assembly • PSC Limits (crab and halibut)
Change in Reproductive Success	• Foreign groundfish fisheries (1960s-1976) spatial/temporal concentration • Climate changes and regime shifts	• Foreign, JV and domestic (post-MSA) groundfish fisheries spatial/temporal concentration	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • Preliminary FMPs – banned bottom trawling in some areas, observers in foreign fisheries • OPA 90 • Clean Water Act	• Annual ABC/TAC limits • Foreign and domestic observer programs
Change in Prey Availability	• Foreign groundfish fisheries (1960s-1976) prey species bycatch • State of Alaska groundfish fisheries prey species bycatch • State of Alaska herring fisheries catch • Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills • Introduction of exotic species	• Foreign, JV and domestic (post-MSA) groundfish fisheries prey species bycatch • Marine pollution and oil spills • Introduction of exotic species	• Industry self imposed actions – gear modifications • Clean Water Act • OPA 90	• GOA FMP Amendment 39 afforded protection for forage fish • GOA Amendments regulating pollock catch
Change in Important Habitat	• Foreign groundfish fishery (post-MSA) gear impacts • Marine pollution and oil	• Foreign, JV and domestic (post-MSA) groundfish fisheries gear impacts • Marine pollution and oil spills	• International Laws regarding marine pollutants • OPA 90 • Clean Water Act	• GOA FMP Amendments 3 and 20 – decrease bottom trawls and provided for habitat protection • GOA FMP Amendments 14, 55, and

Table 3.5-58 (cont.). Gulf of Alaska arrowtooth flounder past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
	spills • Introduction of exotic species • Climate change or regime shifts (1988/89-present)	• Introduction of exotic species	• Industry self-imposed actions; gear modifications	65 – established habitat protection • GOA FMP Amendment 15 –trawl closures, provide habitat protection • GOA FMP Amendment 23 – banned bottom trawling, protect habitat • GOA FMP Amendment 56 EFH and HAPC protection

Comparative Baseline:

- The GOA arrowtooth flounder stock is the most abundant groundfish species in the GOA.
- The GOA arrowtooth flounder is currently of low economic value and is lightly harvested.
- Commercial interest in the GOA arrowtooth flounder stock is growing and is expected to improve retention rates.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-59. Catch and estimated biomass (mt) of arrowtooth flounder in the Gulf of Alaska, 1961-2002.

Year	Catch[a]	Estimated Biomass[b]
1961	--	283,799[c]
1962	--	
1963	--	--
1964	514	--
1965	514	--
1966	2,469	--
1967	2,276	--
1968	1,697	--
1969	1,315	--
1970	1,886	--
1971	1,185	--
1972	4,477	--
1973	10,007	145,744[d]
1974	4,883	
1975	2,776	
1976	3,045	
1977	9,449	--
1978	8,409	--
1979	7,579	--
1980	7,848	--
1981	7,433	--
1982	4,639	--
1983	6,331	--
1984	3,457	979,335[e]

Table 3.5-59 (cont). Catch and estimated biomass (mt) of arrowtooth flounder in the Gulf of Alaska, 1961-2002.

Year	Catch[a]	Estimated Biomass[b]
1985	1,539	--
1986	1,221	--
1987	4,963	979,957[e]
1988	5,138	--
1989	2,584	--
1990	7,706	1,922,107[e]
1991	10,034	--
1992	15,970	--
1993	15,559	1,585,040[e]
1994	23,560	--
1995	18,428	--
1996	22,583	1,639,671[e]
1997	16,319	--
1998	12,975	--
1999	16,207	1,262,797[e]
2000	24,252	--
2001	19,964	1,621,892[e]
2002	19,009	--

Notes: mt - metric tons
[a]Catch data current through October 5, 2002.
[b]The 2001 survey biomass for the eastern Gulf of Alaska was estimated by using the average of the 1993 to 1999 biomass estimates in the eastern Gulf of Alaska.
[c]IPHC survey data for 1961-1962
[d]NMFS groundfish survey data for 1973-1976
[e]NMFS triennial data
Source: Turnock et al. 2002a.

Table 3.5-60. Biological and reproductive attributes of Greenland turbot in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Biological/Reproductive Attributes												
	Feeding Type			Movements		Longevity of Life Stage				Age at Maturity	Fertilization / Spawning Behavior		Spawning Season
	Carnivore	Planktivore	Not Known	Inshore/Offshore Migrations	Not known	1-12 Months	1-5 Years	5-20 Years	Not Known	50% Female (years)	External	Broadcast Spawner	
A	X			X				X		5-10	X	X	Early Fall - Late Winter
LJ	X				X			X					
EJ			X		X		X						
L		X			X	X							
E					X				X				

Notes: A - adult
E - eggs
EJ - early juvenile
L - larvae
LJ - late juvenile

Source: NPFMC 1999b.

Table 3.5-61. Habitat associations of Greenland turbot in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Habitat Associations														
	Location								Substrate			Pelagic Domain			
	Inner Shelf (1-50m)	Middle Shelf (50-100m)	Outer Shelf (100-200m)	Upper Slope (200-1000m)	Lower Slope (>1000m)	Depths of high availability (winter) (of fishable stock)[1]	Depths of high availability (summer) (of fishable stock)[1]	Bottom depths of common occurrence (of fishable stock)[1]	Mud/Clay/Silt	Sand/Granule	Not Applicable	Pelagic	Semi-demersal/Semi-pelagic	Demersal	Not Known
A			X	X	X	300-500m (BSAI) 200+m (GOA)	80-400m (BSAI) 50-200m (GOA)	50-350m (BSAI) 30-300m (GOA)	X	X			X	X	
LJ	X	X	X	X					X	X			X	X	
EJ	X	X	X								X				X
L	X	X	X								X	X			
E		X	X										X	X	

Notes: A - adult
EJ - early juvenile
L - larvae
LJ - late juvenile

Source: NPFMC 1999b.

[1]Source: NPFMC 2002a and 2002b; Table 20 and Table 57, respectively.

Table 3.5-62. Status and catch specifications (mt) of Greenland turbot in the Bering Sea and Aleutian Islands in recent years.

Year	Age-1+ Estimated Biomass[1]	OFL[2]	ABC[2]	TAC	Catch[3]
2001	210,000	31,000	8,400	8,400	5,312
2002	208,000	36,500	8,100	8,000	2,753
2003	112,000	17,800	5,800	4,000	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
OFL - overfishing level
TAC - total allowable catch
[1]Biomas for each year corresponds to the projection given in the SAFE report issued in the preceding year.
[2]OFL and ABC for 2003 are as recommended by the Plan Team.
[3]Catch data are current through November 2, 2002.

Source: NPFMC 2002d.

Table 3.5-63. Being Sea and Aleutian Islands Greenland turbot past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1954-1976) • Marine pollution and oil spills	• Foreign fisheries (1976-1985) • JV fisheries (1968-1990) • Domestic fisheries (1968-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • End of Russian Flounder Fishery (political 1973) • Greenland turbot restrictions • Clean Water Act • OPA 90	• Annual ABC/TAC limits • PSC Limits (crab and halibut) • BSAI FMP Amendments 1, 4, 12, 14, 15, and 28 established harvest quotas and allocations • BSAI FMP Amendments 9, 11a, 12, 13, 27, and 37 addressed domestic and foreign observer programs • BSAI FMP Amendments 15, 16, 23, 39, 44, and 59 set limits, slowed rate of catch, defined OFL. • BSAI FMP Amendments16 and 24 – TAC allocations, reduce bycatch, address ghost fishing • Separation of Greenland Turbot/Arrowtooth Flounder species complex (1986) • 1984 restrictions on the fishery • 1992 TAC set at 7,000 mt/year • PSC limits (halibut)
Change in Reproductive Success	• Foreign groundfish fisheries (1954-1976) spatial/temporal concentration • Climate changes and regime shifts	• Foreign, JV and domestic (post-MSA) groundfish fisheries spatial/temporal concentration	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas, observers in foreign fisheries • SE Bering Sea wintertime halibut closures (pre MSA)	• Annual ABC/TAC limits • Foreign and domestic observer programs • No PSC allocations for trawl fishery (1998)
Change in Prey Availability	• Foreign groundfish fishery (1954-1976) prey species bycatch • Climate changes and regime shifts • Marine pollution and oil spills	• Foreign, JV and domestic groundfish fisheries (post-MSA) prey species bycatch • Marine pollution and oil spills • Introduction of exotic species	• Industry self imposed actions – gear modifications • International laws regarding marine pollutants • Clean Water Act • OPA 90	• BSAI Amendment 36 - protection of forage fish • Annual ABC/TAC limits for pollock • BSAI FMP Amendments regulating pollock catch

Table 3.5-63 (cont.). Being Sea and Aleutian Islands Greenland turbot past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
	• Introduction of exotic species			
Change in Important Habitat	• Foreign groundfish fishery (pre-MSA) gear impacts • Climate changes and regime shifts • Marine pollution and oil spills • Introduction of exotic species	• Foreign, JV and domestic fisheries (post-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species	• Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas. • Industry self-imposed modifications – gear restrictions. • Clean Water Act • OPA 90	• BSAI FMP Amendment 9 – defined habitat requirements • BSAI FMP amendments 13, 15, and 46 – decrease in bottom trawls • BSAI FMP amendments 55– protection for EFH and HAPC.

Comparative Baseline:

- The BSAI Greenland turbot stock is not overfished.
- The BSAI Greenland turbot stock is above target biomass.
- The BSAI Greenland turbot stock is decreasing in stock size.
- The BSAI Greenland turbot fishery is restricted by PSC limits for halibut.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.

Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-64. Catches and estimated biomass (mt) of Greenland turbot in the Bering Sea and Aleutian Islands, 1975-2002.

Year	Eastern Bering Sea		Aleutian Islands	
	Catch[1]	Estimated Biomass	Catch[1]	Estimated
1975	--	126,700[2]	--	--
1976	--	--	--	--
1977	27,708	--	2,453	--
1978	37,423	--	4,766	--
1979	34,998	348,600	6,411	--
1980	48,856	172,000[2]	3,697	48,700
1981	52,921	186,400	4,400	--
1982	45,805	139,200	6,317	--
1983	43,443	35,100[2]	4,115	63,800
1984	21,317	17,900[2]	1,803	--
1985	14,698	86,900	33	--
1986	7,710	5,600[2]	2,154	76,500
1987	6,519	10,600[2]	3,066	--
1988	6,064	57,500[3]	1,044	--
1989	4,061	8,900[2]	4,761	--
1990	7,702	14,300[2]	2,494	--
1991	4,075	53,900[3]	3,636	11,925[4]
1992	951	24,000[2]	725	--
1993	5,125	30,400[2]	3,323	--
1994	6,902	48,800[2]	3,032	28,227[4]
1995	5,713	34,800[2]	2,086	--
1996	4,386	30,300[2]	1,578	--
1997	6,594	29,218[2]	943	28,334[4]
1998	8,303	28,126[2]	821	--
1999	5,204	19,797[2]	423	--
2000	5,624	22,957[2]	1,017	9,359[4]
2001	4,197	25,311[2]	1,046	--
2002	2,279	49,205	436	9,891[4]

Notes: mt - metric tons
[1]Catch data is current through October 19, 2002.
[2]Eastern Bering Sea shelf only.
[3]The 1988 and 1991 estimate are from 200-800 m; earlier (and 2000) slope estimates are from 200-1000 m.
[4]1980, 1983, and 1986 surveys sampled 1-900 m; 1991, 1994, 1997, and 2000 surveys sampled 1-500 m.
Source: Ianelli et al. 2002a.

Table 3.5-65. Status and catch specifications (mt) of the deep water flatfish assemblage in the Gulf of Alaska in recent years.

Year	Tier	ABC[1]	Exploitable Biomass	Catch[2]
2001	Dover sole = 5	5,300	74,460	8,054
2002	Deepsea sole and Greenland turbot = 6	4,880	68,263	558
2003		4,880	68,263	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
[1]ABC for 2003 is recommended by the Plan Team.
[2]Catch data are current through November 2, 2002.

Source: NPFMC 2002d.

Table 3.5-66. Gulf of Alaska deep water flatfish (including Greenland turbot) past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1960s-1976) • State of Alaska crab bait fisheries • IPHC longline bait fisheries • Marine pollution and oil spills	• Foreign Fisheries post MSA (1976-1985) • JV fisheries (1968-1988) • Domestic fisheries (1968-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • OPA 90 • Clean Water Act	• Annual ABC/TAC limits • Foreign and domestic observer programs • GOA FMP Amendments 8 and 21 address ghost fishing • Flatfish assemblage division (1990) • Rex sole division (1993) • Rock sole species split (1996) • PSC Limits (crab and halibut)
Change in Reproductive Success	• Foreign groundfish fisheries (1960s-1976) spatial/temporal concentration • Climate changes and regime shifts	• Foreign, JV and domestic (post-MSA) groundfish fisheries spatial/temporal concentration	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • Preliminary FMPs – banned bottom trawling in some areas, observers in foreign fisheries	• Annual ABC/TAC limits • Foreign and domestic observer programs
Change in Prey Availability	• Foreign groundfish fisheries (1960s-1976) prey species bycatch • Climate changes and regime shifts • Marine pollution and oil spills • Introduction of exotic species	• Foreign, JV and domestic (post-MSA) groundfish fisheries prey species bycatch • Marine pollution and oil spills • Introduction of exotic species	• ndustry self imposed actions – gear modifications • International laws regarding marine pollutants • Clean Water Act • OPA 90	• GOA Amendment 39 - protection of forage fish • Annual ABC/TAC limits for pollock • GOA FMP Amendments regulating pollock catch
Change in Important Habitat	• Foreign groundfish fisheries (post-MSA) gear impacts • State of Alaska scallop fishery • Climate changes and regime shifts • Marine pollution and oil spills • Introduction of exotic species	• Foreign, JV and domestic (post-MSA) groundfish fisheries gear impacts • Marine pollution and oil spills • Introduction of exotic species	• International Laws regarding marine pollutants • OPA 90 • Clean Water Act • Industry self-imposed actions; gear modifications	• GOA FMP Amendments 3 and 20 – decrease bottom trawls and provided for habitat protection • GOA FMP Amendments 14, 55, and 65 – established habitat protection • GOA FMP Amendment 15 –trawl closures, provide habitat protection • GOA FMP Amendment 23 – banned bottom trawling, protect habitat • GOA FMP amendment 56 EFH and HAPC protection

Table 3.5-66 (cont.). Gulf of Alaska deep water flatfish (including Greenland turbot) past/present effects.

Comparative Baseline:

- No accurate biomass estimates exist for the GOA deep water flatfish species
- The deep water flatfish target fishery is severely restricted by PSC limits for halibut.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-67. Catch and biomass estimates (mt) of the deep water flatfish assemblage in the Gulf of Alaska, 1984-2002.

Species	Year[3,4]	Catch[1]	Trawl Survey Biomass Estimates[2]
Greenland turbot	1984	--	292
	1987	--	143
	1990	--	0
	1991	446	--
	1992	3,012[a]	--
	1993	16	0
	1994	17	--
	1995	103	--
	1996	15	0
	1997	13	--
	1998	72	--
	1999	21	0
	2000	26	--
	2001	<1	0
	2002	<1	--
Dover sole	1984	--	68,525
	1987	--	63,397
	1990	--	96,602
	1991	9,741	--
	1992	8,364[b]	--
	1993	3,804	85,422
	1994	3,053	--
	1995	2,082	--
	1996	2,178	79,531
	1997	3,659	--
	1998	2,174	--
	1999	2,263	74,365
	2000	957	--
	2001	536	68,211
	2002	492	--

Table 3.5-67 (cont). **Catch and biomass estimates (mt) of the deep water flatfish assemblage in the Gulf of Alaska, 1984-2002.**

Species	Year[3,4]	Catch[1]	Trawl Survey Biomass Estimates[2]
Deep-sea sole	1984	--	218
	1987	--	160
	1990	--	0
	1991	1.6	--
	1992	2.5	--
	1993	3.1	0
	1994	3.9	--
	1995	1.4	--
	1996	0.4	0
	1997	1	--
	1998	39.9	--
	1999	<1	97
	2000	1	--
	2001	<1	52
	2002	<1	--

Notes: mt - metric tons
[1]Catch data current through November 2, 2002.
[2]Biomass estimates from the triennial trawl survey from 1984 to 2001.
[3]In 1984, 1987, and 1999, depths were surveyed to 1000 m.
[4]In 1990, 1993, and 1996, depths were surveyed to 500 m.
[a]Blend database used because estimated catch was lower than reported catch.
[b]Estimated by subtracting Greenland turbot from deepwater flatfish catch.
Source: Turnock et al. 2002b.

Table 3.5-68. Biological and reproductive attributes of selected rockfish species in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity		Biological/Reproductive Attributes															
		Feeding Type			Social Behavior			Longevity of Life Stage					Age at Maturity		Fertilization		Spawning Season
		Carnivore	Planktivore	Not Known	Solitary	Schooling	Not Known	1-12 Months	5-20 Years	20-50 Years	>50 Years	Not Known	50% Female (years)	50% Male (years)	Internal	Viviparous	
Shortraker/ rougheye rockfish	A	X					X				X		20	20	X	X	Late Spring - Early Summer
	J	X					X					X					
	L			X			X					X					
Northern rockfish	A		X			X					X		12.8		X	X	Late Spring - Early Summer
	J			X			X		X								
	L			X			X					X					
Dusky rockfish	A	X					X			X					X	X	Late Spring - Early Summer
	J			X			X					X					
	L			X			X					X					
Yelloweye rockfish	A	X			X						X		22	22	X	X	Late Spring - Early Summer
	J			X	X				X								
	L		X				X	X									

Notes: A - adult
J - juvenile
L - larvae

Source: NPFMC 1999b.

Table 3.5-69. Habitat associations of selected rockfish species in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life stage/activity									Substrate										
		Inner shelf (1-50m)	Middle shelf (50-100m)	Outer shelf (100-200m)	Upper slope (200-1000m)	Bay/estuaries	Island pass	Not known	Mud/clay/silt	Sand/granule	Gravel	Pebble	Cobble	Boulder	Not applicable	Pelagic	Semi-demersal/semi-pelagic	Demersal	Not known
Shortraker/ rougheye rockfish	A			X	X				X	X	X	X	X	X				X	
	J		X	X															X
	L							X							X				X
Northern rockfish	A			X	X								X	X			X		
	J	X	X	X									X	X			X		
	L							X							X	X			
Dusky rockfish	A			X	X						X		X	X			X		
	J	X	X	X							X		X	X					X
	L														X	X			
Yelloweye rockfish	A		X	X	X	X	X				X		X	X				X	
	J		X	X	X	X	X				X		X					X	
	L							X			X		X					X	

Notes: A - adult
J - juvenile
L - larvae

Source: NPFMC 1999b

Table 3.5-70. Status and catch[1] specifications (mt) of Alaska plaice in the Bering Sea and Aleutian Islands in recent years.

Year	Age 1+ Biomass	ABC	OFL	Catch
2001	865,000	122,000	147,000	9,577
2002	1,110,000	143,000	172,000	12,291
2003	1,080,000	137,000	165,000	NA

Notes: [1]Catch data are current through November 2, 2002, from NMFS Regional Office
Source: NPFMC 2002d.

Table 3.5-71. Status and catch specifications (mt) of other flatfish[1] in the Bering Sea and Aleutian Islands in recent years.

Year	Age 1+ Biomass	ABC	OFL	Catch[2]
2001	78,219	18,394	21,716	2,129
2002	78,293	18,065	21,832	2,628
2003	107,000	16,000	21,400	2,441

Notes: ABC - acceptable biological catch
mt - metric tons
OFL - overfishing level
[1]Other flatfish include English sole, Sakhalin sole, Dover sole, butter sole, longhead dab, rex sole, and starry flounder.
[2]Catch data are current through September 28, 2002, from NMFS Regional Office.
Source: NPFMC 2002d.

Table 3.5-72. Bering Sea and Aleutian Islands Alaska plaice and the other flatfish assemblage past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1954-1976) • Marine pollution and oil spills	• Foreign Fisheries post MSA (1976-1985) • JV fisheries (1988-1991) • Domestic fisheries (1988-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • End of Russian Flounder Fishery (political 1973) • Clean Water Act • OPA 90	• Annual ABC/TAC limits • PSC Limits (crab and halibut) • BSAI FMP Amendments 9, 11a, 12, 13, 27, and 37 addressed domestic and foreign observer programs • BSAI FMP Amendments16 and 24 – TAC allocations, reduce bycatch, address ghost fishing • PSC Limits crab and halibut • 1989 – Rock sole separated out of assemblage • 1995 flathead sole separated from assemblage • PSC limits (halibut)
Change in Reproductive Success	• Foreign groundfish fisheries (1954-1976) spatial/temporal concentration • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (post-MSA) spatial/temporal concentration	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas, observers in foreign fisheries	• Annual ABC/TAC limits • Foreign and domestic observer programs
Change in Prey Availability	• Foreign groundfish fisheries (1954-1976) prey species bycatch • Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills • Introduction of exotic species	• Foreign, JV and domestic groundfish fisheries (post-MSA prey species bycatch • Marine pollution and oil spills • Introduction of exotic species	• Clean Water Act • OPA 90 • International laws regarding marine pollutants	

Table 3.5-72 (cont.). Bering Sea and Aleutian Islands Alaska plaice and the other flatfish assemblage past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Change in Important Habitat	• Foreign groundfish fisheries (post-MSA) gear impacts • Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills • Introduction of exotic species	• Foreign, JV and domestic groundfish fisheries gear impacts • Marine pollution and oil spills • Introduction of exotic species	• Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas. • Industry self-imposed modifications – gear restrictions. • Clean Water Act • International laws regarding marine pollutants • OPA 90	• BSAI FMP Amendment 9 – defined habitat requirements • BSAI FMP Amendments 13, 15, and 46 – decrease in bottom trawls • BSAI FMP Amendments 55 – protection for EFH and HAPC.

Comparative Baseline:

- The BSAI other flatfish assemblage stock is not overfished.
- The BSAI other flatfish assemblage stock is above target biomass.
- The BSAI other flatfish assemblage stock is declining in size.
- The other flatfish assemblage stock is restricted by PSC limits for halibut.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-73. Catch and trawl survey estimated biomass (mt) of Alaska plaice and other flatfish in the Bering Sea and Aleutian Islands, 1975-2002.

Year	Catch[1]		Trawl Survey Estimated Biomass			
			Eastern Bering Shelf		Aleutian Islands region	
	Alaska plaice	Other Flatfish	Alaska plaice[2]	Other Flatfish[2]	Alaska plaice[2]	Other Flatfish[2]
1975	--	--	103,500	22,200	--	--
1976	--	--	--	--	--	--
1977	2,589	981	--	--	--	--
1978	10,420	340	--	--	--	--
1979	13,672	233	277,200	50,900	--	--
1980	6,902	650	354,000	56,500	0	--
1981	8,653	536	535,800	88,000	--	--
1982	6,811	645	715,400	104,700	--	--
1983	10,766	830	743,000	53,000	0	--
1984	18,982	2,096	789,200	51,500	--	--
1985	24,888	2,977	580,000	32,900	--	--
1986	46,519	1,118	553,900	38,800	0	--
1987	18,564	1,950	564,400	47,700	--	--
1988	61,638	5,787	699,400	48,000	--	--
1989	14,134	1,493	534,000	49,400	--	--
1990	10,926	964	522,800	46,600	--	--
1991	18,029	1,040	529,000	73,900	0	2,144
1992	18,985	678	530,400	50,100	--	--
1993	14,536	873	515,200	87,200	--	--
1994	9,227	4,763	623,100	54,100	0	5,466
1995	18,612	1,618	522,292	37,787	--	--
1996	16,106	2,471	529,300	60,200	--	--
1997	20,493	2,378	643,400	70,300	--	7,580
1998	14,003	1,335	452,600	73,947	--	--
1999	13,615	1,637	546,522	69,730	--	--
2000	14,287	2,116	443,620	70,539	--	8,149
2001	8,397	1,578	538,319	78,293	--	--
2002	11,360	2,441	424,971	97,938	--	8,801

Notes: mt - metric tons
[1]Catch data current through September 28, 2002, from NMFS Regional Office Report
[2]Estimated biomass of Alaska plaice and other flatfish from the eastern Bering Sea and Aleutian Islands trawl survey.
Source: Spencer et al. 2002b and 2002c

Table 3.5-74. Status and catch specifications (mt) of rex sole in the Gulf of Alaska in recent years.

Year	ABC	Exploitable Biomass	Catch[1]
2001	9,440	74,600	2,940
2002	9,470	71,326	3,009
2003	9,470	71,326	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
[1]Catch data current through November 2, 2002.
Source: NPFMC 2002e.

Table 3.5-75. Gulf of Alaska rex sole past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	•Foreign groundfish fisheries (1960s -1976) •IPHC halibut longline fisheries •State of Alaska crab fisheries •Marine pollution and oil spills	•Foreign Fisheries post MSA (1976-1985) •JV fisheries (1968-1990) •Domestic fisheries (1968-present) •Marine pollution and oil spills	•Bilateral agreement with Japan and USSR (1973) •Industry self-imposed actions •International laws regarding marine pollutants •OPA 90 •Clean Water Act	•Annual ABC/TAC limits •Foreign and domestic observer programs •GOA FMP Amendments 8 and 21 address ghost fishing •Flatfish assemblage division (1990) •Rex sole separated from other flatfish division (1993) •Rock sole species split into northern and southern (1996) •PSC Limits
Change in Reproductive Success	•Foreign groundfish fisheries (1960s -1976) spatial/temporal concentration •Climate changes and regime shifts	•Foreign, JV and domestic groundfish fisheries (post-MSA) spatial/temporal concentration	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • Preliminary FMPs – banned bottom trawling in some areas, observers in foreign fisheries	•Annual ABC/TAC limits •Foreign and domestic observer programs
Change in Prey Availability	•Foreign groundfish fisheries (1960s -1976) prey species bycatch •Climate change or regime shifts (1988/89-present) •Introduction of exotic species •Marine pollution and oil spills	•Foreign, JV and domestic groundfish fisheries (post-MSA) prey species bycatch •Introduction of exotic species •Marine pollution and oil spills	•Industry self imposed actions – gear modifications •International laws regarding marine pollutants •OPA 90 •Clean Water Act	•PSC Limits for crab
Change in Important Habitat	•Foreign groundfish fisheries (pre-MSA) gear impacts •IPHC halibut longline fisheries •State of Alaska scallop fisheries •Climate change or regime shifts (1988/89-present) •Introduction of exotic species •Marine pollution and oil spills	•Foreign, JV and domestic groundfish fisheries (post-MSA) gear impacts •Introduction of exotic species •Marine pollution and oil spills	•International Laws regarding marine pollutants •OPA 90 •Clean Water Act •Industry self-imposed actions; gear modifications	•GOA FMP Amendments 3 and 20 – decrease bottom trawls and provided for habitat protection •GOA FMP Amendments 14, 55, and 65 – established habitat protection •GOA FMP Amendment 15 –trawl closures, provide habitat protection •GOA FMP Amendment 23 – banned bottom trawling, protect habitat •GOA FMP amendment 56 EFH and HAPC protection

Table 3.5-75 (cont.). Gulf of Alaska rex sole past/present effects.

Comparative Baseline:

- The relative abundance of the GOA rex sole stock is currently unknown.
- The GOA rex sole stock is lightly to moderately harvested.
- The GOA rex sole stock is constrained by PSC limits for halibut.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-76. Catch and estimated biomass (mt) of rex sole in the Gulf of Alaska, 1984-2002.

Year[1]	Catch[2]	Estimated Biomass[3]
1984	--	60,670
1987	--	63,827
1990	--	95,630
1993	--	87,042
1994	3,673	--
1995	4,021	--
1996	5,874	72,757
1997	3,294	--
1998	2,669	--
1999	3,060	74,605
2000	3,591	--
2001	2,940	71,326
2002	3,009	--

Notes: mt - metric tons
[1]1984, 1987, and 1999 depths surveyed were to 1000m; 1990, 1993, and 1996 depths were surveyed to 500 m.
[2]Catch data current through November 2, 2002.
[3]From the triennial trawl survey of 1984 to 2001.
Source: Turnock et al. 2002b.

Table 3.5-77. Biological and reproductive attributes of Pacific Ocean perch in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Biological/Reproductive Attributes												
	Feeding Type		Movements		Social Behavior		Longevity of Life Stage			Age at Maturity	Fertilization		Spawning Season
	Carnivore	Planktivore	Inshore/Offshore Migrations	Not known	Schooling	Not Known	1-12 Months	5-20 Years	>50 Years	Female age at maturity (years)	Internal	Viviparous	
A	X		X		X				X	10.5	X	X	Late Fall - Early Winter
J	X		X	X		X		X					
L		X		X		X	X						

Notes: A - adult
J - juvenile
L - larvae

Source: NPFMC 1999b.

Table 3.5-78. Habitat associations of Pacific Ocean perch in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Habitat Associations																			
	Location										Substrate						Pelagic Domain			Oceanography
	Inner Shelf (1-50m)	Middle Shelf (50-100m)	Outer Shelf (100-200m)	Upper Slope (200-1000m)	Lower Slope (>1000m)	Basin (>3000m)	Not Known	Depths of high availability (winter) of fishable stock)[1]	Depths of high availability (summer) of fishable stock)[1]	Bottom depths of common occurrence (of fishable stock)[1]	Gravel	Pebble	Cobble	Boulder	Bedrock	Not Applicable	Pelagic	Semi-demersal/Semi-pelagic	Demersal	Upwelling Zone
A			X	X				150-250m	80-200m	50-250m	X	X	X					X	X	X
J	X	X	X	X							X	X	X	X	X		X	X	X	X
L	X	X	X	X	X	X										X	X			X

Notes: A - adult
J - juvenile
L - larvae

Source: NPFMC 1999b.

[1]Source: NPFMC 2002a and 2002b; Table 20 and Table 57, respectively.

Table 3.5-79. Status and catch specifications of Pacific Ocean perch in the Bering Sea and Aleutian Islands in recent years[a].

Year	Age 3+ Biomass	ABC	OFL	Catch[b]
2001	NA	11,900[c]	13,800[c]	16,735
2002	377,000	14,800	17,500	11,221
2003	375,000	15,100	17,900	NA

Notes: ABC - acceptable biological catch
NA - data not available
OFL - overfishing level
[a]Pacific Ocean perch stocks were assessed separately in the Bering Sea and Aleutian Islands regions previous to 2001.
[b]Catch data current through October 13, 2001.
[c]Combination of Bering Sea and Aleutian Islands ABC and OFL levels.

Source: NPFMC 2002d.

Table 3.5-80. Bering Sea and Aleutian Islands Pacific Ocean perch past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1960-1976) • Marine pollution and oil spills	• Foreign Fisheries post MSA (1976-1990) • JV fisheries (1980-1990) • Domestic fisheries (1982-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • Clean Water Act • OPA 90	• Annual ABC/TAC limits • PSC Limits (crab and halibut) • BSAI FMP Amendments 9, 11a, 12, 13, 27, and 37 addressed domestic and foreign observer programs • BSAI FMP Amendments16 and 24 – TAC allocations, reduce bycatch, address ghost fishing • Division of rockfish complex • Division of Aleutian Islands TAC • Assessment of BSAI as single stock 2001
Change in Reproductive Success	• Foreign groundfish fisheries (1960-1976) spatial/temporal concentration • Climate changes and regime shifts	• Foreign, JV and domestic (post-MSA) groundfish fisheries spatial/temporal concentration	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas, observers in foreign fisheries	• Annual ABC/TAC limits • Foreign and domestic observer programs
Change in Prey Availability	• Commercial whaling • Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills • Introduction of exotic species	• Marine pollution and oil spills • Introduction of exotic species	• Clean Water Act • OPA 90 • International laws regarding marine pollutants • MMPA of 1972 • IWC ban on commercial whaling	

Table 3.5-80 (cont.). Bering Sea and Aleutian Islands Pacific Ocean perch past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Change in Important Habitat	• Foreign groundfish fishery (post-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species • Climate change or regime shifts (1988/89-present)	• Foreign, JV and domestic (post-MSA) groundfish fisheries gear impacts • Marine pollution and oil spills • Introduction of exotic species	• Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas. • Industry self-imposed modifications – gear restrictions. • Clean Water Act • OPA 90 • International laws regarding marine pollutants	• BSAI FMP Amendment 9 – defined habitat requirements • BSAI FMP amendments 13, 15, and 46 – decrease in bottom trawls • BSAI FMP amendments 55– protection for EFH and HAPC.

Comparative Baseline:

- The BSAI Pacific Ocean perch stock is not overfished.
- The BSAI Pacific Ocean perch stock is below target biomass.
- The BSAI Pacific Ocean perch stock is at a stable size.
- Management takes into account all bycatch when setting annual harvest levels

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-81. Estimated removals and biomass (mt) of Pacific Ocean perch in the Bering Sea and Aleutian Islands, 1977-2002.

Year	Estimated Removals[1,2]	Estimated Biomass[3]
1977	10,734	--
1978	7,507	--
1979	7,210	--
1980	5,797	115,025
1981	4,844	--
1982	1,237	--
1983	500	241,558
1984	2,043	--
1985	983	--
1986	766	270,176
1987	1,714	--
1988	2,800	--
1989	4,702	--
1990	18,182	--
1991	8,170	351,093
1992	13,587	--
1993	17,076	--
1994	12,552	383,618
1995	11,510	--
1996	15,682	--
1997	13,465	625,272
1998	10,068	--
1999	12,261	--
2000	9,028	511,706
2001	8,812	--
2002	9,772	468,588

Notes: mt - metric tons
[1]Removal data current through September 7, 2002
[2]Removal data represents a combination of foreign, joint-venture processing and domestic annual processing removals in the eastern Bering Sea and Aleutian Islands regions since the passage of the MFCMA.
[3]Estimated biomass represents the mean Pacific Ocean perch biomass estimate for the total Aleutian Island survey (southern Bering Sea and Aleutian Islands regions).

Source: Spencer and Ianelli 2002.

Table 3.5-82. Status and catch specifications of Pacific Ocean perch in the Gulf of Alaska in recent years.

Year	ABC	Exploitable Biomass	Catch[1]
2001	13,510	211,160	10,817
2002	13,190	293,240	11,735
2003	13,660	298,820	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
[1]Catch data current through November 2, 2002.

Source: NPFMC 2002e.

Table 3.5-83. Gulf of Alaska Pacific Ocean perch past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1961-1976) • Marine pollution and oil spills	• Foreign Fisheries post MSA (1976-1985) • JV fisheries (1979-1989) • Domestic fisheries (1970-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • OPA 90 • Clean Water Act	• Annual ABC/TAC limits • Foreign and domestic observer programs • GOA FMP Amendments 8 and 21 address ghost fishing • GOA FMP Amendment 32 POP rebuilding plan • GOA FMP Amendment 38 TAC setting • 1991 sub management group • 1993 northern rockfish division
Change in Reproductive Success	• Foreign groundfish fisheries (1961-1976) spatial/temporal concentration • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (post-MSA) spatial/temporal concentration	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • Preliminary FMPs – banned bottom trawling in some areas, observers in foreign fisheries	• Annual ABC/TAC limits • TAC apportionment • Foreign and domestic observer programs
Change in Prey Availability	• Commercial whaling • Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills • Introduction of exotic species	• Marine pollution and oil spills • Introduction of exotic species	• Industry self imposed actions – gear modifications • Clean Water Act • OPA 90 • IWC ban on commercial whaling • MMPA of 1972	
Change in Important Habitat	• Foreign groundfish fisheries (pre-MSA) gear impacts • Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills • Introduction of exotic species	• Foreign, JV and domestic groundfish fisheries (post-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species	• International Laws regarding marine pollutants • OPA 90 • Clean Water Act • Industry self-imposed actions; gear modifications	• GOA FMP Amendments 3 and 20 – decrease bottom trawls and provided for habitat protection • GOA FMP Amendments 14, 55, and 65 – established habitat protection • GOA FMP Amendment 15 –trawl closures, provide habitat protection • GOA FMP Amendment 23 – banned bottom trawling, protect habitat • GOA FMP amendment 56 EFH and HAPC protection

Table 3.5-83 (cont.). Gulf of Alaska Pacific Ocean perch past/present effects.

Comparative Baseline:

- The GOA POP stock is at a low relative abundance.
- The GOA POP stock was considered rebuilt in 1997.
- The GOA POP stock is constrained by PSC limits and bycatch of other species.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-84. Catch and estimated biomass (mt) of Pacific Ocean perch in the Gulf of Alaska, 1977-2002.

Year	Catch[1,2,8,9]	Estimated Biomass[12]
1977[3]	23,453	--
1978[4]	8,176	--
1979[5]	9,921	--
1980[5]	12,471	--
1981[5]	12,184	--
1982[5]	7,991	--
1983[5]	7,405	--
1984[5]	4,452	232,694
1985[5]	1,087	--
1986[5]	2,981	--
1987[5]	4,981	214,827
1988[6]	13,779	--
1989[6,10]	19,002	--
1990[6,10]	21,114	138,003
1991[7,11]	6,631	--
1992[7,11]	6,159	--
1993[7,11]	2,060	483,482
1994[7,11]	1,853	--
1995[7,11]	5,742	--
1996[7,11]	8,378	771,413
1997[7,11]	9,531	--
1998[7,11]	8,961	--
1999[7,11]	10,472	727,263
2000[7,11]	10,157	--
2001[7,11]	10,817	858,982
2002[7]	11,729	--

Notes: mt - metric tons
[1]Catch data are current through October 5, 2002.
[2]Catch data represent a combination of foreign, domestic, and joint-venture fisheries gulfwide.
[3]All *Sebastes* rockfish for Japanese catch and Pacific Ocean perch for catches of other nations.
[4]Pacific Ocean perch only.
[5]Five species comprising the Pacific Ocean perch complex.
[6]18 species comprising the slope rockfish assemblage
[7]Pacific Ocean perch only.
[8]There were no foreign of joint-venture catches after 1988.
[9]Catches prior to 1989 are landed catches only.

Table 3.5-84 (cont.). Catch and estimated biomass (mt) of Pacific Ocean perch in the Gulf of Alaska, 1977-2002.

[10]Catches in 1989 and 1990 also include fish reported in weekly production reports as discarded by processors.
[11]Catches in 1991-2001 also include discarded fish, as determined through a "blend" of weekly production reports and information from the domestic observer program.
[12]2001 survey did not sample the eastern Gulf of Alaska. Substitute estimates for biomass for this region isn 2001 were obtained by averaging the eastern Gulf of Alaska biomass estimates in the 1993, 1996, and 1999 surveys. These estimates have been included in the 2001 biomass.

Sources: 1977-1984, Carlson et al. (1986); 1985-1988, Pacific Fishery Information Network (PacFIN), Pacific Marine Fisheries Commission, 305 State Office Building, 1400 S.W. 5th Avenue, Portland, OR 97201; 1989-2001, National Marine Fisheries Service, Alaska Region, P.O. Box 21668, Juneau, AK 99802, Biomass estimates: Heifetz et al. 2002.

Table 3.5-85. Biological and reproductive attributes of thornyhead rockfish in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Biological/Reproductive Attributes						
	Feeding Type		Longevity of Life Stage		Age at Maturity	Spawning Behavior	Spawning Season
	Carnivore	Not Known	1-12 Months	Not Known	50% Female (years)	Batch Spawner	
A	X			X	12	X	Late Winter/ Early Spring
J	X			X			
L		X	X				
E		X		X			

Notes: A - adult
E - eggs
J - juvenile
L - larvae

Source: NPFMC 1999b.

Table 3.5-86. Habitat associations of thornyhead rockfish in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity	Habitat Associations													
	Location					Substrate							Pelagic Domain	
	Middle Shelf (50-100m)	Outer Shelf (100-200m)	Upper Slope (200-1000m)	Lower Slope (>1000m)	Not Known	Mud/Clay/Silt	Sand/Granule	Gravel	Pebble	Cobble	Boulder	Bedrock	Pelagic	Demersal
A	X	X	X	X		X	X	X	X	X	X	X		X
J	X	X	X			X	X	X	X	X	X	X		X
L					X								X	
E					X								X	

Notes: A - adult
E - eggs
J - juvenile
L - larvae

Source: NPFMC 1999b.

Table 3.5-87. Status and catch specifications (mt) of thornyhead rockfish in the Gulf of Alaska in recent years.

Year	ABC	Exploitable Biomass	Catch[1]
2001	2,310	52,100	1,339
2002	1,990	77,840	1,125
2003	2,000	75,896	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
[1]Catch data current through November 2, 2002.

Source: NPFMC 2002e.

Table 3.5-88. Gulf of Alaska thornyheads past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (late 1800s-1976) • Marine pollution and oil spills	• Foreign fisheries (1976-1985) • JV fisheries (1983-1990) • Domestic fisheries (1983-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • OPA 90 • Clean Water Act	• Annual ABC/TAC limits • Foreign and domestic observer programs • GOA FMP Amendments 8 and 21 address ghost fishing
Change in Reproductive Success	• Foreign groundfish fisheries (late 1800s-1976) spatial/temporal concentration • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (post-MSA) spatial/temporal concentration	• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • Preliminary FMPs – banned bottom trawling in some areas, observers in foreign fisheries	• Annual ABC/TAC limits • Foreign and domestic observer programs
Change in Prey Availability	• Foreign groundfish fisheries (late 1800s-1976) prey species bycatch • State of Alaska shrimp fisheries • Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills • Introduction of exotic species	• Foreign, JV and domestic groundfish fisheries (post-MSA) prey species bycatch • Marine pollution and oil spills • Introduction of exotic species	• Industry self imposed actions – gear modifications • International Laws regarding marine pollutants • Clean Water Act • OPA 90	
Change in Important Habitat	• Foreign groundfish fisheries (pre-MSA) gear impacts • Climate change or regime shifts (1988/89-present) • Marine pollution and oil spills • Introduction of exotic species	• Foreign, JV and domestic groundfish fisheries (post-MSA) gear impacts • Marine pollution and oil spills • Introduction of exotic species	• International Laws regarding marine pollutants • OPA 90 • Clean Water Act • Industry self-imposed actions; gear modifications	• GOA FMP Amendments 3 and 20 – decrease bottom trawls and provided for habitat protection • GOA FMP Amendments 14, 55, and 65 – established habitat protection • GOA FMP Amendment 15 –trawl closures, provide habitat protection • GOA FMP Amendment 23 – banned bottom trawling, protect habitat • GOA FMP amendment 56 EFH and HAPC protection

Table 3.5-88 (cont.). Gulf of Alaska thornyheads past/present effects.

Comparative Baseline:

- The GOA thornyhead rockfish group is at a relatively high abundance.
- The GOA thornyhead rockfish group is not overfished.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-89. Catch (mt) for shortspine thornyhead in the Gulf of Alaska, 1967-2002.

Year	Catch[1,2,3]
1967	7
1968	62
1969	97
1970	53
1971	241
1972	216
1973	1,565
1974	1,537
1975	1,229
1976	1,313
1977	1,397
1978	786
1979	1,098
1980	1,485
1981	1,340
1982	787
1983	729
1984	208
1985	82
1986	714
1987	1,877
1988	2,181
1989	2,616
1990	1,576
1991	2,013
1992	2,020
1993	1,368
1994	1,298
1995	1,363
1996	1,310
1997	1,249
1998	1,148

Table 3.5-89 (cont). **Catch (mt) for shortspine thornyhead in the Gulf of Alaska, 1967-2002.**

Year	Catch[1,2,3]
1999	1,282
2000	1,308
2001	1,339
2002[4]	1,482

Notes: mt - metric tons
[1]1967-1980 based on estimates extracted from NMFS observer reports (e.g., Wall et al. 1978).
[2]1981-1989 based on PacFIN and NMFS observer data.
[3]1990-2000 based on blended NMFS observer data and weekly processor reports.
[4]2002 catch data was projected from October 2002 NMFS reports.

Source: Gaichas and Ianelli 2002.

Table 3.5-90. Common and scientific names of rockfish in the Bering Sea and Aleutian Islands and Gulf of Alaska, separated by management group.

Common Name	Scientific Name	Management Group	
		BSAI[1]	GOA[2]
aurora rockfish	*Sebastes aurora*	Other rockfish	Slope rockfish
black rockfish	*Sebastes melanops*	Other rockfish	--
blackgill rockfish	*Sebastes melanostomus*	Other rockfish	Slope rockfish
blue rockfish	*Sebastes mystinus*	Other rockfish	--
Boccaccio	*Sebastes paucispinis*	Other rockfish	Slope rockfish
canary rockfish	*Sebastes pinniger*	Other rockfish	Demersal shelf rockfish
chillipepper rockfish	*Sebastes goodei*	Other rockfish	Slope rockfish
China rockfish	*Sebastes nebulosus*	--	Demersal shelf rockfish
copper rockfish	*Sebastes caurinus*	Other rockfish	Demersal shelf rockfish
dark blotched rockfish	*Sebastes crameri*	Other rockfish	Slope rockfish
dusky rockfish	*Sebastes ciliatus*	Other rockfish	Pelagic shelf rockfish
greenstripped rockfish	*Sebastes elongatus*	Other rockfish	Slope rockfish
harlequin rockfish	*Sebastes variegatus*	Other rockfish	Slope rockfish
longspine thornyhead	*Sebastolobus altivelis*	Other rockfish	--
northern rockfish	*Sebastes polyspinis*	Other red rockfish	Slope rockfish
Pacific Ocean perch	*Sebastes alutus*	Pacific Ocean perch	Slope rockfish
pygmy rockfish	*Sebastes wilsoni*	Other rockfish	Slope rockfish
quillback rockfish	*Sebastes maliger*	--	Demersal shelf rockfish
redbanded rockfish	*Sebastes babcocki*	Other rockfish	Slope rockfish
redstripe rockfish	*Sebastes proriger*	Other rockfish	Slope rockfish
rosethorn rockfish	*Sebastes helvomaculatus*	Other rockfish	Demersal shelf rockfish
rougheye rockfish	*Sebastes aleutianus*	Other red rockfish	Slope rockfish
sharpchin rockfish	*Sebastes zacentrus*	Other rockfish	Slope rockfish
shortbelly rockfish	*Sebastes jordani*	--	Slope rockfish
shortraker rockfish	*Sebastes borealis*	Other red rockfish	Slope rockfish
shortspine thornyhead	*Sebastolobus alascanus*	Other rockfish	Thornyhead rockfish
silvergrey rockfish	*Sebastes brevispinis*	Other rockfish	Slope rockfish
splitnose rockfish	*Sebastes diploproa*	Other rockfish	Slope rockfish
stripetail rockfish	*Sebastes saxicola*	Other rockfish	Slope rockfish
tiger rockfish	*Sebastes nigrocinctus*	Other rockfish	Demersal shelf rockfish
vermillion rockfish	*Sebastes miniatus*	Other rockfish	Slope rockfish
widow rockfish	*Sebastes entomelas*	Other rockfish	Pelagic shelf rockfish

Table 3.5-90 (cont). Common and scientific names of rockfish in the Bering Sea and Aleutian Islands and Gulf of Alaska, separated by management group.

Common Name	Scientific Name	Management Group	
		BSAI[1]	GOA[2]
yelloweye rockfish	*Sebastes ruberrimus*	Other rockfish	Demersal shelf rockfish
yellowmouth rockfish	*Sebastes reedi*	Other rockfish	Slope rockfish
yellowtail rockfish	*Sebastes flavidus*	Other rockfish	Pelagic shelf rockfish

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
[1]BSAI management groups: Pacific ocean perch (see Section 3.4.1.11); Other red rockfish; Other rockfish
[2]GOA management groups: Slope rockfish (see Section 3.4.1.11); Pelagic shelf rockfish; Demersal shelf rockfish; Thornyhead rockfish (see Section 3.4.1.12).
Source: NPFMC 2001a and NPFMC 2001b.

Table 3.5-91. Biological and reproductive attributes of selected flatfish in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Life Stage/Activity		Biological/Reproductive Attributes											
		Feeding Type		Movements		Longevity of Life Stage				Age at Maturity		Fertilization/ Egg Development	Spawning Season
		Carnivore	Planktivore	Drift with Ocean	Not known	1-12 Months	1-5 Years	5-20 Years	Not Known	50% Female (years)	50% Male (years)	External	
Dover sole	A	X						X		33a		X	Early Winter - Late Spring
	LJ	X					X						
	EJ	X					X						
	L		X	X		X							
	E				X				X				
Alaska plaice	A	X			X			X		6-7		X	Early Spring
	J	X			X			X					
	L		X	X		X							
	E				X				X				
Rex sole	A	X			X		X			24[a]	16[a]	X	Late Winter- Early Summer
	J	X			X		X						
	L		X		X				X				
	E				X				X				

Notes: A - adult
E - eggs
EJ - early juvenile
L - larvae
LJ - late juvenile
Source: NPFMC 1999b.
[a]Source: NPFMC 2002a and 2002b; Table 20 and Table 57, respectively.

Table 3.5-92. Habitat associations of selected rockfish species in the Bering Sea and Aleutian Islands and Gulf of Alaska.

	Life stage/activity								Substrate										
		Inner shelf (1-50m)	Middle shelf (50-100m)	Outer shelf (100-200m)	Upper slope (200-1000m)	Bay/estuaries	Island pass	Not known	Mud/clay/silt	Sand/granule	Gravel	Pebble	Cobble	Boulder	Not applicable	Pelagic	Semi-demersal/semi-pelagic	Demersal	Not known
Shortraker/ rougheye rockfish	A			X	X				X	X	X	X	X	X				X	
	J		X	X															X
	L							X							X				X
Northern rockfish	A			X	X								X	X			X		
	J	X	X	X									X	X			X		
	L							X							X	X			
Dusky rockfish	A			X	X						X		X	X			X		
	J	X	X	X							X		X	X					X
	L														X	X			
Yelloweye rockfish	A		X	X	X	X	X				X		X	X				X	
	J		X	X	X	X	X				X		X					X	
	L							X			X		X					X	

Notes: A - adult
J - juvenile
L - larvae
Source: NPFMC 1999b

Table 3.5-93. Status and catch specifications of northern rockfish and rougheye/shortraker rockfish in the eastern Bering Sea and Aleutian Islands in recent years.

Year	OFL	ABC	Catch[1]
Northern rockfish - EBS			
2001	25	19	153
2002	25	19	96
2003	25	18	NA
Northern rockfish - AI			
2001	9,019	6,745	5,978
2002	9,019	6,745	1,986
2003	9,307	6,980	NA
Rougheye/Shortraker rockfish - EBS			
2001	156	116	42
2002	156	116	91
2003	182	136	NA
Rougheye/Shortraker rockfish - AI			
2001	1,215	912	704
2002	1,215	912	460
2003	1,107	830	NA

Notes: ABC - acceptable biological catch
AI - Aleutian Islands
EBS - eastern Bering Sea
NA - data not available
OFL - overfishing level
[1]Catch current through September 16, 2002.
Source: NPFMC 2002d.

Table 3.5-94. Status and catch specifications of other rockfish (primarily thornyheads) in the eastern Bering Sea and Aleutian Islands in recent years.

Area	Year	Survey Biomass[1]	OFL[2]	ABC[2]	TAC	Catch[3]
EBS	2001	6,880	482	360	360	293
	2002	6,880	482	361	361	399
	2003	18,000	1,280	960	NA	NA
AI	2001	12,900	900	680	680	605
	2002	12,900	901	676	676	547
	2003	15,000	846	634	NA	NA

Notes: ABC - acceptable biological catch
AI - Aleutian Islands
EBS - eastern Bering Sea
NA - data not available
OFL - overfishing level
TAC - total allowable catch
[1]Biomass for each year corresponds to the projection given in the SAFE report issued the preceding year.
[2]The OFL and ABC for 2003 are those recommended by the Plan Team.
[3]Catch data current through November 2, 2002
Source: NPFMC 2002d.

Table 3.5-95. Bering Sea and Aleutian Islands other rockfish and other red rockfish assemblages past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1960-1976) • Marine pollution and oil spills	• Foreign Fisheries post MSA (1976-1985) • JV fisheries (1980-1990) • Domestic fisheries (1986-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • Clean Water Act • OPA 90	• Annual ABC/TAC limits • BSAI FMP Amendments 9, 11a, 12, 13, 27, and 37 addressed domestic and foreign observer programs • BSAI FMP Amendments16 and 24 – TAC allocations, reduce bycatch, address ghost fishing • 1991 division of POP complex • 2000 division of BS other red rockfish • 2002 TAC recommendation
Change in Reproductive Success	• Foreign groundfish fisheries (1960-1976) spatial/temporal concentration • Climate changes and regime shifts		• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas, observers in foreign fisheries	• Annual ABC/TAC limits • Foreign and domestic observer programs
Change in Prey Availability	• State of Alaska shrimp fisheries • Climate changes and regime shifts • Introduction of exotic species • Marine pollution and oil spills	• Introduction of exotic species • Marine pollution and oil spills	• Industry self imposed actions – gear modifications • Clean Water Act • OPA 90 • International laws regarding marine pollutants	
Change in Important Habitat	• Climate changes and regime shifts • Introduction of exotic species • Marine pollution and oil spills	• Introduction of exotic species • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • 1977 BSAI Preliminary FMP – banned bottom trawling in some areas. • Industry self-imposed modifications – gear restrictions. • Clean Water Act • International laws regarding marine pollutants • OPA 90	• BSAI FMP Amendment 9 – defined habitat requirements • BSAI FMP amendments 13, 15, and 46 – decrease in bottom trawls • BSAI FMP amendments 55– protection for EFH and HAPC.

Comparative Baseline:

Table 3.5-95 (cont.). Bering Sea and Aleutian Islands other rockfish and other red rockfish assemblages past/present effects.

- The BSAI other red rockfish group is not overfished, and is at a stable stock size.
- The BSAI other rockfish group is not overfished and is a bycatch-only fishery.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.

Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-96. Catch and estimated biomass (mt) of other red rockfish in the Bering Sea and Aleutian Islands, 1977-2002.

Year	Catch[1]		Estimated Biomass[2]		
	EBS	AI	EBS Survey	EBS Area I[3] (AI portion)	AI Survey[3]
Northern rockfish					
1977	4	3,232	--	--	--
1978	21	549	--	--	--
1979	61	195	53	--	--
1980	58	221	--	341	43,312
1981	20	92	23	--	--
1982	71	177	24	--	--
1983	42	47	--	1,516	43,458
1984	32	196	--	--	--
1985	6	189	--	--	--
1986	61	208	--	67,934	133,662
1987	77	308	--	--	--
1988	40	493	4	--	--
1989	87	306	--	--	--
1990	247	1,235	--	--	--
1991	455	--	--	582 (0.63)	214,673 (0.16)
1992	328	1,541	--	--	--
1993	959	4,480	--	--	--
1994	47	4,666	--	855 (0.60)	92,433 (0.48)
1995	286	3,858	--	--	--
1996	116	6,637	--	--	--
1997	118	1,997	--	204 (0.68)	87,186 (0.31)
1998	47	3,674	--	--	--
1999	144	5,254	--	--	--
2000	114	4,737	--	49 (0.40)	205,300 (0.29)
2001	153	6,131	--	--	--
2002	96	1,986	33 (0.38)	290 (0.67)	175,950 (0.27)

Table 3.5-96 (cont). **Catch and estimated biomass (mt) of other red rockfish in the Bering Sea and Aleutian Islands, 1977-2002.**

Year	Catch[1]		Estimated Biomass[2]		
	EBS	AI	EBS Survey	EBS Area I[3] (AI portion)	AI Survey[3]
Shortraker rockfish					
1977	0	26	--	--	--
1978	713	131	--	--	--
1979	372	977	1,391	--	--
1980	380	74	--	1,020	15,963
1981	258	315	3,571	--	--
1982	242	379	5,176	--	--
1983	145	90	--	13,079	27,913
1984	54	28	--	--	--
1985	19	1	4,010	--	--
1986	18	12	--	6,478	19,345
1987	28	36	--	--	--
1988	31	37	1,260 (0.43)	--	--
1989	58	130	--	--	--
1990	116	546	--	--	--
1991	157	--	2,758 (0.38)	1,925 (0.66)	21,778 (0.69)
1992	72	292	--	--	--
1993	184	257	--	--	--
1994	55	174	--	1,959 (0.78)	26,230 (0.22)
1995	43	178	--	--	--
1996	68	109	--	--	--
1997	79	85	--	2,428 (0.97)	36,058 (0.27)
1998	39	137	--	--	--
1999	69	102	--	--	--
2000	112	187	--	645 (0.75)	37,136 (0.45)
2001	32	89	--	--	--
2002	90	234	1,463 (0.46)	1,463 (0.65)	15,382 (0.20)

Table 3.5-96 (cont). **Catch and estimated biomass (mt) of other red rockfish in the Bering Sea and Aleutian Islands, 1977-2002.**

Year	Catch[1]		Estimated Biomass[2]		
	EBS	AI	EBS Survey	EBS Area I[3] (AI portion)	AI Survey[3]
Rougheye rockfish					
1977	1	153	--	--	--
1978	66	364	--	--	--
1979	637	999	1,053	--	--
1980	94	265	--	922	21,885
1981	166	493	816	--	--
1982	124	189	605	--	--
1983	53	58	--	2,830	20,582
1984	79	35	--	--	--
1985	18	10	1,716	--	--
1986	52	21	--	3,511	48,843
1987	99	79	--	--	--
1988	111	75	876 (0.32)	--	--
1989	204	381	--	--	--
1990	369	1,619	--	--	--
1991	83	--	884 (0.30)	676 (0.12)	10,445 (0.48)
1992	65	1,174	--	--	--
1993	82	873	--	--	--
1994	27	751	--	1,208 (0.49)	13,344 (0.28)
1995	13	381	--	--	--
1996	23	850	--	--	--
1997	33	958	--	561 (0.66)	11,035 (0.22)
1998	11	524	--	--	--
1999	10	383	--	--	--
2000	18	256	--	1,054 (0.29)	14,205 (0.23)
2001	10	615	--	--	--
2003	1	226	565 (0.21)	1,251 (0.48)	8,361 (0.21)

Table 3.5-96 (cont). **Catch and estimated biomass (mt) of other red rockfish in the Bering Sea and Aleutian Islands, 1977-2002.**

Notes: AI - Aleutian Islands
EBS - eastern Bering Sea
mt - metric tons
[1]Catch data current through September 7, 2002.
[2]Estimated biomass of rougheye, shortraker, and northern rockfishes from the NMFS bottom trawl surveys. For the Aleutians Islands surveys since 1981 and the eastern Bering Sea surveys since 1988.
[3]Coefficient of variation shown in parentheses.
Source: Spencer and Reuter 2002.

Table 3.5-97. Catch and estimated biomass (mt) for other rockfish in the eastern Bering Sea and Aleutian Islands regions, 1977-2002.

Year	Catch[1]		Estimated Biomass		
	EBS	AI	EBS Shelf/Slope	EBS Area I (AI portion)[4]	AI Survey[4]
1977[2]	112	700	--	--	--
1978[2]	941	212	--	--	--
1979[2]	759	1,039	3,251	--	--
1980	459	420	--	1,095	19,078
1981	356	328	4,975	--	--
1982	276	2,114	4,381	--	--
1983	220	1,045	--	1,696	15,995
1984	176	56	--	--	--
1985	92	99	5,127	--	--
1986	102	169	--	5,187	20,336
1987	474	147	--	--	--
1988	341	278	8,759	--	--
1989	192	481	--	--	--
1990	418	858	--	--	--
1991	422	343	4,529	246 (0.49)	6,668 (0.22)
1992	600	664	--	--	--
1993	192	496	--	--	--
1994	133	292	--	1,171(0.48)	6,449 (0.16)
1995	288	219	--	--	--
1996	170	282	--	--	--
1997	163	305	--	1,683 (0.63)	10,063 (0.17)
1998	188	364	--	--	--
1999	135	631	--	--	--
2000	232	563	–[3]	1,107 (0.45)	11,070 (0.14)
2001	295	592	--	--	--
2002	362	487	16,988 (0.11)	1,116 (0.37)	15,029 (0.03)

Notes: AI - Aleutian Islands
EBS - eastern Bering Sea
mt - metric tons
[1]Catch data current through September 21, 2002
[2] These biomass estimates were revised (2001) to show the catch of those species currently in the other rockfish category.
[3]Biomass estimates from the 2000 EBS slope survey will not be used in stock assessment; experimental survey.
[4]Coefficient of variation listed in parentheses.

Source: Reuter and Spencer 2002.

Table 3.5-98. Status and catch specifications (mt) of pelagic shelf rockfish (primarily dusky rockfish) in the Gulf of Alaska in recent years.

Year	ABC	Exploitable Biomass	Catch[1]
2001	5,980	66,440	3,008
2002	5,490	62,489	3,318
2003	5,490	62,489	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
[1]Catch data current through November 2, 2002.
Source: NPFMC 2002e.

Table 3.5-99. Status and catch specifications of demersal shelf rockfish (primarily yelloweye rockfish) in the Gulf of Alaska in recent years.

Year	ABC	Exploitable Biomass	Catch[1]
2001	330	14,695	326
2002	350	15,615	188
2003	390	17,510	NA

Notes: ABC - acceptable biological catch
NA - data not available
[1]Catch data current through November 2, 2002.
Source: NPFMC 2002e.

Table 3.5-100. Status and catch specifications (mt) of northern rockfish and other slope rockfish in the Gulf of Alaska in recent years.

Management Group	Year	ABC	Exploitable Biomass	Catch[1]
Shortraker/rougheye rockfish	2001	1,730	70,890	1,730
	2002	1,610	66,830	1,620
	2003	1,620	66,829	NA
Northern rockfish	2001	4,880	93,850	4,880
	2002	4,980	94,350	4,980
	2003	5,530	105,263	NA
Other slope rockfish	2001	4,900	102,510	1,010
	2002	5,040	107,960	990
	2003	5,050	107,962	NA

Notes: ABC - acceptable biological catch
mt - metric tons
NA - data not available
[1]Catch data current through October 5, 2002.

Source: NPFMC 2002e.

Table 3.5-101. Gulf of Alaska other rockfish (including pelagic shelf, demersal shelf, northern and other slope rockfish) past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (1962-1976) • Slope rockfish: State of Alaska groundfish fisheries • Marine pollution and oil spills	• Foreign Fisheries post MSA (1976-1985) • JV fisheries (1980-1991) • Domestic fisheries (1981-present) • Marine pollution and oil spills	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions • International laws regarding marine pollutants • OPA 90 • Clean Water Act	• Annual ABC/TAC limits • Foreign and domestic observer programs • GOA FMP Amendments 8 and 21 address ghost fishing • GOA FMP 1988-pelagic shelf rockfish fish group formed • 1990s – restrictive TACs • GOA FMP Amendment 46 – removed blue and black rockfish • GOA FMP Amendment 14 – separated DSR • GOA FMP Amendment 21 – DSR under State in SE • 1998-full retention of DSR • 1988-separation of slope rockfish
Change in Reproductive Success	• Slope rockfish: Foreign groundfish fisheries (1962-1976) spatial/temporal concentration • Climate changes and regime shifts		• Industry self imposed actions – gear modifications • Bilateral agreement with Japan and USSR (1973) • Preliminary FMPs – banned bottom trawling in some areas, observers in foreign fisheries	• Annual ABC/TAC limits • Foreign and domestic observer programs
Change in Prey Availability	• State of Alaska shrimp fisheries • Climate changes and regime shifts • Marine pollution and oil spills • Introduction of oil spills	• Marine pollution and oil spills • Introduction of oil spills	• Industry self imposed actions – gear modifications • Clean Water Act • OPA 90 • International laws regarding marine pollutants	
Change in Important Habitat	• Climate changes and regime shifts • Marine pollution and oil spills • Introduction of oil spills	• Marine pollution and oil spills • Introduction of oil spills • PSR: Foreign, JV and domestic groundfish fisheries (post-MSA) gear impacts	• International Laws regarding marine pollutants • OPA 90 • Clean Water Act • Industry self-imposed actions; gear modifications	• GOA FMP Amendments 3 and 20 – decrease bottom trawls and provided for habitat protection • GOA FMP Amendments 14, 55, and 65 – established habitat protection • GOA FMP Amendment 15 –trawl closures, provide habitat protection • GOA FMP Amendment 23 – banned bottom trawling, protect habitat • GOA FMP amendment 56 EFH and HAPC protection

Table 3.5-101 (cont.). Gulf of Alaska other rockfish (including pelagic shelf, demersal shelf, northern and other slope rockfish) past/present effects.

Comparative Baseline:

- The GOA pelagic shelf rockfish group is exploited at 50-90% of the ABC, and relative abundance is unknown.
- The relative abundance of the GOA demersal shelf rockfish group is unknown.
- The GOA slope rockfish group is not overfished, although the some species within the group are highly exploited.
- Management takes into account all bycatch when setting annual harvest levels.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
EEZ – exclusive economic zone
EFH – essential fish habitat
HAPC – habitat area of particular concern
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
N/A – not applicable
POP – Pacific Ocean perch
PSC – prohibited species catch
TAC – total allowable catch

Table 3.5-102. Landings and estimated biomass (mt) of demersal shelf rockfish in the SEO region of the Gulf of Alaska, 1982-2003.

Year[1]	Reported Landings	Estimated Biomass (adult yelloweye rockfish)[2,3]
1982	120	--
1983	176	--
1984	563	--
1985	499	--
1986	494	--
1987	855	--
1988	552	--
1989	475	--
1990	379	--
1991	889	--
1992	503	--
1993	901	--
1994	441	30,453
1995	282	20,188
1996	436	29,285
1997	381	
1998	363	25,031
1999	348	
2000	282	15,067
2001	326	14,693
2002	226	15,616
2003	--	17,509

Notes: mt - metric tons
[1]1982-1997 landings from ADF&G Southeast Region fishticket database and NMFS weekly catch reports through November 4, 2002.
[2]Estimated unreported demersal shelf rockfish mortality associated with halibut fishery not reflected in totals. In 2000 unreported mortality assumed to be 90 mt, in 2001 unreported mortality estimated to be 70 mt.
[3]Biomass estimates based on sum of the lower 90 percent confidence limits of biomass estimates for each management area.
Source: O'Connell et al. 2002.

Table 3.5-103. Catch and estimated biomass (mt) of pelagic shelf rockfish in the Gulf of Alaska, 1984-2002.

Year	Catch[1,2,3]	Estimated Biomass
1984	--	31,539
1985	--	--
1986	--	--
1987	--	81,641
1988	1,086	--
1989	1,738	--
1990	1,647	28,020
1991	2,342	--
1992	3,605	--
1993	3,193	57,217
1994	2,989	--
1995	2,891	--
1996	2,296	75,843
1997	2,629	--
1998	3,113	--
1999	4,659	64,694
2000	3,731	--
2001	3,008	46,929[4]
2002	3,303	--

Notes: mt - metric tons

[1]Catches for 1988-1997 include black and blue rockfish, which were members of the assemblage during those years. There were no foreign or joint-venture catches after 1988. Catches in 1988 are landed catches only.

[2]Catches 1989-1991 include fish reported in weekly production reports as discarded by fishermen or processors.

[3]Catches in 1992-2002 include discarded fish, as determined through a “blend” of weekly production reports and information from the domestic observer program.

[4]The Yakutat and Southeastern areas were not sampled in the 2001 survey; estimates of biomass for these two areas were obtained by averaging the corresponding area biomass in 1993, 1996, and 1999 surveys.

Source: Catch: 1988, Pacific Fishery Information Network (PacFIN), Pacific Marine Fisheries Commision; 1989-2001, National Marine Fisheries Service, Alaska Region. Clausen et al. 2002.

Table 3.5-104. Catch and estimated biomass (mt) of slope rockfish in the Gulf of Alaska, 1977-2002.

Year	Catch[1,2]	Estimated Biomass[11]
1977[5]	23,453	--
1978[6]	8,176	--
1979[7]	9,921	--
1980[7]	12,471	--
1981[7]	12,184	--
1982[7]	7,991	--
1983[7]	7,405	--
1984[7]	4,452	359,027
1985[7]	1,087	--
1986[7]	2,981	--
1987[7]	4,981	604,974
1988[7,8]	13,779	--
1989[3,8]	19,002	--
1990[3,8]	21,114	406,269
1991[4,9]	5,508	--
1992[4,9]	11,603	--
1993[4,9]	12,180	758,985
1994[4,10]	9,413	--
1995[4,10]	9,281	--
1996[4,10]	5,885	1,066,593
1997[4,10]	5,773	--
1998[4,10]	5,646	--
1999[4,10]	7,498	1,131,327
2000[4,10]	5,647	--
2001[4]	5,659	1,387,364
2002[4]	5,267	--

Notes: mt - metric tons
Catch data are current through October 5, 2002
[1]Catch data represent a combination of foreign, domestic, and joint-venture fisheries gulfwide; there were no foreign of joint-venture catches after 1988.

Table 3.5-104 (cont). Catch and estimated biomass (mt) of slope rockfish in the Gulf of Alaska, 1977-2002.

[2]Catches prior to 1989 are landed catches only.
[3]Catches in 1989 and 1990 also include fish reported in weekly production reports as discarded by processors.
[4]Catches in 1991-2002 also include discarded fish, as determined through a "blend" of weekly production reports and information from the domestic observer program.
[5]All *Sebastes* rockfish for Japanese catch, and Pacific ocean perch for catches of other nations.
[6]Pacific ocean perch only.
[7]Five species comprising the Pacific ocean perch complex.
[8]The 18 species comprising the slope rockfish assemblage.
[9]Twenty species comprising the slope rockfish assemblage minus Pacific Ocean perch.
[10]Twenty-one species comprising the slope rockfish assemblage minus Pacific Ocean perch.
[11]2001 survey did not sample the eastern Gulf of Alaska; substitute estimates for this region in 2001 were obtained by averaging the eastern Gulf of Alaska biomass estimates in the 1993, 1996, and 1999 surveys. These eastern Gulf of Alaska estimates have been included in the 2001 biomass estimate listed.

Sources: 1977-1984, Carlson et al. (1986); 1985-1988, Pacific Fishery Information Network (PacFIN), Pacific Marine Fisheries Commission, 305 State Office Building, 1400 S.W. 5th Avenue, Portland, OR 97201; 1989-2001, National Marine Fisheries Service, Alaska Region, P.O. Box 21668, Juneau, AK 99802, Biomass estimates: Heifetz et al. 2002.

Table 3.5-105. Comparison of biomass[1] estimates (mt) for slope rockfish in the Gulf of Alaska.

Species	1984	1987	1990	1993	1996	1999	2001[2]
Shortraker rockfish	17,721	41,457	10,809	19,710	20,258	28,231	27,929
Rougheye rockfish	46,999	43,929	46,142	61,833	45,913	39,620	43,784
Total, shortraker/ rougheye	64,720	85,386	56,951	81,543	66,171	67,850	71,713
Northern rockfish	40,564	140,049	112,948	104,480	98,965	242,187	355,275
Sharpchin rockfish	7,219	70,160	37,050	23,676	64,570	20,841	34,276
Redstripe rockfish	4,803	23,706	24,681	29,619	14,964	8,226	17,571
Harlequin rockfish	2,442	63,833	17,194	9,281	19,974	9,877	14,940
Silvergrey rockfish	4,145	4,710	13,774	18,979	24,127	37,641	27,029
Redbanded rockfish	1,400	1,564	3,173	3,675	4,594	10,941	6,414
Darkblotched rockfish	6	33	184	291	121	272	227
Splitnose rockfish	0	2	3	0	0	7	2
Greenstriped rockfish	16	62	156	268	352	467	362
Vermillion rockfish	0	0	0	20	0	0	0
Bocaccio	502	38	176	106	137	0	81
Pygmy rockfish	0	366	76	3	283	187	141
Yellowmouth rockfish	516	241	1,900	3,563	923	5,570	3,352
Total, other slope rockfish	21,049	164,712	98,367	89,480	130,044	94,027	101,394
Total, all species	359,027	604,974	406,269	758,985	1,066,985	1,131,327	1,387,364

Notes: mt - metric tons

[1]Biomass estimates are from 1984, 1987, 1990, 1993, 1996, 1999, and 2001 trawl surveys. Biomass estimates for 1993, 1996, and 1999 have been slightly revised from those listed in SAFE reports previous to 2001 for slope rockfish. These are estimates of total biomass.

[2]The 2001 survey did not sample the eastern Gulf of Alaska; substitute estimates of biomass for this region in 2001 were obtained by averaging the eastern Gulf of Alaska biomass estimates in the 1993, 1996, and 1999 surveys. These eastern Gulf of Alaska estimates have been included in the 2001 biomass estimates listed here.

Source: Heifetz et al. 2001.

Table 3.5-106. Halibut past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality Catch/ Bycatch	• IPHC commercial catch (1923 to present) • Foreign fisheries bycatch of adults and < 81 cm juveniles (pre-MSA 1910 to 1980)	• Foreign fisheries bycatch (post-MSA 1980 to 1987) • JV fisheries bycatch (1982 to 1991) • Domestic fisheries bycatch (1982 to present)	• International commission for halibut management established (1923) • U.S. multilateral and bilateral agreements • Japanese self-imposed management • Industry self-imposed actions • IPHC management takes into account bycatch of < 81 cm	• Annual PSC limits • IFQ Program • Longline Careful Release Program • Steller sea lion protection measures may have provided an indirect reduction in bycatch
Change in Reproductive Success	• Decadal oscillations (1910 to present)	• N/A	• N/A	• N/A
Change in Important Habitat	• IPHC commercial catch in winter spawning areas (1923 to 1930)	• Unknown	• IPHC closure of halibut fishery during winter spawning time indirectly halted fishing on spawning grounds (1930 to present)	• None

Comparative Baseline

- Pacific halibut stock is considered healthy.
- IPHC management takes into account all catch and bycatch when setting annual harvest levels.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
cm - centimeters
IFQ - individual fishing quota
IPHC - International Pacific Halibut Commission
JV - joint venture
MSA - Magnuson-Stevens Act
N/A - not applicable
PSC - prohibited species catch

Table 3.5-107. Chronology of management measures to control bycatch of prohibited species in the groundfish fisheries of the Bering Sea and Aleutian Islands and Gulf of Alaska, 1935–2000.

Effective Year	Management Action
1935	Trawls prohibited except for shrimp and flounder fishing in BSAI.
1937	Use of dynamite prohibited in BSAI.
1938	Use of gillnets prohibited for catching halibut in BSAI.
1942	Trawls permitted except for salmon and herring fishing in BSAI.
1944	Use of trawls prohibited for catching halibut in BSAI.
1948	Five-inch minimum mesh size required for trawls in BSAI.
1959	Trawls prohibited for taking any crab species in BSAI. Trawling prohibited in Bristol Bay king crab pot sanctuary in BSAI.
1967	Halibut nursery area closed to halibut fishing in BSAI. Foreign fisheries prohibited around Fox Islands in BSAI.
1969	Pribilof Islands area closed to foreign fishing.
1972	Pot gear prohibited for catching halibut in BSAI.
1973	Use of tangle nets prohibited for catching crab in BSAI.
1974	Catch quotas established for Japanese groundfish fisheries limit effort for BSAI pollock and flatfish and GOA Pacific ocean perch and sablefish.
1975	Catch quotas established for USSR groundfish fisheries in BSAI. Trawling prohibited in winter halibut savings area and along most of the Aleutian Islands.
1976	Magnuson-Stevens Act passed, providing national standards and regulations for managing federal fisheries to 200 miles.
1977	Preliminary groundfish FMPs implemented with groundfish optimum yields; closures of foreign fisheries when any one species limit is attained; several closure areas in BSAI and GOA extended from bilateral agreements; prohibited status for halibut, salmon, crabs, and shrimp.
1979	GOA FMP implemented with no retention of prohibited species (salmonids, halibut, shrimp, herring, crab, scallops); expansion of time-area closures to reduce halibut bycatch; restrictions on use of non-pelagic trawls by foreign fleets; limit of 25 percent of TALFF taken December 1 to May 31 to minimize halibut bycatch; domestic trawlers restricted by halibut PSC limits for five areas for December 1–May 31; halibut and Tanner crab PSC limits for domestic fishermen included; depth restrictions on use of foreign longlines seaward of 500 m May 1–September 30 to minimize bycatch of halibut. Created new species OY for grenadiers (rattails) to protect them from bycatch (since rescinded, GOA-5). Pacific cod TALFF allocated to foreign longlines around Chirikov to reduce bycatch of other species, permitted directed longlining for Pacific cod to reduce halibut bycatch, required foreign vessel operators to report bycatch and discard of salmon and halibut.
1980	Set OY and four species categories, required biodegradable panels on sablefish pots to minimize bycatch of small sablefish, and established four species categories (target, PSC, unallocated, other) (GOA-8).

Table 3.5-107 (cont). Chronology of management measures to control bycatch of prohibited species in the groundfish fisheries of the Bering Sea and Aleutian Islands and Gulf of Alaska, 1935–2000.

Effective Year	Management Action
1982	BSAI FMP implemented with specific management objective to rebuild halibut; established PSC category for halibut, salmon, crabs; expanded time-area closures for foreign fisheries to reduce bycatch of juvenile halibut; set bycatch policy for domestic fishermen; set target observer coverage in foreign fisheries at 35–40 percent. Set chinook PSC of 65,000 fish for foreign trawl fishery (BSAI -1a). Closed waters east of 140°W to foreign fishery and restricted domestic fishery to pelagic trawling between 140 and 147°W (GOA-10). Prohibited pot longline gear for sablefish, partially to eliminate ghostfishing (GOA-12).
1983	PSC bycatch reduction schedule established for BSAI foreign trawl fishery, allowed domestic trawling in pot sanctuary and halibut savings area in BSAI, set 1986 goal of 17,473 salmon (BSAI-3). Closed GOA southeast to foreign trawl fisheries to protect halibut, allowed foreign longlines to fish shallower than 500 m in winter halibut savings area, until halibut bycatch reached 105 mt.
1984	Set BSAI groundfish OY cap at 2 million mt, allowed domestic trawling in winter halibut savings area with observers and Bristol Bay pot sanctuary until halibut PSC limit is reached (BSAI -7). Raised halibut PSC to 270 mt in western GOA and 768 mt in central GOA and exempted domestic pelagic trawl fishery from halibut PSC limit.
1985	Set BSAI salmon PSC at 27,957 salmon (26,000 chinook) (BSAI-8). Established reporting requirements and directed fishing definitions (BSAI-9, GOA-14). Revised OYs and implemented framework for setting and revising halibut PSC limits (GOA-14).
1987	PSC bycatch limits and zones established in BSAI domestic and JV flatfish trawl fisheries, set Bristol Bay trawl closure area (Area 512) to all trawling year-round, allowed RD discretion to set target species as PSC once TAC is reached (BSAI-10). Established four red King crab bottom trawl closed areas during February 15–June 15 around Kodiak Island to protect crab, revised OYs, implemented framework for setting and revising PSC limits, revised reporting requirements, (GOA-15).
1988	Began pilot observer program in Dutch Harbor and Kodiak, revised ABC definition (BSAI-11). Added steelhead and salmon to PSC list and established target, other, and nonspecified categories, required 30-day comment period for annual specifications and PSC limits (BSAI-11a/GOA-16).
1989	Required weekly reporting, established PSC limits for foreign and JV fisheries, set limits on retention of bycatch after target fishery closes (BSAI-12/GOA-17). Area 516 closed to trawling seasonally during crab molting period. Endorsed voluntary herring bycatch plan. Adopted policy on full utilization of BSAI and GOA groundfish.
1990	Established crab and halibut PSC limits (BSAI-12a). New observer program, data reporting system, and directed fishing standards implemented (BSAI-13/GOA-18). Pot, jig, hand, and troll gear exempted from GOA halibut PSC limits.
1991	Prohibited pollock roe-stripping as wasteful (BSAI-14/GOA-19). Allowed seasonal apportionment of PSC limits, established vessel incentive program to reduce bycatch rates of red king crab and halibut bycatch, refined overfishing, specification process and fishing gear definitions (BSAI-16/GOA-21). Established herring savings areas and hotspot authority (BSAI-16a). Season for BSAI yellowfin sole fishery changed to May 1. BSAI flatfish fisheries delayed to May 1 to reduce halibut and crab bycatch.

Table 3.5-107 (cont). Chronology of management measures to control bycatch of prohibited species in the groundfish fisheries of the Bering Sea and Aleutian Islands and Gulf of Alaska, 1935–2000.

Effective Year	Management Action
1992	Regional Administrator authorized to approve experimental fishing permits to reduce bycatch (BSAI-17/GOA-22). Established time and area closures for bycatch reduction, delayed rockfish trawl opening to Monday closest to July 1 to reduce salmon bycatch and groundfish trawl fisheries to January 20 to reduce salmon and halibut bycatch, expanded VIP for all trawl fisheries and GOA, halibut PSC limits established for BSAI non-trawl fisheries, and redefined VIP and PSC limits in GOA (BSAI-19/GOA-24).
1993	Gillnets and seines prohibited for groundfish fishing in BSAI. Careful release requirements established for halibut bycatch in groundfish longline fisheries in BSAI and GOA, halibut PSC limit set at 3,775 mt for halibut trawl fishery with regulatory framework for revisions (BSAI-21). Crab bycatch performance standards set for pelagic trawl fishery in BSAI. Kodiak Island crab protection zones made permanent (GOA-26). Set performance-based pelagic trawl definition in BSAI and GOA. Established a separate species category for Atka mackerel (GOA-31).
1994	Council adopts minimum mesh-size requirements for trawl codends used in pollock, cod, and rock sole fisheries in BSAI. NMFS published vessel specific bycatch rates on the Internet, required observers to monitor salmon discards, eliminated primary halibut PSC but kept 3,775 mt trawl limit (BSAI-25). Gillnets and seines prohibited.
1995	Halibut and sablefish IFQ program implemented (BSAI-15/GOA-20). BSAI chum salmon savings area, chinook salmon savings area, red king crab savings area, and Pribilof Islands Habitat Conservation Area established to protect crabs (BSAI-21a; 21b; 35). Established minimum trawl mesh size in BSAI. BSAI jig gear exempted from halibut PSC.
1996	BSAI red King Crab Savings Area permanently established as year-round trawl closure area. Voluntary salmon donation program implemented to reduce bycatch and waste (BSAI-26/GOA-29).
1997	Nearshore Bristol Bay closed to all trawling year-round. PSC limits for red king crab and bairdi Tanner crab reduced and for opilio Tanner crab implemented (BSAI-37; 41). Overfishing definitions implemented (BSAI-44/GOA-44).
1998	Established PSC limits for opilio Tanner crab in trawl fisheries and opilio Tanner crab bycatch limitation zone (BSAI-40). Improved retention/improved utilization program implemented for pollock and cod (BSAI-49/GOA-49). Prohibited species donation program redefined to include halibut (BSAI-50/ GOA-50). Forage fish category and ban on fishing implemented (BSAI-36/GOA-39).
1999	Revised overfishing definitions implemented (BSAI-56/GOA-56).
2000	Bottom trawl ban in BSAI pollock fisheries (BSAI-57). Chinook salmon PSC limits reduced to 29,000 fish in four years (pending) (BSAI-58). GOA demersal shelf rockfish full retention to account for bycatch (pending). Sponge and coral identified as HAPC-biota types under prohibited species category in BSAI and GOA pending).

Table 3.5-107 (cont). Chronology of management measures to control bycatch of prohibited species in the groundfish fisheries of the Bering Sea and Aleutian Islands and Gulf of Alaska, 1935–2000.

Notes: BSAI – Bering Sea and Aleutian Islands
FMP – Fishery Management Plan
GOA – Gulf of Alaska
HAPC – habitat areas of particular concern
JV – joint venture
OY – optimum yield
PSC – prohibited species catch
TAC – total allowable catch
TALFF – total allowable level of foreign fishing
USSR – Union of Soviet Socialist Republics
VIP – Vessel Incentive Program
mt – metric tons

Table 3.5-108. Pacific salmon past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality Catch/ Bycatch	• Catch/bycatch State directed fisheries • Catch/bycatch in foreign groundfish fisheries pre-MSA • Catch/bycatch foreign fisheries outside U.S. EEZ • Subsistence fisheries catch • Climatic variability effects on prey and salmon survival	• Bycatch in foreign groundfish fisheries post-MSA • Bycatch JV fisheries • Bycatch domestic groundfish fisheries	• ADF&G Management • International Pacific Salmon Treaty • Foreign Fisheries Management • Industry self imposed measures	• BSAI FMP PSC bycatch limits • Salmon closure areas
Harvest of distinct genetic stock	• Catch/bycatch in external groundfish fisheries pre-MSA in U.S. EEZ • Catch/Bycatch foreign fisheries outside U.S. EEZ	• Bycatch in MSA groundfish fisheries post-MSA	• ADF&G Management • Foreign Fisheries Management	• BSAI FMP PSC bycatch limits • Salmon closure areas
Change in Reproductive Success	• EVOS • Salmon mariculture competition • Climatic variability effects on salmon marine survival	• N/A	• EVOS Trustees Council monitoring • Alaska ban on fin fish mariculture	• N/A
Change in Prey Availability	• Climatic variability effects on salmon prey	• N/A	• N/A	• N/A

Comparative Baseline:

- Southeast Alaska stocks are stable.

Table 3.5-108 (cont.). Pacific salmon past/present effects.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ADF&G - Alaska Department of Fish & Game
BSAI - Bering Sea and Aleutian Islands
EEZ - exclusive economic zone
EVOS - Exxon Valdez Oil Spill Trustees
FMP - fisheries management plan
GOA - Gulf of Alaska
IFQ - individual fishing quota
IPHC - International Pacific Halibut Commission
JV - joint venture
N/A - not applicable
PSC - prohibited species catch
U.S. EEZ - United States exclusive economic zone

Table 3.5-109. Total groundfish catch and estimated bycatch of chinook and other Pacific salmon in U.S. groundfish fisheries, 1990 to 1999[a].

Year	Region	Number of Fish						Total Catch (mt)
		Groundfish	Chinook	Chum	Coho	Sockeye	Pink	
Domestic								
1990	BSAI	1,706,379	14,085	16,202	153	30	31	30,501
1991	BSAI[b]	2,154,903	48,873	29,706	396	79	79	79,133
1992	BSAI	1,963,523	41,955	40,090	1,266	14	80	83,405
1993	BSAI[b]	1,754,384	45,964	242,895	321	22	8	289,210
1994	BSAI	1,855,031	44,380	95,978	231	20	202	140,811
1995	BSAI	1,830,295	23,079	20,901	858	0	21	44,859
1996	BSAI	1,755,872	63,205	77,771	218	5	1	141,200
1997	BSAI	1,740,663	50,218	67,349	114	3	69	117,753
1998	BSAI	1,531,838	58,966	69,237				128,203
1999	BSAI	1,243,051	16,861	62,372				79.233
1990	GOA	244,397	16,913	2,541	1,482	85	64	21,085
1991	GOA	269,616	38,894	13,713	1,129	51	57	53,844
1992	GOA	269,797	20,462	17,727	86	33	0	38,308
1993	GOA	255,434	24,465	55,268	306	15	799	80,853
1994	GOA	239,503	13,973	40,033	46	103	331	54,486
1995	GOA	216,585	14,647	64,067	668	41	16	79,439
1996	GOA	202,054	15,761	3,969	194	2	11	19,937
1997	GOA	230,448	15,119	3,349	41	7	23	18,539
1998	GOA	245,115	16,941	13,539				30,480
1999	GOA	217.680	24,943	7,293				32.230
1990	WOC[c]	4,478	617	0	0	0	0	617
1991	WOC[c]	198,953	6,165	11	132	0	23	6,331
1992	WOC[c]	155,333	4,863	36	201	0	0	5,100
1993	WOC[c]	99,698	4,843	71	20	126	3,313	8,373
1994	WOC[c]	175,731	3,626	275	39	0	61	4,001
1995	WOC[c]	103,598	11,577	200	1,775	6	2,433	15,991
1996	WOC[c]	129,489	3,152	196	89	0	0	3,437
1997	WOC[c]	147,221	4,404	139	304	0	563	5,410
1998	WOC[c]	147,396	na	na	na	na	na	na
1999	WOC[c]	140,001	na	na	na	na	na	na
Joint Venture								
1990	BSAI	133,438	147	2	3	0	0	152
1990	GOA	0	0	0	0	0	0	0
1990	WOC	172,069	9,141	133	34	0	0	9,308

Notes: [a]Through October 9, 1999. For 1998 and 1999, the estimates of non-chinook salmon have not yet been separated by species and are thus listed as a single value.
[b]One steelhead was reported in 1991 and five steelheads were reported in 1993.
[c]At-sea processing only.
BSAI – Bering Sea and Aleutian Islands
GOA – Gulf of Alaska
mt – metric tons
na – data not available
WOC – Washington-Oregon-California

Table 3.5-110. Salmon bycatch (number of fish) in groundfish fisheries.

Year	Bering Sea and Aleutian Islands			Gulf of Alaska		
	Chinook	Others	Total	Chinook	Others	Total
1990	14,085	16,416	30,501	16,913	4,172	21,085
1991	48,873	79,133	79,133	38,894	53,844	53,844
1992	41,955	41,450	83,405	20,462	17,846	38,308
1993	45,964	243,246	289,210	24,465	56,388	80,853
1994	44,380	96,431	140,811	13,973	40,513	54,486
1995	23,079	21,780	44,859	14,647	64,792	79,439
1996	63,205	77,995	141,200	15,761	4,176	19,937
1997	50,218	67,535	117,753	15,119	3,420	18,539
1998	58,966	69,237	128,203	16,941	13,539	30,480
1999	16,861	62,372	79,233	13,539	18,691	32,230
10-year average	40,759	72,672	113,431	19,071	23,849	42,920
Percent	36%	64%		44%	56%	

Source: Berger 1999

Table 3.5-111. Productivity (in metric tons) and status of Alaska salmon fishery resources.

Alaska Salmon	Recent Average Yield (1995–1997)	Current Potential Yield	Long-term Potential Yield	Stock Level Relative to LTPY
Pink	153,600	125,700	125,700	Above
Sockeye	128,900	116,800	116,800	Above
Chum	70,800	44,900	44,900	Above
Coho	17,700	17,700	17,700	Near
Chinook	5,100	5,500	5,500	Below
Total	376,100	310,600	310,600	

Note: LTPY – long-term potential yield
mt - metric tons
Source: NOAA 1999

Table 3.5-112. Pacific herring past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality Catch/ Bycatch	• Alaska State directed fisheries • Foreign fishery catch (1900 to 1980)	• Pollock trawl fisheries bycatch (1980 to present)	• ADF&G management • Industry self-imposed measures	• MSA disallowed foreign fisheries direct catch • Annual PSC limits
Change in Reproductive Success	• Egg, larvae, adult exposure to EVOS (Prince William Sound population only)	• N/A	• EVOS Trustee Council monitoring	• N/A
Change in Prey Availability	• Climate influence on plankton populations	• N/A	• N/A	• N/A
Change to Important Habitat	• EVOS spawning habitat contamination (Prince William Sound population only)	• N/A	• EVOS Trustee Council monitoring	• N/A

Comparative Baseline:

- Herring stocks are considered stable.
- Prince William Sound stock is potentially recovering.
- ADF&G quota setting process is responsive to fluctuations in herring biomass.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ADF&G - Alaska Department of Fish & Game
BSAI - Bering Sea and Aleutian Islands
EVOS - Exxon Valdez Oil Spill Trustees
FMP - fisheries management plan
GOA - Gulf of Alaska
IFQ - individual fishing quota
IPHC - International Pacific Halibut Commission
JV - joint venture
N/A - not applicable
PSC - prohibited species catch
U.S. EEZ - United States exclusive economic zone

Table 3.5-113. Estimated Bering Sea and Aleutian Islands Pacific herring catch (metric tons) and percent change, 2001 to 2005, by alternative.

	Alternative								
Projection Year	**1**	**2.1**	**2.2**	**3**	**4.1**	**4.2**	**5**	**6.1**	**6.2**
2000	1,064	1,064	169	1,067	1,064	1,066	1,081	860	1,064
2001	1,163	700	170	858	791	793	1,177	938	1,705
2002	1,193	883	170	1,008	959	961	1,205	962	1,358
2003	1,103	919	170	1,004	972	975	1,114	887	1,154
2004	1,049	878	169	956	926	927	1,061	847	1,149
2005	1,157	942	170	1,030	995	997	1,170	933	1,320
Predicted average, 2001– 2005	1,133	864	170	971	928	930	1,145	914	1,337
Recent average, 1997–1999	1,037	1,037	1,037	1,037	1,037	1,037	1,037	1,037	1,037
Percent change from recent	9	-17	-84	-6	-10	-10	10	-12	
Percent change from Alternative 1	0	-24	-85	-14	-18	-18	1	-19	18

Table 3.5-114. Estimated Gulf of Alaska Pacific herring catch (metric tons) and percent change, 2001 to 2005, by alternative.

	Alternative								
Projection Year	**1**	**2.1**	**2.2**	**3**	**4.1**	**4.2**	**5**	**6.1**	**6.2**
2000	11	11	5	12	11	11	10	9	11
2001	9	5	5	9	9	9	8	8	14
2002	9	5	5	8	9	9	8	8	13
2003	12	7	5	9	12	12	11	10	16
2004	14	8	5	11	14	14	13	12	19
2005	16	9	5	13	16	16	15	13	20
Predicted average 2001–2005	12	7	5	10	12	12	11	10	16
Recent average 1997–1999	13	13	13	13	13	13	13	13	13
Percent change from recent	-7	-49	-62	-24	-7	-7	-16	-24	
Percent change from Alternative 1	0	-46	-59	-18	0	0	-10	-18	34

Table 3.5-115. Crab past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality Catch/Bycatch	• Catch in Japanese and Russian crab fisheries (1953 to 1975) • Bycatch in foreign groundfish fisheries pre-MSA • Bycatch and unobserved mortality from foreign fleet gear conflicts with State fisheries (pre-MSA) • Catch/bycatch in State crab fisheries • Subsistence Fisheries catch • Predation of larval and juvenile life stages	• Bycatch in foreign groundfish fisheries pre-MSA • Bycatch in foreign groundfish fisheries post-MSA • Bycatch in JV fisheries • Bycatch in domestic groundfish fisheries	• Bilateral agreements to reduce gear conflict (mid-1960s) • Crab FMP management • Industry self imposed measures to control and reduce bycatch of crab • BSAI king and Tanner crab FMP (NPFMC 1989)	• BSAI FMP amendment 57 banned non-pelagic gear in the pollock fishery • BSAI Groundfish FMP PSC bycatch limits • BSAI Groundfish FMP crab closure areas
Change in Reproductive Success	• Spatial concentration of State fisheries catch/bycatch • Catch/bycatch in commercial crab fisheries • Direct catch in subsistence crab fisheries • Bycatch and unobserved mortality from foreign fleet gear conflicts with State fisheries (pre-MSA) • Worm predation of egg masses in Southcentral Alaskan waters • Climatic variability effects on food and crab larval transport	• Spatial concentration of the MSA groundfish fisheries bycatch	• Crab FMP management (restricted harvest, legal males only)	• None
Change in Prey Availability	• Unknown	• Unknown	• None	• None
Changes in Important Habitat	• Spatial concentration of external bottom trawl fisheries • Spatial concentration of commercial crab pot fisheries	• Spatial concentration of the MSA bottom trawl fisheries	• Closures in State directed crab fisheries.	• BSAI FMP Amendment 10 • BSAI FMP Amendment 37 • BSAI FMP Amendment 21a • BSAI FMP Amendment 40 • GOA FMP Amendment 15 and 26

Comparative Baseline:

- Red King Crab stocks in the Pribilof Islands show estimated biomass levels above MSST but these estimates are considered poor with a high degree of uncertainty. Currently, there is no harvest due to bycatch concerns; Bristol Bay stock has shown an increase in biomass in the last year, and Kodiak Island stocks are in decline.
- Blue King Crab stocks in the Pribilof Islands are considered to be overfished and a rebuilding plan is in progress. The Saint Matthew Island stock is considered overfished and a rebuilding plan is in effect.

Table 3.5-115 (cont.). Crab past/present effects.

- Golden King Crab population levels are unknown due to lack of survey information.
- Bairdi Tanner Crab stock in the Bering Sea is considered overfished and a rebuilding plan is in effect.
- Opilio Tanner Crab stock in the Bering Sea was declared overfished in 1999, and a rebuilding plan has been in effect since 2000.
- GOA Crab stock status is unknown due to lack of survey information. However, ADF&G survey data generally shows depressed stocks overall.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ADF&G - Alaska Department of Fish & Game
BSAI - Bering Sea and Aleutian Islands
EVOS - Exxon Valdez Oil Spill Trustees
FMP - fisheries management plan
GOA - Gulf of Alaska
IFQ - individual fishing quota
IPHC - International Pacific Halibut Commission
JV - joint venture
MSA - Magnuson-Stevens Act
MSST - maximum stock size threshold
N/A - not applicable
PSC - prohibited species catch
U.S. EEZ - United States exclusive economic zone

Table 3.5-116. Estimated bycatch of Pacific halibut (metric tons of mortality), King crab, tanner crab, Pacific herring, chinook salmon, and other salmon taken in Bering Sea and Aleutian Islands groundfish fisheries, 1977–1999[a].

Year	Pacific Halibut (mt)	King Crabs (all species) No. of Crabs	Tanner Crabs (all species) No. of Crabs	Pacific Herring (mt)	Chinook Salmon No. of Fish	Other Salmon No. of Fish
1977	1,758	599,623	17,600,000	NA	47,840	
1978	3,030	1,227,931	17,300,000	NA	44,548	
1979	3,269	1,007,796	18,000,000	NA	107,706	
1980	5,571	1,147,671	11,400,000	783	115,036	6,726
1981	3,866	1,817,152	6,300,000	287	36,218	5,800
1982	2,869	573,919	2,400,000	1,986	15,644	7,686
1983	2,575	1,034,157	3,000,000	2,513	10,334	32,134
1984	2,830	691,088	3,000,000	1,257	11,274	72,195
1985	2,538	1,225,073	2,700,000	4,539	11,069	10,598
1986	3,364	275,066[c]	7,200,000[c]	4,018[c]	9,237	14,433
1987	3,462	147,386[c]	7,400,000[c]	487[c]	22,221	4,799
1988	5,344	88,033[c]	3,100,000[c]	351[c]	30,320	3,709
1989	4,393	207,70[c]	3,800,000[c]	2,527[c]	40,354	5,545
1990	5,176	109,20[d]	1,731,725[e]	3,379	13,990	16,661
1991	6,046	255,607	14,498,270	3,252	35,766	31,987
1992	6,466	315,788	19,613,453	3,758	37,372	38,919
1993	4,684	388,664	18,881,490	1,076	45,964	243,246
1994	5,711	359,436	15,059,028	1,711	43,636	94,508
1995	5,264	48,191[d]	7,695,643	969	23,079	21,780
1996	5,131	28,682[d]	4,730,000	1,391	63,531	78,649
1997	4,753	76,290[d]	7,798,267	1,313	51,137	69,725
1998	4,660	49,051[d]	6,196,155	912	48,387	67,977
1999	4,326	154,519[d]	2,759,364	1,084	17,285	64,637

Notes: [a]1999 data are preliminary.
[b]Other salmon species catch combined with chinook salmon.
[c]Foreign and joint-venture bycatch only.
[d]Red king crab only.
[e]Bairdi Tanner crab only.
mt - metric tons
NA – data not available

Source: Guttormsen et al.1990; Queirolo et al.1995; NPFMC 1995; Williams 1997.

Table 3.5-117. Estimated total catch (mt) of other species in the eastern Bering Sea and Aleutian Islands, 1977-2002.

Year	Eastern Bering Sea				Aleutian Islands				Grand Total
	Foreign	JV	Domestic	Total	Foreign	JV	Domestic	Total	
1977	35,902			35,902	16,170			16,170	52,072
1978	61,567			61,537	12,436			12,436	73,973
1979	38,767			38,767	12,934			12,934	51,701
1980	33,955	678		34,633	13,028			13,028	47,661
1981	32,363	3,138	100	35,651	7,028	246		7,274	42,925
1982	17,480	720		18,200	4,781	386		5,167	23,367
1983	11,062	1,139	3,264	15,465	3,193	439	43	3,675	19,140
1984	6,243	1,159		8,508	184	1,486		1,670	10,178
1985	4,043	4,365	895	11,503	40	1,978	32	2,050	13,553
1986	2,673	6,115	313	10,471	1	1,442	66	1,509	11,980
1987		4,977	919	8,569		1,144	11	1,155	9,724
1988		11,559	647	12,206		281	156	437	12,643
1989		4,695	298	4,993		1	107	108	5,101
1990			16,115	16,115			4,693	4,693	20,808
1991			16,261	16,261			938	938	17,199
1992			29,994	29,994			3,081	3,081	33,075
1993			20,574	20,574			3,277	3,277	23,851
1994			23,456	23,456			1,099	1,099	24,555
1995			20,923	20,923			1,290	1,290	22,213
1996			19,733	19,733			1,706	1,706	21,440
1997			23,656	23,656			1,520	1,520	25,176
1998			23,077	23,077			2,455	2,455	25,531
1999				18,884			1,678	1,678	20,562
2000				23,098			3,010	3,010	26,108
2001				23,148			4,029	4,029	27,178
2002[1]									23,466

Notes: JV - joint venture
mt - metric tons
[1]2002 catch reported through October 5, 2002.

Sources: Graichas 2002. Foreign and JV catches - U.S. Foreign Fisheries Observer Program, AFSC, NMFS, NOAA, BIN C15700, Bld. 4, 7600 Sand Point Way NE, Seattle, WA 98115. Domestic catches before 1989 (retained only; do not include discards): Pacific Fishery Information Network (PacFIN), Pacific Marine Fisheries Commission, Portland, OR 97201. Domestic catches since 1989 - NMFS Regional Office BLEND database, Juneau, AK 99801.

Table 3.5-118. Estimated total catch of other species in the Gulf of Alaska, 1977-2001.

Year[1]	Catch (mt)
1977	4,642
1978	5,990
1979	4,115
1980	5,604
1981	7,145
1982	2,350
1983	2,646
1984	1,844
1985	2,343
1986	401
1987	253
1988	647
1989[2]	1,560
1990[3]	6,289
1991[3]	1,577
1992[3]	2,515
1993	6,867
1994	2,752
1995	3,433
1996	4,302
1997	5,409
1998	3,748
1999	3,858
2000	5,649
2001	4,780

Notes: GOA - Gulf of Alaska
mt - metric tons
[1]Pre-1981 includes sharks, skates, sculpins, Osmeridae family, and octopus.
[2]Atka mackerel and squid were added
[3]Atka mackerel reported separately; assigned separately thereafter.

Source: GOA SAFE Report 2001

Table 3.5-119. Estimated catch (metric tons) of other species[a], squid, forage fish, and miscellaneous fish by groundfish fisheries in the Bering Sea and Aleutian Islands and Gulf of Alaska by target species fishery and gear, 1999.

Target Groundfish Species	Gear	Other Species						Forage Fish	Miscellaneous Fish
		Skate	Shark	Sculpin	Octopus	Total	Squid		
BERING SEA AND ALEUTIAN ISLANDS									
Atka mackerel	Trawl	96	0[c]	285	0[c]	382	5	-[b]	75
Pacific cod	Trawl	831	8	954	23	1,817	2	2	132
Pacific cod	Pot	0[c]	-[b]	649	260	909	0[c]	-[b]	10
Pacific cod	Longline	9,625	105	1,139	21	10,890	0	0	113
Pacific cod	All	10,455	113	2,742	304	13,615	2	2	255
Flatfish	Trawl	11,750	179	9,101	11	21,041	60	20	2,589
Flatfish	Longline	5	NA	0[c]	NA	5	NA	-[b]	42
Flatfish	All	11,755	179	9,101	11	21,045	60	20	2,630
Rockfish	Trawl	53	3	21	0[c]	77	5	0[c]	55
Rockfish	Longline	9	1	0[c]	0[c]	11	-[b]	-[b]	223
Rockfish	All	62	4	21	0[c]	88	5	0[c]	278
Pollock	Pelagic trawl	314	104	40	0[c]	458	403	38	209
Pollock	Bottom trawl	42	2	18	1	62	4	1	10
Pollock	All	355	105	58	1	520	406	39	219
Rock sole	Trawl	207	0[c]	152	12	371	NA	0[c]	69
Sablefish	Pot	0[c]	NA	NA	0[c]	0[c]	NA	-[b]	0
Sablefish	Longline	105	21	0[c]	0[c]	126	-[b]	-[b]	4,730
Sablefish	All	105	21	0[c]	0[c]	126	-[b]	-[b]	4,730
Turbot	Trawl	11	NA	3	0[c]	15	4	0[c]	12
Turbot	Pot	1	-[b]	-[b]	0[c]	1	0[c]	-[b]	0
Turbot	Longline	273	203	2	0[c]	479	-[b]	-[b]	3,840
Turbot	All	285	203	6	0[c]	494	4	0[c]	3,852
Yellowfin sole	Trawl	566	1	935	2	1,503	NA	2	328
All	Trawl	13,827	295	11,492	48	25,662	478	63	3,469
All	Pot	1	-[b]	649	260	909	0[c]	-[b]	10
All	Longline	10,017	330	1,141	22	11,509	0[c]	0[c]	8,947
All	All	23,844	625	13,282	329	38,080	478	63	12,426

Table 3.5-119 (cont). **Estimated catches (metric tons) of other species[a], squid, forage fish, and miscellaneous fish by groundfish fisheries in the Bering Sea, Aleutian Islands, and Gulf of Alaska by target species fishery and gear, 1999.**

Target Groundfish Species	Gear	Other Species						Forage Fish	Miscellaneous Fish
		Skate	Shark	Sculpin	Octopus	Total	Squid		
GULF OF ALASKA									
Pacific cod	Trawl	216	10	98	3	238	0[c]	15	24
Pacific cod	Pot	0[c]	1	111	15	118	-[b]	45	13
Pacific cod	Longline	333	230	129	5	675	-[b]	1	5
Pacific cod	All	549	241	338	123	1,032	0	61	42
Flatfish	Trawl	470	46	58	9	490	7	9	350
Flatfish	Longline	0[c]	-[b]	-[b]	-[b]	-[b]	-[b]	-[b]	4
Flatfish	All	470	46	58	9	490	7	9	353
Rockfish	Trawl	46	5	26	0c	17	6	101	123
Rockfish	Longline	27	58	0[c]	-[b]	-[b]	-[b]	10	6
Rockfish	All	73	63	26	0[c]	17	6	111	129
Pollock	Bottom trawl	20	63	0[c]	0[c]	83	2	2	107
Pollock	Pelagic trawl	2	131	3	0[c]	118	18	23	120
Pollock	All	22	194	4	0[c]	201	20	25	227
Sablefish	Trawl	0[c]	-[b]	0[c]	0[c]	-[b]	0[c]	0[c]	1
Sablefish	Longline	200	126	0[c]	0[c]	19	1	2	9,338
Sablefish	All	201	126	0[c]	0[c]	19	1	2	9,339
All	Trawl	754	255	185	13	946	33	151	724
All	Pot	0[c]	1	111	115	118	-[b]	45	13
All	Longline	1,030	460	187	15	1,184	8	22	9,703
All	All	1,784	716	484	143	2,248	41	218	10,440

Notes: [a]Forage fish are myctophids, osmerids, bathylagids, sandfish, sand lance, gunnels, and pricklebacks. Miscellaneous fish are mostly grenadiers, but also include greenlings, poachers, lumpsuckers, ronquils, gastropods, fish waste, snipe eels, eelpouts, hagfish, pomfrets, and snailfish.
[b]less than 0.01 mt
[c]0 less than 0.01 and less than 0.5 mt of estimated catch.
NA – data not available

Source: Observer and NMFS blend data

Table 3.5-120. Estimated biomass (mt) of other species in the eastern Bering Sea.

Year	EBS shelf survey biomass estimates				EBS slope survey biomass estimates			
	Sharks	Skates	Sculpins	Octopi	Sharks	Skates	Sculpins	Octopi
1975	0	24,349	111,160	6,129				
1976								
1977								
1978								
1979	692	58,147	284,228	30,815	0	3,056	4,555	729
1980								
1981					1	2,743	5,372	234
1982	0	164,084	340,877	12,442	23	2,723	3,261	180
1983	379	161,041	292,025	3,280				
1984	0	186,980	252,259	2,488				
1985	47	149,576	182,469	2,582	314	3,329	2,316	152
1986	0	251,321	303,671	480				
1987	223	346,691	195,501	7,834				
1988	4,058	409,076	233,169	9,846	1,967	3,271	4,944	138
1989	0	410,119	215,666	4,979				
1990	0	534,556	219,020	11,564				
1991	0	448,458	272,653	7,990	2,635	4,031	2,449	61
1992	2,564	390,466	239,947	5,326				
1993	0	375,466	215,922	1,355				
1994	5,012	414,235	260,994	2,183				
1995	1,005	391,768	218,693	2,779				
1996	2,804	423,913	187,817	1,746				
1997	37	393,716	215,766	211				
1998	2,378	354,188	197,675	1,225				
1999	2,079	370,543	146,185	832				
2000	1,487	325,292	161,350	2,041	*Pilot survey*			
2001	0	419,508	143,368	5,357				
2002	5,527	365,249	174,807	2,423	25,445	69,275	6,409	979

Notes: EBS - eastern Bering Sea
mt - metric tons

Source: Graichas 2002. Alaska Fisheries Science Center surveys.

Table 3.5-121. Estimated biomass (mt) of Aleutian Islands other species.

Year	Sharks	Skates	Sculpins	Octopi	Squid
1980	800	10,123	33,624	757	16,461
1983	0	16,259	24,570	440	20,786
1986	0	19,491	32,211	781	25,982
1991	2,927	14,987	15,904	1,148	28,935
1994	421	24,964	17,192	1,728	11,082
1997	2,497	28,902	13,680	1,219	2,677
2000	2,663	29,206	13,037	775	2,675
2002	1,557	34,412	14,248	1,384	2,087

Notes: mt - metric tons
Source: Graichas 2002 (Alaska Fisheries Science Center surveys).

Table 3.5-122. Squid past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality Catch/Bycatch	C Foreign directed squid fisheries (1975-1987) conducted by Japan and Republic of Korea C Foreign groundfish fisheries pre-MSA bycatch (mid 1960s-1976) C State of Alaska groundfish fisheries bycatch C State of Alaska shrimp fisheries bycatch	C Foreign groundfish fisheries post-MSA bycatch C JV groundfish fisheries bycatch C Domestic groundfish fisheries bycatch	C Bilateral agreement with Japan and USSR (1973)	**C 1977 BSAI Preliminary FMP - established observers in foreign fisheries and restricted squid catch** **C Domestic observer program to monitor bycatch** **C BSAI FMP Amendment 57 – banned non-pelagic gear in pollock fishery** **C Conversion to pelagic pollock fishery (1996)** **C 1999 and 2000 restrictions on pollock fisheries reduced squid bycatch** **C Steller sea lion conservation measures – closures to pollock fisheries have indirectly benefitted squid by reducing bycatch**
Change in Reproductive Success	C Spatial concentration of external fisheries bycatch of large squid aggregations could alter stock structure C Climatic variability effects on drifting egg masses	C Spatial concentration of MSA fisheries bycatch of large squid aggregations could alter stock structure	C N/A	C 1999 and 2000 restrictions on pollock fisheries in areas of historically concentrated squid bycatch C Steller sea lion conservation measures – closures to pollock fisheries have indirectly benefitted squid by reducing bycatch in spatially concentrated areas

Comparative Baseline:

- Minimal life history and distribution information for squid species in the BSAI and GOA.
- No survey biomass estimate exists for squid species in the BSAI or GOA.
- The squid complex represents a relatively low proportion of the non-target species bycatch in the BSAI and GOA groundfish fisheries.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI - Bering Sea and Aleutian Islands
FMP - fisheries management plan
GOA - Gulf of Alaska
JV - joint venture
N/A - not applicable
TAC - total allowable catch

Table 3.5-123. Estimated total catch of squid (mt) in the eastern Bering Sea and Aleutian Islands, 1977-2002.

Year	Foreign	JV	Domestic	Total	Foreign	JV	Domestic	Total	Grand Total
1977	4,926			4,926	1,808			1,808	6,734
1978	6,886			6,886	2,085			2,085	8,971
1979	4,286			4,286	2,252			2,252	6,538
1980	4,040			4,040	1,763			2,332	6,372
1981	4,178	4		4,182	1,201			1,763	5,945
1982	3,833	5		3,838	509	1		1,201	5,039
1983	3,461	9		3,470	336	7		510	3,980
1984	2,797	27		2,824	5	4		343	3,167
1985	1,583	28		1,611	1	19		9	1,620
1986	829	19		848		23	1	20	868
1987	96	12	1	109		3		24	131
1988		168	246	414		1		3	417
1989		106	194	300			5	6	306
1990			532	532			94	94	626
1991			544	544			88	88	632
1992			819	819			61	61	880
1993			611	611			72	72	683
1994			517	517			87	87	604
1995			364	364			95	95	459
1996			1,083	1,083			84	84	1,167
1997			1,403	1,403			71	71	1,474
1998			891	891			25	25	915
1999			432	432			9	9	441
2000			375	375			8	8	384
2001			1,761	1,761			5	5	1,766
2002[1]									743

Notes: JV - joint venture
mt - metric tons
[1]2002 catch reported through October 25, 2002.

Source: Graichas 2002. Foreign and JV catches - U.S. Foreign Fisheries Observer Program, AFSC, NMFS, NOAA, BIN C15700, Bld. 4, 7600 Sand Point Way NE, Seattle, WA 98115. Domestic catches before 1989 (retained only; do not include discards) - Pacific Fishery Information Network (PacFIN), Pacific Marine Fisheries Commission, Portland, OR 97201. Domestic catches since 1989 - NMFS Regional Office BLEND database, Juneau, AK 99801.

Table 3.5-124. Estimated total catch of squid (metric tons) in the Gulf of Alaska, 1997-2000.

Year	Catch
1997	98
1998	59
1999	41
2000	19
2001	91

Table 3.5-125. Sculpin past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality Bycatch	• Foreign groundfish fisheries pre-MSA bycatch • State of Alaska groundfish fisheries (1995-present) bycatch	• Foreign groundfish fisheries bycatch (post-MSA) • JV groundfish fisheries bycatch • Domestic groundfish fisheries bycatch	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions; gear modifications	• Domestic observer program to monitor bycatch • BSAI FMP Amendment 57 – banned non-pelagic gear in pollock fisheries– may decrease sculpin bycatch • Conversion to pelagic pollock fishery (1996) – may have indirectly reduced sculpin bycatch
Change to Important Habitat	• External groundfish fisheries bottom trawling	• MSA bottom trawl fisheries	• Unknown	• BSAI FMP Amendment 57 – banned non-pelagic gear in pollock fisheries • Conversion to pelagic pollock fishery (1996) • BSAI FMP 55/65 – EFH/HAPC designed to protect habitat
Change in Reproductive Success	• Spatial/temporal concentration of external fisheries may over exploit a given sex at certain times of the year. • Habitat alterations may impact reproductive success.	• Spatial/temporal concentration of MSA fisheries may over exploit a geiven sex at certain times of the year. • Habitat alterations may impact reproductive success.	• Unknown	• Unknown

Comparative Baseline:

- Minimal life history and distribution information for sculpin species in the BSAI and GOA.
- BSAI and GOA survey biomass estimates are uncertain.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI - Bering Sea and Aleutian Islands
EFH - essential fish habitat
FMP - fisheries management plan
GOA - Gulf of Alaska
HAPC - habitat areas of particular concern
JV - joint venture
MSA - Magnuson-Stevens Act
N/A - not applicable

Table 3.5-126. Estimated total catch of sculpins (mt) in the Bering Sea and Aleutian Islands and Gulf of Alaska, 1997-2000.

BSAI					GOA				
1997	**1998**	**1999**	**2000**	**2001**	**1997**	**1998**	**1999**	**2000**	**2001**
7,478	6,286	5,470	7,087	7,670	907	541	544	943	601

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
mt - metric tons

Source: Graichas 2002; NORPAC observer database and year-end estimates of target species catch from the NMFS Regional Office BLEND database.

Table 3.5-127. Shark past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality Bycatch	• Foreign groundfish fisheries (pre-MSA) bycatch • IPHC halibut longline fisheries bycatch • State of Alaska shark sport fisheries • State of Alaska groundfish fisheries bycatch	• Foreign fisheries bycatch (post-MSA) • JV fisheries bycatch • Domestic groundfish fisheries bycatch	• Bilateral agreement with Japan and USSR (1973)	• 1977 BSAI Preliminary FMP - established observers in foreign fisheries • Annual ABC/TAC limits • Domestic observer program to monitor bycatch • BSAI FMP Amendment 57 – banned non-pelagic gear in pollock fisheries • Conversion to pelagic pollock fishery (1996)
Change in Reproductive Success	• Spatial/temporal concentration of external fisheries may over exploit a given sex at certain times of the year. • Habitat alterations may impact reproductive success.	• Spatial/temporal concentration of MSA fisheries may over exploit a given sex at certain times of the year. • Habitat alterations may impact reproductive success.	• Unknown	• Unknown

Comparative Baseline:

- Minimal life history and distribution information for shark species in the BSAI and GOA.
- The survey biomass estimates for shark in the BSAI and GOA are uncertain.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC - acceptable biological catch
BSAI - Bering Sea and Aleutian Islands
FMP - fisheries management plan
GOA - Gulf of Alaska
IPHC - International Pacific Halibut Commission
JV - joint venture
MSA - Magnuson-Stevens Act
TAC - total allowable catch

Table 3.5-128. Catch (number) of Bering Sea and Aleutian Islands and Gulf of Alaska Pacific sleeper shark in from the sablefish longline survey, 1979-2000.

Year	Number
1979	0
1980	1
1981	1
1982	1
1983	0
1984	5
1985	10
1986	9
1987	27
1988	21
1989	45
1990	33
1991	34
1992	74
1993	110
1994	175
1995	61
1996	86
1997	103
1998	91
1999	93
2000	111

Source: Courtney and Sigler 2002.

Table 3.5-129. Estimated total catch (mt) of sharks in the Bering Sea and Aleutian Islands and Gulf of Alaska, 1997-2001.

Species	BSAI					GOA				
	1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
Dogfish	4	6	5	9	17	658	865	314	398	494
Salmon	7	18	30	23	24	124	71	132	38	33
Sleeper shark	304	336	319	490	687	136	74	558	608	249
Unidentified shark	53	136	176	68	35	124	1,380	33	74	77

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
mt - metric tons

Source: Gaichas 2002; NORPAC observer database and year-end estimates of target species catch from the NMFS Regional Office BLEND database.

Table 3.5-130. Skate species identified in Alaska Fisheries Science Center bottom trawl surveys.

Species	Common Name	Bering Sea 1999	Aleutian Islands 1997	GOA 1999	Other Records
Raja binoculata	Big skate	X	X	X	
Raja rhina	Longnose skate		X	X	
Raja stellulata	Starry skate				Pre-1990
Bathyraja interrupta	Bering skate	X	X	X	
Bathyraja tanaretzi	Mud skate	X	X	X	
Bathyraja trachura	Black skate		X	X	
Bathyraja parmifera	Alaska skate	X	X	X	
Bathyraja aleutica	Aleutian skate	X	X	X	
Bathyraja lindberghi	Commander skate		X	X	
Bathyraja maculata	Whiteblotched skate	X	X	X	
Bathyraja minispinosa	Whitebrow skate	X	X		
Bathyraja violacea	Okhotsk skate	X			
Bathyraja smirnovi	Golden skate				1983 BSAI
Bathyraja spinosissima	White skate				1983 Aleutian Islands
Bathyraja abyssicola	Deepsea skate				Pre-1995

Notes: BSAI – Bering Sea and Aleutian Islands
GOA – Gulf of Alaska

Table 3.5-131. Skate life history information available for Bering Sea and Aleutian Islands and Gulf of Alaska species.

Species	Common Name	Maximum Length (cm)[1]	Maximum Age (years)	Age and Length at Maturity[2]	Feeding Mode[3]	No./ Egg Case[1]	Depth Range (m)[4]	Estimated Natural Mortality Rate
Raja binoculata	Big skate	180–240	?	8–12 yrs 109–130 cm	Predatory[1]	1-7	3–800[5]	0.10
Raja rhina	Longnose skate	137	?	7–10 yrs 74–100 cm	?	1	25–675[5]	0.10
Bathyraja interrupta	Bering skate	86	?	?	Benthophagic	1	50–1380	0.10
Bathyraja tanaretzi	Mud skate	70[6]	?	?	?	1		0.10
Bathyraja trachura		89	?	?	?	1	800–2,050	0.10
Bathyraja parmifera		61–91, 113[6]	?	?	Predatory	1	25–300	0.10
Bathyraja aleutica	Aleutian skate	120–150	?	?	Predatory	1	300–950	0.10
Bathyraja lindberghi	Commander skate	93[6]	Black skate	?	?	1	175–950	0.10
Bathyraja maculata	Whiteblotched skate	120[6]	Alaska skate	?	Predatory	1	175–550	0.10
Bathyraja minispinosa	Whitebrow skate	82[6]	?	?	Benthophagic	1	100–1400	0.10
Bathyraja violacea	Okhotsk skate	150[6]	?	?	Benthophagic	1	25–500	0.10

Notes: cm - centimeters
m - meters
yrs - years
? - data not available
[1]Eschemeyer 1983 (assuming that B. kincaidii = B. interrupta).
[2]Zeiner and Wolf 1993.
[3]Orlov 1998,1999 (benthophagic eats mainly amphipods and worms. Predatory diet primarily fish and cephalopods).
[4]McEachran and Miyake 1990b.
[5]Allen and Smith 1988.
[6]Species identification notes by Jay Orr (American Fisheries Science Center).

Table 3.5-132. Skate past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality Bycatch	C Foreign groundfish fisheries (pre-MSA) bycatch C IPHC halibut longline fisheries bycatch C State of Alaska groundfish fisheries bycatch C State of Alaska sport halibut fisheries bycatch	C Foreign, fisheries bycatch (post MSA) C JV fisheries bycatch C Domestic groundfish fisheries bycatch	C Bilateral agreement with Japan and USSR (1973): Reduced catch of groundfish and thus bycatch C Industry self-imposed actions	C 1977 BSAI Preliminary FMP - established observers in foreign fisheries C Domestic observer program to monitor bycatch
Change in Reproductive Success	C Bycatch in external fisheries could over exploit rarer species C Bycatch in external fisheries could over exploit immature skates, affecting population	C Bycatch in MSA fisheries could overexploit rarer species C Bycatch in MSA fisheries could over exploit immature skates, affecting population	C Unknown	C Unknown

Comparative Baseline:

- Little life history or distribution information is currently known of the different skate species existing within the BSAI and GOA.
- The survey biomass estimates for skate in the BSAI and GOA are uncertain.
- Skates make up the majority of the other species bycatch.
-

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI - Bering Sea and Aleutian Islands
FMP - fisheries management plan
GOA - Gulf of Alaska
IPHC - International Pacific Halibut Commission
JV - joint venture
MSA - Magnuson-Stevens Act

Table 3.5-133. Estimated total catch (mt) of skates in the Bering Sea and Aleutian Islands and Gulf of Alaska, 1997-2001.

BSAI					GOA				
1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
17,747	19,318	14,080	18,877	20,571	3,120	4,476	2,000	3,238	1,828

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
mt - metric tons
Sources: Gaichas 2002; NORPAC observer database and year-end estimates of target species catch from the NMFS Regional Office BLEND database.

Table 3.5-134. Estimated aggregate biomass (metric tons) of skate species complex from bottom trawl surveys.

Year	Eastern Bering Sea	Aleutian Islands	Gulf of Alaska
1979	74,400		
1980	123,100	10,100	
1981	127,400		
1982	173,200		
1983	166,000	16,300	
1984	190,500		38,800
1985	154,000		
1986	258,000	19,500	
1987	350,800		36,400
1988	452,100		
1989	414,000		
1990	583,800		38,500
1991	467,300	16,500	
1992	377,500		
1993	375,000		63,200
1994	414,200	26,200	
1995	391,800		
1996	423,900		81,200
1997	393,700	30,600	
1998	354,200		
1999	370,500		112,900

Table 3.5-135. Estimated biomass (metric tons) of common skate species from recent bottom trawl surveys.

Year	Area	Species	Biomass Estimate
1999	Eastern Bering Sea	*Bathyraja parmifera*	337,998
		Bathyraja interrupta	23,694
		All (6) other skate species	8,580
1999	Gulf of Alaska	*Raja binoculata*	54,612
		Raja rhina	39,336
		Bathyraja aleutica	11,290
		Bathyraja interrupta	3,817
		All (5) other skate species	3,788
1997	Aleutian Islands	*Bathyraja maculata*	13,729
		Bathyraja parmifera	8,435
		Bathyraja aleutica	4,878
		Bathyraja tanaretzi	1,002
		All (6) other skate species	2,629

Table 3.5-136. Estimated catch (metric tons) of all skate species combined by gear and target fishery.

Bering Sea and Aleutian Islands					Gulf of Alaska				
Gear	**1997**	**1998**	**1999**	**Average**	**Gear**	**1997**	**1998**	**1999**	**Average**
Bottom trawl	3,619	5,169	3,601	4,130	Bottom trawl	2,247	1,166	926	1,446
Pelagic trawl	311	204	359	291	Pelagic trawl	5	15	20	14
Pot	1	0	1	1	Pot	1	0	0	0
Longline	13,816	13,945	10,118	12,627	Longline	867	3,295	1,054	1,738
Total	**17,747**	**19,318**	**14,080**	**17,048**	**Total**	**3,120**	**4,476**	**2,000**	**3,199**
Target Species	**1997**	**1998**	**1999**	**Average**	**Target Species**	**1997**	**1998**	**1999**	**Average**
Arrowtooth	2	118	27	49	Arrowtooth	133	21	49	67
Atka	111	131	127	123	Cod	954	873	1,174	1,000
Cod	14,016	14,305	10,636	12,985	Deep water	42	31	17	30
Flathead	777	1,868	1,215	1,287	Demersal shelf	200		22	111
Other flats	39	103	69	71	Flathead sole	139	130		134
Other rockfish	110	1	1	37	Northern	4	9	15	9
Other species		10	26	18	Other species	446	138	0	195
Other targets	0	3	1	1	Pelagic shelf	8	15	11	11
Pacific ocean	30	40	54	41	Pacific ocean	52	15	44	37
Pollock B[a]	52	205	28	95	Pollock B[a]	29	41	19	30
Pollock P[b]	298	200	347	282	Pollock P[b]	2	11	5	6
Rock sole	679	559	322	520	Rex sole	489	172	331	331
Sablefish	266	110	110	162	Sablefish	166	2,834	243	1,081
Shortraker/ rougheye		6	0	3	Shallow water flats	427	186	70	228
Turbot	157	300	338	265	Shortraker/ rougheye	28		1	14
Yellowfin sole	1,211	1,359	778	1,116	Thornyheads	1			1
Total	**17,747**	**19,318**	**14,080**	**17,048**	**Total**	**3,120**	**4,476**	**2,000**	**3,199**

Notes: [a]When pollock is majority of retained catch, but less than 95 percent of total catch.
[b]When catch of pollock is more than 95 percent of total catch.

Table 3.5-137. Octopi past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality Catch/Bycatch	• Foreign groundfish fisheries (pre-MSA) bycatch • State of Alaska directed fisheries • State of Alaska groundfish fisheries bycatch • State of Alaska crab fisheries bycatch	• Foreign Fisheries bycatch (post-MSA) • JV fisheries bycatch • Domestic groundfish fisheries bycatch	• Bilateral agreement with Japan and USSR (1973) • Industry self-imposed actions	• 1977 BSAI Preliminary FMP - established observers in foreign fisheries • Domestic observer program to monitor bycatch
Change in Reproductive Success	• Spatial/temporal concentration of external fisheries may over exploit a given sex at certain times of the year	• Spatial/temporal concentration of MSA fisheries may over exploit a given sex at certain times of the year	• Unknown	• Unknown

Comparative Baseline:

- Minimal life history and distribution information for octopus species in the BSAI and GOA.
- No accurate survey biomass estimates exist for octopi species in the BSAI or GOA.
- The octopi complex represents a relatively low proportion of the non-target species bycatch in the BSAI and GOA groundfish fisheries.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI - Bering Sea and Aleutian Islands
FMP - fisheries management plan
GOA - Gulf of Alaska
JV - joint venture
MSA - Magnuson-Stevens Act

Table 3.5-138 Estimated total catch (mt) of octopi in the Bering Sea and Aleutian Islands and Gulf of Alaska, 1997-2001.

BSAI					GOA				
1997	**1998**	**1999**	**2000**	**2001**	**1997**	**1998**	**1999**	**2000**	**2001**
248	190	326	418	227	232	112	166	176	88

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
mt - metric tons

Source: Gaichas 2002.

Table 3.5-139. Biological and reproductive attributes of selected osmeridae species in the Bering Sea and Aleutian Islands and Gulf of Alaska.

		HABITAT ASSOCIATIONS															
		Location						Substrate				Pelagic Domain				Oceanography	
	Life stage/activity	Beach (intertidal)	Inner shelf (1-50m)	Middle shelf (50-100m)	Outer shelf (100-200m)	Upper slope (200-1000m)	Bay/estuaries	Sand/granule	Gravel	Cobble	Not applicable	Near surface	Pelagic	Semi-demersal/semi-pelagic	Demersal	Fronts	Edges (ice, bathymetric)
Capelin	A	X	X	X	X			X	X				X	X	X	X	X
	J		X	X							X		X			X	X
	L		X	X							X	X	X				
	E	X						X		X					X		
Eulachon	A			X	X	X	X	X		X			X		X	X	
	J			X	X	X					X		X			X	
	L		X								X		X				
	E						X	X		X					X		

Table 3.5-139 (cont.). Biological and reproductive attributes of selected osmeridae species in the Bering Sea and Aleutian Islands and Gulf of Alaska.

Notes: A - adult
E - early juvenile
J - juvenile
L - larvae

Source: NPFMC 1999b

Table 3.5-140. Habitat associations of selected osmeridae species in the Bering Sea and Aleutian Islands and Gulf of Alaska.

		HABITAT ASSOCIATIONS																													
		Location										Substrate								Vegetation		Pelagic Domain					Oceanography				
	Life stage/activity	Beach (intertidal)	Inner shelf (1-50m)	Middle shelf (50-100m)	Outer shelf (100-200m)	Upper slope (200-1000m)	Lower slope (>1000m)	Basin (>3000m)	Bay/estuaries	Island pass	Not known	Mud/clay/silt	Sand/granule	Gravel	Pebble	Cobble	Boulder	Bedrock	Not applicable	Kelp forest	Sea grasses	Near surface	Pelagic	Semi-demersal/semi-pelagic	Demersal	Not Known	Upwelling Zone	Gyres	Thermo/pycnocline	Fronts	Edges (ice, bathymetric)
Capelin	A	X	X	X	X								X	X									X	X	X					X	X
	J		X	X															X				X							X	X
	L		X	X															X			X	X								
	E	X											X			X									X						
Eulachon	A			X	X	X			X				X			X							X		X					X	
	J			X	X	X													X				X							X	
	L		X																X				X								
	E								X				X			X									X						

Notes: A - adult
E - early juvenile
J - juvenile
L - larvea

Source: NPFMC 1999, Environmental Assessment for Essential Fish Habitat.

Table 3.5-141. The diet[1,2] of selected eastern Bering Sea shelf groundfish species.

Rank	Pollock	Cod	Arrowtooth Flounder	Pacific Halibut	Greenland Halibut
1	Euphausiids (44.9)	Pollock (49.1)	Pollock (67.4)	Pollock (53.9)	Pollock (74.8)
2	Pollock (17.0)	Offal (12.1)	Miscellaneous fish (15.3)	Flatfish (9.0)	Squid (11.1)
3	Copepods (11.4)	Brachyuran crab (10.3)	Herring (5.4)	Brachyuran crabs (7.8)	Miscellaneous fish (6.2)
4	Shrimp (8.0)	Miscellaneous fish (7.6)	Offal (3.6)	Misc. fish (7.6)	Offal (4.1)
5	Amphipods (4.1)	Flatfish (7.1)	Amphipods (1.8)	Anomuran crabs (4.6)	Flatfish (1.2)
6	Mysids (3.2)	Anomuran crabs (3.4)	Squid (1.8)	Cod (4.3)	Cod (0.9)
7	Miscellaneous fish (2.8)	Shrimp (2.5)	Euphausiids (1.5)	Offal (4.1)	Herring (0.7)
8	Offal (1.1)	Polychaete worms (1.0)	Flatfish (1.0)	*Sand lance* (2.2)	*Myctophids* (0.2)
9	*Capelin* (0.7)	*Sand lance* (0.8)	Scorpaenids (0.3)	*Capelin* (1.8)	Shrimp (0.2)
10	*Sand lance* (0.5)	Gastropods (0.5)	*Capelin* (0.2)	Herring (1.1)	Cyclopterids (0.2)
Other forage fish	*Osmerids* (<0.1) *Bathylagids* (<0.1) *Myctophids* (<0.1) *Eulachon* (<0.1)	*Capelin* (0.1) *Osmerids* (<0.1) *Bathylagids* (<0.1) *Myctophids* (<0.1) *Eulachon* (<0.1)	*Eulachon* (0.2) *Osmerids* (0.1) *Myctophids* (<0.1) *Sand lance* (<0.1)	*Osmerids* (0.1) *Eulachon* (<0.1)	*Bathylagids* (0.1) *Osmerids* (<0.1) *Sand lance* (<0.1)
Rank	**Yellowfin Sole**	**Rock Sole**	**Alaska Plaice**	**Flathead Sole**	**Skates**
1	Echiuroid worms (22.4)	Polychaete worms (44.9)	Polychaete worms (55.5)	Echinoderms (28.3)	Pollock (56.7)
2	Bivalves (18.5)	*Sand lance* (14.3)	Bivalves (11.1)	Pollock (25.6)	Miscellaneous fish (9.9)
3	Polychaete worms (18.1)	Echiuroid worms (11.0)	Echiuroid worms (10.7)	Shrimp (12.8)	Brachyuran crabs (8.8)
4	Amphipods (7.0)	Amphipods (7.2)	Sipunculid worms (10.7)	Miscellaneous fish (5.8)	Flatfish (6.7)
5	Echinoderms (3.7)	Bivalves (5.1)	Amphipods (4.6)	Euphausiids (4.5)	Shrimp (5.5)
6	Anomuran crabs (3.7)	Sipunculid worms (5.0)	Priapulid worms (2.8)	Offal (3.9)	Offal (5.2)
7	Euphausiids (3.2)	Echinoderms (2.8)	Exhinoderms (2.0)	Mysids (3.5)	Anomuran crabs (3.1)
8	Shrimp (3.1)	Shrimp (2.0)	Unidentified crustaceans (0.6)	Bivalves (3.1)	Ampipods (1.3)
9	Gastropods (2.6)	Miscellaneous fish (1.6)	*Sand lance* (0.5)	Anomuran crab (2.5)	*Sand lance* (0.7)
10	Brachyuran crabs (2.4)	Priapulid worms (1.5)	Brachyuran crabs (0.2)	Brachyuran crab (2.3)	Cod (0.4)
Other forage fish	*Sand lance* (0.6) *Bathylagids* (<0.1) *Capelin* (<0.1)	*Osmerids* (<0.1)	N/A	*Capelin* (1.3) *Sand lance* (0.5) *Osmerids* (0.1) *Myctophids* (<0.1)	*Capelin* (0.1) *Sandfish* (0.1) *Myctophids* (<0.1)

Table 3.5-141 (cont.). The diet[1,2] of selected eastern Bering Sea shelf groundfish species.

Notes: [1]Forage fish in the diet appear in italics.

[2]Numbers in parentheses represent percent by weight contribution to the diet.
N/A – indicates no other forage fish in the diet.

Source: NMFS, unpublished data.

Table 3.5-142. Diet[1,2] of selected eastern Bering Sea slope groundfish species.

Rank	Greenland Halibut	Flathead Sole	Arrowtooth Flounder	Pollock	Cod
1	Pollock (58.3)	Echinoderm (49.6)	Pollock (55.4)	Euphausiids (26.4)	Pollock (51.4)
2	Squid (18.5)	Offal (23.7)	Miscellaneous fish (15.9)	Shrimp (16.4)	Offal (9.7)
3	Offal (11.9)	Scorpaenidae (10.1)	Squid (11.3)	Pollock (15.8)	Miscellaneous fish (9.1)
4	Miscellaneous fish (5.0)	Shrimp (4.2)	Herring (11.1)	Squid (8.3)	Shrimp (8.6)
5	Cyclopterids (2.7)	Miscellaneous fish (4.0)	Shrimp (4.6)	Miscellaneous fish (7.0)	Brachyuran crab (6.2)
6	Flatfish (0.8)	Pollock (2.9)	Offal (0.7)	*Bathylagids* (7.0)	Flatfish (4.0)
7	Herring (0.6)	Polychaete worms (1.6)	Echinoderm (0.3)	*Myctophids* (5.5)	Herring (3.5)
8	*Bathylagids* (0.4)	Brachyuran crab (1.4)	Miscellaneous Unidentified (0.3)	Offal (3.7)	Squid (1.9)
9	*Myctophids* (0.4)	Squid (0.4)	Euphausiids (0.2)	Copepods (2.2)	Cod (1.0)
10	Anomuran crab (0.1)	Mysid (0.4)	*Myctophids* (0.2)	Herring (2.5)	Polychaete worms (0.9)
Other forage fish	N/A	*Myctophids* (0.3) *Bathylagids* (0.1)	N/A	*Osmerids* (0.1) *Sand lance* (<0.1)	*Bathylagids* (<0.1)

Notes: [1]Forage fish in the diet appear in italics.
[2]Numbers in parentheses represent percent by weight contribution to the diet.
N/A – No other forage fish in the diet.

Source: Lang and Livingston 1996.

Table 3.5-143. Percent by weight of important prey consumed by groundfish in the Aleutian Islands.

Prey	Predator										
	Arrowtooth Flounder	Pacific Halibut	Pacific Cod	Greenland Turbot	Pollock	Shortspine thornyhead	Rougheye Rockfish	Shortraker Rockfish	Atka Mackerel	Pacific Ocean Perch	Northern Rockfish
Atka mackerel	44	12	27	0	0	0	0	0	0	0	0
Pollock	13	19	17	1	0	0	0	0	2	0	0
Herring	-	2	1	0	0	0	0	0	0	0	0
Capelin	0	5	0	0	-	0	0	0	0	0	0
Myctophid	7	0	3	28	37	0	4	15	1	34	1
Bathylagid	0	0	-	13	1	0	0	0	0	0	0
Pacific sand lance	-	-	-	0	-	0	0	0	0	0	0
Eulachon	0	0	0	0	-	0	0	0	0	0	0
Tanner crab	0	7	2	0	-	0	0	0	-	0	0
Cottid	3	1	7	0	-	51	0	19	-	0	0
Cyclopterid	-	-	-	0	-	1	45	0	0	0	0
Shrimp	2	-	10	0	4	23	45	32	-	0	3
Cephalopods	3	27	12	50	2	-	0	3	8	2	1
Euphausiids	5	-	-	0	43	1	2	1	55	51	50
Calanoid copepods	-	0	-	0	3	0	0	0	17	7	17

Notes: - indicates less than 1 percent.
Source: Yang 1996.

Table 3.5-144. Percent by weight of important prey consumed by groundfish in the Gulf of Alaska.

Prey	Predator										
	Arrowtooth Flounder	Pacific Halibut	Sablefish	Pacific Cod	Pollock	Shortspine Thornyhead	Rougheye Rockfish	Shortraker Rockfish	Dusky Rockfish	Pacific Ocean Perch	Northern Rockfish
Pollock	66	57	24	7	2	1	0	0	0	0	0
Herring	9	0	2	-	-	0	0	0	0	0	0
Capelin	8	1	-	2	13	1	0	0	0	0	0
Pacific sand lance	-	1	-	-	-	0	0	0	0	0	0
Eulachon	1	-	6	-	0	0	0	0	0	0	0
Atka mackerel	1	0	0	0	0	0	0	0	0	0	0
Bathylagid	0	0	0	0	-	0	0	0	0	0	0
Myctophid	0	0	-	0	0	0	0	18	0	1	0
Tanner crab	0	6	-	12	0	1	2	0	0	-	-
Pandalids	4	-	4	9	19	54	51	0	4	2	0
Cephalopods	2	5	8	10	3	1	21	82	6	1	-
Offal	1	7	29	13	0	0	0	0	0	0	0
Euphausiids	3	0	7	1	39	0	2	0	69	87	96
Calanoid copepods	0	0	0	0	1	0	0	0	2	2	3

Notes: - indicates less than 1 percent.
Source: Yang and Nelson 2000.

Table 3.5-145. Bering Sea and Aleutian Islands and Gulf of Alaska forage fish past/present effects.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality	• Foreign groundfish fisheries (pre-MSA) • State of Alaska capelin fishery • Subsistence and personal use fisheries • Marine pollution and oil spills	• Foreign, JV and domestic groundfish fisheries (post-MSA) • Marine pollution and oil spills	• State of Alaska capelin fishery regulations • International laws regarding marine pollutants • Clean Water Act • OPA 90	• Annual ABC/TAC limits • BSAI/GOA FMP Amendment 36/39 – protect forage fish from developing into a commercial fishery, forage fish established as bycatch only
Change in Reproductive Success	• Foreign groundfish fisheries (pre-MSA) predator removal • Climate changes and regime shifts	• Foreign, JV and domestic groundfish fisheries (post-MSA) predator removal		
Change in Prey Availability	• Climate changes and regime shifts • Introduction of exotic species • Marine pollution and oil spills	• Introduction of exotic species • Marine pollution and oil spills	• International laws regarding marine pollutants • Clean Water Act •OPA 90	•
Change in Important Habitat	• Foreign groundfish fisheries (pre-MSA) fishery gear impacts • Climate changes and regime shifts • Introduction of exotic species • Marine pollution and oil spills	• Foreign, JV and domestic (post-MSA) fishery gear impacts • Introduction of exotic species • Marine pollution and oil spills	• International laws regarding marine pollutants • Clean Water Act •OPA 90 •Industry self-regulations: modification to gear	• Steller sea lion conservation measures • Reduction in use of bottom trawl gear

Comparative Baseline:

- Abundance data is limited or does not exist for most species groups within the forage fish category.
- Forage fish category has been limited to bycatch only.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.

Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
ABC – acceptable biological catch
JV – joint venture
MSA – Magnuson-Stevens Act
N/A – not applicable
TAC – total allowable catch

Table 3.5-146. Estimated catch (metric tons) of forage fish by target fishery and gear type by groundfish fisheries in the Bering Sea and Aleutian Islands and the Gulf of Alaska, 1999.

Target	Gear	Target Catch	Osmerids	Sandfish	Others [a]
Bering Sea and Aleutian Islands					
Atka mackerel	Trawl	43,025	0	0	0
Pollock	Bottom trawl	64,527	38	0	0
Pollock	Pelagic trawl	730,413	39	0	0
Pacific cod	Trawl	26,925	1	1	0
Pacific cod	Pot	4,268	0	0	0
Pacific cod	Longline	6,436	0	0	0
Flatfish	Trawl	1,712	20	0	0
Rockfish	Trawl	12,101	0	0	0
Rockfish	Longline	7	0	0	0
Rock sole	Trawl	0	0	0	0
Sablefish	All	0	0	0	0
Turbot	Trawl	591	0	0	0
Turbot	Longline	2,371	0	0	0
Yellowfin sole	Trawl	33,217	2	0	0
All species	Trawl	922,618	61	2	0
All species	Pot	4,282	0	0	0
All species	Longline	63,171	0	0	0
Gulf of Alaska					
Pollock	Bottom trawl	2,530	2	0	0
Pollock	Pelagic trawl	26,235	23	0	0
Pacific cod	Trawl	4,868	15	0	0
Pacific cod	Pot	1,575	45	0	0
Pacific cod	Longline	1,406	1	0	0
Flatfish	Trawl	13,556	9	0	0
Flatfish	Longline	1	0	0	0
Rockfish	Trawl	9,957	101	0	0
Rockfish	Longline	10	0	0	0
Sablefish	Trawl	84	0	0	0
Sablefish	Longline	1,843	2	0	0
All species	Trawl	48,365	150	0	0
All species	Pot	1,575	45	0	0
All species	Longline	7,866	22	0	0

Notes: [a]Composed of bathylagids, gunnels, and pricklebacks.

Table 3.5-147. Estimated total bycatch (mt) of smelt, by region, from 1997-2001.

BSAI					GOA				
1997	**1998**	**1999**	**2000**	**2001**	**1997**	**1998**	**1999**	**2000**	**2001**
29.8	36.6	45.3	51.7	80.1	23.1	122.7	26.1	123.8	534.8

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
mt - metric tons
Source: Mark Nelson, personal communication - January 22, 2003

Table 3.5-148. Estimated total bycatch (mt) of lanternfish, by region, from 1997-2001.

BSAI					GOA				
1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
0.4	0.4	0	0.1	0.3	0	0	0	0	0

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
mt - metric tons

Source: **Mark Nelson, personal communication - January 22, 2003

Table 3.5-149. Estimated total bycatch (mt) of sandlance, by region, from 1997-2001.

BSAI					GOA				
1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
0.1	0	0	0.1	0.1	0	0	0.1	0.4	0

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
mt - metric tons

Source: Mark Nelson, personal communication - January 22, 2003.

Table 3.5-150. Estimated total bycatch (mt) of sandfish, by region, from 1997-2001.

BSAI					GOA				
1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
1.1	0.4	3.3	20.3	1.8	3.7	2.2	0.5	0.3	1.2

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
mt - metric tons

Source: Mark Nelson, personal communication - January 22, 2003.

Table 3.5-151. Estimated total bycatch (mt) of gunnels, by region, from 1997-2001.

BSAI					GOA				
1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
0	0	0	0	0	0.1	0	0	0	0

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
mt - metric tons

Source: Mark Nelson, personal communication - January 22, 2003

Table 3.5-152. Estimated total bycatch (mt) of Sticheidae (pricklebacks), by region, from 1997-2001.

BSAI					GOA				
1997	1998	1999	2000	2001	1997	1998	1999	2000	2001
0.4	0.2	0	0.1	0.4	0.3	0	3.5	0.5	4.7

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
mt - metric tons

Source: Mark Nelson, personal communication - January 23, 2002.

Table 3.5-153. Estimated populations and principal diets of seabirds that breed in the Bering Sea and Aleutian Islands and Gulf of Alaska regions.

Species	Population[a,b] BSAI	GOA	Diet[c,d]
Northern Fulmar (*Fulmarus glacialis*)	1.500,000	600,000	Q,M,P,S,F,Z,I,C
Fork-tailed Storm-Petrel (*Oceanodroma furcata*)	4,500,000	1,200,000	Q,I,Z,C,P,F
Leach's Storm-Petrel (*Oceanodroma leucorrhoa*)	4,500,000	1,500,000	Z,Q,F,I
Double-crested Cormorant (*Phalacrocorax auritis)*[e]	9,000	8,000	F,I
Pelagic Cormorant (*Phalacrocorax pelagicus*)	80,000	70,000	S,C,P,H,F,I
Red-faced Cormorant (*Phalacrocorax urile*)	90,000	40,000	C,S,H,F,I
Brandt's Cormorant (*Phalacrocorax penicillatus*)	0	Rare	H,F,G,I
Pomarine Jaeger (*Stercorarius pomarinus*)	Uncommon-Rare	Uncommon	C,S,F
Parasitic Jaeger (*Stercorarius parasiticus*)	Uncommon	Uncommon	C,S,F
Long-tailed Jaeger (*Stercorarius longicaudus*)	Uncommon	Rare	C,S,F
Bonaparte's Gull (*Larus philadelphia*)	Rare	Uncommon	Z,I,F
Mew Gull (*Larus canus*)[e]	700	40,000	C,S,I,D,Z
Herring Gull (*Larus argentatus*)[e]	50	300	C,S,H,F,I,D
Glaucous-winged Gull (*Larus glaucescens*)	150,000	300,000	C,S,H,F,I,D
Glaucous Gull (*Larus hyperboreus*)[e]	30,000	2,000	C,S,H,I,D
Black-legged Kittiwake (*Rissa tridactyla*)	800,000	1,000,000	C,S,H,P,F,M,Z
Red-legged Kittiwake (*Rissa brevirostris*)	150,000	0	M,C,S,Z,P,F
Sabine's Gull (*Xema sabini*)	Uncommon	Uncommon	F,Q,Z
Arctic Tern (*Sterna paradisaea*)[e]	7,000	20,000	C,S,Z,F,H
Aleutian Tern (*Sterna aleutica*)	9,000	25,000	C,S,Z,F
Common Murre (*Uria aalge*)	3,000,000	2,000,000	C,S,H,G,F,Z
Thick-billed Murre (*Uria lomvia*)	5,000,000	200,000	C,S,P,Q,Z,M,F,I
Pigeon Guillemot (*Cepphus columba*)	100,000	100,000	S,C,F,H,P,I,G,Q
Black Guillemot (*Cepphus grylle)*	Rare	0	S,F,I
Marbled Murrelet (*Brachyramphus marmoratus*)	Uncommon	Common	C,S,H,P,F,G,Z,I
Kittlitz's Murrelet (*Brachyramphus brevirostris*)	Uncommon	Uncommon	S,C,H,Z,I,P,F
Ancient Murrelet (*Synthliboramphus antiquus*)	200,000	600,000	Z,F,C,S,P,I
Cassin's Auklet (*Ptychoramphus aleuticus*)	250,000	750,000	Z,Q,I,S,F
Least Auklet (*Aethia pusilla*)	9,000,000	50	Z
Parakeet Auklet (*Cyclorrhynchus psittacula*)	800,000	150,000	F,I,S,P,Z,C,H
Whiskered Auklet (*Aethia pygmaea*)	30,000	0	Z
Crested Auklet (*Aethia cristatella*)	3,000,000	50,000	Z,I

Table 3.5-153 (cont.). Estimated populations and principal diets of seabirds that breed in the Bering Sea and Aleutian Islands and Gulf of Alaska regions.

Species	Population[a,b] BSAI	GOA	Diet[c,d]
Rhinoceros Auklet (*Cerorhinca monocerata*)	50	200,000	C,S,H,A,F
Tufted Puffin (*Fratercula cirrhata*)	2,500,000	1,500,000	C,S,P,H,F,Q,Z,I
Horned Puffin (*Fratercula corniculata*)	500,000	1,500,000	C,S,P,H,F,Q,Z,I
Total	**36,000,000**	**12,000,000**	

Notes: [a] Population data for colonial seabirds that breed in coastal colonies were modified from USFWS 1998a. Estimates are minimal, especially for storm-petrels, auklets, and puffins.

[b] Numerical estimates are not available for species that do not breed in coastal colonies. Approximate numbers: abundant 10^6; common = 10^5 to 10^6; uncommon = 10^3 to 10^5; rare #10^3.

[c] Abbreviations of diet components: M, Myctophid; P, walleye pollock; G, other gadids; C, capelin; S, sandlance; H, herring; A, Pacific saury; F, other fish; Q, squid; Z, zooplankton; I, other invertebrates; D, detritus; ?, no information for Alaska. Diet components are listed in approximate order of importance. However, diets depend on availability and usually are dominated by one or a few items (NPFMC 2000). [d] For sources of diet data, see species accounts in seabird section of NPFMC 2000.

[e] Species breeds both coastally and inland; population estimate is only for coastal colonies.

Table 3.5-154. Comparative population estimates and diets of nonbreeding seabirds that frequent the Bering Sea and Aleutian Islands and Gulf of Alaska regions.

Species	Population[a,b]			Diet[c,d]
	BSAI	GOA	World[e]	
Short-tailed Albatross (*Phoebastria albatrus*)	Rare	Rare	1,600	Q,F,I
Black-footed Albatross (*Phoebastria nigripes*)	Uncommon	Common	250,000	Q,M,F,I,D
Laysan Albatross (*Phoebastria immutabilis*)	Common	Common	2.5 million	Q,M,F,I
Sooty Shearwater (*Puffinus griseus*)	Common	Abundant	>30 million	M,C,S,A,Q,S,F,Z,I
Short-tailed Shearwater (*Puffinus tenuirostris*)	Abundant	Common	23 million	Z,I, C,Q, F,S
Ivory Gull (*Pagophila eburnea*)	Uncommon	0	~35,000	M,P,R,I,F,Q

Notes: [a]Population data for colonial seabirds that breed in coastal colonies were modified from USFWS 1998a. Estimates are minimal, especially for storm-petrels, auklets, and puffins.

[b]Numerical estimates are not available for species that do not breed in coastal colonies. Approximate numbers: abundant $\geq 10^6$; common = 10^5 to 10^6; uncommon = 10^3 to 10^5; rare $\leq 10^3$.

[c]Abbreviations of diet components: M, Myctophid; P, walleye pollock; G, other gadids; C, capelin; S, sandlance; H, herring; A, Pacific saury; F, other fish; Q, squid; Z, zooplankton; I, other invertebrates; D, detritus; ?, no information for Alaska. Diet components are listed in approximate order of importance. However, diets depend on availability and are usually dominated by one or a few items (see text seabird section of NPFMC 2000).

[d]For sources of diet data, see species accounts in text.

[e]World population estimates are provided solely to provide a relative scale. In populations where multiple breeding colonies exist, any analysis of effects on populations must be considered at the colony level, not at the global level. These estimates provided by: Hasegawa, pers. comm.; Whittow, 1993; Whittow, 1993; C. Baduini, pers. comm.; Oka et al 1987; USFWS. Species breeds both coastally and inland; population estimate is only for coastal colonies.

Table 3.5-155. Numbers of northern fur seals, Steller sea lions, and harbor seals in parts of the Gulf of Alaska and Bering Sea.

Year	Northern Fur Seal	Steller Sea Lion[a]	Harbor Seal[b]
1950	451,000		
1955	461,000		
1960	320,000	140,115	
1965	253,768		
1970	230,485		
1975	278,261	103,976	
1976	298,000		6,919
1977	235,200		6,617
1978	247,100		4,839
1979	245,932		3,836
1980	203,825		
1981	179,444		
1982	203,581		1,575
1983	165,941		
1984	173,274		1,390
1985	182,258	67,617	
1986	167,656		1,270
1987	171,422		
1988	202,300		1,014
1989	171,530	24,953	
1990	201,310	27,860	960

Notes: [a]Index counts of adults and juveniles on rookeries and haulouts from the Kenai Peninsula to Kiska Island are from Loughlin et al. (1990) and Merrick et al. (1991, 1987).
[b]Mean counts of seals hauled out on Tugidak Island during the fall molt are from Pitcher (1990) and ADF&G (unpublished data).

Table 3.5-156. Rank of prey species in the diets of northern fur seals, Steller sea lions, and harbor seals in the Gulf of Alaska and Bering Sea.

Ranking	Northern Fur Seal[a]	Steller Sea Lion[b]	Harbor Seal[c]
1	Squids (33.3)	Pollock (58.3)	Pollock (21.4)
2	Capelin (30.6)	Herring (20.6)	Octopus (18.3)
3	Pollock (25.1)	Capelin (7.4)	Eulachon (11.6)
4	Atka mackerel (3.5)	Salmon (5.1)	Capelin (10.4)
5	Herring (2.9)	Squid (4.2)	Herring (6.4)
6	Bathylagidae (2.9)	Sculpins (1.3)	Salmon (4.4)
7	Salmon (1.1)	Pacific cod (0.9)	Shrimps (3.3)
8	Flatfishes (0.6)	Rockfishes (0.8)	Pacific cod (3.2)
9	Sablefish (0.2)	Flatfishes (0.3)	Flatfishes (2.6)
10	Sand lance (0.2)	Octopus (<0.1)	Squids (1.6)

Notes: [a]Rankings based on modified volume, numbers in parentheses are modified volumes; from Perez and Bigg (1981).
[b]Rankings based on combination rank index, numbers in parentheses are percent of total sample volume; from Pitcher and Calkins (1981).
[c]Rankings based on modified index of relative importance, numbers in parentheses are percent of total sample volume; from Pitcher (1980a, 1980b).

Table 3.5-157. Life history information available for common Gulf of Alaska grenadier species.

Species	Common Name	Maximum Length (cm)	Maximum Age (years)	Age and Length at Maturity	Feeding Mode and Fecundity	Depth Range (meters)	Estimate of Natural Mortality Rate
Albatrossia pectoralis[a]	Giant grenadier	150 TL	56	10–16 yrs 50–56 cm TL	?	140–1,200	0.074
Coryphaenoides acrolepis[b]	Pacific grenadier	84 TL	73	20–40 yrs 46–65 cm TL	?	600–2,500	0.057
Coryphaenoide	Popeye	56 TL	?	?	?	225–2,832	0.074

Notes: [a]Burton 1999
[b]Andrews et al. 1999
[c]Macrourid life history project notes provided by Jerry Hoff (American Fisheries Science Center)
cm – centimeters
TL - total length

Table 3.5-158. Estimated catches (mt) of non-target species groups[1], 1997 to 1999, with average.

Fishery Management Plan Category	Species Group	Bering Sea and Aleutian Islands				Gulf of Alaska			
		1997	1998	1999	Average	1997	1998	1999	Average
Forage	Gunnels	0	0	0	0	0	0	0	0
Forage	Lantern fishes	0	0	0	0	0	0	0	0
Forage	Sandfish	1	0	3	2	4	2	1	2
Forage	Sand lances	0	0	0	0	0	0	0	0
Forage	Smelts	30	37	45	37	23	123	26	57
Forage	Sticheidae	0	0	0	0	0	0	4	1
Nonspecified	Anemones	183	114	172	156	18	16	17	17
Nonspecified	Benthic Invertebrates	673	531	226	477	25	31	25	27
Nonspecified	Birds	29	43	24	32	2	6	6	5
Nonspecified	Corals	39	28	52	40	4	8	1	4
Nonspecified	Crabs	304	186	109	200	15	25	11	17
Nonspecified	Echinoderms	45	24	30	33	23	32	8	21
Nonspecified	Grenadiers	5,852	6,589	7,388	6,610	12,029	14,683	11,388	12,700
Nonspecified	Invertebrates unidentified	1,609	638	140	796	8	43	1	17
Nonspecified	Jellyfish	8,849	7,148	7,153	7,717	36	167	107	103
Nonspecified	Other fish species	1,569	1,363	1,327	1,420	576	8,400	819	3,265
Nonspecified	Sea pens and sea whips	3	2	5	3	1	3	3	2
Nonspecified	Shrimps	3	2	1	2	4	2	1	2
Nonspecified	Sponges	530	501	322	451	4	4	13	7
Nonspecified	Starfish	6,191	3,287	3,051	4,177	987	1,245	1,510	1,247
Nonspecified	Tunicates	1,794	728	372	965	2	1	0	1
Other	Dogfish	4	6	5	5	657	865	314	612
Other	Octopus	248	190	326	255	232	112	166	170
Other	Salmon sharks	7	18	30	18	124	71	132	109
Other	Sculpins	7,478	6,285	5,470	6,411	907	541	544	664
Other	Sharks unidentified	53	136	176	122	123	1,380	33	512
Other	Skates	17,747	19,318	14,080	17,048	3,120	4,476	2,000	3,199
Other	Sleeper sharks	304	336	319	320	136	74	558	256
Other	Squids	1,573	1,256	502	1,110	97	59	41	66

Notes: [1]Prohibited species catch is excluded from totals; it is reported in Section 4.6.
mt - metric tons

Table 3.5-159. Estimated catch (mt) of all grenadier species combined by gear and target fishery.

Bering Sea and Aleutian Islands					Gulf of Alaska				
Gear	**1997**	**1998**	**1999**	**Averag**	**Gear**	**1997**	**1998**	**1999**	**Average**
Bottom-trawl	214	241	132	195	Bottom-trawl	965	655	529	716
Pelagic trawl	36	41	79	52	Pelagic trawl	28	5	81	38
Pot	0	0	0	0	Pot	0	0	0	0
Longline	5,602	6,307	7,177	6,362	Longline	11,037	14,023	10,777	11,946
Total	5,852	6,589	7,388	6,610	Total	12,029	14,683	11,388	12,700
Target Species	**1997**	**1998**	**1999**	**Averag**	**Target**	**1997**	**1998**	**1999**	**Average**
Arrowtooth	0	1	43	15	Arrowtooth	102	28	140	90
Atka mackerel	10	92	1	34	Cod	191	1	439	211
Cod	835	693	571	700	Deep water flats	318	232	285	278
Flathead	3	11	3	6	Demersal shelf rockfish	0		0	0
Other flats	0	0	6	2	Flathead sole	46	6		26
Other rockfish	232	1	4	79	Northern rockfish	44	149	2	65
Other species		0	59	29	Other species	0	0	0	0
Other targets	0	0	0	0	Pelagic shelf rockfish	83	7	26	39
Pollock B[a]	0	0	0	0	Pollock B[a]	0	2	29	10
Pollock P[b]	36	41	79	52	Pollock P[b]	28	0	52	27
Pacific ocean perch	149	104	115	123	Pacific ocean perch	185	136	29	117
Rock sole	0	0	0	0	Rex sole	166	77	26	90
Sablefish	2,309	881	2,008	1,732	Sablefish	10,806	14,023	10,351	11,727
Shortraker/ rougheye		49	0	24	Shallow water flats	20	21	0	14
Turbot	2,276	4,713	4,499	3,830	Shortraker/ rougheye	2		8	5
Yellowfin sole	1	3	0	1	Thornyheads	38			38
Total	5,852	6,589	7,388	6,610	Total	12,029	14,683	11,388	12,700

Notes: [a]Pollock is majority of retained catch, but less than 95 percent of total catch.
[b]Pollock is more than 95 percent of total catch.

Table 3.5-160. Bering Sea and Aleutian Islands and Gulf of Alaska grenadier past/present effect.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality Bycatch	• Foreign groundfish fisheries (pre-MSA) bycatch • State of Alaska groundfish fisheries bycatch	• Foreign fisheries bycatch (post MSA) • JV fisheries bycatch • Domestic groundfish fisheries bycatch	• Bilateral Agreement between Japan, USSR and US	• GOA FMP Amendment 5 – grenadier bycatch in sablefish fishery; separate management of grenadier • GOA FMP Amendment 8 – established non-specified category • Observer program monitors bycatch
Change in Reproductive Success	• Spatial concentration of external fisheries bycatch; may over exploit one sex over the other in sex-specific aggregations • Possible to over exploit rarer species in bycatch	• Spatial concentration of MSA fisheries bycatch; may over exploit one sex over the other in sex-specific aggregations • Possible to over exploit rarer species in bycatch	• Unknown	• Unknown

Comparative Baseline:

- Biomass estimates were collected in 1999 for giant grenadier, but accurate biomass data does not exist for other species of grenadier.
- Grenadiers make up the largest portion of the non-target species bycatch in the GOA.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
FMP - fisheries management plan
GOA - Gulf of Alaska
JV - joint venture
MSA - Magnuson-Stevens Act
N/A - not applicable

Table 3.5-161. Estimated aggregate biomass (mt) of grenadier species complex from trawl surveys.

Year	Eastern Bering Sea	Aleutian Islands	Gulf of Alaska
1979	91,500		
1980		322,400	
1981	90,500		
1982	104,700		
1983		364,100	
1984			169,800
1985	107,600		
1986		618,100	
1987			136,000
1988	61,400		
1989			
1990			
1991	38,100		
1992			
1993			
1994			
1995			
1996			
1997			
1998			
1999			410,820

Notes: mt - metric tons

Table 3.5-162. Observed Gulf of Alaska fishery catch[1] (mt) of grenadiers by average depth and gear type, 1999.

Observed Longline Catch						Observed Bottom Trawl Catch					
Depth Range (meters)	1997	1998	1999	Average	Percentage by Depth	Depth Range (meters)	1997	1998	1999	Average	Percentage by Depth
10–100	0	3	5	3	0.10	10–100	3	1	1	2	0.64
101–200	81	48	48	59	2.00	101–200	87	111	23	74	24.70
201–300	1,080	1,876	958	1,305	44.37	201–300	190	141	117	149	50.03
301–500	1,860	1,549	1,284	1,564	53.19	301–500	66	81	74	74	24.63
501–700	1	8	0	3	0.10	501–700	0	0	0	0	0
701–1,000	0	0	12	4	0.14	701–1000	0	0	0	0	0
1,000+	0	0	10	3	0.11	1000+	0	0	0	0	0
Total	3,022	3,484	2,317	2,941	100.00	Total	346	335	216	299	100.00

Notes: [1]Data are from observed sampled sets and hauls only in each year, which is why the total is substantially less than the overall estimated catch of grenadiers in each year. This, in part, reflects the lower level of observer coverage in the Gulf of Alaska.

Table 3.6-1. Time series of groundfish management measures and closure areas protecting habitat under Bering Sea and Aleutian Islands and Gulf of Alaska fishery management plans.

Year	Location	Season	Area Size	Notes
Bering Sea and Aleutian Islands				
1982 - BSAI groundfish FMP; descriptions of fish habitat, gear restrictions and several no-trawl zones.				
1983 - NOAA Fisheries adopts a National Habitat Conservation Policy.				
1985 - Intentional discarding of fishing gear and debris prohibited.				
1986 - MSA amended to give Council's authority to protect habitat and recommend habitat protection measures.				
1986 - Habitat policy added to BSAI FMP.				
1987	Area 512	Year-round	8,000 nm^2	Trawling prohibited to protect king crab habitat
	Area 516	3/15-6/15	4,000 nm^2	Trawling prohibited during crab molting period
1995	Chum Salmon Savings Area	8/1-8/31	5,000 nm^2	Re-closed if 42,000 chum salmon bycaught
	Chinook Salmon Savings Area	Trigger	9,000 nm^2	Closed if 48,000 chinook salmon bycaught
	Herring Savings Area	Trigger	30,000 nm^2	Closed to specified trawl fisheries when trigger reached
	Zone 1	Trigger	30,000 nm^2	Closed to specified trawl fisheries when trigger reached
	Zone 2	Trigger	50,000 nm^2	Closed to specified trawl fisheries when trigger reached
	Pribilof Islands	Year-round	7,000 nm^2	Established to protect red king crab habitat
	Red King Crab Savings Area	Year-round	4,000 nm^2	Bottom trawling prohibited by emergency rule, pelagic trawling allowed.
	Walrus Islands	5/1-9/30	900 nm^2	12–mile no-fishing zones around 3 haulouts
	Steller sea lion rookeries	Year-round	5,800 nm^2	10–mile no-trawl zones around 27 rookeries
	Steller sea lion rookeries	Seasonal extension	5,100 nm^2	20–mile extensions around 8 rookeries
1996 - Same closures in effect as in 1995.				
1997 - Red King Crab Savings Area permanently established as year-round closure area.				
1997 - Same closures in effect as in 1995 and 1996, with two additions:				
1997	Nearshore Bristol Bay	Year-round	19,000 nm^2	Expanded Area 512 closure
	Opilio Tanner Crab Bycatch Limitation Zone	Trigger	90,000 nm^2	Closed to specified trawl fisheries when trigger reached
1998 - Same closures in effect as in 1995, 1996, and 1997.				
1999 - Same closures in effect as in 1995, 1996, 1997, and 1998.				
2000 - Non-pelagic trawls prohibited in BSAI pollock fisheries.				
2000 - Same closures in effect as in 1995, 1996, 1997, and 1998 with three additions:				
2000	EBS and AI Pollock Trawl exclusion zones	Year-round	11,900 nm^2 (includes GOA)	Trawling for pollock prohibited for Steller sea lion protection
	EBS and AI Pollock Trawl exclusion zones	Jan-June	14,800 nm^2 (includes GOA)	Trawling for pollock prohibited for Steller sea lion protection
	EBS and AI Trawl exclusion zones	Year-round	29,000 nm^2 (includes GOA)	Trawling for Atka mackerel restricted for Steller sea lion protection
2001 - Same closures in effect as in 1995, 1996, 1997, 1998, 1999, and 2000.				

Table 3.6-1 (cont). Time series of groundfish management measures and closure areas protecting habitat under Bering Sea and Aleutian Islands and Gulf of Alaska fishery management plans.

Year	Location	Season	Area Size	Notes
2002 - Same closures in effect as in 1995, 1996, 1997, 1998, 1999, 2000, and 2001.				
Gulf of Alaska				
1978 - GOA groundfish FMP; descriptions of fish habitat, gear restrictions, and area closures to foreign fishing.				
1985 - NOAA Fisheries habitat policy added to GOA FMP.				
1987	Kodiak	Year-round	1,000 nm^2	Trawling prohibited; Intended to protect juvenile red king crab habitat
	Kodiak	2/15-6/15	500 nm^2	Trawling prohibited; Intended to protect juvenile red king crab habitat
1990 - Kodiak trawl closures extended.				
1993 - Kodiak no-trawl zones made permanent.				
1995	Steller sea lion rookeries	Year-round	3,000 nm^2	10–mile no-trawl zones around 14 rookeries
	Steller sea lion rookeries	Seasonal extension	1,900 nm^2	20–mile no-trawl extensions around 3 rookeries
1996 and 1997 - Same closures in effect as in 1995.				
1998 - Same closures in effect as in 1995, 1996, and 1997, with one addition:				
1998	Southeast Trawl areas	Year-round	52,600 nm^2 (1,929 nm^2 on the shelf)	Adopted as part of license limitation program, all trawling prohibited east of 140°
1999 - Additional closures to protect Steller sea lion critical habitat and:				
1999	Sitka Pinnacles Marine Reserve	Year-round	3.1 nm^2	Closure to all commercial gear
2000 - Same closures in effect as in 1995, 1996, 1997, 1998, and 1999 plus:				
2000	GOA Pollock Trawl exclusion zones	Year-round	11,900 nm^2 (includes EBS & AI)	Steller sea lion protection
	GOA Pollock Trawl exclusion zones	Jan-June	14,800 nm^2 (includes EBS & AI)	Steller sea lion protection
	Cook Inlet Trawl Closure	Year-round	7,000 nm^2 (includes State waters	Control crab bycatch and protect crab habitat in an area with depressed King and Tanner crab stocks.
2001 - Same closures in effect as in 1995, 1996, 1997, 1998, 1999, and 2000.				
2002 - Same closures in effect as in 1995, 1996, 1997, 1998, 1999, 2000, and 2001.				

Notes: AI - Aleutian Islands
BSAI - Bering Sea and Aleutian Islands
EBS - eastern Bering Sea
FMP - fishery management plan
GOA - Gulf of Alaska
nm^2 - square nautical miles

Sources: Draft PSEIS 2001and NPFMC, C. Coon.

Table 3.6-2. Habitat past and present effects.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
(1) Changes to Non-Living Habitat Cross reference effects (see Section 3.6.4.3): a) Alteration of Physical Structure b) Sediment Resuspension c) Chemical and Physical Modification of the Water Column	Dredging (for scallops, clams, and/or for navigation) Foreign fisheries pre-MSA (1958-1976) Foreign fisheries post-MSA (1976-1985) State of Alaska Trawl fisheries Longline/pots • IPHC • Shrimp pot fisheries • State crab fisheries • Subsistence Offal discharge from non-FMP regulated fisheries; onshore processing plants Vessel groundings/sinkings Port Constr./Devel.[1] Petrol. Exp./Facilities[1] Oil/HazMat Release Storm Surges Wind–induced Waves Volcanic Eruptions Earthquakes/underwater landslides	JV fisheries (1980-1991) Domestic bottom trawl fisheries (1988-present): • Pollock • Rockfish • Atka mackerel. • Flatfish • P. Cod Domestic Longline/pots: • Pacific cod • Sablefish • Rockfish Offal discharge from domestic fishing vessels; catcher processors Vessel groundings/sinkings	Bilateral agreement with Japan and USSR (1973): Self-monitoring of foreign fishery in EBS Industry self-imposed actions – gear modifications Clean Water Act OPA 90 International laws regarding marine pollutants	Fishing equipment restrictions: • Seasonal and areal restrictions on the use of specified equipment • Equipment modifications • Prohibitions on anchoring or setting equipment in sensitive areas • Prohibitions on fishing activities that cause physical damage Time/Area Closures • Seasonal closures • Year round closures Reduction in fishing effort • Annual TAC/ABC limits • PSC limits BSAI/GOA FMP 55/65 – EFH/HAPC designed to protect habitat

Comparative Baseline:
Adversely Impacted
Non-living Habitat Baseline
Physical characteristics:
Bering Sea
- Large, relatively shallow (<100m) plain consisting of mud, sand, sand and mud, and gravels. Boulders and smaller rock are scattered.
- Bedrock and gravel shelf break relatively far offshore, as compared to the Aleutian Islands.
- Non-living shell hash is common.

Aleutian Islands
- Volcanic island system consisting of higher relief and vertical rock wall bedrock ledges with numerous rock and gravel passes, canyons, and trenches.
- Shelf break relatively nearshore.

Gulf of Alaska
- Diverse rock, cobble, gravel, sand, and mud slope extending to bedrock shelf break consisting of canyons, banks, and flats.

Non-living habitats have been historically exposed to fishing activity. Generally, theses habitats can be categorized into hard substrates (bedrock, boulders), coarse substrates (cobble, gravel) and soft substrates (sand, mud). Harder substrates are considered static with some local relocation of smaller boulders. Softer and coarse substrates are thought to be altered in some degree, but the extent of these alterations is not well known.

Physical benthic information is limited to site-specific investigations. Existing information includes recent Bering Sea sampling grid efforts, older OCSEAP investigations for a portion for the Central Gulf of Alaska, and no specific physical mapping effort for the Aleutian Islands. A complete representation of the physical benthic environment for Alaska does not exist.

Table 3.6-2 (cont.). Habitat past and present effects.

(2) Changes to Living Habitat a) Direct Mortality of Benthic Organisms b) Changes to Benthic Community Structure	Dredging (for clams, scallops, and/or for navigation) Foreign fisheries pre-MSA (1958-1976) Foreign fisheries post-MSA (1976-1985) State of Alaska Trawl fisheries Longline/pots • IPHC • Shrimp pot fisheries • State crab fisheries • Subsistence Offal discharge from non-FMP regulated fisheries; onshore processing plants Vessel groundings/sinkings Port constr./devel.[1] Petrol. exp./facilities[1] Oil/HazMat release Toxic algal blooms Intro. of exotic species Climatic changes Storm surges Wind–induced waves Volcanic eruptions Earthquakes/underwater landslides	JV fisheries (1980-1991) Domestic bottom trawl fisheries (1988-present): • Pollock • Rockfish • Atka mackerel. • Flatfish • P. Cod Domestic Longline/pots • Pacific cod • Sablefish • Rockfish Offal discharge Vessel groundings/sinkings	Bilateral agreement with Japan and USSR (1973): Self-monitoring of foreign fishery in EBS Industry self-imposed actions – gear modifications Clean Water Act OPA 90 International laws regarding marine pollutants	Fishing equipment restrictions: • Seasonal and areal restrictions on the use of specified equipment • Equipment modifications • Prohibitions on anchoring or setting equipment in sensitive areas • Prohibitions on fishing activities that cause physical damage Time/Area Closures • Seasonal closures • Year round closures Reduction in fishing effort • Annual TAC/ABC limits • PSC limits BSAI/GOA FMP 55/65 – EFH/HAPC designed to protect habitat

Living-Habitat Baseline:
Bering Sea
- Diverse benthic community consisting of infauna and epifauna such as sponges, soft and hard corals, anemones, and bryozoans.

Aleutian Islands
- Rich, diverse, concentrated benthic bio-structures such as sponges, soft corals, tree corals, and anemones.

Gulf of Alaska
- Diverse benthic community consisting of infauna and epifauna such as sponges, tree corals, soft corals, anemones, and bryozoans.

Benthic habitats have been exposed to fishing in larger areas of the Bering Sea, smaller areas in the Gulf of Alaska, and in more discrete locations in the Aleutian Islands. Benthic community diversity has been altered in these areas. However, the direct association of the fishing intensity and the degree of diversity alteration remains relatively unknown. Information suggests that areas subject to high disturbance notice some change in species diversity, as compared to similar habitats or historical species distribution.

Habitat Impacts modeling indicates that biostrucure has been reduced in these locations. In the Bering Sea, impacts to biostructure range from 1.8 to 9% of the fishable EEZ and 8.2 to 41.9% of the fished area. In the Aleutian Islands, baseline impacts ranged from 1.1 to 6.8% of the fishable EZ and 5.4 to 32.6% of the fished area. In the GOA, baseline effects averaged over the entire fishable EEZ range from 0.9 to 6.9% and 3.8 to 29% of the fished area.

Long-lived corals and sponges are more prevalent in the Aleutian Islands. These organisms have life history traits that make them very susceptible to fishery-induced mortality. Past fishing practices likely have had lingering effects on these species.

Table 3.6-2 (cont.). Habitat past and present effects.

(3) Changes in Distribution of Fishing Effort a) Geographic diversity of management measures	Dredging (for clams, scallops, and/or for navigation) Foreign fisheries pre-MSA (1958-1976) Foreign fisheries post-MSA (1976-1985) Russian pollock fishery (1976-present) State of Alaska trawl fisheries Longline/pots • IPHC • Shrimp pot fisheries • State crab fisheries • Subsistence	JV fisheries (1980-1991) Domestic bottom trawl fisheries (1988-present): • Pollock • Rockfish • Atka mackerel. • Flatfish • P. Cod Domestic Longline/pots • Pacific cod • Sablefish • Rockfish	Bilateral agreement with Japan and USSR (1973): Self-monitoring of foreign fishery in EBS	Fishing equipment restrictions: • Seasonal and areal restrictions on the use of specified equipment • Equipment modifications • Prohibitions on anchoring or setting equipment in sensitive areas • Prohibitions on fishing activities that cause physical damage Time/Area Closures • Seasonal closures • Year round closures Reduction in fishing effort • Annual TAC/ABC limits • PSC limits BSAI/GOA FMP 55/65 – EFH/HAPC designed to protect habitat

Distribution of Fishing Effort Baseline:
Bering Sea
- Bottom trawl fisheries mainly target shallow and deepwater flatfish, Pacific cod, and rockfish.
- Pelagic fisheries mainly target Walleye pollock and Atka mackerel.
- Pot gear fisheries mainly target Pacific cod, sablefish, and crab.
- Longline fisheries mainly target sablefish and rockfish.

Aleutian Islands
- Bottom trawl fisheries mainly target Pacific cod, Atka mackerel, and Pacific Ocean perch.
- Pelagic fisheries mainly target Walleye pollock.
- Pot gear fisheries mainly target Pacific cod, sablefish, and crab.
- Longline fisheries mainly target sablefish and rockfish.

Gulf of Alaska
- Bottom trawl fisheries mainly target Pacific cod, flatfish, and rockfish.
- Pelagic fisheries mainly target Walleye pollock and Atka mackerel.
- Pot gear fisheries mainly target Pacific cod, sablefish and crab.
- Longline fisheries mainly target sablefish and rockfish.

Fishery Management Plans for the Bering Sea/Aleutian Islands and Gulf of Alaska distribute effort to specific fishery management units with the plan. Areas are seasonally and permanently closed to a particular gear type and afford protection of habitats. In the Gulf of Alaska, there exists a large permanently closed area to a trawl gear and a mixture of seasonal closures. In the Bering Sea, there is a mixture of open fishing areas adjacent to areas closed to fishing. In the Aleutian Islands, closure areas exist for a limited number of fishing types and there are no permanent closure areas for all fishing activities.

Carry Forward for Cumulative Effects Analysis?
Yes

Notes: **External =** Natural, climatic, and human controlled events and actions not directly associated with the NOAA groundfish fisheries
Internal = Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries
[1]Anticipated external impact for GOA only.
ABC – acceptable biological catch
BSAI – Bering Sea and Aleutian Islands
EBS – eastern Bering Sea
FMP – fisheries management plan
GOA – Gulf of Alaska
HAPC – habitat areas of particular concern
IPHC – International Pacific Halibut Commission
JV – joint venture
PSC – prohibited species catch

Table 3.7-1. Annual estimates, by area, of total fishery effort, total numbers and bycatch rates of seabirds taken in longline fisheries.

Year	Effort (Number of hooks in thousands)	Number of Birds[1]	Bycatch Rate (Number of birds per 1,000 hooks)	Percent of Hooks Observed
Bering Sea and Aleutian Islands				
1993	123,232	7,975 (6981-8968)	0.06	24.5
1994	134,954	10,633 (9604-11662)	0.08	24.5
1995	141,779	19,214 (17853-20576)	0.14	24.2
1996	141,810	8,480 (7594-9366)	0.06	23.8
1997	176,534	18,063 (16491-19634)	0.10	22.6
1998	175,530	24,592 (22769-26415)	0.14	23.5
1999	157,319	12,409 (10940-13877)	0.08	25.0
2000	192,994	18,154 (16,562-19,746)	0.09	22.8
2001	226,186	9,992 (9,027-10,958)	0.04	21.0
Average Annual Estimates				
1993-1996	135,444	11,576 (11034-12117)	0.09	24.5
1997-2001	185,725	16,642 (15,966-17,318)	0.09	22.8
1993-2001	163,377	14,390 (13,344-14,836)	0.09	23.3
Gulf of Alaska				
1993	56,300	1,309 (1056-1563)	0.02	10.2
1994	49,452	532 (397-668)	0.01	4.9
1995	42,357	1,519 (1302-1736)	0.04	12.7
1996	33,195	1,631 (1203-2059)	0.05	10.8
1997	28,047	514 (338-689)	0.02	10.0
1998	29,399	1,495 (792-2198)	0.05	8.1
1999	31,895	1,093 (812-1375)	0.03	8.6
2000	35,345	742 (392-1,032)	0.02	6.5
2001	34,216	512 (311-713)	0.01	7.8

Table 3.7-1 (cont.). Annual estimates, by area, of total fishery effort, total numbers and bycatch rates of seabirds taken in longline fisheries.

Year	Effort (Number of hooks in thousands)	Number of Birds[1]	Bycatch Rate (Number of birds per 1,000 hooks)	Percent of Hooks Observed
Average Annual Estimates				
1993-1996	45,326	1,248 (1108-1388)	0.03	9.5
1997-2001	31,780	871 (696-1,047)	0.03	8.1
1993-2001	37,801	1,039 (923-1,154)	0.03	8.8

Notes: [1]Values in parentheses are 95 percent confidence bounds.

Table 3.7-2. Estimated total incidental catch[a] of seabirds by species or species groups[b] in Bering Sea and Aleutian Islands longline fisheries, 1993-2001.

Year	Actual Number Taken[c]	STAL	BFAL	LAAL	NOFU	Gull	SHWR	Unid. Tubenoses	Alcid	Other	Unid. ALB	Unid. Seabird	Total Bering Sea and Aleutian Islands
1993	1,942	0	11 (4-21)	617 (458-777)	4,251 (3416-5103)	853 (576-1130)	64 (22-107)	0	15 (4-30)	4 (1-10)	352 (188-517)	1,799 (1399-2200)	7,975 (6981-8968)
1994	2,700	0	37 (7-66)	311 (218-404)	4,826 (4185-5467)	1,734 (1297-2172)	675 (487-864)	350 (226-475)	4 (1-13)	4 (1-11)	76 (43-109)	2,615 (1956-3274)	10,633 (9604-11662)
1995	4,832	0	66 (26-107)	463 (267-660)	9,628 (8613-10643)	3,954 (3274-4634)	330 (225-434)	475 (253-697)	4 (1-11)	45 (16-74)	38 (19-57)	4,211 (3489-4933)	19,214 (17853-20576)
1996	2,002	4 (1-13)	20 (5-48)	234 (156-313)	5,636 (4817-6455)	1,487 (1232-1741)	487 (246-728)	14 (4-26)	46 (9-103)	49 (13-86)	60 (31-90)	442 (326-558)	8,480 (7594-9366)
1997	4,123	0	9 (2-22)	343 (252-433)	13,611 (12109-15122)	2,755 (2276-3234)	300 (154-445)	173 (103-243)	0	7 (2-16)	14 (3-28)	852 (519-1185)	18,063 16491-19634)
1998	5,851	8 (2-15)	9 (2-21)	1,431 (1068-1734)	15,533 (13873-17192)	4,413 (3732-5093)	1,131 (936-1326)	21 (5-38)	53 (24-82)	48 (15-81)	4 (1-11)	1,941 (1584-2297)	24,592 (22769-26415)
1999	3,293	0	18 (4-34)	573 (475-675)	7,843 (6477-9209)	2,208 (1816-2600)	449 (358-540)	409 (144-673)	4 (1-10)	47 (12-85)	0	859 (551-1167)	12,409 (10,940-13,877)
2000	3,868	0	16 (5-33)	441 (320-562)	10,941 (9,503-12,378)	4,504 3,857-5150	556 (414-697)	85 (44-125)	5 (1-14)	16 (4-30)	15 (3-30)	1,576 (1,166-1,985)	18,154 (16,462-19,746)
2001	1,987	0	4 (1-12)	425 (304-547)	5,517 (4,701-6,332)	2,459 (2,044-2,873)	457 (337-578)	94 (49-139)	2 (1-6)	33 (6-61)	5 (1-14)	997 (698-1,295)	9,992 (9,027-10,958)
Average Annual Estimate													
1993 - 1996	na	1 (0-4)	33 (18-48)	406 (336-477)	6,087 (5667-6508)	2,007 (1784-2230)	389 (307-471)	210 (146-274)	17 (3-33)	26 (13-38)	132 (89-175)	2,267 (2001-2533)	11,576 (11034-12117)
1997 - 2001	na	2 (0-4)	11 (5-18)	643 (558-728)	10,689 (10,069-11,309)	3,268 (3,028-3,507)	578 (514-643)	156 (100-213)	13 (6-19)	30 (18-43)	7 (2-13)	1,245 (1,091-1,399)	16,642 (15,966-17,318)
1993 - 2001	na	1 (0-3)	21 (14-29)	538 (481-595)	8,644 (8,252-9,036)	2,707 (2,541-2,874)	494 (443-545)	180 (137-223)	15 (7-23)	28 (19-37)	63 (43-82)	1,699 (1,553-1,845)	14,390 13,944-14,836

Table 3.7-2 (cont.). Estimated total incidental catch[a] of seabirds by species or species groups[b] in Bering Sea and Aleutian Islands longline fisheries, 1993-2001.

Notes: [a]Values in parentheses are 95 percent confidence bounds.
[b]Species or species group codes.
[c]Actual number taken is the total number of seabirds recorded dead in the observed hauls.
Alcid – Unidentified alcids (guillemots, murres, puffins, murrelets, auklets)
BFAL – Black-footed albatross
Gull – Unidentified gulls (herring gulls, glaucous gulls, glaucous-winged gulls)
LAAL – Laysan's albatross
na – data not available
NOFU – Northern fulmar
Other – Miscellaneous birds (could include loons, grebes, storm-petrels, cormorants, waterfowl, eiders, shorebirds, phalaropes, jaeger/skuas, red-legged kittiwakes, black-legged kittiwakes, terns)
SHWR – Unidentified shearwaters (unidentified dark shearwaters, sooty shearwaters, short-tailed shearwaters)
STAL – Short-tailed albatross,
Unidentified ALB – Unidentified albatrosses (could include short-tailed albatrosses, Layson's albatrosses, black-footed albatrosses)
Unidentified Tubenose – Unidentified procellariiformes (albatrosses, shearwaters, petrels)

Source: (NMFS observer data; analyzed by Alaska Fisheries Science Center/National Marine Mammal Laboratory, 2002). Spectacled eider, Steller's eider, marbled murrelet, red-legged kittiwake, and Kittlitz's murrelet were not reported by observers in any observed sample from 1993 to 2001. Although of these birds only the two eider species are listed under Endangered Species Act in the action area, USFWS identifies the other three species as "species of concern" because of low and/or declining population levels. "Species of concern" is an informal classification by the USFWS, Office of Migratory Bird Management. Inclusion on the "species of concern" list has no regulatory implications.

Table 3.7-3. Estimated total incidental catch[a] of seabirds by species or species groups[b] in Gulf of Alaska longline fisheries, 1993-2001.

Year	Actual Number Taken[c]	STAL	BFAL	LAAL	NOFU	Gull	SHWR	Unid. Tubenoses	Alcid	Other	Unid. ALB	Unid. Seabird	Total Gulf of Alaska
1993	318	0	29 (9-50)	125 (62-187)	833 (615-1052)	45 (12-77)	59 (18-99)	0	0	3 (1-7)	3 (1-9)	213 (107-318)	1,309 (1056-1563)
1994	126	0	7 (2-16)	169 (89-250)	258 (165-351)	30 (2-81)	26 (5-54)	0	0	0	8 (2-18)	33 (8-66)	532 (397-668)
1995	374	0	236 (169-304)	67 (35-99)	520 (348-692)	99 (53-145)	39 (9-69)	6 (1-16)	0	3 (2-6)	376 (275-476)	173 (105-240)	1,519 (1302-1736)
1996	250	0	658 (455-860)	154 (90-128)	665 (349-982)	121 6-317)	14 (2-35)	0	0	0	0	19 (3-42)	1,631 (1203-2059)
1997	74	0	99 (32-167)	40 (5-109)	307 (164-451)	46 (14-79)	9 (2-21)	0	0	0	0	12 (2-30)	514 (338-689)
1998	184	0	289 (25-596)	217 (56-378)	919 (308-1530)	53 (14-92)	13 (3-30)	0	0	0	4 (1-12)	0	1,495 (792-2198)
1999	159	0	183 (70-297)	202 (123-280)	277 (156-399)	358 (136-581)	50 (8-93)	0	0	7 (1-21)	0	16 (4-37)	1,093 (812-1375)
2000	72	0	139 (53-225)	93 (25-160)	297 (70-524)	179 (15-415)	0	0	0	0	0	34 (2-102)	742 (392-1,032)
2001	45	0	72 (20-124)	67 (6-128)	230 (115-344)	98 (4-244)	20 (1-58)	0	6 (1-18)	0	15 (1-44)	3 (1-9)	512 (311-713)
Average Annual Estimate													
1993-1996	na	0	233 (179-287)	129 (97-160)	569 461-677)	74 (21-127)	35 (19-50)	1 (0-4)	0	1 (0-3)	97 (71-122)	109 (76-142)	1,248 (1108-1388)
1997-2001	na	0	156 (86-227)	124 (81-167)	406 (268-544)	147 (75-219)	18 (6-31)	0	1 (0-4)	1 (0-5)	4 (0-10)	13 (1-28)	871 (696-1,047)
1993-2001	na	0	190 144-236	126 (98-154)	479 (388-569)	114 (68-161)	26 (16-36)	1 (0-2)	1 (0-2)	1 (0-4)	45 (33-57)	56 (39-73)	1,039 (923-1,154)

Table 3.7-3 (cont.). Estimated total incidental catch[a] of seabirds by species or species groups[b] in Gulf of Alaska longline fisheries, 1993-2001.

Notes: [a]Values in parentheses are 95 percent confidence bounds.
[b]Species or species group codes.
[c]Actual number taken is the total number of seabirds recorded dead in the observed hauls.
Alcid – Unidentified alcids (guillemots, murres, puffins, murrelets, auklets)
BFAL – Black-footed albatross
Gull – Unidentified gulls (herring gulls, glaucous gulls, glaucous-winged gulls)
LAAL – Laysan albatross
na – data not available
NOFU – Northern fulmar
Other – Miscellaneous birds (could include loons, grebes, storm-petrels, cormorants, waterfowl, eiders, shorebirds, phalaropes, jaeger/skuas, red-legged kittiwakes, black-legged kittiwakes, terns).
SHWR – Unidentified shearwaters (unidentified dark shearwaters, sooty shearwaters, short-tailed shearwaters).
STAL – Short-tailed albatross
Unidentified ALB – Unidentified albatrosses (could include short-tailed albatrosses, Layson's albatrosses, black-footed albatrosses).
Unidentified Tubenose – Unidentified procellariiformes (albatrosses, shearwaters, petrels)

Source: (NMFS Observer data; analyzed by Alaska Fisheries Science Center/National Marine Mammal Laboratory, 2002).
Spectacled eider, Steller's eider, marbled murrelet, red-legged kittiwake, and Kittlitz's murrelet were not reported by observers in any observed sample from 1993 to 2001. Although of these birds only the 2 eider species are listed under ESA in the action area, USFWS identifies the other 3 species as "species of concern" because of low and/or declining population levels. "Species of concern" is an informal classification by the USFWS, Office of Migratory Bird Management. Inclusion on the "species of concern" list has no regulatory implications.

Table 3.7-4. Range of estimates of total incidental catch of seabirds by species or species groups in the combined Bering Sea and Aleutian Islands and Gulf of Alaska trawl fisheries, 1997-2001.

Year	Actual Number Taken[a]	Estimate Range[b]	STAL	BFAL	LAAL	NOFU	Gull	SHWR	Unid. Tubenoses	Alcid	Other	Unid. ALB	Unid. Seabird	Total
1997	55	low	0	0	80	75	0	77	0	115	0	0	181	528
		high	0	0	149	343	0	662	0	115	0	0	1074	2343
1998	45	low	0	0	134	93	708	856	1	110	3	0	8	1912
		high	0	0	341	2617	1590	1238	163	543	2494	0	1035	10,020
1999	154	low	0	0	8	446	0	82	0	664	0	0	17	1218
		high	0	0	27	7810	0	812	0	730	85	0	663	10,187
2000	101	low	0	0	0	298	37	10	2	1	0	0	60	407
		high	0	0	0	9,432	114	3,034	155	182	0	0	480	13,397
2001	141	low	0	0	8	323	4	329	9	1	3	0	65	741
		high	0	0	150	9,255	288	887	863	68	297	0	681	12,488
Average Annual Estimate														
1997-2001	na	low	0	0	46	274	150	271	2	178	1	0	66	961
		high	0	0	133	5,891	398	1,327	236	340	575	0	787	9,687

Notes: [a]Actual number taken is the total number of seabirds recorded dead in the observed hauls.
[b]The high and low estimates result from different methodologies used by observers to sample the haul. "Low" from effort data of observed hauls based on largest sample unit actually used by observers for fish species monitoring ("whole sample approach"). "High" from effort data of observed hauls based on smallest sample unit actually used by observers for fish species monitoring ("basket sample approach").
BFAL – Black-footed albatross
Gull – Unidentified gulls (herring gulls, glaucous gulls, glaucous-winged gulls)
LAAL – Laysan's albatross
na – data not available
NOFU – Northern fulmar
Other – Miscellaneous birds (could include loons, grebes, storm-petrels, cormorants, waterfowl, eiders, shorebirds, phalaropes, jaeger/skuas, red-legged kittiwakes, black-legged kittiwakes, terns)
SHWR – Unidentified shearwaters (unidentified dark shearwaters, sooty shearwaters, short-tailed shearwaters)
STAL – Short-tailed albatross,
Unidentified ALB – Unidentified albatrosses (could include short-tailed albatrosses, Layson's albatrosses, black-footed albatrosses)
Unidentified Tubenose – Unidentified procellariiformes (albatrosses, shearwaters, petrels)

Table 3.7-5. Estimated total incidental catch[a] of seabirds by species or species groups in the combined Bering Sea and Aleutian Islands and Gulf of Alaska pot fisheries, 1993-2001.

Year	Actual Number Taken[b]	STAL	BFAL	LAAL	NOFU	Gull	SHWR	Unid. Tubenoses	Alcid	Other	Unid. ALB	Unid. Seabird	Total
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	6	0	0	0	9 (2-23)	3 (1-10)	7 (1-20)	0	19 (2-55)	0	0	0	39 (6-79)
1996	9	0	0	0	80 (7-174)	0	0	2 (1-6)	0	0	0	7 (1-19)	89 (9-183)
1997	4	0	0	0	14 (3-29)	0	0	0	9 (1-26)	0	0	0	23 (4-46)
1998	2	0	0	0	19 (1-54)	15 (1-44)	0	0	0	0	0	0	33 (2-79)
1999	47	0	0	0	166 (71-261)	0	9 (1-26)	14 (5-28)	0	0	0	0	189 (91-286)
2000	1	0	0	0	0	0	0	0	0	0	0	42 (1-22)	42 (1-22)
2001	3	0	0	0	13 (2-33)	3 (1-8)	0	0	0	0	0	0	16 (3-36)
Average Annual Estimate													
1993-1996	na	0	0	0	22 (2-46)	1 (0-3)	2 (0-5)	1 (0-2)	5 (0-14)	0	0	2 (0-5)	32 (6-58)
1997-2001	na	0	0	0	42 (21-64)	4 (0-10)	2 (0-6)	3 (1-6)	2 (0-6)	0	0	8 (0-25)	61 (33-88)
1993-2001	na	0	0	0	33 (17-49)	2 (0-6)	2 (0-5)	2 (0-4)	3 (0-8)	0	0	5 (0-15)	48 (28-67)

Notes: [a]Values in parentheses are 95 percent confidence bounds.
[b]Actual number taken is the total number of seabirds recorded dead in the observed hauls.
BFAL - Black-footed albatross
Gull - Unidentified gulls (herring gulls, glaucous gulls, glaucous-winged gulls)
LAAL – Laysan's albatross
na – data not available
NOFU - Northern fulmar
Other – Miscellaneous birds (could include loons, grebes, storm-petrels, cormorants, waterfowl, eiders, shorebirds, phalaropes, jaeger/skuas, red-legged kittiwakes, black-legged kittiwakes, terns)
SHWR - Unidentified shearwaters (unidentified dark shearwaters, sooty shearwaters, short-tailed shearwaters)
STAL - Short-tailed albatross,
Unidentified ALB - Unidentified albatrosses (could include short-tailed albatrosses, Layson's albatrosses, black-footed albatrosses)
Unidentified Tubenose - Unidentified procellariiformes (albatrosses, shearwaters, petrels)

Table 3.7-6. Black-footed albatross past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Feather hunters (1900) • Military activities at breeding colonies (1940s to 1970s) • Foreign fisheries incidental take (1960s to present) • Other U.S. longline fisheries	• Incidental take in MSA groundfish longline fisheries (1978 to present). • Observer Program data 1993-2001: estimated average take in BSAI = 21 birds per year and in GOA = 190 birds per year.	• Migratory Bird Treaty Act (1918) • U.N. Resolution (46/215) banning high-seas drift fishing (1992) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird /fishery interaction monitoring and research through Observer Program (1990 to present) • Seabird protection measures instituted for longline fleet (1997 to present) have reduced numbers of albatross taken in both BSAI and GOA.
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey •High-seas squid drift fisheries (1970s-1991)	• Impact unknown but presumed to be minimal	• U.N. Resolution (46/215) banning high-seas drift fishing (1992)	• Ban on targeting forage fish (BSAI/GOA FMP amendments 36/39, 1997)
Reduced fitness through consumption of fishery wastes	• Foreign fisheries and processing vessels throughout North Pacific • Other U.S. fisheries	• MSA groundfish vessels and at-sea processors (1979 to present). • Benefits of supplemental food offset by increased risk of take in gear.	• National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird protection measures prohibit discharge of fishery wastes over baited hooks (1997 to present)
Reduced fitness through consumption of plastics	• Numerous sources of raw plastic pellets and plastic consumer products on land and at sea	• Fishing vessels and processors contribute unknown amounts of plastic products	• MPPRCA (1987)	• Educational effort on importance of compliance with MPPRCA (1995 to present)

Comparative Baseline:

- Worldwide population about 300,000 but declining
- Concern for impacts of international longline fishing on declining population (incidental take)
- Seabird deterrence measures for BSAI/GOA longline fisheries have reduced incidental

Carry Forward for Cumulative Effects Analysis?

YES. Incidental take in longline fisheries expected to remain under all alternatives. Discussed in conjunction with Laysan albatross and

Table 3.7-6 (cont.). Black-footed albatross past/present effects.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MPPRCA – Marine Plastic Pollution Research and Control Act
MSA – Magnuson-Stevens Act

Table 3.7-7. Laysan albatross past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Feather hunters (1900) • Military activities at breeding colonies (1940s to 1970s) • High-seas squid drift fisheries may have taken over 100,000 Laysan's per year (1970s to 1991) • Foreign fisheries incidental take could exceed 15,000 birds per year at present (1960s to present) • Incidental take in other U.S. longline fisheries	• Incidental take in MSA groundfish longline fisheries (1978 to present). • Observer Program data 1993-2001: estimated average take in BSAI longlines = 629 birds per year and in GOA = 144 birds per year. • Incidental take in trawls averages 46-133 birds per year in the BSAI and GOA • Vessel and third wire strikes.	• Migratory Bird Treaty Act (1918) • U.N. Resolution (46/215) banning high-seas drift fishing (1992) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird /fishery interaction monitoring and research through Observer Program (1990 to present) • Seabird protection measures instituted for longline fleet (1997 to present) did not reduce numbers of Laysan albatross taken in either BSAI or GOA.
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey • High-seas squid drift fisheries (1970s-1991)	• Impact unknown but presumed to be minimal	• U.N. Resolution (46/215) banning high-seas drift fishing (1992)	• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through consumption of fishery wastes	• Foreign fisheries and processing vessels throughout North Pacific • Other U.S. fisheries	• MSA groundfish vessels and at-sea processors (1979 to present). • Benefits of supplemental food offset by increased risk of take in gear.	• National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird protection measures prohibit discharge of fishery wastes over baited hooks (1997 to present)
Reduced fitness through consumption of plastics	• Numerous sources of raw plastic pellets and plastic consumer products on land and at sea	• Fishing vessels and processors contribute unknown amounts of plastic products	• MPPRCA (1987)	• Educational effort on importance of compliance with MPPRCA (1995 to present)

Comparative Baseline:

- Worldwide population about 2.4 million but declining at largest nesting colony
- Concern for impacts of international longline fishing on declining population (incidental take)
- Seabird deterrence measures for BSAI/GOA longline fisheries have not reduced incidental take since 1997.
- Ongoing efforts to reduce incidental take guided by scientific evaluation of deterrence measures through Observer Program and directed research

Carry Forward for Cumulative Effects Analysis?

YES. Incidental take in longline fisheries expected to remain under all alternatives. Discussed in conjunction with black-footed

Table 3.7-7 (cont.). Laysan albatross past/present effects.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MMPRCA - Marine Plastic Pollution Research and Control Act

Table 3.7-8. Timeline of NOAA Alaska Region seabird activities and related seabird issues, as of May 31, 2002.

1980	USFWS proposes domestic Endangered Species Act listing of short-tailed albatross (short-tailed albatross is listed as endangered "outside of the United States," which would include in the Exclusive Economic Zone, 45 FR 49844, July 25, 1980. Proposed rule is not finalized.
1989	USFWS issues biological opinion under Section 7 of the Endangered Species Act that groundfish fisheries off Alaska (particularly hook-and-line and gillnet) have the potential for taking the endangered short-tailed albatross. Incidental take set at two birds per year; this is based on historical take (1983 and 1987).
1989	First pilot NMFS observer program for high seas squid fishery in North Pacific; information collected on marine mammal and bird takes. Japanese squid fishery expanding in North Pacific in mid-1970s.
1990	Squid observer training program relocated to NMFS Groundfish Observer Program (GFOP). Pat Gould brought in as principal investigator of seabird component of High Seas Driftnet Program. Gould recognizes need for GFOP to collect more extensive seabird bycatch data.
1992	Pilot program targeting hook-and-line fisheries initiated. Special project NMFS observers use special data forms, bird ID, take numbers, number of hooks, whether caught during set or retrieval.
	May 8, USFWS publishes proposed rule in *Federal Register* to list the spectacled eider as a threatened species throughout its range (57 FR 19852).
	NMFS section 7 ESA consultations with USFWS on potential effects of BSAI and GOA groundfish fisheries on listed species references the spectacled and Steller's eiders. USFWS determines that the groundfish fisheries are not likely to adversely affect either of the species. From 1995 on, the consultations focus on the short-tailed albatross.
1993	GFOP expands above seabird duties to all groundfish NMFS observers, to include sightings of sensitive species, sightings of miscellaneous species, bird/vessel interactions, gear-related mortality, intended and direct mortality, use of deterrent device by the vessel, detailed information found on leg bands of banded seabirds, and Seabird Daily Notes (record notes associated with seabirds).
	May 10, the USFWS publishes final rule in *Federal Register* to list the spectacled eider as a threatened species throughout its range (58 FR 27474).
1994	Numerous NMFS news releases, support of privately [to present] produced brochure to notify/educate public and industry about methods to reduce seabird bycatch.
	July 14, the USFWS publishes proposed rule in *Federal Register* to list the Alaska breeding population of the Steller's eider as a threatened species (58 FR 35896).
1995	USFWS amends biological opinion on short-tailed albatross to require that NMFS collect fishery observer data. Coordination with USFWS to begin process of estimating total seabird take in groundfish fisheries.
1996	North Pacific hook-and-line industry petitions the North Pacific Fishery Management Council for regulations to reduce seabird bycatch in hook-and-line fisheries (November).
1997	
Feb:	USFWS amends biological opinion on short-tailed albatross, incidental take revised to four birds per two years; reasonable and prudent measures revised to require regulations for seabird avoidance

Table 3.7-8 (cont.). Timeline of NOAA Alaska Region seabird activities and related seabird issues, as of May 31, 2002.

	measures and to require development of a plan to test the effectiveness of such measures; conservation recommendations added.
Mar:	Proposed rule published in *Federal Register* that would require groundfish hook-and-line vessels to use seabird avoidance measures (62 FR 10016).
Mar:	Begin involvement in United Nation's Food and Agriculture Organization (FAO) initiative to reduce incidental catch of seabirds in global longline fisheries; NMFS and USFWS are co-leads for the Interagency Seabird Team.
Apr:	Final rule published in *Federal Register* requiring groundfish hook-and-line vessels to use seabird avoidance measures (62 FR 23176); regulations effective May 29, 1997.
Apr:	GFOP begins collecting information from groundfish observers (at debriefing) on what types of seabird avoidance measures are being used by hook-and-line vessels in the GOA and BSAI groundfish fisheries.
Jun:	Council recommends similar measures for Pacific halibut fishery.
	June 11, USFWS publishes final rule in *Federal Register* to list the Alaska breeding population of the Steller's eider as a threatened species (62 FR 31748).
Aug:	NMFS, USFWS, and International Pacific Halibut Commission (IPHC) staff and industry representatives observe deployment of seabird avoidance gear on F/V *Frontier Spirit*, a freezer-longliner, in Puget Sound.
Aug:	GFOP transmits seabird bycatch data and seabird notes from observer logbooks to USFWS.
Sep:	NMFS staff (U.S. co-lead) meet with USFWS (U.S. co-lead), Japan representatives, and FAO representative in Anchorage, Alaska, on FAO seabird consultation initiative.
Sep:	NMFS staff attend USFWS-sponsored public seminar by Dr. Hiroshi Hasegawa, Toho University, Japan, world expert on the short-tailed albatross; NMFS staff meet with Dr. Hasegawa, USFWS, and university staff to discuss impacts to short-tailed albatross population.
Sep:	USFWS publishes in the *Federal Register* a "notice of review" that lists the short-tailed albatross as an ESA candidate species (62 FR 49398).
Nov:	NMFS, USFWS, and industry participation in Fish EXPO conference, "Fisherman to Fisherman: Seabird Avoidance in North Pacific Longline Fisheries"; joint sponsors for information booth.
Nov:	Letters to 2,500 federal fisheries permit holders asking that short-tailed albatross sightings be reported to USFWS. Letters enclosed laminated identification chart of North Pacific albatrosses.
<u>1998</u>	
Jan:	NMFS distributes laminated identification chart of North Pacific albatrosses to 6,000 Individual Fishing Quota (IFQ) permit holders (halibut and sablefish).
Feb:	NMFS publishes proposed rule in *Federal Register* that would require seabird avoidance

Table 3.7-8 (cont.). Timeline of NOAA Alaska Region seabird activities and related seabird issues, as of May 31, 2002.

	measures in the Pacific halibut fishery and exempt vessels less than 26 ft LOA in this fishery and the GOA and BSAI groundfish fisheries from some of the measures (62 FR 65635).
Mar:	Final rule published in *Federal Register* requiring vessels in Pacific halibut fisheries to use seabird avoidance measures (63 FR 11161) and exempting vessels less than 26 ft LOA in this fishery and the GOA and BSAI groundfish fisheries from some of the measures; regulations effective April 6, 1998.
Mar:	IPHC issues news release regarding the above regulations and notice that IPHC port samplers will interview fishermen for information on seabirds.
Mar:	NMFS and USFWS staff are invited to participate in the FAO's Seabird Technical Working Group (STWG) meeting in Tokyo. The STWG's objective is to draft a plan of action for implementing guidelines to reduce incidental catches of seabirds in longline fisheries.
Mar:	NMFS staff provide script advice to New England Aquarium staff that are producing a video on fishery bycatch. Script specifically mentions incidental catch of seabirds in hook-and-line fisheries.
Apr:	NMFS submits to USFWS the "Test Plan to Evaluate Effectiveness of Seabird Avoidance Measures Required in Alaska's Hook-and-Line Groundfish and Halibut Fisheries," as required by the 1997 USFWS biological opinion. NMFS begins process to secure funding for test plan's implementation.
Jun:	NMFS Seabird Coordinator hired to address seabird bycatch management issues and the requirements within section 7 consultations on effects of the groundfish and halibut fisheries off Alaska on the short-tailed albatross.
Sep:	NMFS transmits 1993–1997 commercial fisheries catch data to the USFWS for use in extrapolation of seabird bycatch estimates for the GOA and BSAI groundfish fisheries.
Oct:	NMFS staff (Hawaii and Alaska) attend Black-footed Albatross Population Biology Workshop co-sponsored by the Western Pacific Regional Fishery Management Council, the USFWS, and NMFS.
Oct:	NMFS and USFWS staff on the U.S. delegation to the FAO's Reduction of Incidental Catch of Seabirds in Longline Fisheries technical consultation held in Rome, Italy.
Nov:	NMFS distributes seabird bycatch information with annual mailing of NMFS groundfish fisheries permits. Information includes: information bulletin of recent short-tailed albatross takes, measures to avoid seabirds, USFWS's short-tailed albatross encounter form.
Nov:	NMFS provides above seabird bycatch information at Fish Expo in Seattle and seeks industry comment on effective use of seabird avoidance measures.
Nov:	The USFWS proposes domestic ESA listing of short-tailed albatross (short-tailed albatross is listed as endangered "outside of the United States," which would include in the EEZ), 63 FR 58692, November 2, 1998.
Dec:	NMFS presents Seabird Bycatch Report at Council meeting.

Table 3.7-8 (cont.). Timeline of NOAA Alaska Region seabird activities and related seabird issues, as of May 31, 2002.

1999

Feb: NMFS and USFWS staff participate in and present a paper at the symposium entitled, *Seabird Bycatch: Trends, Roadblocks, and Solutions* at the annual meeting of the Pacific Seabird Group.

Feb: At its February meeting, the Council recommends that NMFS release for public review the EARIR/IRFA for a regulatory amendment to revise regulations for seabird avoidance measures in the hook-and-line fisheries off Alaska to reduce bycatch of the short-tailed albatross and other seabird species.

Mar: NMFS awards $180K to the Washington Sea Grant Program a Saltonstall-Kennedy Grant to conduct research on the effectiveness of seabird avoidance measures in the North Pacific longline fisheries. NMFS participates in the implementation of this research.

Mar: NMFS publishes notice of receipt of an exempted fishing permit (EFP) application from the Washington Sea Grant Program to be used in conjunction with its Saltonstall-Kennedy grant award to test the effectiveness of seabird avoidance measures (64 FR 14885).

NMFS receives a second EFP application from Washington Sea Grant Program to augment the first EFP.

USFWS issues a biological opinion on March 19 on the effects of the BSAI and GOA groundfish hook-and-line fisheries on the endangered short-tailed albatross. Incidental take limit is four birds in 1999 and 2000.

Apr: At its April meeting, the Council recommends that NMFS promulgate revisions to the current regulations that require the use of seabird avoidance gear and methods in the hook-and-line fisheries off Alaska.

May: NMFS announces issuance of EFP 99-01 to the Washington Sea Grant Program to conduct an experiment in the GOA and BSAI to test the effectiveness of seabird avoidance measures (64 FR 25478).

June: NMFS announces issuance of EFP 99-02 to the Washington Sea Grant Program to conduct experiments on freezer-longliners in the Pacific cod BSAI fishery to test the effectiveness of seabird avoidance measures (64 FR 29994, June 4, 1999).

NMFS and the IPHC are notified of approval of a National Fish and Wildlife Foundation (NFWF) grant "Evaluation of Effectiveness of Seabird Avoidance Measures Required in Alaska's Hook-and-Line Groundfish and Halibut Fisheries" ($41K NFWF Funds, $100K Challenge Funds).

NMFS issues Information Bulletin 99-62 to announce the incidental take limit established for the endangered short-tailed albatross in the Alaska hook-and-line groundfish fishery for 1999 and 2000.

Sept: Participation on Seabird Inter-Agency Working Group (SIAWG) to develop a U.S. National Plan of Action for the Reduction of the Incidental Catch of Seabirds in Longline Fisheries (NPOA-Seabirds). Notice of schedule for development of NPOA-Seabirds published in the *Federal Register* (64 FR 48987 September 9, 1999).

Table 3.7-8 (cont.). Timeline of NOAA Alaska Region seabird activities and related seabird issues, as of May 31, 2002.

Dec:	Continued participation since September on the SIAWG. Draft NPOA-Seabirds made available for review and public comment (64 FR 73017 December 29, 1999).
<u>2000</u>	
Jan:	Changes made to observer data collection and vessel logbook information to collect data on types of seabird avoidance measures used on a haul-by-haul basis. This will allow for some quantitative measure of the effectiveness of measures at reducing seabird bycatch.
Feb:	Notice of extension of public comment period for draft NPOA-Seabirds, published in the *Federal Register* (65 FR 4945 February 2, 2000).
	NMFS staff attendance at a USFWS informational briefing in Anchorage on the proposals for designating critical habitat for spectacled eiders and Steller's eiders, February 1, Tudor Road USFWS office.
	USFWS proposed rule for proposed designation of critical habitat for the spectacled eider. Published in the *Federal Register* (65 FR 6114 February 8, 2000).
	NMFS staff attendance at 27th Annual Meeting of the Pacific Seabird Group in Napa, California, February 23–26. Presentation of "A National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries."
Mar:	USFWS proposed rule for proposed designation of critical habitat for the Steller's eider. Published in the *Federal Register* (65 FR 13262 March 13, 2000).
	NMFS contract awarded to IPHC for feasibility study that investigates all options for monitoring bycatch of the endangered short-tailed albatross in the Pacific halibut fishery in waters off Alaska. $20K award, work to commence by May 1, progress report due by September 1, final report due no later than December 1.
Apr:	NMFS staff report on status of seabird Issues to the North Pacific Fishery Management Council at its April meeting in Anchorage.
	NMFS Domestic Fisheries Division and National Observer Program Office staff and Alaska Region staff attendance at Conservation of Arctic Flora and Fauna (CAFF) Workshop on Seabird Bycatch in Waters of Arctic Countries. Bedford Institute of Oceanography, Dartmouth, Nova Scotia, April 26–28. General session presentation on "Addressing the problem: seabird mortality from longline fisheries in the waters of Arctic countries" by John Cooper, Euan Dunn, Kim Rivera. Session 1: Poster presentation "A National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries." "US National Plan of Action" by Al Manville, USFWS, and Steve Leathery, NMFS. Session 3: "The Collection of Seabirds and Seabird Bycatch Data by U.S. Fishery Observer Programs: An Overview." by Victoria Cornish, NMFS. "Incidental Observations of Seabirds Taken Incidentally by Alaskan Nearshore Commercial Net Fisheries: Is it Good Enough?"by Brian Fadely.
	NMFS staff attendance at 11th Western Groundfish Conference, Sitka, Alaska, April 24–28. Poster presentation of "A National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries" and oral presentation "Incidental Catch of Seabirds by Hook-and-Line Fisheries in Alaska."

Table 3.7-8 (cont.). Timeline of NOAA Alaska Region seabird activities and related seabird issues, as of May 31, 2002.

USFWS notice of extension of comment period for proposed designation of critical habitat for the Steller's eider and the spectacled eider. Published in the *Federal Register* (65 FR 20938 April 19, 2000).

May: Presentation for the public (evening of May 3) and NMFS staff (noon, May 3) by Dr. John Cooper, Birdlife International Seabird Conservation Programme, "Keeping the World's Seabirds off the Hook: Efforts to Save the Albatross." AKR efforts reported on in presentation.

NMFS staff attendance at 2nd International Conference on the Biology and Conservation of Albatrosses and other Petrels, May 8–12, Honolulu, Hawaii. Poster presentation of "A National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries" and oral presentation "Incidental Catch of Seabirds by Longline Fisheries in Alaska." Participation in associated "Workshop on Albatross and Petrel Mortality from Longline Fishing," presentation on "The FAO International Plan of Action: what are nations doing?"

Mailing of USFWS's Short-tailed Albatross Fact Sheet and Short-tailed Albatross Reporting Form to IFQ permit holders with the IFQ Report to the Fleet, mid-May.

July: USFWS final rule to extend endangered status for the short-tailed albatross (*Phoebastria albatrus*) to include the species range within the United States. 65 FR 46643, July 31.

August:

USFWS publishes an extension of comment periods and notice of availability of draft economic analyses on proposed critical habitat determinations for the spectacled eider and Steller's eider. Published in the Federal Register (65 FR 51577, August 24, 2000).

"Avoiding Seabirds in the Hook-and-Line Fisheries" information included in the NMFS IFQ Report to the Fleet 2000; mailed to approximately 5000 IFQ halibut and sablefish permit holders.

November:

First meeting of the North Pacific Albatross Working Group. Goal of group is to "Improve albatross conservation and protection in the North Pacific through enhanced communication and coordination of conservation, management, monitoring, outreach and research activities."

Participation by representatives of NMFS Alaska Region, Washington Sea Grant Program, and the Alaska freezer-longliner industry at the "International Fishers Forum on Solving the Incidental Capture of Seabirds in Longline Fisheries". The Forum is sponsored and hosted by the New Zealand Fishing Industry and the New Zealand Government.

December:

A Feasibility Study that Investigates Options for Monitoring Bycatch of the Short-tailed Albatross in the Pacific Halibut Fishery off Alaska, Prepared for NMFS by IPHC Staff, December 1.

2001

January:

Presidential Executive Order 13186 of January 10, 2001: Responsibilities of Federal Agencies to Protect Migratory Birds. Published in the Federal Register (66 FR 3853, January 17, 2001).

Table 3.7-8 (cont.). Timeline of NOAA Alaska Region seabird activities and related seabird issues, as of May 31, 2002.

NMFS issues news release (NMFS 01-02-AKR) on steps to develop a monitoring plan the incidental catch of short-tailed albatross in the Pacific halibut fishery off Alaska.

NMFS issues Information Bulletin 01-07 to announce the extension of the incidental take limit established for the endangered short-tailed albatross in the Alaska hook-and-line groundfish fishery for 1999 and 2000, until superseded by a subsequent USFWS Biological Opinion.

February:

Revised A Feasibility Study that Investigates Options for Monitoring Bycatch of the Short-tailed Albatross in the Pacific Halibut Fishery off Alaska, Prepared for NMFS by IPHC Staff, February 1.

Information on Washington Sea Grant Program's research on effectiveness of seabird avoidance measures included in materials mailed to approximately 2500 Federal Fisheries and IFQ permit holders using longline gear. Also included was the USFWS's Short-tailed Albatross Encounter Form and the NOAA-AKR news release on development of a monitoring plan in the Pacific halibut fishery off Alaska.

USFWS makes final determination of critical habitat for the Alaska-breeding population of the Steller's eider. Published in the Federal Register (66 FR 8850, February 2, 2001).

USFWS makes final determination of critical habitat for the spectacled eider. Published in the Federal Register (66 FR 9146, February 6, 2001).

Meeting of the North Pacific Albatross Working Group, concurrent with annual meeting of Pacific Seabird Group.

Poster entitled Seabird Bycatch in Longline Fisheries Off Alaska: 1993-1999 Preliminary Estimates and Bycatch Reduction Efforts presented by NMFS AKR staff at annual meeting of the Pacific Seabird Group.

NMFS announces the availability of the United States' National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries. Notice published in the Federal Register (66 FR 12764, February 28, 2001).

April:

NMFS staff participate at a workshop in South Africa to develop a grant proposal for submission to the United Nations' Global Environmental Facility (GEF) on seabird bycatch reduction initiatives and National Plan of Action development in developing countries.

May:

NMFS issues Information Bulletin 01-54 to clarify code descriptions in logbook instructions for seabird avoidance devices used with longline gear. Mailed materials to approximately 2500 Federal Fisheries and IFQ permit holders using longline gear.

USFWS and Japan begin preliminary work on a joint satellite telemetry study of the endangered short-tailed albatross at the breeding colony of Torishima Island, Japan.

North Pacific Albatross Working Group teleconference meeting.

Table 3.7-8 (cont.). Timeline of NOAA Alaska Region seabird activities and related seabird issues, as of May 31, 2002.

Participation by NMFS staff in Panel Session at Pew Fellows Program for Marine Conservation Annual Meeting, Nova Scotia, "Legislating Change: What Policy Makers Need & Want from Scientists and Advocates" "Case Study: Incidental Catch of Seabirds in Longline Fisheries off Alaska: Collaborative Efforts to Reduce the Bycatch".

June:

NMFS publishes seabird mitigation measures for Hawaii-based pelagic longline fishery in emergency interim rule in the Federal Register (66 FR 31565, June 12, 2001).

September:

Washington Sea Grant Program makes available Solutions to Seabird Bycatch in Alaska's Demersal Longline Fisheries. Final results and recommendations based on a 2-year experimental study conducted on commercial longline vessels.

October:

NMFS staff participate on the U.S. delegation to the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) ad-hoc group, IMALF (Incidental Mortality of Albatross in Longline Fisheries).

USFWS initiates an international recovery team for the short-tailed albatross under the Endangered Species Act.

Interagency Seabird Working Group (ISWG) formed (per NPOA). Representatives from NMFS, USFWS, Department of State, and regional fishery management councils. NMFS representatives from each of the 5 NMFS regions, fishery science centers, and headquarter division offices.

NMFS appoints a National Seabird Coordinator. First tasks will be coordinating the regional implementation of the US's National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries (NPOA). DOC NOAA News Release NOAA 01-R144

North Pacific Fishery Management Council takes initial action on proposed changes to seabird avoidance regulations in the groundfish and halibut hook-and-line fisheries off Alaska. Proposed changes based on WSGP study and additional considerations for small vessel operations.

November:

North Pacific Albatross Working Group meets by teleconference.

NMFS/USFWS Alaska staff meeting on seabird issues of joint concern.

Panel discussion/seminar scheduled at Fish Expo, Seattle, Washington, on Alaska seabird bycatch initiatives——research and efforts to reduce bycatch.

December:

NMFS publishes extension to emergency interim rule in the Federal Register seabird mitigation measures for Hawaii-based pelagic longline fishery (66 FR 63630, December 10, 2001).

North Pacific Fishery Management Council takes final action on proposed changes to seabird avoidance regulations in the groundfish and halibut hook-and-line fisheries off Alaska. NMFS AKR

Table 3.7-8 (cont.). **Timeline of NOAA Alaska Region seabird activities and related seabird issues, as of May 31, 2002.**

News Release 01-22-AKR

Seabird outreach material mailed to all holders of hook-and-line Federal groundfish fisheries permits. Material included: WSGP material on effective use of streamer lines, upcoming changes to seabird avoidance regulations, short-tailed albatross encounter form.

2002:

January:

Interagency Seabird Working Group meets in Silver Spring at NMFS Headquarters to address NPOA implementation (e.g. regional assessments of longline fisheries, promotion of NPOA development in international fora).

NMFS includes seabird incidental catch issues in topics to be addressed by an interagency International Bycatch Reduction Task Force.

February:

Seabird outreach material included in the NMFS IFQ 2002 Report to the Fleet.

North Pacific Albatross Working Group teleconference meeting, in conjunction with PSG's annual meeting.

NMFS poster at Pacific Seabird Group's annual meeting in Santa Barbara, CA, Changing Regulations in Alaska's Longline Fisheries—An Example of Regional Implementation of the United State's National Plan of Action for Seabirds.

March:

Alaska Board of Fisheries delegates authority to Alaska Department of Fish & Game's Commissioner to parallel Federal regulations for seabird avoidance requirements in State of Alaska waters.

April:

Asia Pacific Economic Cooperation (APEC) Ministerial meeting in Seoul, Korea. United States includes NPOA development and implementation on the meeting agenda.

Seabird Bycatch Avoidance Workshop presented at Kodiak's ComFish Expo; joint presentation by Washington Sea Grant Program, NMFS, USFWS.

May:

Seabird issues included on the agenda of the United States' bilateral fisheries meeting with the People's Republic of China, in Beijing.

Washington Sea Grant Program begins conducting work on commercial longline vessels less than 55 ft to address the performance standards recommended for use on smaller vessels. Work will be conducted in Sitka, Cordova, and Petersburg, Alaska.

Washington Sea Grant Program works with the IPHC and Alaska Department of Fish & Game to have standard bird abundance data collected during existing survey platforms.

Table 3.7-8 (cont.). **Timeline of NOAA Alaska Region seabird activities and related seabird issues, as of May 31, 2002.**

Seabird Bycatch Avoidance Workshop presented in Sitka, Alaska and Cordova, Alaska. NMFS Information Bulletin 02-31.

Notes: NMFS - National Marine Fisheries Service
USFWS - U.S. Fish & Wildlife Service

Table 3.7-9. NOAA Fisheries seabird avoidance requirements under the Endangered Species Act.

The current nondiscretionary reasonable and prudent measures in the USFWS Biological Opinions for the groundfish and Pacific halibut fisheries off Alaska are as follows:

- Observer data on short-tailed albatross sightings and fishery interactions is collected. Observers are trained in seabird identification and provided with instructions and materials for reporting short-tailed albatross observations (groundfish fisheries).
- Incidental take and observations of any short-tailed albatross are reported to USFWS (in G&H fisheries).
- Short-tailed albatross that are found in fishing equipment but still appear healthy, are evaluated and carefully handled and released as soon as identification is confirmed (groundfish).
- Dead short-tailed albatross are tagged with complete catch information and delivered to USFWS (in G&H fisheries).
- An information program is conducted each year to inform fishermen about (1) need and possible methods for avoiding entanglement of short-tailed albatross in fishery gear, (2) request reports of short-tailed albatross sightings, and (3) encourage compliance with (MARPOL) and related treaties to protect marine animals including the short-tailed albatross, (4) short-tailed albatross identification, and (5) ways to avoid taking short-tailed albatross when they are sighted near bait (in G&H fisheries).
- Vessels operators are required to use seabird bycatch avoidance devices and methods during fishing activities (in G&H fisheries).
- A test plan to evaluate the effectiveness of seabird bycatch avoidance gear and methods shall be completed and implemented. A final report of the evaluation is due December 31, 2000 (in G&H fisheries).
- NOAA Fisheries shall prepare a plan to investigate all options for monitoring the Pacific halibut fishery and will institute changes to the fishery appropriate to the results of the investigation.
- NOAA Fisheries shall review current seabird deterrent device regulations to determine if changes in the regulations could minimize the likelihood of short-tailed albatross mortalities. NOAA Fisheries shall revise regulations if revisions are likely to reduce the risk of short-tailed albatross bycatch.

Notes: G&H - gut-and-head
MARPOL - International Convention for the Prevention of Pollution from Ships (of the International Maritime Organization)
USFWS - U.S. Fish and Wildlife Service

Table 3.7-10. Conservation recommendations regarding seabirds and groundfish fisheries.

The USFWS included the following discretionary conservation recommendations to NOAA in the 1997 amendment to the groundfish biological opinion:

- In cooperation with the USFWS, initiate discussions with the Department of State to lead to data exchanges with other nations whose vessels fish with hook-and-line gear in the Pacific Ocean. Such data will allow us to determine the incidental take and mortality of seabirds by time and area and are essential to assess the need for additional conservation measures on an international scale.

- Continue cooperative efforts with the USFWS to identify demographic parameters of the Torishima Island breeding population of short-tailed albatrosses with the goal of using these data to quantify the level of take that would appreciably reduce the survival and recovery of the species.

- In cooperation with the USFWS, initiate efforts to conduct a population viability analysis using demographic data and available information on sources and magnitudes of threats to the species.

USFWS included the following discretionary conservation recommendations to NOAA in the 1999 amendment to the groundfish biological opinion:

- Following completion of the research to evaluate the effectiveness of seabird avoidance measures, develop an instructional video which outlines the most effective seabird avoidance devices and methods with hook-and-line gear. Distribute the video to individual permit holders, longline fishing organizations, and at the annual Fish Expo in Seattle.

The following conservation recommendations were made in the 1998 Pacific halibut biological opinion:

- Develop and/or evaluate new seabird avoidance measures.

- Suggest to fishermen actions they may take to prevent the taking of short-tailed albatross that have alighted near their hook-and-line gear.

- Educate fishermen in the proper care of injured seabirds.

- Consider temporary adjustments to the fishery during the times when short-tailed albatross are most abundant in the areas fished by Pacific halibut hook-and-liner gear in waters off Alaska.

- Encourage self-reporting of short-tailed albatross encounters. However, substantial evidence exists that self-reporting by itself is an inadequate method for monitoring protected species encounters in a fishery. The USFWS strongly discourages the use of self-reporting as a sole method for monitoring this fishery, and strongly encourage the use of observers on Pacific halibut hook-and-line vessels over 60 feet in length.

Notes: NOAA - NOAA Fisheries
USFWS – U.S. Fish and Wildlife Service

Table 3.7-11. Short-tailed albatross reported[1] takes in Alaska fisheries.

Date	Location	Latitude/Longitude	Fishery	Date Banded as Chick[2]	Age at Take	Band(s) No. and Color
July 1983	300 miles north of St. Matthew Island	Between 60°N, 180°W and 58°5'N, 175°W	In net of vessel fishing for brown crab	March 20, 1983	Juvenile (4 months)	130-01562 orange 039
October 1, 1987	Gulf of Alaska	59°27.7'N, 145°53.3'W	Halibut	April 5, 1987	Juvenile (6 months)	130-01836 red 173
August 28, 1995	South of Krenitizin Islands	53°31'N, 165°38'W	Hook-and-line	April 16, 1994	Sub-adult (16 months)	13A0853 green 131
October 8, 1995	Bering Sea and Aleutian Islands	57°01'N, 170°39'W	Hook-and-line	April 21, 1992	Sub-adult (3 years)	----?? black 063
September 27, 1996	Bering Sea and Aleutian Islands	58°41.3'N, 177°02.6'W	Hook-and-line	April 15, 1991	Sub-adult (5 years)	13A0518 green 057
September 21, 1998	Bering Sea and Aleutian Islands	57°30'N, 173°57'W	Pacific cod hook-and-line	April 18, 1990	Adult (8 years)	130-04189 brown 087
September 28, 1998	Bering Sea and Aleutian Islands	58°27'N, 175°16'W	Pacific cod hook-and-line	Not known	Sub-adult	not known
No birds reported taken since 1998						

Notes: [1]Except for the second take in 1998, leg bands were recovered from all of the above albatrosses, allowing scientists to verify identification and age.
[2]Since 1977, Dr. Hiroshi Hasegawa, Toho University, Japan, has banded all short-tailed albatross chicks at their breeding colony on Torishima Island, Japan.

Table 3.7-12. Short-tailed albatross past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through natural disasters	• Volcanic eruptions on Torishima Island killed birds and destroyed nests (periodic)		• Japanese efforts to restore and protect nest sites and to reestablish nesting in alternate areas	
Mortality through intentional and incidental take	• Commercial hunters (late 1800s to early 1900s) • Foreign fisheries incidental take (1960s to present) • Incidental take in other U.S. longline fisheries	• Incidental take in MSA groundfish longline fisheries (1983 to present). • Observer Program data 1993-2001: estimated average take in BSAI = 1 bird per year and in GOA = 0 birds per year.	• Japanese ban on hunting, other protections (1958) • Migratory Bird Treaty Act (1918) • Endangered Species Act (1973) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Continuous ESA Section 7 consultations with USFWS (1989 to present). • Seabird /fishery interaction monitoring and research through Observer Program (1990 to present) • Seabird protection measures instituted for longline fleet (1997 to present). • Collaborative research on effectiveness of deterrence techniques (2001).
Reduced fitness through consumption of fishery wastes	• Foreign fisheries and processing vessels throughout North Pacific • Other U.S. fisheries	• MSA groundfish vessels and at-sea processors (1979 to present). • Benefits of supplemental food offset by increased risk of take in gear.	• National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird protection measures prohibit discharge of fishery wastes over baited hooks (1997 to present)
Reduced fitness through consumption of plastics	• Numerous sources of raw plastic pellets and plastic consumer products on land and at sea	• Fishing vessels and processors contribute unknown amounts of plastic products	• MPPRCA (1987)	• Educational effort on importance of compliance with MPPRCA (1995 to present)

Comparative Baseline:

- Endangered species
- Worldwide population 1600 to 1700 but increasing at near-maximum rate
- Concern for impacts of longline fishing incidental take on recovery of population
- Seabird deterrence measures for BSAI/GOA longline fisheries instituted in 1997. Did not eliminate incidental take.
- Ongoing efforts to reduce incidental take guided by scientific evaluation of deterrence measures through Observer Program and directed research.

Carry Forward for Cumulative Effects Analysis?

YES. Incidental take in groundfish fisheries remains a concern under all alternatives. Discussed as a separate species with special

Table 3.7-12 (cont.). Short-tailed albatross past/present effects.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
ESA – Endangered Species Act
GOA – Gulf of Alaska
MPPRCA – Marine Plastic Pollution Research and Control Act
MSA – Magnuson-Stevens Act

Table 3.7-13. Northern fulmar past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Foreign fisheries incidental take (1960s to present) • Incidental take in other U.S. longline fisheries	• Incidental take in MSA groundfish fisheries (1978 to present). • Observer Program data 1993-2001: estimated average take in BSAI longlines = 8,644 birds per year and in GOA = 479 birds per year. • Incidental take in trawls averages 274-5,891 birds per year in BSAI/GOA • Incidental take in pot gear. • Vessel and third wire strikes.	• Migratory Bird Treaty Act (1918) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird/fishery interaction monitoring and research through Observer Program (1990 to present) • Seabird protection measures instituted for longline fleet (1997 to present) increased numbers of fulmars taken in BSAI but decreased take in GOA.
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but presumed to be minimal		•Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through consumption of fishery wastes	• Foreign fisheries and processing vessels throughout North Pacific • Other U.S. fisheries	• MSA groundfish vessels and at-sea processors (1979 to present). • Benefits of supplemental food offset by increased risk of take in gear.	• National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird protection measures prohibit discharge of fishery wastes over baited hooks (1997 to present)

Comparative Baseline:

- Abundant resident and breeder with BSAI and GOA population of about 2 million.
- Concern for colony-level impacts of incidental take in longlines and trawls.
- Seabird deterrence measures for BSAI and GOA longline fisheries (1997 to present) have increased incidental take in BSAI and decreased take in GOA.
- Ongoing efforts to reduce incidental take guided by scientific evaluation of deterrence measures through Observer Program and directed research.

Carry Forward for Cumulative Effects Analysis?

YES. Incidental take in groundfish fisheries expected to remain under all alternatives. Due to its status as the predominant species taken in all three groundfish sectors, northern fulmar will be discussed as a separate species in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act

Table 3.7-14. Shearwaters past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Commercial and subsistence hunts in South Pacific (historic to present) • High-seas squid drift fisheries may have taken over 1,000,000 shearwaters per year (1970s to 1991) • Foreign fisheries may take thousands of birds per year (1960s to present) • Incidental take in other U.S. longline fisheries	• Incidental take in MSA groundfish fisheries (1978 to present). • Not identified to species in Observer Program • Observer Program data 1993-2001: estimated average take of known shearwaters in BSAI longlines = 674 birds per year and in GOA = 30 birds per year. • Incidental take in trawls averages 271-1,327 birds per year in BSAI and GOA (1997-2001) • Vessel strikes.	• Migratory Bird Treaty Act (1918) • U.N. Resolution (46/215) banning high-seas drift fishing (1992) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird/fishery interaction monitoring and research through Observer Program (1990 to present) • Seabird protection measures instituted for longline fleet (1997 to present) did not reduce numbers of shearwaters taken in BSAI but did decrease take in GOA.
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but presumed to be minimal		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through consumption of fishery wastes	• Foreign fisheries and processing vessels throughout Pacific • Other U.S. fisheries	• MSA groundfish vessels and at-sea processors (1979 to present). • Benefits of supplemental food offset by increased risk of take in gear.	• National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird protection measures prohibit discharge of fishery wastes over baited hooks (1997 to present)

Comparative Baseline:

- Worldwide populations estimated to be 23 million short-tailed shearwaters and over 30 million sooty shearwaters. Indications of declining population trends.
- Large numbers of shearwaters taken in commercial and subsistence hunts in the southern hemisphere and in several international fisheries.
- No population modeling to assess impact of fishery takes versus other sources of mortality on declining population.
- Seabird deterrence measures for BSAI/GOA longline fisheries have not reduced incidental take since 1997.

Carry Forward for Cumulative Effects Analysis?

YES. Incidental take in groundfish fisheries expected to remain under all alternatives. Discussed in conjunction with Laysan and black-footed albatross in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands

Table 3.7-14 (cont.). Shearwaters past/present effects.

FMP – fisheries management plan
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act

Table 3.7-15. Storm-petrels past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Foreign fisheries incidental take (1960s to present)	• Incidental take in MSA groundfish longline fisheries (1978 to present). Not identified to species in Observer Program but have group code • Vessel strikes	• Migratory Bird Treaty Act (1918) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird/fishery interaction monitoring and research through Observer Program (1990 to present)
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but presumed to be minimal		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through introduction of nest predators	• Commercial fox farming on Aleutian Islands (1750 to 1930s) • Accidental introduction of rats from marine vessels	• Fishing vessels and processors contribute to risk of accidentally introducing rats to islands	• USFWS fox eradication program (1970s to present) • USFWS rat invasion prevention programs	

Comparative Baseline:

- Leach's and fork-tailed storm-petrels are abundant breeders in BSAI and GOA. Population trends poorly known.
- Quantitative impact of fisheries on species largely unknown.

Carry Forward for Cumulative Effects Analysis?

YES. Frequency of interaction with groundfish fisheries warrants inclusion in Cumulative Effects Analysis. Due to the lack of species-specific quantitative information on fishing impacts, these species will be included in the planktivorous seabirds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
USFWS – U.S. Fish and Wildlife Service

Table 3.7-16. Cormorants past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Foreign and domestic fisheries, especially coastal net fisheries, may take cormorants but no data is available	• Incidental take in MSA groundfish fisheries unknown (1978 to present). • Not identified to species in Observer Program but have group code	• Migratory Bird Treaty Act (1918)	
Reduced fitness through contamination with oil	• *Exxon Valdez* oil spill probably killed thousands of cormorants			

Comparative Baseline:

- Pelagic, red-faced, and double-crested cormorants are widely distributed in the BSAI and GOA but are not abundant anywhere. Population trend information is unreliable.
- There is no information on the incidental take of cormorants in any Alaska fisheries, including groundfish.
- Large numbers of cormorants were killed in the *Exxon Valdez* oil spill and they are considered to be "not recovered" in Prince William Sound.

Carry Forward for Cumulative Effects Analysis?

NO. Lack of quantitative information on population trends and fishery impacts precludes further analysis except as part of piscivorous seabirds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act

Table 3.7-17. Spectacled eider past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence and sport harvest (historic to present)	• Have separate Observer Program species code but no takes have been recorded	• Migratory Bird Treaty Act (1918)	
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but concern for benthic habitat impacts of bottom-trawls	• USFWS BiOp recommendation to avoid benthic disturbance in Critical Habitat in any season	
Reduced fitness through contamination with oil and lead shot	• Pollution from foreign and U.S. fisheries and marine vessels throughout Pacific • Waterfowl hunting on breeding grounds with lead shot.	• Pollution from MSA groundfish vessels and at-sea processors (1979 to present)	• Oil spill prevention laws and regulations • Hunting with lead shot illegal (1991).	

Comparative Baseline:

- Worldwide population estimates for spectacled eider exceed 300,000 birds but their Alaska-nesting populations have declined 95% in the last 30 years.
- Spectacled eider was listed as threatened under the Endangered Species Act in 1993.
- Spectacled eiders have not been recorded as being taken incidentally in the groundfish fisheries.
- Concern for chronic contamination from lead shot on breeding grounds and exposure to oil from all sources while in massive wintering flocks.
- Concern for impacts of bottom trawling and disturbance on benthic foraging habitats.

Carry Forward for Cumulative Effects Analysis?

YES. The status of spectacled eiders as threatened under the Endangered Species Act warrants further consideration in the cumulative effects analysis. Because of the similarities in their conservation concerns and status under the ESA, spectacled eiders will be considered in conjunction with Steller's eiders in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BiOp – Biological Opinion
ESA – Endangered Species Act
MSA – Magnuson-Stevens Act
USFWS – U.S. Fish and Wildlife Service

Table 3.7-18. Steller's eiders past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence and sport harvest (historic to present)	• Have separate Observer Program species code and one recorded take in the groundfish fishery	• Migratory Bird Treaty Act (1918)	
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but concern for benthic habitat impacts of bottom-trawls and generalized impact of fishery on ecosystem structure		
Reduced fitness through contamination with oil and lead shot	• Foreign and U.S. fisheries and marine vessels throughout Pacific • Waterfowl hunting on breeding grounds with lead shot	• MSA groundfish vessels and at-sea processors (1979 to present)	• Oil spill prevention laws and regulations • Hunting with lead shot illegal (1991)	

Comparative Baseline:

- Worldwide population estimates for Steller's eider unreliable but their Alaska-nesting populations have declined substantially in the last 100 years.
- Steller's eider was listed as threatened under the Endangered Species Act in 1997.
- One recorded incidental take of Steller's eider in the groundfish fisheries since 1993.
- Concern for chronic contamination from lead shot on breeding grounds and exposure to oil from all sources while in wintering and staging flocks.
- Concern for impacts of bottom trawling and disturbance on benthic foraging habitats.

Carry Forward for Cumulative Effects Analysis?
YES. The status of Steller's eiders as threatened under the Endangered Species Act warrants further consideration in the cumulative effects analysis. Because of the similarities in their conservation concerns and status under the Endangered Species Act, Steller's eiders will be considered in conjunction with spectacled eiders in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
MSA – Magnuson-Stevens Act

Table 3.7-19. Jaegers past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Foreign and domestic fisheries may take jaegers but no data is available	• Incidental take in MSA groundfish fisheries unknown (1978 to present). • Not identified to species in Observer Program.	• Migratory Bird Treaty Act (1918)	·

Comparative Baseline:

- Pomarine, parasitic, and long-tailed jaegers migrate through the BSAI and GOA in small numbers. Population information is not available.
- There is no information on the incidental take of jaegers in any Alaska fisheries, including groundfish.

Carry Forward for Cumulative Effects Analysis?

NO. Lack of quantitative information on population trends and fishery impacts precludes further analysis except as part of piscivorous seabirds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act

Table 3.7-20. Gulls past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence hunts and egging (historic to present) • Foreign fisheries incidental take, no data (1960s to present) • Incidental take in other U.S. longline fisheries, no data	• Incidental take in MSA groundfish fisheries (1978 to present). • Observer Program data 1993-2001: estimated average take of gulls in BSAI longlines = 2,707 birds per year and in GOA = 114 birds per year. • Incidental take in trawls averages between 150 (low est.) and 398 (high est.) birds per year in BSAI and GOA (1997-2001)	• Migratory Bird Treaty Act (1918) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird /fishery interaction monitoring and research through Observer Program (1990 to present) • Seabird protection measures instituted for longline fleet (1997 to present) did not reduce numbers of gulls taken in either BSAI or GOA
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but presumed to be minimal		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through consumption of fishery wastes	• Foreign fisheries and processing vessels throughout Pacific • Other U.S. fisheries	• MSA groundfish vessels and at-sea processors (1979 to present) • Benefits of supplemental food offset by increased risk of take in gear	• National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird protection measures prohibit discharge of fishery wastes over baited hooks (1997 to present)

Comparative Baseline:

- Population estimates for all species only roughly known. Population trends measured only for glaucous-winged gull in few places.
- Seabird deterrence measures for BSAI/GOA longline fisheries have not reduced incidental take since 1997.
- Impact of fishery waste consumption may be beneficial to some species but harmful to others through predator/prey relationships.

Carry Forward for Cumulative Effects Analysis?

YES. Incidental take in groundfish fisheries expected to remain under all alternatives. Because of a lack of species-specific quantitative information on population trends and fishery impacts, gulls will be included as part of the piscivorous seabirds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act

Table 3.7-21. Seabird population trends compared within regions (only sites counted in 1999 and 2000 are included)[a].

Region	Site	NOFU	PECO	RFCO	GWGU	BLKI	RLKI	COMU	TBMU	UNMU	LEAU	CRAU	RHAU	TUPU
SE Bering	C. Peirce		=			–		–						
	Bogoslof I.													+
	Aiktak I.				=					=				+
	St. Paul I.					–	–	–	–					
	St. George I.	=				–	–	+	+					
SW Bering	Kasatochi I.				=						=	=		
	Koniuji I.						=							
Gulf of Alaska	Paule Bay					=				–				
	Chiniak Bay		–	–		+								
	E. Amatuli I.				+	=		+						
	Gull I.		–			+		+						
	Prince William Sound					+								
	Middleton I		–			–				–				
Southeast	St. Lazaria I.		+		=					–			=	

Table 3.7-21 (cont.). Seabird population trends compared within regions (only sites counted in 1999 and 2000 are included)[a].

Notes: — - negative population trend for this site or region
= - no discernable trend
+ - positive population trend for this site or region
BLKI - black-legged kittiwake
COMU - common murre
CRAU - crested auklet
GWGU - glaucous-winged gull
LEAU - least auklet
NOFU - northern fulmar
PECO - pelagic cormorant
RFCO - red-faced cormorant
RHAU - rhinoceros auklet
RLKI - red-legged kittiwake
TBMU - thick-billed murre
TUPU - tufted puffin
UNMU - unidentified murre
[a]Table printed with permission from the Alaska Maritime National Wildlife Refuge, from their report: Breeding Status and Population Trends of Seabirds in Alaska in 2000 (Source for this table is Ecosystem Considerations for 2003 Report Appendix D, Table 3). 1999 data incorporated is from Dragoo et al. 2000. Breeding status and population trends of seabirds in Alaska 1999. USFWS Report, Table 34.

Table 3.7-22. Kittiwakes past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence harvest (historic to present) • Foreign fisheries incidental take, very little data (1960s to present) • Incidental take in other U.S. longline fisheries, no data	• Incidental take in MSA groundfish fisheries (1978 to present). • Observer Program data does not distinguish kittiwakes by species in any of the fisheries	• Migratory Bird Treaty Act (1918) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird /fishery interaction monitoring and research through Observer Program (1990 to present)
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but concern for colony-level effects on forage fish availability		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through consumption of fishery wastes	• Foreign fisheries and processing vessels throughout Pacific • Other U.S. fisheries	• MSA groundfish vessels and at-sea processors (1979 to present) • Benefits of supplemental food offset by increased risk of take in gear	• National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird protection measures prohibit discharge of fishery wastes over baited hooks (1997 to present)
Reduced fitness through introduction of nest predators	• Fox farming in Aleutians and GOA (1750s to 1930s) • Accidental escape from marine vessels of all types	• Accidental escape from MSA groundfish vessels	• Fox extermination program of USFWS • Rat invasion prevention program of USFWS	

Comparative Baseline:

- Black-legged kittiwakes widespread and abundant. Population trends monitored in many places throughout the BSAI and GOA.
- Red-legged kittiwakes less numerous and restricted in range. Population trends have been decreasing substantially, leading to status as USFWS species of management concern.
- Since these species are not distinguished in the Observer Program data, no assessment can be made of incidental take impacts.
- Concern for colony-level impacts on prey availability, especially for red-legged kittiwakes on St. George Island.
- Concern for introduction of rats to Pribilofs.

Carry Forward for Cumulative Effects Analysis?
YES. Frequency of interaction with the groundfish fisheries and concern for colony-level impacts warrants analysis under all FMP Alternatives. Since some Alternative FMPs call for special management goals for seabird Species of Management Concern, red-legged kittiwakes will be considered along with marbled and Kittlitz's murrelets in Chapter 4. Black-legged kittiwakes will be discussed in conjunction with the piscivorous birds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act
USFWS – U.S. Fish and Wildlife Service

Table 3.7-23. Terns past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence harvest (historic to present) • Incidental take in foreign and domestic fisheries likely but undocumented.	• Incidental take in MSA groundfish fisheries likely but not recorded to species in Observer Program data.	• Migratory Bird Treaty Act (1918) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but assumed to be minimal		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)

Comparative Baseline:

- Arctic and Aleutian terns are uncommon breeders in BSAI and GOA. Population trends are not monitored anywhere in the project area.
- Since these species are not distinguished in the Observer Program data, no assessment can be made of incidental take impacts.

Carry Forward for Cumulative Effects Analysis?

Yes. Lack of species-specific quantitative information on population trends and fishery impacts precludes further analysis except as part of piscivorous seabirds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act

Table 3.7-24. Murres past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence harvest (historic to present) • Foreign fisheries incidental take, very little data (1960s to present) • Incidental take in other U.S. net fisheries, very little data	• Incidental take in MSA groundfish fisheries (1978 to present) • Observer Program has species specific codes but are reported in alcid group	• Migratory Bird Treaty Act (1918) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird /fishery interaction monitoring and research through Observer Program (1990 to present)
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but assumed to be minimal		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through contamination with oil	• Foreign fishing and marine transport vessels throughout Pacific • Other U.S. fishing and marine transport vessels • *Exxon Valdez* and other large oil spills from vessel accidents	• MSA groundfish vessels and at-sea processors (1979 to present)	• Oil spill prevention laws and regulations	
Reduced fitness through introduction of nest predators	• Fox farming in the Aleutian Islands and GOA (1750s to 1930s) • Accidental escape from marine vessels of all types	• Accidental escape from MSA groundfish vessels	• Fox extermination program of USFWS • Rat invasion prevention program of USFWS	

Comparative Baseline:

- Common and thick-billed murres widespread and abundant in BSAI and GOA. Population trends monitored in many places throughout BSAI and GOA.
- Population trends vary by species and area with some colonies increasing, others stable, and others in decline.
- Since these species are not distinguished in the Observer Program data, no assessment can be made of incidental take impacts.
- Concern for chronic and acute contamination with oil from all sources.
- Concern for introduction of rats to colonies.

Carry Forward for Cumulative Effects Analysis?

YES. Frequency of interaction with the groundfish fisheries and good population trend data warrants analysis of the Alternative FMPs. Because there is no species specific quantitative data on the impacts of the fisheries, these species will be discussed in conjunction with the fish-eating (piscivorous) birds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act
USFWS – U.S. Fish and Wildlife Service

Table 3.7-25. Guillemots past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Foreign fisheries incidental take, very little data (1960s to present) • Incidental take in nearshore net fisheries likely but no data.	• Guillemots are not identified to species in the Observer Program data but are included in the alcid group.	• Migratory Bird Treaty Act (1918)	
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but assumed to be minimal.		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through contamination with oil	• Foreign fishing and marine transport vessels throughout Pacific • Other U.S. fishing and marine transport vessels • *Exxon Valdez* and other large oil spills from vessel accidents.	• MSA groundfish vessels and at-sea processors (1979 to present).	• Oil spill prevention laws and regulations	

Comparative Baseline:

- Population estimates for both guillemot species are uncertain. Population trends only monitored for pigeon guillemots in Prince William Sound.
- Guillemots do not appear to interact with the groundfish fisheries on a regular basis.
- Since these species are not distinguished in the Observer Program data, no assessment can be made of incidental take impacts.
- Concern for chronic and acute contamination with oil from all sources.

Carry Forward for Cumulative Effects Analysis?

Yes. Lack of species-specific quantitative information on population trends and fishery impacts precludes further analysis except as part of piscivorous seabirds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act

Table 3.7-26. Murrelets past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence harvest (historic to present) • Foreign fisheries incidental take, very little data (1960s to present) • Incidental take in other U.S. net fisheries, very little data.	• Incidental take in MSA groundfish fisheries (1978 to present). • Murrelets have separate identification codes in the Observer Program but are reported in the alcid group	• Migratory Bird Treaty Act (1918)	
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but assumed to be minimal.		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through contamination with oil	• Foreign and U.S. fisheries and marine vessels throughout Pacific	• MSA groundfish vessels and at-sea processors (1979 to present).	• Oil spill prevention laws and regulations	
Reduced fitness through disturbance from vessels	• Marbled and Kittlitz's murrelets sensitive to boat traffic of all types	• Fishing vessels and processors contribute to total disturbance		
Reduced fitness through introduction of nest predators	• Fox farming in Aleutians and GOA (1750s to 1930s) • Accidental escape from marine vessels of all types.	• Accidental escape from MSA groundfish vessels.	• Fox extermination program of USFWS. • Rat invasion prevention program of USFWS	.

Comparative Baseline:

- Population estimates for all three murrelets species are uncertain and population trends are poorly known.
- Marbled and Kittlitz's murrelets are USFWS species of management concern due to apparent population declines. Kittlitz's has been petitioned for ESA listing.
- Since murrelets are only reported in the alcid group in the Observer Program data, no species-specific assessment can be made of incidental take impacts.
- Concern for disturbance from vessel traffic.
- Concern for chronic and acute contamination with oil from all sources.
- Concern for introduction of rats to ancient murrelets colonies.

Carry Forward for Cumulative Effects Analysis?

YES. The status of marbled and Kittlitz's murrelets as Species of Management Concern warrants further consideration in the cumulative effects analysis. Since some Alternative FMPs call for special management goals for these species, they will be considered with red-legged kittiwakes in Chapter 4. Because population trend data for ancient murrelets are not available and there is no species specific quantitative data on the impacts of the fisheries, ancient murrelets will be discussed in conjunction with the fish-eating (piscivorous) birds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act
USFWS – U.S. Fish and Wildlife Service

Table 3.7-27. Auklets past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence harvest (historic to present) • Foreign fisheries incidental take, very little data (1960s to present) • Incidental take in other U.S. net fisheries, very little data.	• Incidental take in MSA groundfish fisheries (1978 to present). • Auklets do not have separate identification codes in the Observer Program but are reported in the alcid group •	• Migratory Bird Treaty Act (1918) • International Plan of Action for reducing incidental take of seabirds in longlines (1999) • National Plan of Action for reducing incidental take of seabirds in longlines (2001)	• Seabird/fishery interaction monitoring and research through Observer Program (1990 to present)
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but assumed to be minimal.		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through contamination with oil	• Foreign and U.S. fisheries and marine vessels throughout Pacific	• MSA groundfish vessels and at-sea processors (1979 to present).	• Oil spill prevention laws and regulations	
Reduced fitness through consumption of plastics	• Numerous sources of raw plastic pellets and plastic consumer products on land and at sea	• Fishing vessels and processors contribute unknown amounts of plastic products	• MPPRCA (1987)	• Educational effort on importance of compliance with MPPRCA (1995 to present)
Reduced fitness through introduction of nest predators	• Fox farming in Aleutians and GOA (1750s to 1930s) • Accidental escape from marine vessels of all types.	• Accidental escape from MSA groundfish vessels.	• Fox extermination program of USFWS. • Rat invasion prevention program of USFWS	

Comparative Baseline:

- Five auklet species are generally widespread and abundant in BSAI and GOA although population estimates are uncertain and population trends are poorly known.
- Since these species are not distinguished in the Observer Program data, no species-specific assessment can be made of incidental take impacts.
- Concern for chronic and acute contamination with oil from all sources.
- Concern for plastic ingestion by parakeet auklets.
- Concern for introduction of rats to colonies.

Carry Forward for Cumulative Effects Analysis?

Yes. Lack of species-specific quantitative information on population trends and fishery impacts precludes further analysis except as part of planktivorous seabirds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MPPRCA – Marine Plastic Pollution Research and Control Act
MSA – Magnuson-Stevens Act
USFWS – U.S. Fish and Wildlife Service

Table 3.7-28. Puffins past/present effects.

Direct/ Indirect Effect	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence harvest (historic to present) • Foreign fisheries incidental take (1960s to present) • High-seas squid drift fisheries took huge numbers of puffins per year (1970s to 1991) • Incidental take in other U.S. net fisheries, very little data	• Incidental take in MSA groundfish fisheries (1978 to present) • All three species have separate identification codes in the Observer Program data but are reported in the alcid group	• Migratory Bird Treaty Act (1918) • U.N. Resolution (46/215) banning high-seas drift fishing (1992)	
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but assumed to be minimal		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through contamination with oil	• Foreign and U.S. fisheries and marine vessels throughout Pacific	• MSA groundfish vessels and at-sea processors (1979 to present)	• Oil spill prevention laws and regulations	~~?~~
Reduced fitness through introduction of nest predators	• Fox farming in Aleutians and GOA (1750s to 1930s) • Accidental escape from marine vessels of all types	• Accidental escape from MSA groundfish vessels	• Fox extermination program of USFWS • Rat invasion prevention program of USFWS	

Comparative Baseline:

- Population estimates for horned and tufted puffins and rhinoceros auklets are imprecise and population trends are poorly known but all species are abundant or common in the BSAI and GOA.
- Puffins suffered major losses from high-sea drift fisheries.
- Since puffins are not distinguished in the Observer Program data, no assessment can be made of incidental take impacts.
- Concern for chronic and acute contamination with oil from all sources.
- Concern for introduction of rats to ancient murrelets colonies.

Carry Forward for Cumulative Effects Analysis?

Yes. Lack of species-specific quantitative information on population trends and fishery impacts precludes further analysis except as part of piscivorous seabirds in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Act
USFWS – U.S. Fish and Wildlife Service

Table 3.8-1. Steller sea lion past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Commercial harvest for hides and meat – 45,000 pups from 1963-1972 • Incidental take of over 20,000 in foreign JV fisheries- 1966-1988 • Incidental take in State managed gillnet, longline, and trawl fisheries • Subsistence harvest of 549 in 1992 to 198 in 2001 • Shooting of sea lion in shore-based fisheries	• Incidental take of up to 20 per year in the groundfish fisheries in the 1990s	• Marine Mammal Protection Act (1972) • Endangered Species Act listing as threatened in 1990, western population listed as endangered in 1993	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)
Mortality from entanglement in marine debris	• Intentional and accidental loss of fishing gear and other material from all fishing vessels plus shoreside sources	• Groundfish fisheries contribution to lost gear and other materials	• MPPRCA	• Educational efforts on importance of compliance with the MPPRCA (1995 to present)
Reduced fitness through disturbance	• Sound pollution from vessels and research • Disturbance from state controlled fisheries, recreational boaters	• Sound pollution from fishing gear and groundfish fishing vessels • Physical disturbance during foraging	• SSL closures around rookeries and haulouts by State fisheries and recreational boaters. • Ban on killing of sea lions outside of subsistence take	• SSL protective measure 3nm no transect area around instituted in 1991
Reduced fitness through changes in prey availability	• Climate and oceanographic fluctuations impact abundance and distribution of prey • Foreign JV fisheries • State managed salmon and herring fisheries	• Impact from removal of large biomass of key Steller sea lion prey species - pollock, Pacific cod and Atka mackerel • Potential localized depletion of key prey species in SSL Critical Habitat	• Cessation of Foreign JV fisheries • Parallel State regulations in SSL critical habitat	• Ban on targeting forage fish (BSAI and GOA) • 3 nm closures around rookeries and haulouts • Prohibition of groundfish trawling within 10-20 nm of certain rookeries • Spatial and temporal allocation of GOA Pollock TAC • Spatial and temporal dispersal of BSAI Pollock and cod fisheries • Reduction of removal of Atka mackerel in SSL critical habitat and dispersion of Atka mackerel harvest • Closure of the AI to Pollock trawling

Table 3.8-1 (cont.). Steller sea lion past/present effects.

Comparative Baseline:	Carry Forward for Cumulative Effects Analysis?
• The western stock of the Steller sea lion is currently listed as endangered on the ESA due to a population declined approximately 80 percent from late 1970s, although decline has lessened in the 1990s to 5.4 percent. Take from groundfish fisheries and other fisheries (29) and subsistence harvest (198) exceeds the Potential Biological Removal (PBR=208) for this species. There is concern for direct competition between the groundfish fisheries and the Steller sea lion prey but recent SSL protective measures have potentially lessened this effect. • The eastern stock is listed as threatened under the ESA but population levels have been increasing approximately 2 percent over the last ten years and numbers are currently considered approximately 10,000 (non-pups).	YES. Steller sea lions, because of their status under the MMPA and the ESA, will be considered as two separate stocks in analysis of Alternatives in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
AI – Aleutian Islands
BSAI – Bering Sea and Aleutian Islands
ESA – Endangered Species Act
GOA – Gulf of Alaska
JV – joint venture
MMPA – Marine Mammal Protection Act
MPPRCA – Marine Plastic Pollution Research and Control Act
nm – nautical miles
SSL – Steller sea lion
TAC – total allowable catch

Table 3.8-2. Northern fur seals past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence harvest (historic to present) Average 1,605/year in Pribilof Islands from 1986-1996; Average 1,340/year in 1995-2000 • Commercial hunts (historic to 1985) peak take of 126,000 seals in 1961. • Incidental take in high sea driftnet fisheries, thousands/year (1960s to 1992) • Incidental take in State net fisheries; average 15/year in BSAI (1990-1998).	• Small numbers of incidental take in foreign, joint venture, and MSA groundfish fisheries (1978 to present). • Observer Program data; average less than 1 seal/year in trawls. Last recorded take in 1996.	• Marine Mammal Protection Act (1972) • U.N. Resolution 46/215 banning high seas driftnet fisheries.	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)
Mortality from entanglement in marine debris	• Intentional and accidental loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources.	•Contribution to lost gear and material.	•MPPRCA (1987)	• Educational effort on importance of compliance with MPPRCA (1995 to present)
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey	• Impact unknown but some direct competition for prey. • Concern for localized depletion of prey around Pribilofs, increasing due to displaced fishing effort from SSL habitats.		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)

Comparative Baseline:

- Population estimate in 2000 about 940,000 and declining.
- Population declined substantially in 1970s to early 1980s, leading to “depleted” status under MMPA in 1988.
- Majority of population breeds on Pribilof Islands.
- Anthropogenic take small relative to PBR.
- Concern for localized depletion of prey by groundfish fisheries, especially around Pribilof Islands. Displacement of fishing effort from Steller sea lion Critical Habitats is increasing effort in areas important to fur seals.

Carry Forward for Cumulative Effects Analysis?

YES. Regular interaction and direct competition with the groundfish fisheries and depleted population status warrants analysis as a separate species in the analysis of Alternative FMPs in Chapter 4.

Table 3.8-2 (cont.). Northern fur seals past/present effects.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
MMPA – Marine Mammal Protection Act
MPPRCA – Marine Plastic Pollution Research and Control Act
MSA – Magnuson-Stevens Act
SSL – Steller sea lion

Table 3.8-3. Pacific walrus past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence hunts in Alaska average almost 6,000 walrus/year (historic to present) • Commercial hunts (1700s to 1950s)	• Rare incidental take in BSAI groundfish trawls	• Marine Mammal Protection Act (1972) • Cooperative management agreement with Eskimo Walrus Commission (1997)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:

- Walrus population is considered large and stable. Direct interactions with commercial fishing vessels are rare. There is no overlap of diet with groundfish harvest.

Carry Forward for Cumulative Effects Analysis?

YES. Walrus will be considered under the "other pinniped" group in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands

Table 3.8-4. Harbor seals past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence harvest (historic to present) Average 161/year in Bering ; Average 791/year in GOA; Average 1,749/year in Southeast. (1992-96) • State predator control programs (1950s to 1972) • Commercial hunts (1963 to 1972) • Incidental take in State net fisheries; average 30/year in BSAI and 25/year in GOA in 1990s	• Incidental take in MSA groundfish fisheries (1978 to present) • Observer Program data; Bering Sea estimate = 3 seals/year, GOA estimate < 1 seal/year, Southeast estimate = 4 seals/year	• Marine Mammal Protection Act (1972)	• Marine mammal /fishery interaction monitoring and research through Observer Program (1990 to present)
Reduced fitness through changes in prey availability	• Climate and oceanic fluctuations impact abundance and distribution of prey • Concern that decline in Steller sea lion population has caused killer whales to prey heavily on seals instead.	• Impact unknown but some direct competition for prey.		• Ban on targeting forage fish (BSAI and GOA FMP amendments 36/39, 1997)
Reduced fitness through disturbance	• Foreign fisheries and processing vessels throughout Pacific • Other U.S. fisheries.	• MSA groundfish vessels (1979 to present).		
Reduced fitness through contamination with oil	• *Exxon Valdez* and other large oil spills from vessel accidents • Many other chronic sources of pollution	• Contribution of groundfish vessels to chronic pollution.		

Comparative Baseline:

- Three recognized stocks but under reassessment; Bering Sea estimate = 13,300 seals, GOA and AI estimate = 29,200 seals, Southeast estimate = 77,900 seals.
- Population trends mixed. Increasing in Bristol Bay but decreasing around Pribilofs. Major declines in GOA from 1976-1992 followed by steady increases. Generally increase in Southeast.
- Concern for chronic and acute contamination with oil from all sources.

Carry Forward for Cumulative Effects Analysis?

YES. Regular interaction and direct competition with the groundfish fisheries and major population declines in GOA warrants analysis as a separate species in the analysis of Alternative FMPs in Chapter 4.

Table 3.8-4 (cont.). Harbor seals past/present effects.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
AI – Aleutian Islands
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska
JV – joint venture

Table 3.8-5. Spotted seal past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence hunts in Alaska average > 5000 seals/year (historic to present). • Incidental take in salmon gillnet fisheries	• Rare incidental take in BSAI groundfish trawls	• Marine Mammal Protection Act (1972)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:

- Spotted seal population is considered large and stable. Direct interactions with commercial fishing vessels are rare. There is only a partial overlap of diet with groundfish harvest.

Carry Forward for Cumulative Effects Analysis?

YES. Spotted seals will be considered under the "other pinniped" group in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands

Table 3.8-6. Bearded seal past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence hunts in Alaska average > 6000 seals/year (historic to present). • Incidental take in State fisheries.	• Rare incidental take in BSAI groundfish trawls	• Marine Mammal Protection Act (1972)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:

- Bearded seal population is considered large and stable. Direct interactions with commercial fishing vessels are rare. There is only a partial overlap of diet with groundfish harvest.

Carry Forward for Cumulative Effects Analysis?

YES. Bearded seals will be considered under the "other pinniped" group in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands

Table 3.8-7. Ringed seal past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence hunts in Alaska average > 9000 seals/year (historic to present).	• Rare incidental take in BSAI groundfish trawls	• Marine Mammal Protection Act (1972)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:

- Ringed seal population is considered large and stable. Direct interactions with commercial fishing vessels are rare. There is only a partial overlap of diet with groundfish harvest.

Carry Forward for Cumulative Effects Analysis?

YES. Ringed seals will be considered under the "other pinniped" group in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands

Table 3.8-8. Ribbon seal past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence hunting (historic to present)	• Very low level of take in BSAI groundfish trawls	• Marine Mammal Protection Act (1972)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:

- Ribbon seal population trends and current estimates are unknown although there is no evidence that they are declining. Incidental take by groundfish trawls has been documented but is a rare occurrence, Appears to be some overlap of prey species with groundfish catch.

Carry Forward for Cumulative Effects Analysis?

YES. Ribbon seals will be considered under the "other pinniped" group in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands

Table 3.8-9. Northern elephant seal past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Commercial hunts in California and Mexico in 1800s • Incidental take in various gillnet fisheries average 86 per year from CA - WA	• Very low level of take in groundfish trawls and longlines	• Marine Mammal Protection Act (1972)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:

- Elephant seal population is expanding and numbers over 100,000 in U.S. waters. Direct interactions with commercial fishing vessels are infrequent. Incidental take by the groundfish fleet approaches zero.

Carry Forward for Cumulative Effects Analysis?

YES. Elephant seals will be considered under the "other pinniped" group in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.

Table 3.8-10. Sea otter past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Commercial hunts (1700s to 1911). • Subsistence hunts (historic to present). • Rare Incidental take in State fisheries	• Rare incidental take in BSAI groundfish trawls	• International Fur Seal Treaty (1911) • Marine Mammal Protection Act (1972)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)
Mortality through oil pollution	• *Exxon Valdez* disaster • Chronic small-scale pollution from all vessels	• Contribution to chronic pollution	• Oil transportation regulations	

Comparative Baseline:
Sea otter population in Alaska is divided into three stocks. Southwest stock has declined precipitously in past 15 years and is a Candidate for ESA listing. Southcentral and Southeast stocks have generally increased over same period. Direct interactions with commercial fishing vessels are rare. There is a partial overlap of diet with groundfish harvest although sea otters prefer nearshore habitats.

Carry Forward for Cumulative Effects Analysis?

YES. Because of their ESA Candidate status and regular interaction with the groundfish fleet, sea otters will be considered as a separate species in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
ESA – Endangered Species Act

Table 3.8-11. Blue whale past/present effects table.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	•Commercial hunts in North Pacific until 1965. •Illegal whaling in Russian waters after 1965. •Rare evidence of ship strikes in California.	•No recorded take in MSA fisheries	•IWC ban on whaling (1966) •Marine Mammal Protection Act (1972)	•Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Blue whales are listed as endangered under the ESA but the population in Alaskan waters is unknown. Direct interactions with commercial fishing vessels are very rare with no recorded take in Alaska. Diet does not overlap with groundfish fisheries.

Carry Forward for Cumulative Effects Analysis?
Yes. Blue whales will be considered under the "baleen whales" group in Chapter 4.

Notes: External **-** Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries
ESA - Endangered Species Act
IWC - International Whaling Commission
MSA - Magnuson-Stevens Fishery Conservation Management Act
N/A - not applicable

Table 3.8-12. Fin whale past/present effects table.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	•Commercial whaling in North Pacific until 1976.	•One recorded take in BSAI groundfish trawl (1999)	•Marine Mammal Protection Act (1972)	•Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Fin whales are listed as endangered under the ESA. Population size and trends in Alaskan waters is not known. Direct interactions with commercial fishing operations are rare with only one recorded incidental take in the BSAI trawl fishery. Diet overlaps partially with groundfish fisheries.

Carry Forward for Cumulative Effects Analysis?
Yes. Fin whales will be considered under the "baleen whales" group in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries
BSAI - Bering Sea and Aleutian Islands
ESA - Endangered Species Act
N/A - not applicable

Table 3.8-13. Sei whale past/present effects table.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	•Commercial whaling in North Pacific until 1976.	•No recorded take in MSA groundfish fisheries	•Marine Mammal Protection Act (1972) •IWC ban on sei whale hunts (1976)	•Marine mammal /fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Sei whales are listed as endangered under the ESA due to commercial whaling. Population trends and current estimates are unavailable. Direct interactions with commercial fishing operations are rare with no recorded incidental takes in any fisheries. Diet does not overlap with groundfish fisheries.

Carry Forward for Cumulative Effects Analysis?
Yes. Sei whales will be considered under the "baleen whales" group in Chapter 4.

Note: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries
ESA - Endangered Species Act
IWC - International Whaling Commission
MSA - Magnuson-Stevens Fishery Conservation Management Act
N/A - not applicable

Table 3.8-14. Minke whale past/present effects table.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	•Incidental take in gillnet fisheries	•One recorded take in GOA joint-venture trawl groundfish fishery (1989)	•Marine Mammal Protection Act (1972)	•Marine mammal /fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Minke whales are not listed under the ESA and were not subject to commercial whaling. Population trends and current estimates are unavailable but they are believed to be common in the project area based on frequency of sightings. Direct interactions with commercial fishing operations are rare with no recorded incidental takes in any fisheries since 1989. Diet overlaps partially with groundfish fisheries.

Carry Forward for Cumulative Effects Analysis?
Yes. Minke whales will be considered under the "baleen whales" group in Chapter 4.

Note: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries
ESA - Endangered Species Act
GOA - Gulf of Alaska
N/A - not applicable

Table 3.8-15. Humpback whale past/present effects table.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	•Commercial whaling until 1966 •Incidental take in gillnet, longline, and pot fisheries in Hawaii and Alaska. •Ship strikes from fishing and non-fishing vessels	•Two recorded takes in BSAI trawl groundfish fishery (1998 and 1999) •Contribution to entanglement in fishing gear •Contribution to ship strikes	•IWC ban on whaling (1966) •Marine Mammal Protection Act (1972)	•Marine mammal /fishery interaction monitoring and research through Observer Program (1990 to present)
Reduced fitness through disturbance	•Sound pollution from vessels and research •Whale watching	•Sound pollution from vessels	•Whale watching regulations	•

Comparative Baseline:
Humpback whales are listed as endangered under the ESA due to commercial whaling. The population of Alaska stocks was estimated at about 4,370 animals in 1993. Numbers are thought to be increasing but at an unknown rate. Direct interactions with commercial fishing operations occur on a regular basis. Two cases of incidental take were observed in the BSAI groundfish trawl fisheries since 1998. Diet does not overlap with groundfish fisheries.

Carry Forward for Cumulative Effects Analysis?
Yes. Humpback whales will be considered under the "baleen whales" group in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries
BSAI - Bering Sea and Aleutian Islands
ESA - Endangered Species Act
IWC - International Whaling Commission
N/A - not applicable

Table 3.8-16. Gray whale past/present effects table.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	•Commercial whaling in North Pacific until 1948. •Subsistence hunts from California to Russia (historic to present) •Incidental take in coastal gillnet fisheries	•No recorded take in MSA groundfish fisheries	•International Convention for the Regulation of Whaling (1948) •IWC regulation of subsistence take (1966 to present) •Marine Mammal Protection Act (1972)	•Marine mammal /fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Gray whales were previously listed as endangered under the ESA but were delisted in 1994 because population size had recovered to near pre-whaling levels. Population trends have shown increases for past two decades but have recently leveled off. Direct interactions with commercial fishing operations are rare with no recorded incidental takes in the MSA groundfish fisheries. Diet does not overlap with groundfish fisheries.

Carry Forward for Cumulative Effects Analysis?
Yes. Gray whales will be considered under the "baleen whales" group in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries
ESA - Endangered Species Act
IWC - International Whaling Commission
MSA - Magnuson-Stevens Fishery Conservation Management Act
N/A - not applicable

Table 3.8-17. Northern right whale past/present effects table.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	•Commercial whaling in North Pacific until 1931. •Illegal whaling after 1931 •Incidental take in Russian driftnet fisheries (1980s)	•No recorded take in MSA groundfish fisheries	•League of Nations ban on right whale hunts (1931) •IWC ban on right whale hunts (1949) •Marine Mammal Protection Act (1972)	•Marine mammal /fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Northern right whales are listed as endangered under the ESA due to commercial whaling. Population trends and current estimates are unavailable but believed to be very small. Direct interactions with commercial fishing operations are rare with no recorded incidental takes in any fisheries since 1989. Diet does not overlap with groundfish fisheries.

Carry Forward for Cumulative Effects Analysis?
Yes. Right whales will be considered under the "baleen whales" group in Chapter 4.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries
ESA - Endangered Species Act
IWC - International Whaling Commission
MSA - Magnuson-Stevens Fishery Conservation Management Act
N/A - not applicable

Table 3.8-18. Bowhead whale past/present effects table.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	•Commercial hunts in North Pacific until 1965. •Subsistence hunts in Bering Sea (historic to present) •Rare evidence of entanglement in fishing gear	•No recorded take in MSA fisheries	•IWC ban on whaling (1966) •Marine Mammal Protection Act (1972)	•Marine mammal /fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Bowhead whales are listed as endangered under the ESA but the population in Alaskan waters is increasing. Direct interactions with commercial fishing operations are rare with very few recorded incidences of entanglement in fishing gear, most of which appears to be crab gear. Diet does not overlap with groundfish fisheries.

Carry Forward for Cumulative Effects Analysis?
Yes. Bowhead whales will be considered under the "baleen whales" group in Chapter 4.

Notes: External = Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries
Internal = Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries
ESA – Endangered Species Act
IWC – International Whaling Commission
MSA – Magnuson-Stevens Fishery Conservation Management Act
N/A = not applicable

Table 3.8-19. Sperm whale past/present effects table.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	•Commercial whaling (until 1988) •No subsistence take	•No incidental take in BSAI/GOA groundfish fisheries (1990-1999)	•Endangered Species Act (1970) •Marine Mammal Protection Act (1972)	•Marine mammal /fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Sperm whales are listed as endangered under the ESA but no population estimates are available for Alaskan waters. No incidental take of sperm whales has been observed or reported in commercial fisheries, including the MSA groundfish fisheries, although there have been reports of fishermen trying to deter sperm whales from their longline catches in the GOA. NOAA Fisheries has issued a BiOp that concludes the groundfish fisheries do not place sperm whales in jeopardy of extinction or reduce their chances of recovery.

Carry Forward for Cumulative Effects Analysis?
Yes. Based on the infrequent interaction between the groundfish fisheries and sperm whales, they will be discussed only as part of the "toothed whales" species group in the analysis of FMP alternatives in Chapter 4.

Notes: External = Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries
Internal = Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries
BiOp – Biological Opinion
BSAI – Bering Sea and Aleutian Islands
ESA – Endangered Species Act
FMP – fishery management plan
GOA – Gulf of Alaska
MSA – Magnuson-Stevens Fishery Conservation Management Act
N/A = not applicable

Table 3.8-20. Beaked whales (Baird's, Cuvier's and Stejneger's) past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Incidental take in Prince William Sound, Bristol Bay and southeast drift gillnet fisheries combined - 2/year •No subsistence take	• No incidental take in BSAI and GOA groundfish trawl and longline is 1/year (1990-1998)	• Marine Mammal Protection Act (1972)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:

- All three species of beaked whales are very rare and seldom if ever interact with the groundfish fisheries in the BSAI and GOA. No incidental take has been recorded from these fisheries. From what is known of these whales, there is little if any competitive overlap as far as prey species.
- Beard's Beaked whales are very rarely, if ever, interacts with the groundfish fisheries. Take is or approaches zero. Little is know of the size of the stock or its distribution but its not considered a strategic stock under the MMPA and not listed under the ESA.

Carry Forward for Cumulative Effects Analysis?

No. Based on the lack of interaction between the groundfish fisheries and the beaked whales, the low level of effect in other fisheries, and its lack of status under the MMPA or ESA, this species will not be discussed as a single species in the analysis in Chapter 4.
No. Because so little is known of this whales and its interaction with the groundfish fisheries, it will not be carried forward as a separate species to Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
ESA – Endangered Species Act
GOA – Gulf of Alaska
MMPA – Marine Mammals Protection Act

Table 3.8-21. Pacific white-sided dolphin past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Incidental take in Prince William Sound, Bristol Bay and southeast drift gillnet fisheries combined - 2/year • No subsistence take	• No incidental take in BSAI and GOA groundfish trawl and longline is 1/year (1990-1998)	• Marine Mammal Protection Act (1972)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:

- The Pacific white-sided dolphin is a seasonal resident of the BSAI and GOA has little competitive overlap with groundfish fisheries as far as prey. Incidental take in the groundfish fisheries approaches zero. This stock is not classified as a strategic stock under the MMPA and is not an ESA -listed species.

Carry Forward for Cumulative Effects Analysis?

No. Based on the lack of interaction between the groundfish fisheries and the Pacific white-sided dolphin, the low level of effect in other fisheries, and its lack of status under the MMPA or ESA, this species will not be discussed as a single species in the analysis in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
ESA – Endangered Species Act
MMPA – Marine Mammals Protection Act

Table 3.8-22. Killer whale past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Illegal shooting of killer whales in various fisheries	• Incidental take of 1.4 whales per year in groundfish trawls and longlines (1995-1999) • Vessel strikes • Illegal shooting	• Marine Mammal Protection Act (1972) .	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)
Reduced fitness through changes in prey availability	• Climate and oceanographic fluctuations impact abundance and distribution of prey • State managed salmon and herring fisheries	• Potential competitive overlap with groundfish harvest and bycatch. • Potential cascade effects on marine mammal prey populations.		• Ban on targeting forage fish (BSAI and GOA) • Steller sea lion protection measures (protection of killer whale prey)

Comparative Baseline:
Killer whales are divided into two stocks that regularly inhabit Alaskan waters, including 745 known residents and 251 known transients. Population estimates do not include provisional identifications so they should be considered minimums. Resident whales feed on various fish species and are likely the type that interacts directly with the fisheries through depredation of longline catches, incidental take in trawl and longline gear, and other effects. Transient whales concentrate on marine mammal prey and are being investigated for their potential role in the decline of Steller sea lion populations as well as other marine mammal species.

Carry Forward for Cumulative Effects Analysis?

YES. Because of their frequent interaction with the groundfish fisheries and their possible role in the decline of several marine mammal species, killer whales will be considered as a separate species in the analysis of Alternative FMPs in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
FMP – fisheries management plan
GOA – Gulf of Alaska

Table 3.8-23. Beluga whale past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Subsistence hunts (historic to present) • Infrequent take in salmon gillnet fisheries	• No observed or reported incidental takes	• Marine Mammal Protection Act (1972) • Cooperative management agreements with Alaska Native groups. .	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Beluga whales are divided into five stocks including four stocks that winter in the Bering Sea and one that resides in Cook Inlet. The four Bering Sea stocks appear to be stable or increasing. The Cook Inlet stock declined substantially in the last ten years because of excessive subsistence harvests and was recently listed as depleted under the MMPA. The stock is now under a co-management agreement that greatly controls subsistence harvest. Belugas feed on a variety of fish species but prefer to forage near coastal waters or near the pack ice. No belugas have been reported taken in the groundfish fisheries but they are infrequently taken in State-managed salmon fisheries.

Carry Forward for Cumulative Effects Analysis?

YES. Because of their infrequent interaction with the groundfish fisheries, beluga whales will be considered as part of the "toothed whale" group in the analysis of Alternative FMPs in Chapter 4.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
FMP – fisheries management plan
MMPA – Marine Mammal Protection Act

Table 3.8-24. Harbor porpoise past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• Take in Southeast gillnet fisheries 2.8/year (1990-1998) • No subsistence take	• No incidental take in BSAI groundfish trawl or longline (1990-1998)	• Marine Mammal Protection Act (1972)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Harbor porpoise is a common species in the BSAI and GOA but has little interaction with the groundfish fisheries. There is little competitive overlap between the ground fisheries and harbor porpoise prey. Annual incidental take in the groundfish fisheries rarely, if every, occurs. This species is not classified as a strategic stock under the MMPA and is not an ESA -listed species.

Carry Forward for Cumulative Effects Analysis?
No. The low level of interaction between the Harbor Porpoise and the groundfish fisheries and lack of incidental take, harbor porpoise will not be considered as a separate species in the analysis of Alternative in Chapter 4, but would be address with the toothed whale groups.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
ESA – Endangered Species Act
GOA – Gulf of Alaska
MMPA – Marine Mammal Protection Act

Table 3.8-25. Dall's porpoise past/present effects.

Direct/Indirect Effect Indicator	Past/Present Events		Past/Present Management Actions	
	External	Internal	External	Internal
Mortality through intentional and incidental take	• No Incidental take in State fisheries. • No subsistence take • 54 taken per year off Japan but may be different stock	• No incidental take in BSAI and GOA groundfish trawl or longline fisheries (1990-1998)	• Marine Mammal Protection Act (1972)	• Marine mammal/fishery interaction monitoring and research through Observer Program (1990 to present)

Comparative Baseline:
Dall's Porpoise is a common species in the BSAI and GOA and interacts with the groundfish fisheries on a regular basis. Annual incidental take in the groundfish fisheries is relatively low for the large populations size in this region. There is little overlap between the prey of Dall's porpoise and the fish targeted by the groundfish fisheries. This species is not classified as a strategic stock under the MMPA and is not an ESA -listed species.

Carry Forward for Cumulative Effects Analysis?

No. Considering the low level of incidental take in the groundfish fisheries and their very limited overlap in prey species, Dall's porpoise will not be carried forward as separate species in analysis of Alternatives in Chapter 4 but will be grouped with the toothed whale group.

Notes: External – Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal – Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.
BSAI – Bering Sea and Aleutian Islands
ESA – Endangered Species Act
FMP – fisheries management plan
GOA – Gulf of Alaska
MMPA – Marine Mammal Protection Act

Table 3.9-1. Catcher vessel and processor classes identified for the sector and regional profiles.

ACRONYM	CATCHER VESSEL CLASSES (all mutually exclusive)
TCV BSP ≥ 125	Bering Sea Pollock Trawl Catcher Vessel Greater than or Equal to 125 Feet in Length
TCV BSP 60-124	Bering Sea Pollock Trawl Catcher Vessel 60 to 124 Feet in Length
TCV Div. AFA	Diversified AFA-Eligible Trawl Catcher Vessel Greater than or Equal to 60 Feet in Length
TCV Non-AFA	Non-AFA Trawl Catcher Vessel Greater than or Equal to 60 Feet in Length
TCV < 60	Trawl Catcher Vessel Less than 60 Feet in Length
PCV	Pot Catcher Vessel
LCV	Longline Catcher Vessel
FGCV 33-59	Fixed Gear Catcher Vessel 33 Feet to 59 Feet in Length
FGCV ≤ 32	Fixed Gear Catcher Vessel Less Than or Equal to 32 Feet in Length
ACRONYM	**CATCHER PROCESSOR CLASSES (all mutually exclusive)**
ST-CP	surimi trawl catcher-processor
FT-CP	fillet trawl catcher-processor
HT-CP	head-and-gut trawl catcher-processor
L-CP	longline catcher-processor
P-CP	pot catcher-processor
ACRONYM	**INSHORE PROCESSOR AND MOTHERSHIP CLASSES (all mutually exclusive)**
BSP-SP	Bering Sea pollock shore plant
APAI-SP	Alaska Peninsula and Aleutian Islands shore plant
K-SP	Kodiak shore plant
SC-SP	Southcentral Alaska shore plant
SE-SP	Southeast Alaska shore plant
FLT	Floating inshore plant
MS	Mothership

Table 3.9-2. Species groups identified for the sector and regional profiles.

ACRONYM	SPECIES GROUPS
A-R-S-O	Atka mackerel, all rockfish species, sablefish, and other groundfish
FLAT	all flatfish species (excludes halibut, which is not a groundfish)
PCOD	Pacific cod
PLCK	Pollock
GFSH	all groundfish species, including PLCK, PCOD, FLAT, and A-R-S-O
non-GFSH	all non-groundfish species harvested in Alaska commercial fisheries, including salmon, crab, halibut, and herring

Table 3.9-3. Regions identified for the sector and regional profiles.

ACRONYM	REGIONS (Boroughs, Census Areas, Municipalities, and Counties Included)
AKAPAI	Alaska Peninsula and Aleutian Islands Region. Includes the Aleutians East Borough and the Aleutians West Census Area.
AKSC	Southcentral Alaska Region. Includes Valdez-Cordova Census Area, Kenai Peninsula Borough, Matanuska-Susitna Borough, and the Municipality of Anchorage.
AKKO	Kodiak Region. Includes the Kodiak Island Borough and other parts of the Kodiak archipelago.
AKSE	Southeast Alaska Region. Includes Yakutat Borough, Skagway-Hoonah-Angoon Borough, Haines Borough, City and Borough of Juneau, City and Borough of Sitka, Wrangell-Petersburg Census Area, Prince of Wales-Outer Ketchikan Census Area, and Ketchikan Gateway Borough.
WAIW	Washington Inland Waters Region. All counties bordering Puget Sound and the Strait of Juan de Fuca, including Clallum, Island, Jefferson, King, Kitsap, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom.
ORCO	Oregon Coast Region. Counties bordering the Northern Oregon coast including Lincoln, Tillamook, and Clatsop.
OTHER	Includes all other boroughs, census areas, municipalities and counties in the United States.

Table 3.9-4. Fisheries management plan sub-areas identified for the sector and regional profiles.

ACRONYM	FMP AREAS and FMP SUB-AREAS
BSAI	Bering Sea and Aleutian Islands FMP Area
AI	Aleutian Islands FMP Sub-area
BS	Bering Sea FMP Sub-area
GOA	Gulf of Alaska FMP Area
WG	Western Gulf FMP Sub-area
CG	Central Gulf FMP Sub-area
EG	Eastern Gulf FMP Sub-area

Table 3.9-5. Summary of domestic harvesting and processing activities in Alaska groundfish fisheries, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Groundfish Vessels and Processors										
Catcher vessels[a]	1,374	1,142	1,240	1,076	1,002	1,032	961	1,005	1,078	917
Catcher-processors	136	120	116	118	112	106	98	88	90	89
Inshore processors and motherships[b]	77	69	73	77	67	64	62	61	69	59
All vessels and processors	1,587	1,331	1,429	1,271	1,181	1,202	1,121	1,154	1,237	1,065
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
Groundfish ($Millions)	264.3	169.6	200.3	254.7	229.0	264.8	181.5	248.4	324.7	299.5
Non-groundfish ($Millions)[c]	561.5	499.4	541.2	470.2	405.5	382.9	371.1	542.4	245.1	NA
Groundfish (% of total)	32.0	25.4	27.0	35.1	36.1	40.9	32.8	31.4	57.0	NA
Total Groundfish Catch										
Groundfish Catch (1,000s of mt)[d]	2,275	2,139	2,178	2,140	2,048	2,057	1,864	1,654	1,823	1,998
Groundfish Catch by Species Group										
A-R-S-O (% of Total)	9.7	11.0	9.8	10.2	11.6	10.5	9.1	11.1	10.5	7.4
FLAT (% of Total)	10.4	8.9	10.5	9.8	11.2	13.5	10.2	8.8	9.8	8.4
PCOD (% of Total)	12.5	10.4	11.0	14.6	15.0	15.9	13.8	14.6	13.4	10.9
PLCK (% of Total)	67.3	69.7	68.6	65.4	62.1	60.2	67.0	65.5	66.3	73.0
Groundfish Catch by FMP Subarea										
BSAI (% of Total)	85.5	84.6	85.9	87.4	87.7	85.1	82.3	83.0	86.0	90.7
GOA (% of Total)	14.5	15.4	14.1	12.6	12.3	14.9	17.7	17.0	14.0	9.3
Quantity and Value of Processed Product										
Product Quantity (1,000s of mt)	565.7	544.9	569.8	594.6	598.1	598.5	550.7	533.2	593.8	656.2
Gross Product Value ($Millions)	1,411.3	990.3	1,124.1	1,381.4	1,224.0	1,194.7	1,048.6	1,210.9	1,371.6	1,426.8
Groundfish Fishery Employment by Region (FTE Positions)[e]										
Alaska[f]	4,483	3,953	4,302	4,814	4,686	4,833	4,527	4,817	5,369	5,579
WAIW[g]	5,520	5,430	5,076	6,109	6,706	5,508	5,569	4,473	4,638	4,805
Total[h]	10,404	9,682	9,680	11,205	11,651	10,640	10,371	9,664	10,379	10,384
Groundfish Fishery Payments to Labor by Region ($Millions)										
Alaska[f]	194.8	143.1	174.3	207.8	183.3	191.1	159.3	200.6	225.7	256.9
WAIW[g]	428.9	293.1	326.1	412.1	368.6	387.8	308.0	347.4	410.1	391.3
Total[h]	652.2	494.0	547.4	646.8	585.3	573.0	517.1	578.5	645.3	648.2

Table 3.9-5 (cont.). Summary of domestic harvesting and processing activities in Alaska groundfish fisheries, 1992–2001.

Notes: [a]The count of catcher vessels excludes vessels that made only incidental landings or could not be classified. Since 1992, there have been an average of 408 such vessels. The annual deliveries of these vessels have averaged less than 70 mt and generated an average of only $87,000 in ex-vessel value.

[b]The count of processors does not include facilities that acted as buying stations or inshore processors that were not identified with a specific port. There were an average of 53 excluded facilities, which accounted for an average of 0.3 percent of total groundfish processing since 1992.

[c] Includes all deliveries of salmon, crab, halibut, and other non-groundfish species to groundfish processors. Data for 2000 does not include halibut.

[d]Includes all groundfish reported by processors including at-sea discards.

[e]Includes skippers, fishing crew, processing crew, managers, and home office support staff. Total employment estimates combine FTE positions from all processors with position counts from catcher vessels.

[f]Includes coastal boroughs and census areas from the Aleutians southward and eastward through Southeast Alaska.

[g]Includes coastal counties in Washington that border on Puget Sound and the Strait of Juan de Fuca.

[h]Totals include all areas of the U.S. not included in Alaska and WAIW.

Source: CFEC/ADF&G fish tickets, NOAA Fisheries observer data, NOAA Fisheries blend data and NOAA Fisheries Weekly Production Report data.

Table 3.9-6 A comparison of the activities of catcher vessel classes, 2001.

Catcher vessel class	Number of Vessels	Groundfish Landings Retained (1,000s of Metric Tons)				Ex-Vessel Value of Groundfish ($Millions)	Payments to Labor ($Millions)	Employment (No. of FTE Positions)
		PLCK	PCOD	A-R-S-O	FLAT			
TCV BSP ≥ 125	29	357.5	2.2	0.8	0.8	86.2	34.5	157.7
TCV BSP 60-124	51	365.0	8.4	1.3	1.3	91.7	36.7	290.5
TCV Div. AFA	20	41.3	10.2	2.3	2.1	17.2	6.9	102.2
TCV Non-AFA	42	25.8	11.1	4.7	6.6	17.1	6.8	147.8
TCV < 60	44	22.8	8.1	0.3	0.8	12.1	4.9	169.2
PCV	89	0.0	14.3	0.3	0.0	9.1	3.6	176.1
LCV	72	0.0	0.5	4.0	0.0	18.7	7.5	179.2
FGCV 33-59	514	0.1	8.6	6.7	0.2	33.8	13.5	687.7
FGCV ≤ 32	56	0.0	0.9	0.0	0.0	0.8	0.3	86.9
Total	917	812.4	64.2	20.4	11.7	286.7	114.7	1,997.4

Table 3.9-7. Summary of catcher vessel activities, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels										
Number of vessels	1,374	1,142	1,240	1,076	1,002	1,032	961	1,005	1,078	917
AKAPAI owners (% of total)	4.4	3.9	4.8	6.6	7.0	7.2	7.9	6.7	6.5	7.6
AKKO owners (% of total)	12.4	11.4	11.5	13.4	14.2	15.5	15.9	15.6	17.8	15.5
AKSC owners (% of total)	24.7	25.2	24.4	22.0	19.0	19.0	17.8	16.8	18.3	16.9
AKSE owners (% of total)	29.8	31.4	30.6	28.2	28.9	26.7	25.5	24.4	22.2	22.9
WAIW owners (% of total)	19.7	19.3	19.8	22.3	23.1	23.6	23.9	25.8	25.0	26.1
ORCO owners (% of total)	3.1	2.9	3.1	3.5	3.6	3.5	3.7	3.9	3.9	3.8
Other owners (% of total)	5.9	5.9	5.7	4.0	4.3	4.5	5.2	6.9	6.3	7.2
Total Groundfish Catch Retained										
Groundfish catch retained (1,000s of mt)	823.6	771.9	790.7	834.3	813.7	969.9	809.6	785.1	833.6	908.8
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	266.2	172.9	197.6	261.3	232.4	334.7	181.0	247.4	308.3	224.6
Non-GFSH ($Millions)[a]	182.7	134.0	168.0	193.1	155.2	170.6	139.4	250.7	108.2	NA
Salmon (% of Total)	38.7	33.4	31.9	21.2	15.8	15.9	22.9	19.5	24.6	NA
Crab (% of Total)	37.5	31.5	28.6	47.9	36.2	29.0	35.4	43.7	65.5	NA
Halibut (% of Total)	18.5	27.8	32.8	24.9	37.2	45.8	34.5	32.9	0.0	NA
Other (% of Total)	5.3	7.3	6.7	6.1	10.7	9.3	7.3	4.0	9.8	NA
GFSH (% of Total)	59.3	56.3	54.0	57.5	60.0	66.2	56.5	49.7	74.0	NA
Ex-Vessel Value of Groundfish Retained by Species Group (% of Total)										
A-R-S-O	19.5	25.1	29.1	27.9	28.7	20.6	24.0	18.7	20.3	18.2
FLAT	3.6	2.0	2.2	2.2	2.6	4.9	1.5	0.7	0.9	1.3
PCOD	15.2	17.1	14.0	18.1	21.6	21.6	23.2	28.0	24.3	12.4
PLCK	61.6	55.8	54.7	51.8	47.1	52.8	51.3	52.6	54.6	68.2
Ex-Vessel Value of Groundfish Retained by FMP Subarea (% of Total)										
Aleutian Islands	2.5	2.3	2.2	2.5	1.9	2.6	1.8	2.0	2.8	2.3
Bering Sea	59.9	52.4	52.6	55.5	54.7	60.6	49.1	53.3	58.1	58.1
WG	6.8	4.7	3.8	6.1	6.7	6.5	8.2	8.4	7.4	7.1
CG	21.3	27.0	21.3	21.1	21.6	19.5	28.4	26.5	21.5	19.5
EG	8.8	13.5	20.1	14.7	15.1	10.7	12.1	9.2	9.9	13.0
Groundfish Fishery Employment by Region (FTE Positions)[b]										
AKAPAI	103.8	65.0	93.7	123.7	127.6	140.9	147.3	129.8	130.1	113.7
AKKO	310.0	211.0	236.4	270.0	285.3	332.3	294.2	291.9	337.3	237.2
AKSC	487.6	321.2	334.4	363.1	302.2	321.9	270.9	268.3	317.1	199.7
AKSE	545.7	371.2	393.3	445.7	432.1	433.6	369.7	375.9	372.0	348.1
WAIW	590.0	412.2	468.3	560.4	554.6	558.5	526.0	598.9	622.0	808.6
ORCO	120.3	91.1	97.0	112.0	108.0	108.2	105.7	114.1	110.8	136.2
Total[c]	2,297.3	1,572.2	1,723.9	1,968.0	1,907.0	1,994.9	1,820.8	1,913.2	2,021.1	1,997.4
Groundfish Fishery Payments to Labor by Region ($Millions)[c]										
AKAPAI	2.3	1.4	1.8	2.0	3.2	3.9	3.0	4.0	2.8	3.2
AKKO	11.4	8.5	8.9	11.0	11.3	15.8	9.1	12.0	12.4	8.2
AKSC	6.9	4.9	4.5	4.9	3.7	4.5	3.0	4.1	5.6	3.8
AKSE	7.9	7.7	10.6	10.6	10.1	9.7	6.5	7.0	9.2	7.8
WAIW	61.0	36.2	42.6	59.2	50.9	84.9	39.9	56.0	74.9	74.0
ORCO	9.1	6.0	5.9	9.0	7.6	8.7	6.4	9.1	9.6	10.4
Total[c]	107.0	69.3	79.2	106.7	94.5	134.7	73.1	99.1	122.4	114.7

Table 3.9-7 (cont.). Summary of catcher vessel activities, 1992–2001.

Notes: [a]Salmon, crab, halibut, and other.
[b]Includes skipper, crew, and support staff.
[c]Includes estimates for residents of other regions.
NA - data is not available

Source: CFEC/ADF&G fish tickets

Table 3.9-8. Summary of activities of Bering Sea pollock trawl catcher vessels greater than or equal to 125 feet in length, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels										
Number of vessels	25	22	22	24	29	36	31	33	30	29
WAIW owners (% of Total)	88.0	90.9	90.9	91.7	89.7	97.2	96.8	97.0	96.7	96.6
ORCO owners (% of Total)	4.0	4.5	4.5	4.2	0.0	0.0	0.0	0.0	0.0	0.0
Other owners (% of Total)	8.0	4.5	4.5	4.2	10.3	2.8	3.2	3.0	3.3	3.4
Total Groundfish Catch Retained										
Groundfish catch retained (1,000s of mt)	205.8	226.0	232.9	233.5	268.6	382.6	269.2	300.6	309.1	361.3
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	55.5	35.0	39.2	49.5	49.0	100.4	39.6	64.6	79.5	86.2
Non-GFSH ($Millions)[a]	CR	3.1	CR	1.8	CR	1.6	2.2	5.0	1.2	NA
Salmon (% of total)	0.0	0.0	0.0	0.0	0.0	0.0	CR	CR	0.0	NA
Crab (% of total)	CR	100.0	CR	100.0	CR	100.0	100.0	100.0	100.0	NA
Other (% of total)	0.0	0.0	0.0	0.0	0.0	CR	0.0	CR	0.0	NA
GFSH (% of total)	CR	91.9	CR	96.5	CR	98.4	94.8	92.8	98.5	NA
Ex-Vessel Value of Groundfish Retained by Species Group (% of Total)										
A-R-S-O	0.0	0.0	0.1	0.3	0.0	0.0	0.1	0.0	0.0	0.1
FLAT	1.7	0.0	1.2	1.1	0.8	5.4	0.1	0.3	0.5	0.4
PCOD	2.4	5.0	3.8	5.7	9.5	5.2	5.8	6.5	4.5	1.2
PLCK	95.9	95.0	94.9	92.9	89.7	89.4	94.0	93.2	95.1	98.3
Ex-Vessel Value of Groundfish Retained by FMP Subarea (% of Total)										
Aleutian Islands	6.5	5.3	6.5	7.1	3.9	4.2	3.0	1.7	1.3	0.8
Bering Sea	89.3	90.4	88.9	86.4	93.3	93.1	91.4	95.2	98.7	99.2
WG	3.4	2.0	2.5	4.8	2.0	1.9	2.9	1.9	CR	CR
CG	0.9	2.1	1.3	1.6	0.8	0.2	0.8	0.8	0.0	0.0
EG	0.0	0.2	0.7	0.1	0.0	0.5	2.0	0.3	0.0	0.0
Groundfish Fishery Employment by Region (FTE Positions)[b]										
WAIW	66.7	62.8	68.4	76.6	87.1	101.5	95.5	106.7	95.9	151.1
ORCO	3.0	3.1	3.4	3.5	0.0	0.0	0.0	0.0	0.0	6.7
Total[c]	75.8	69.1	75.3	83.6	97.1	104.4	98.7	110.1	99.2	157.7
Groundfish Fishery Payments to Labor by Region ($Millions)[c]										
WAIW	21.0	13.1	15.1	19.9	19.2	42.3	16.1	24.9	32.2	33.0
ORCO	0.7	0.6	0.6	0.7	0.0	0.0	0.0	0.0	0.0	1.5
Total[c]	22.2	14.0	15.7	19.8	19.6	40.2	15.8	25.8	31.8	34.5

Notes: [a] Salmon, crab, halibut, and other.
[b] Includes skipper, crew, and support staff.
[c] Includes estimates for residents of other regions.
NA - data is not available
CR - data can not be presented due to NOAA Fisheries data confidentiality restrictions

Source: CFEC/ADF&G fish tickets

Table 3.9-9. Summary of activities of Bering Sea pollock trawl catcher vessels 60 to 124 feet in length, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels										
Number of vessels	56	54	54	63	62	54	48	42	45	51
AKAPAI owners (% of total)	0.0	1.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AKKO owners (% of total)	1.8	1.9	1.9	6.3	8.1	3.7	6.3	2.4	2.2	5.9
AKSC owners (% of total)	5.4	1.9	1.9	1.6	0.0	1.9	0.0	0.0	0.0	0.0
WAIW owners (% of total)	71.4	79.6	74.1	69.8	67.7	74.1	81.3	83.3	77.8	68.6
ORCO owners (% of total)	14.3	5.6	11.1	14.3	16.1	13.0	6.3	9.5	15.6	21.6
Other owners (% of total)	7.1	9.3	9.3	7.9	8.1	7.4	6.3	4.8	4.4	3.9
Total Groundfish Catch Retained										
Groundfish catch retained (1,000s of mt)	404.6	352.4	384.2	424.3	370.9	350.8	292.2	254.3	320.4	376.0
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	95.1	52.1	63.8	88.8	68.3	79.9	43.4	53.9	82.7	91.7
Non-GFSH ($Millions)[a]	5.8	8.0	4.0	4.2	1.2	3.4	4.1	7.7	3.1	NA
Salmon (% of total)	CR	CR	CR	0.0	0.0	CR	CR	0.0	0.0	NA
Crab (% of total)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	NA
Halibut (% of total)	0.0	CR	CR	CR	CR	CR	0.0	CR	0.0	NA
Other (% of total)	0.0	0.0	0.0	0.0	CR	CR	CR	0.0	0.0	NA
GFSH (% of total)	94.2	86.7	94.2	95.4	98.3	95.9	91.3	87.5	96.4	NA
Ex-Vessel Value of Groundfish Retained by Species Group (% of Total)										
A-R-S-O	0.0	0.2	0.1	0.4	1.9	0.6	0.6	0.3	0.4	0.5
FLAT	0.4	0.1	1.5	2.5	1.7	0.8	0.6	0.0	0.2	0.4
PCOD	5.7	7.9	11.1	12.4	16.8	14.0	13.6	12.5	12.7	4.5
PLCK	93.8	91.7	87.3	84.7	79.6	84.6	85.2	87.2	86.7	94.5
Ex-Vessel Value of Groundfish Retained by FMP Subarea (% of Total)										
Aleutian Islands	1.8	2.6	1.3	1.1	1.9	2.1	2.4	1.7	1.3	CR
Bering Sea	92.9	93.2	93.4	91.5	92.3	92.9	90.3	94.4	97.1	97.2
WG	2.9	2.2	2.0	3.8	1.2	2.0	1.9	2.2	CR	CR
CG	2.4	1.9	2.5	3.6	4.1	2.5	5.0	1.7	1.6	2.8
EG	0.0	0.1	0.8	0.0	0.5	0.5	0.5	0.0	0.0	0.0
Groundfish Fishery Employment by Region (FTE Positions)[b]										
AKAPAI	0.0	3.1	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AKKO	3.9	3.1	3.5	14.6	17.8	5.8	9.6	3.0	3.3	13.1
AKSC	11.8	3.1	3.5	3.7	0.0	2.9	0.0	0.0	0.0	0.0
WAIW	157.6	134.0	141.9	161.0	149.8	116.9	125.3	106.4	116.7	216.2
ORCO	31.5	9.3	21.3	32.9	35.7	20.5	9.6	12.2	23.3	51.8
Total[c]	220.7	168.2	191.6	230.5	221.2	157.8	154.2	127.7	150.1	290.4
Groundfish Fishery Payments to Labor by Region ($Millions)[c]										
AKAPAI	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AKKO	0.7	0.5	0.5	2.3	2.4	1.3	1.1	0.7	0.8	1.6
AKSC	1.6	0.3	0.3	0.3	0.0	0.3	0.0	0.0	0.0	0.0
WAIW	29.2	17.1	20.0	27.2	20.2	25.6	14.8	17.8	27.0	27.3
ORCO	4.3	1.1	2.4	4.4	4.3	3.5	1.1	2.1	4.6	6.5
Total[c]	38.5	21.0	25.7	37.7	28.9	32.8	18.1	21.7	33.8	36.7

Table 3.9-9 (cont.). **Summary of activities of Bering Sea pollock trawl catcher vessels 60 to 124 feet in length, 1992–2001.**

Notes: [a]Salmon, crab, halibut, and other.
[b]Includes skipper, crew, and support staff.
[c] Includes estimates for residents of other regions.
NA - data is not available
CR - -data can not be presented due to NOAA Fisheries data confidentiality restrictions

Source: CFEC/ADF&G fish tickets

Table 3.9-10. Summary of activities of diversified AFA-eligible trawl catcher vessels greater than or equal to 60 feet in length, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels										
Number of vessels	31	31	27	24	19	26	32	34	30	20
AKKO owners (% of total)	38.7	35.5	40.7	33.3	36.8	34.6	25.0	17.6	20.0	20.0
AKSC owners (% of total)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	3.3	5.0
WAIW owners (% of total)	19.4	6.5	11.1	12.5	10.5	15.4	12.5	23.5	26.7	45.0
ORCO owners (% of total)	32.3	45.2	40.7	41.7	42.1	42.3	50.0	44.1	36.7	20.0
Other owners (% of total)	9.7	12.9	7.4	12.5	10.5	7.7	12.5	11.8	13.3	10.0
Total Groundfish Catch Retained										
Groundfish catch retained (1,000s of mt)	111.1	99.3	78.2	70.5	47.6	75.7	106.5	94.9	74.2	55.7
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	33.4	20.0	16.4	18.1	11.8	22.1	20.4	28.4	25.3	17.2
Non-GFSH ($Millions)[a]	1.0	1.9	1.8	1.0	1.4	1.0	0.8	2.0	0.8	NA
Salmon (% of total)	CR	0.0	CR	0.0	0.0	CR	CR	CR	CR	NA
Crab (% of total)	86.2	78.2	45.9	CR	CR	CR	58.1	64.2	99.8	NA
Halibut (% of total)	12.7	19.3	33.2	35.5	29.5	44.8	41.5	24.3	0.0	NA
Other (% of total)	0.0	CR	CR	CR	0.0	CR	0.0	CR	0.0	NA
GFSH (% of total)	97.0	91.4	89.9	94.8	89.3	95.5	96.3	93.3	97.0	NA
Ex-Vessel Value of Groundfish Retained by Species Group (% of Total)										
A-R-S-O	7.3	2.7	7.5	4.0	6.5	6.1	4.2	4.5	5.9	4.9
FLAT	17.8	5.0	5.8	6.5	3.8	6.4	3.3	1.6	2.9	3.4
PCOD	23.7	34.9	23.0	36.9	43.1	40.1	41.6	45.0	43.1	30.2
PLCK	51.2	57.4	63.8	52.6	46.6	47.4	50.8	48.9	48.0	61.5
Ex-Vessel Value of Groundfish Retained by FMP Subarea (% of Total)										
Aleutian Islands	CR	0.0	0.0	0.0	0.0	CR	CR	CR	8.8	8.8
Bering Sea	49.8	32.7	24.6	58.3	59.0	42.1	44.5	44.8	39.0	42.8
WG	6.0	3.8	4.1	5.1	7.9	8.2	8.0	4.2	7.7	13.7
CG	44.2	63.2	67.9	36.1	33.1	49.1	47.2	50.7	44.3	33.9
EG	0.0	0.2	3.5	0.5	0.0	0.6	0.3	0.4	0.2	0.8
Groundfish Fishery Employment by Region (FTE Positions)[b]										
AKKO	50.7	42.0	41.0	30.8	27.0	35.6	29.1	22.4	19.8	26.1
AKSC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	3.3	9.1
WAIW	25.3	7.6	11.2	11.6	7.7	15.8	14.5	29.9	26.4	37.6
ORCO	42.2	53.5	41.0	38.5	30.8	43.5	58.2	56.1	36.4	18.3
Total[c]	130.8	118.4	100.7	92.4	73.2	102.8	116.3	127.2	99.2	102.2
Groundfish Fishery Payments to Labor by Region ($Millions)[c]										
AKKO	5.3	3.3	3.0	2.5	1.9	3.4	2.1	2.5	2.2	1.8
AKSC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.6
WAIW	2.8	0.5	0.8	1.0	0.5	1.5	1.1	2.7	2.8	2.5
ORCO	3.4	3.5	2.2	2.6	1.9	3.2	4.1	5.2	3.3	1.2
Total [c]	13.4	8.0	6.6	7.2	4.7	8.8	8.2	11.4	10.1	6.9

Notes: [a]Salmon, crab, halibut, and other
[b]Includes skipper, crew, and support staff
[c]Includes estimates for residents of other regions
NA - data is not available
CR - data can not be presented due to NOAA Fisheries data confidentiality restrictions

Source: CFEC/ADF&G fish tickets.

Table 3.9-11. Summary of activities of non-AFA trawl catcher vessels greater than or equal to 60 feet in length, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels										
Number of vessels	48	40	32	35	34	38	40	39	38	42
AKAPAI owners (% of total)	10.4	7.5	6.3	11.4	8.8	7.9	7.5	7.7	7.9	7.1
AKKO owners (% of total)	29.2	32.5	43.8	31.4	29.4	39.5	32.5	30.8	31.6	26.2
AKSC owners (% of total)	6.3	7.5	3.1	5.7	5.9	5.3	7.5	5.1	5.3	2.4
WAIW owners (% of total)	37.5	35.0	34.4	28.6	32.4	21.1	22.5	25.6	23.7	21.4
ORCO owners (% of total)	8.3	10.0	6.3	11.4	14.7	15.8	15.0	15.4	15.8	21.4
Other owners (% of total)	8.3	7.5	6.3	11.4	8.8	10.5	15.0	15.4	15.8	21.4
Total Groundfish Catch Retained										
Groundfish catch retained (1,000s of mt)	38.3	37.8	32.6	33.4	39.7	53.0	55.7	50.8	47.0	48.2
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	13.3	9.7	9.0	11.3	12.5	22.2	11.9	16.7	16.4	17.1
Non-GFSH ($Millions)[a]	1.6	2.5	1.6	2.9	3.1	4.3	2.7	3.2	CR	NA
Salmon (% of total)	0.0	CR	0.0	CR	0.0	0.0	CR	0.0	CR	NA
Crab (% of total)	34.8	38.1	CR	43.6	34.3	CR	CR	CR	CR	NA
Halibut (% of total)	59.8	39.5	88.5	54.9	60.4	60.6	65.7	90.5	CR	NA
Other (% of total)	CR	22.4	CR	CR	5.3	CR	CR	CR	CR	NA
GFSH (% of total)	89.2	79.2	85.4	79.5	80.0	83.8	81.6	83.9	CR	NA
Ex-Vessel Value of Groundfish Retained by Species Group (% of Total)										
A-R-S-O	6.2	4.9	13.4	6.5	11.4	10.0	7.7	7.4	14.5	10.7
FLAT	15.7	18.0	17.4	13.8	16.5	30.5	10.1	4.6	8.4	11.7
PCOD	50.0	46.0	34.8	51.6	43.2	36.0	35.9	50.3	41.2	36.1
PLCK	28.1	31.0	34.4	28.1	28.8	23.4	46.3	37.8	35.9	41.4
Ex-Vessel Value of Groundfish Retained by FMP Subarea (% of Total)										
Aleutian Islands	0.0	CR	CR	0.0	0.0	0.0	CR	CR	CR	0.0
Bering Sea	22.0	16.7	20.2	18.2	12.0	26.0	5.6	9.3	11.2	8.4
WG	14.2	10.7	6.4	7.1	10.2	7.0	7.3	9.8	10.5	6.1
CG	63.4	72.3	71.4	74.0	76.6	62.0	86.6	78.8	74.8	81.7
EG	0.4	0.3	2.0	0.7	1.1	5.1	0.6	2.1	3.5	3.8
Groundfish Fishery Employment by Region (FTE Positions)[b]										
AKAPAI	14.4	8.8	6.3	11.2	10.3	9.9	9.1	10.1	8.4	9.0
AKKO	40.4	38.0	44.1	30.8	34.2	49.4	39.3	40.3	33.4	29.6
AKSC	8.7	8.8	3.1	5.6	6.8	6.6	9.1	6.7	5.6	1.9
AKSE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WAIW	52.0	40.9	34.6	28.0	37.6	26.3	27.2	33.6	25.1	27.0
ORCO	11.6	11.7	6.3	11.2	17.1	19.8	18.1	20.1	16.7	45.9
Total[c]	138.6	116.8	100.7	98.1	116.3	125.1	121.0	130.8	105.9	147.8
Groundfish Fishery Payments to Labor by Region ($Millions)[c]										
AKAPAI	0.5	0.2	0.1	0.3	0.4	0.6	0.3	0.5	0.4	0.4
AKKO	1.6	1.5	1.8	1.5	1.6	3.9	1.6	2.6	2.2	1.4
AKSC	0.3	0.2	0.1	0.1	0.2	0.3	0.2	0.3	0.3	0.1
WAIW	2.1	1.4	1.3	1.4	1.8	2.0	1.1	1.7	1.6	1.2
ORCO	0.4	0.4	0.2	0.5	0.7	1.2	0.7	1.1	0.9	2.1
Total[c]	5.3	3.9	3.6	4.5	5.0	8.9	4.8	6.7	6.6	6.8

Notes: [a]Salmon, crab, halibut, and other
[b]Includes skipper, crew, and support staff
[c]Includes estimates for residents of other regions
NA - data is not available

CR - data can not be presented due to NOAA Fisheries data confidentiality restrictions

Source: CFEC/ADF&G fish tickets

Table 3.9-12. Summary of activities of trawl catcher vessels less than 60 feet in length, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels										
Number of vessels	58	66	60	55	58	61	54	51	46	44
AKAPAI owners (% of total)	48.3	48.5	50.0	56.4	53.4	49.2	55.6	56.9	63.0	54.5
AKKO owners (% of total)	19.0	16.7	18.3	18.2	17.2	21.3	16.7	11.8	6.5	6.8
AKSC owners (% of total)	5.2	6.1	6.7	1.8	5.2	3.3	1.9	2.0	0.0	2.3
AKSE owners (% of total)	3.4	6.1	3.3	5.5	5.2	3.3	3.7	5.9	6.5	4.5
WAIW owners (% of total)	24.1	22.7	21.7	18.2	19.0	21.3	22.2	23.5	21.7	27.3
Other owners (% of total)	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	2.2	4.5
Total Groundfish Catch Retained										
Groundfish catch retained (1,000s of mt)	22.2	22.6	25.1	19.8	32.5	38.6	39.8	31.0	26.1	32.0
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	9.1	7.3	8.1	7.6	11.1	13.8	10.5	13.2	13.4	12.1
Non-GFSH ($Millions)[a]	14.1	11.7	12.3	12.3	6.8	7.1	7.4	10.8	3.9	NA
Salmon (% of total)	83.5	75.2	58.2	76.1	51.3	54.5	73.5	72.4	85.2	NA
Crab (% of total)	CR	4.3	7.1	5.8	4.6	3.0	CR	CR	5.2	NA
Halibut (% of total)	11.9	14.4	29.3	14.9	27.6	35.0	21.1	20.6	0.0	NA
Other (% of total)	2.9	6.0	5.5	3.1	16.5	7.5	5.0	5.4	9.6	NA
GFSH (% of total)	39.1	38.4	39.7	38.4	62.1	65.9	58.6	55.0	77.4	NA
Ex-Vessel Value of Groundfish Retained by Species Group (% of Total)										
A-R-S-O	7.9	15.7	24.9	19.5	14.3	12.2	12.0	8.2	8.9	8.9
FLAT	3.0	2.8	1.4	3.3	7.1	3.6	2.0	0.9	0.8	1.6
PCOD	80.5	69.8	53.2	57.5	60.7	56.7	59.9	69.7	68.9	37.1
PLCK	8.6	11.7	20.5	19.7	17.9	27.4	26.2	21.1	21.3	52.4
Ex-Vessel Value of Groundfish Retained by FMP Subarea (% of Total)										
Aleutian Islands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	CR	CR	2.7
Bering Sea	2.7	0.8	CR	1.0	CR	0.6	0.8	1.0	5.1	1.1
WG	54.6	51.8	39.9	38.3	49.5	50.6	53.2	74.1	78.5	68.1
CG	39.9	45.9	50.5	53.6	45.8	44.6	41.6	21.7	12.1	22.1
EG	2.8	1.5	9.6	7.1	4.7	4.2	4.4	3.2	4.3	5.9
Groundfish Fishery Employment by Region (FTE Positions)[b]										
AKAPAI	51.9	43.9	55.2	59.8	61.4	65.4	71.5	66.9	63.4	86.3
AKKO	20.4	15.1	20.2	19.3	19.8	28.3	21.5	13.8	6.6	7.3
AKSC	5.6	5.5	7.4	1.9	5.9	4.4	2.4	2.3	0.0	3.9
AKSE	3.7	5.5	3.7	5.8	5.9	4.4	4.8	6.9	6.6	9.6
WAIW	26.0	20.6	23.9	19.3	21.8	28.3	28.6	27.7	21.9	53.4
ORCO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total[c]	107.5	90.5	110.3	106.2	114.9	132.9	128.8	117.7	100.6	169.2
Groundfish Fishery Payments to Labor by Region ($Millions)[c]										
AKAPAI	1.5	0.9	1.0	1.0	2.0	2.4	1.9	2.7	1.5	2.5
AKKO	0.7	0.6	0.7	0.6	0.8	1.3	0.7	0.8	0.7	0.2
AKSC	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
AKSE	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.3	0.1	0.3
WAIW	0.9	0.7	0.7	0.6	0.9	1.3	1.0	1.2	0.9	1.5
Total[c]	3.6	2.9	3.2	3.1	4.4	5.5	4.2	5.3	3.6	4.9

Notes: [a]Salmon, crab, halibut, and other
[b]Includes skipper, crew, and support staff
[c]Includes estimates for residents of other regions
NA - data is not available
CR - data can not be presented due to NOAA Fisheries data confidentiality restrictions

Source: CFEC/ADF&G fish tickets

Table 3.9-13. Summary of activities of pot catcher vessels, 1992-2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels										
Number of vessels	72	37	40	101	100	76	65	103	158	89
AKAPAI owners (% of total)	1.4	0.0	0.0	3.0	5.0	1.3	3.1	2.9	2.5	0.0
AKKO owners (% of total)	25.0	40.5	37.5	23.8	32.0	32.9	33.8	24.3	22.8	23.6
AKSC owners (% of total)	29.2	21.6	10.0	17.8	16.0	10.5	15.4	16.5	14.6	13.5
AKSE owners (% of total)	0.0	0.0	0.0	0.0	0.0	3.9	0.0	1.9	2.5	0.0
WAIW owners (% of total)	31.9	29.7	37.5	44.6	37.0	38.2	32.3	45.6	46.8	49.4
ORCO owners (% of total)	11.1	5.4	12.5	5.9	5.0	6.6	6.2	5.8	6.3	5.6
Other owners (% of total)	1.4	2.7	2.5	5.0	5.0	6.6	9.2	2.9	4.4	7.9
Total Groundfish Catch Retained										
Groundfish catch retained (1,000s of mt)	10.6	7.4	10.8	21.2	26.9	25.0	16.3	20.3	26.5	14.7
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	6.5	4.3	4.7	11.0	12.5	12.6	7.8	13.6	21.0	9.1
Non-GFSH ($Millions)[a]	45.0	16.4	26.7	73.8	50.2	38.4	40.0	90.8	62.4	NA
Salmon (% of total)	CR	CR	0.0	0.0	CR	CR	CR	0.0	CR	NA
Crab (% of total)	94.9	87.9	92.5	95.0	90.0	86.2	91.2	93.3	98.8	NA
Halibut (% of total)	4.8	11.5	7.4	5.0	9.9	13.5	8.4	6.6	0.0	NA
Other (% of total)	0.3	0.6	CR	0.0	CR	0.3	0.4	0.0	CR	NA
GFSH (% of total)	12.6	20.9	15.0	13.0	20.0	24.7	16.2	13.0	25.2	NA
Ex-Vessel Value of Groundfish Retained by Species Group (% of Total)										
A-R-S-O	18.7	29.0	16.7	16.0	13.0	9.5	11.7	4.8	10.6	13.9
FLAT	0.0	NA	0.0	0.0	0.1	1.8	0.4	0.0	0.0	0.0
PCOD	81.2	70.5	83.3	84.0	86.9	88.6	87.8	95.2	89.1	86.1
PLCK	0.1	NA	0.0	0.0	0.0	0.1	0.1	0.0	0.3	0.0
Ex-Vessel Value of Groundfish Retained by FMP Subarea (% of Total)										
Aleutian Islands	CR	CR	CR	CR	0.4	CR	CR	8.2	10.0	6.9
Bering Sea	35.3	19.4	48.8	52.6	62.8	67.8	46.9	43.2	38.3	71.4
WG	3.5	5.8	3.0	4.1	6.5	6.6	6.1	4.2	10.1	4.0
CG	55.1	63.3	41.6	38.7	28.0	24.2	45.0	43.7	39.5	17.2
EG	6.2	11.5	6.6	4.6	2.3	1.3	2.0	0.5	2.1	0.5
Groundfish Fishery Employment by Region (FTE Positions)[b]										
AKAPAI	2.1	0.0	0.0	5.7	10.9	2.4	4.3	6.3	8.3	0.0
AKKO	37.4	29.3	31.4	46.0	70.1	61.0	46.8	52.5	75.0	40.9
AKSC	43.7	15.6	8.4	34.5	35.0	19.5	21.3	35.7	47.9	13.9
AKSE	0.0	0.0	0.0	0.0	0.0	7.3	0.0	4.2	8.3	0.0
WAIW	47.8	21.5	31.4	86.2	81.0	70.7	44.7	98.7	154.3	86.9
ORCO	16.6	3.9	10.5	11.5	10.9	12.2	8.5	12.6	20.8	15.0
Total [c]	149.8	72.3	83.8	193.6	218.9	185.3	138.3	216.4	329.4	176.1
Groundfish Fishery Payments to Labor by Region ($Millions)[c]										
AKAPAI	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.2	0.0
AKKO	0.7	0.8	0.8	1.1	1.7	1.9	1.1	1.7	2.1	0.8
AKSC	0.6	0.3	0.1	0.4	0.4	0.3	0.3	0.6	0.9	0.3
AKSE	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.2	0.0
WAIW	0.9	0.5	0.8	2.2	2.0	2.1	1.1	2.5	4.1	1.8
ORCO	0.2	0.1	0.2	0.2	0.2	0.3	0.2	0.3	0.5	0.3
Total [c]	2.6	1.7	1.9	4.4	5.0	5.0	3.1	5.4	8.4	3.6

Notes: [a]Salmon, crab, halibut, and other
[b]Includes skipper, crew, and support staff
[c]Includes estimates for residents of other regions
NA - data is not available

CR - data can not be presented due to NOAA Fisheries data confidentiality restrictions

Source: CFEC/ADF&G fish tickets

Table 3.9-14. Summary of activities of longline catcher vessels greater than or equal to 60 feet in length, 1992-2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels										
Number of vessels	117	91	121	99	94	96	88	89	72	72
AKAPAI owners (% of total)	0.0	0.0	1.7	1.0	1.1	1.0	2.3	1.1	0.0	0.0
AKKO owners (% of total)	12.0	12.1	9.1	8.1	7.4	8.3	6.8	7.9	4.2	9.7
AKSC owners (% of total)	22.2	27.5	27.3	22.2	20.2	12.5	12.5	9.0	15.3	12.5
AKSE owners (% of total)	18.8	17.6	15.7	22.2	22.3	19.8	22.7	21.3	25.0	23.6
WAIW owners (% of total)	38.5	36.3	36.4	37.4	38.3	45.8	44.3	47.2	43.1	40.3
ORCO owners (% of total)	1.7	2.2	4.1	4.0	3.2	3.1	2.3	2.2	2.8	2.8
Other owners (% of total)	6.8	4.4	5.8	5.1	7.4	9.4	9.1	11.2	9.7	11.1
Total Groundfish Catch Retained										
Groundfish catch retained (1,000s of mt)	6.3	4.2	4.7	8.2	6.6	18.4	5.4	5.8	5.5	4.5
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	13.1	8.3	11.2	28.2	25.7	39.5	16.6	17.4	21.0	18.7
Non-GFSH ($Millions)[a]	18.8	18.8	22.7	25.0	22.7	33.8	18.7	33.7	1.8	NA
Salmon (% of total)	CR	0.2	0.2	0.3	0.3	CR	0.4	0.2	3.4	NA
Crab (% of total)	55.1	49.5	41.9	33.4	15.7	17.5	14.1	19.5	32.1	NA
Halibut (% of total)	39.7	43.8	51.0	60.1	76.5	76.0	77.9	77.0	0.0	NA
Other (% of total)	4.9	6.5	7.0	6.2	7.5	6.4	7.6	3.3	64.5	NA
GFSH (% of total)	41.1	30.5	33.1	53.1	53.1	53.9	47.0	34.1	92.0	NA
Ex-Vessel Value of Groundfish Retained by Species Group (% of Total)										
A-R-S-O	92.7	94.1	93.5	97.6	98.1	68.8	98.3	95.1	95.1	83.0
FLAT	0.2	2.6	2.0	0.4	0.4	3.2	0.3	0.7	0.2	0.2
PCOD	7.0	3.3	4.5	1.9	1.6	27.9	1.4	4.2	4.7	16.8
PLCK	0.0	CF	0.0	CF	CF	CF	CF	CF	0.0	0.0
Ex-Vessel Value of Groundfish Retained by FMP Subarea (% of Total)										
Aleutian Islands	7.0	7.2	5.7	5.9	4.0	6.3	3.8	6.2	5.4	4.0
Bering Sea	6.6	7.5	6.8	3.5	2.5	28.0	2.6	3.3	1.3	5.0
WG	17.9	4.4	3.6	11.8	13.8	11.1	11.5	11.7	9.2	11.2
CG	43.1	51.2	33.6	36.8	38.0	27.5	44.7	41.1	42.3	36.6
EG	25.4	29.7	50.2	41.9	41.8	27.1	37.4	37.6	41.8	43.3
Groundfish Fishery Employment by Region (FTE Positions)[b]										
AKAPAI	0.0	0.0	2.6	2.2	2.1	2.1	4.1	2.1	0.0	0.0
AKKO	25.1	13.9	14.1	17.4	14.5	16.6	12.2	14.8	7.1	17.0
AKSC	46.5	31.6	42.4	47.8	39.4	24.9	22.3	16.9	25.9	9.7
AKSE	39.4	20.2	24.4	47.8	43.5	39.4	40.5	40.1	42.4	40.2
WAIW	80.5	41.7	56.5	80.4	74.6	91.3	79.0	88.6	73.0	89.8
ORCO	3.6	2.5	6.4	8.7	6.2	6.2	4.1	4.2	4.7	3.4
Total[c]	209.4	114.9	155.5	215.1	194.8	199.3	178.3	187.8	169.4	179.2
Groundfish Fishery Payments to Labor by Region ($Millions)[c]										
AKAPAI	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
AKKO	0.7	0.5	0.5	0.9	0.8	1.5	0.5	0.7	0.4	0.7
AKSC	0.9	0.7	0.8	1.4	1.1	1.1	0.5	0.5	0.9	0.4
AKSE	1.0	0.6	0.9	2.5	2.3	2.8	1.5	1.3	2.1	1.7
WAIW	2.2	1.2	1.7	4.6	4.3	7.8	3.1	3.3	3.8	3.8
ORCO	0.1	0.1	0.2	0.4	0.3	0.4	0.2	0.2	0.2	0.1
Total[c]	5.2	3.3	4.5	11.3	10.3	15.8	6.7	7.0	8.4	7.5

Notes: [a]Salmon, crab, halibut, and other
[b]Includes skipper, crew, and support staff
[c]Includes estimates for residents of other regions

Table 3.9-14 (cont.). Summary of activities of longline catcher vessels greater than or equal to 60 feet in length, 1992-2001.

NA - data is not available
CR - data can not be presented due to NOAA Fisheries data confidentiality restrictions
CF - data was combined with FLAT due to NOAA Fisheries data confidentiality restrictions

Source: CFEC/ADF&G fish tickets

Table 3.9-15. Summary of activities of fixed gear catcher vessels greater than 32 and less than 60 feet in length, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels										
Number of vessels	860	718	785	609	551	580	546	554	590	514
AKAPAI owners (% of total)	2.7	1.1	2.3	4.4	4.2	4.7	5.5	4.2	5.3	7.2
AKKO owners (% of total)	10.5	8.6	9.0	11.8	11.3	12.8	14.7	15.3	18.8	15.6
AKSC wners (% of total)	27.0	28.3	26.1	25.9	22.7	24.7	22.9	21.5	22.4	20.6
AKSE owners (% of total)	41.5	44.3	43.4	43.7	46.5	42.2	39.6	38.6	34.7	36.6
WAIW owners (% of total)	11.9	11.0	12.5	10.7	11.6	12.1	13.0	12.6	12.0	13.4
ORCO owners (% of total)	0.9	1.0	1.0	0.7	0.9	0.7	0.9	1.1	1.0	0.8
Other owners (% of total)	5.6	5.7	5.6	2.8	2.9	2.9	3.5	6.7	5.8	5.8
Total Groundfish Catch Retained										
Groundfish catch retained (1,000s of mt)	23.7	21.4	21.2	22.8	20.1	24.6	23.3	26.7	23.7	15.4
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	39.1	34.7	43.8	46.0	40.5	43.4	30.1	38.9	47.9	33.8
Non-GFSH ($Millions)[a]	88.1	67.5	90.8	69.9	67.3	78.6	61.6	94.1	33.3	NA
Salmon (% of total)	61.3	49.3	46.6	43.0	29.7	28.5	41.8	42.1	66.8	NA
Crab (% of total)	6.3	6.3	6.3	7.5	5.2	4.1	4.5	3.8	8.3	NA
Halibut (% of total)	23.3	33.9	37.8	35.6	44.9	51.3	41.0	45.6	0.0	NA
Other (% of total)	9.2	10.6	9.3	13.9	20.1	16.1	12.7	8.5	24.9	NA
GFSH (% of total)	30.8	33.9	32.5	39.7	37.6	35.6	32.8	29.2	59.0	NA
Ex-Vessel Value of Groundfish Retained by Species Group (% of Total)										
A-R-S-O	86.0	88.8	92.4	86.1	84.4	79.5	75.4	64.5	72.1	83.0
FLAT	0.0	0.8	0.2	0.0	2.4	0.6	0.5	0.2	0.1	0.2
PCOD	14.0	10.3	7.4	13.8	13.2	19.9	24.1	35.3	27.8	16.8
PLCK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Ex-Vessel Value of Groundfish Retained by FMP Subarea (% of Total)										
Aleutian Islands	1.1	0.5	0.6	1.0	0.5	0.8	1.2	1.7	2.4	4.3
Bering Sea	1.1	2.0	1.2	3.1	3.1	1.5	1.8	1.0	1.6	3.1
WG	5.4	0.3	0.7	4.0	4.1	5.7	7.6	7.8	8.2	10.8
CG	43.8	40.5	26.6	37.3	36.3	41.1	43.8	51.2	45.9	35.5
EG	48.6	56.7	70.9	54.5	55.9	51.0	45.7	38.2	41.8	46.3
Groundfish Fishery Employment by Region (FTE Positions)[b]										
AKAPAI	29.9	8.1	18.2	38.2	33.1	40.8	43.4	33.9	45.6	12.6
AKKO	117.1	62.5	71.8	101.9	89.3	111.9	115.8	125.3	163.4	83.8
AKSC	301.8	204.7	207.3	223.6	180.0	216.3	181.0	175.5	194.3	109.8
AKSE	464.4	320.7	344.8	376.4	368.6	370.6	312.8	315.6	301.8	296.4
WAIW	132.7	79.7	99.1	92.0	92.2	105.9	102.8	103.2	104.5	142.6
ORCO	10.4	7.1	8.1	5.7	7.2	6.1	7.2	8.8	8.8	1.9
Total[c]	1,118.8	724.2	793.8	861.7	793.4	877.4	790.6	816.9	868.6	687.7
Groundfish Fishery Payments to Labor by Region ($Millions)[c]										
AKAPAI	0.4	0.1	0.3	0.5	0.6	0.7	0.5	0.6	0.8	0.2
AKKO	1.7	1.4	1.8	2.2	2.0	2.5	1.9	3.0	3.9	1.6
AKSC	3.3	3.0	2.9	2.6	1.9	2.4	1.8	2.4	3.1	2.2
AKSE	6.7	6.7	9.4	7.9	7.5	6.6	4.8	5.3	6.7	5.8
WAIW	2.0	1.6	2.3	2.2	2.1	2.3	1.7	2.0	2.4	2.8
ORCO	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.0
Total[c]	15.7	13.9	17.5	18.4	16.2	17.4	12.1	15.6	19.2	13.5

Notes: [a]Salmon, crab, halibut, and other
[b]Includes skipper, crew, and support staff

Table 3.9-15 (cont). **Summary of activities of fixed gear catcher vessels greater than 32 and less than 60 feet in length, 1992–2001.**

[c]Includes estimates for residents of other regions
NA - data is not available
Source: CFEC/ADF&G fish tickets

Table 3.9-16. Summary of activities of fixed gear catcher vessels less than or equal to 32 feet in length, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels										
Number of vessels	107	83	99	66	55	65	57	60	69	56
AKAPAI owners (% of total)	3.7	1.2	7.1	7.6	12.7	18.5	15.8	13.3	4.3	10.7
AKKO owners (% of total)	10.3	7.2	9.1	10.6	16.4	21.5	21.1	25.0	29.0	23.2
AKSC owners (% of total)	47.7	53.0	55.6	53.0	45.5	43.1	36.8	35.0	40.6	44.6
AKSE owners (% of total)	26.2	25.3	18.2	18.2	18.2	10.8	12.3	11.7	13.0	5.4
WAIW owners (% of total)	0.9	3.6	1.0	6.1	3.6	1.5	8.8	5.0	4.3	7.1
ORCO owners (% of total)	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other owners (% of total)	10.3	9.6	9.1	4.5	3.6	4.6	5.3	10.0	8.7	8.9
Total Groundfish Catch Retained										
Groundfish catch retained (1,000s of mt)	1.0	1.0	1.0	0.7	0.7	1.2	1.2	0.9	1.1	0.9
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	1.2	1.5	1.4	0.7	0.9	0.8	0.7	0.8	1.1	0.8
Non-GFSH ($Millions)[a]	5.9	4.0	6.2	2.2	2.1	2.3	1.8	3.3	1.1	NA
Salmon (% of total)	81.7	67.4	66.3	64.0	50.3	33.4	29.4	40.4	93.5	NA
Crab (% of total)	2.6	7.2	6.6	5.6	CR	7.7	CR	CR	CR	NA
Halibut (% of total)	15.3	24.2	26.2	27.7	44.2	57.4	67.4	58.9	0.0	NA
Other (% of total)	0.5	1.1	0.9	2.7	4.7	1.5	2.2	0.4	CR	NA
GFSH (% of total)	17.2	27.1	18.7	23.2	31.3	26.0	26.9	19.2	51.2	100.0
Ex-Vessel Value of Groundfish Retained by Species Group (% of Total)										
A-R-S-O	74.7	85.7	83.8	65.4	73.2	34.5	26.6	23.0	28.2	18.6
FLAT	0.1	CP	0.0	CP	0.2	CP	5.1	0.0	CP	0.1
PCOD	25.0	13.7	16.2	34.6	26.5	65.3	68.1	76.9	71.8	81.2
PLCK	0.2	CP	0.0	CP	CP	0.2	0.1	0.0	CP	0.1
Ex-Vessel Value of Groundfish Retained by FMP Subarea (% of Total)										
Aleutian Islands	0.0	0.0	0.0	CR	0.0	0.0	0.0	CR	0.0	CR
Bering Sea	5.9	CR	10.7	18.9	10.0	7.9	14.2	5.7	3.1	5.5
WG	9.6	CR	1.0	CR	CR	9.0	6.3	12.1	7.0	11.8
CG	60.9	62.9	62.0	49.5	50.9	73.8	68.3	75.8	76.4	77.6
EG	23.6	37.1	26.4	31.6	39.1	9.3	11.1	6.5	13.4	5.1
Groundfish Fishery Employment by Region (FTE Positions)[b]										
AKAPAI	5.5	1.2	7.9	6.6	9.8	20.3	14.9	10.5	4.3	5.9
AKKO	15.0	7.1	10.2	9.2	12.6	23.7	19.9	19.6	28.6	19.5
AKSC	69.5	51.9	62.3	46.0	35.0	47.3	34.9	27.5	40.1	51.3
AKSE	38.2	24.8	20.4	15.8	14.0	11.8	11.6	9.2	12.9	1.9
WAIW	1.4	3.5	1.1	5.3	2.8	1.7	8.3	3.9	4.3	4.0
ORCO	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total[c]	145.8	97.8	112.2	86.8	77.1	109.8	94.6	78.5	98.8	86.9
Groundfish Fishery Payments to Labor by Region ($Millions)[c]										
AKAPAI	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
AKKO	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
AKSC	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2
AKSE	0.1	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0
Total[c]	0.5	0.6	0.6	0.3	0.4	0.3	0.3	0.3	0.5	0.3

Notes:
[a]Salmon, crab, halibut, and other
[b]Includes skipper, crew, and support staff
[c]Includes estimates for residents of other regions
NA - data is not available
CR - data can not be presented due to NOAA Fisheries data confidentiality restrictions
CP - the data was added to PCOD due to NOAA Fisheries confidentiality restrictions

Source: CFEC/ADF&G fish tickets

Table 3.9-17. A comparison of the activities of catcher-processor classes, 2001.

Vessel Class	Number of Vessels	Groundfish Catch (1,000s of Metric Tons)				Gross Product Value ($Millions)	Payments to Labor ($Millions)	Total Employment (FTE Positions)
		PLCK	PCOD	A-R-S-O	FLAT			
ST-CP	12	505.9	1.8	1.4	5.1	308.0	107.8	1317.7
FT-CP	4	98.2	4.0	0.3	0.4	75.8	30.2	339.3
HT-CP	23	31.8	28.7	100.2	139.5	196.6	64.2	1211.6
P-CP	7	0.1	5.6	0.1	0.2	7.1	2.4	67.9
L-CP	43	6.0	111.9	19.0	5.5	156.5	61.3	940.2
Total	89	642.0	152.0	120.9	150.7	743.9	265.9	3876.7

Sources: NOAA Fisheries blend data and NOAA Fisheries Weekly Production Report data

Table 3.9-18. Summary of catcher processor activities, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels and Vessel Ownership by Region										
Number of vessels	136	120	116	118	112	106	98	88	90	89
AKAPAI owners (% of total)	0.7	0.0	0.9	0.8	0.9	0.9	1.0	1.1	1.1	1.1
AKKO owners (% of total)	1.5	1.7	1.7	2.5	2.7	2.8	4.1	4.5	4.4	4.5
AKSC owners (% of total)	4.4	2.5	2.6	2.5	2.7	3.8	3.1	3.4	3.3	4.5
AKSE owners (% of total)	3.7	4.2	4.3	2.5	2.7	1.9	4.1	4.5	4.4	3.4
WAIW owners (% of otal)	78.7	80.8	83.6	84.7	85.7	85.8	83.7	79.5	81.1	78.7
All other (% of total)	11.0	10.8	6.9	6.8	5.4	4.7	4.1	6.8	5.6	7.9
Total Groundfish Catch										
Groundfish catch (1,000s of mt)	1,432	1,330	1,368	1,338	1,269	1,268	1,110	874	976	1,066
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	13.2	15.3	13.5	14.0	16.2	14.5	12.9	17.6	16.1	11.3
FLAT	13.8	12.6	14.4	12.9	15.5	18.5	15.7	14.7	16.1	14.1
PCOD	13.0	10.1	10.9	14.2	13.8	15.5	14.6	16.5	14.6	14.3
PLCK	60.0	62.0	61.2	58.9	54.6	51.5	56.8	51.2	53.2	60.2
Groundfish Catch by FMP Subarea (% of Total)										
BSAI	88.0	88.0	89.0	90.0	90.0	89.0	86.0	86.0	88.0	97.1
GOA	12.0	12.0	11.0	10.0	10.0	11.0	14.0	14.0	12.0	2.9
Quantity and Value of Processed Product										
Product quantity (1,000s of mt)	339.0	322.0	331.0	346.0	355.0	355.0	316.0	280.0	307.0	313.6
Gross product value ($Millions)	812.0	585.0	623.0	748.0	681.0	639.0	569.0	625.0	699.0	743.9
Groundfish Fishery Employment by Region (FTE Positions)[a]										
Alaska	145	115	119	101	134	136	153	155	187	294
WAIW	4,528	4,655	4,257	4,880	5,391	4,439	4,593	3,546	3,465	3,582
Total[b]	4,673	4,770	4,376	4,981	5,525	4,575	4,746	3,701	3,652	3,877
Groundfish Fishery Payments to Labor by Region ($Millions)[a]										
Alaska	8.0	5.8	6.7	4.9	6.9	6.1	7.5	9.8	11.7	17.8
WAIW	285.9	209.4	225.4	274.8	249.8	234.0	209.8	223.1	246.1	248.1
Total[b]	312.4	230.5	247.5	292.8	269.7	252.8	229.1	249.8	278.5	265.9

Notes: [a]Includes skippers, fishing crew, processing crew, and home-office staff
[b]Total includes estimates for resident of other regions

Sources: NOAA Fisheries blend data and NOAA Fisheries Weekly Production Report data

Table 3.9-19. Summary of activities of surimi trawl catcher-processors, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels and Vessel Ownership by Region										
Number of vessels	20	18	20	20	18	16	16	12	11	12
WAIW owners (% of total)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Groundfish Catch										
Groundfish catch (1,000s of mt)	670	514	601	586	507	481	453	354	413	514
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	2.6	1.1	2.7	2.7	2.9	3.7	2.7	0.7	1.4	0.3
FLAT	3.1	3.6	5.1	5.9	9.6	6.7	5.5	4.0	2.6	1.0
PCOD	1.7	1.3	1.7	2.7	1.5	0.9	1.4	0.9	0.3	0.4
PLCK	92.6	94.1	90.5	88.7	86.1	88.7	90.3	94.4	95.7	98.4
Groundfish Catch by FMP Subarea (% of Total)										
Aleutian Islands	6.8	6.4	8.2	9.1	4.9	5.4	5.2	0.4	0.0	0.0
Bering Sea	92.7	93.6	91.7	90.8	95.0	94.5	94.8	99.5	100.0	100.0
GOA	0.5	0.1	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0
Quantity and Value of Processed Product										
Product quantity (1,000s of mt)	119.2	95.5	120.2	125.7	115.7	103.2	98.3	93.0	107.5	126.0
Gross product value ($Millions)	397.4	200.0	257.5	351.3	246.9	259.1	217.4	277.4	321.4	308.9
Groundfish Fishery Employment by Region (FTE)[a]										
WAIW	1,717	1,562	1,736	2,029	2,000	1,478	1,692	1,436	1,439	1,318
Total[b]	1,717	1,562	1,736	2,029	2,000	1,478	1,692	1,436	1,439	1,318
Groundfish Fishery Payments to Labor by Region ($Millions)[a]										
WAIW	143.0	72.8	93.7	129.5	90.7	95.4	81.7	104.0	117.7	107.8
Total[b]	143.0	72.8	93.7	129.5	90.7	95.4	81.7	104.0	117.7	107.8

Notes: [a]Includes skippers, fishing crew, processing crew, and home-office staff
[b]Total includes estimates for resident of other regions

Sources: NOAA Fisheries blend data and NOAA Fisheries Weekly Production Report data

Table 3.9-20. Summary of activities of fillet trawl catcher-processors, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels and Vessel Ownership by Region										
Number of vessels	18	22	15	13	14	13	12	4	4	4
WAIW owners (% of total)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Groundfish Catch										
Groundfish catch (1,000s of mt)	350	422	306	277	264	243	222	91	95	103
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	13.8	13.9	5.9	3.7	3.6	3.8	2.9	0.8	2.0	0.2
FLAT	16.7	8.2	8.7	6.5	5.3	9.3	1.4	0.6	0.5	0.4
PCOD	10.8	7.3	6.7	8.7	10.0	11.2	8.0	10.8	4.6	3.9
PLCK	58.7	70.7	78.7	81.2	81.1	75.8	87.7	87.7	92.8	95.5
Groundfish Catch by FMP Subarea (% of Total)										
Aleutian Islands	8.3	9.8	4.0	4.2	5.2	8.8	7.4	10.0	3.6	3.7
Bering Sea	88.1	87.0	94.7	93.4	91.3	89.5	90.5	90.0	96.4	96.3
GOA	3.5	3.2	1.2	2.4	3.5	1.8	2.1	0.0	0.0	0.0
Quantity and Value of Processed Product										
Product quantity (1,000s of mt)	70.9	87.7	57.9	49.5	53.1	47.7	44.2	20.7	25.7	24.4
Gross product value ($Millions)	171.6	171.6	125.7	128.9	137.0	122.1	118.6	69.0	80.6	75.8
Groundfish Fishery Employment by Region (FTE)[a]										
WAIW	1,583	1,956	1,156	1,282	1,508	1,052	1,167	369	378	339
Total[b]	1,583	1,956	1,156	1,282	1,508	1,052	1,167	369	378	339
Groundfish Fishery Payments to Labor by Region ($Millions)[a]										
WAIW	70.6	71.3	52.3	54.3	57.5	51.4	50.9	29.5	33.7	30.2
Total[b]	70.6	71.3	52.3	54.3	57.5	51.4	50.9	29.5	33.7	30.2

Notes: [a]Includes skippers, fishing crew, processing crew, and home-office staff
[b]Total includes estimates for resident of other regions

Sources: NOAA Fisheries blend data and NOAA Fisheries Weekly Production Report data.

Table 3.9-21. Summary of activities of head-and-gut trawl catcher-processors, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels and Vessel Ownership by Region										
Number of vessels	28	25	25	32	28	28	23	24	24	23
AKKO owners (% of total)	3.6	4.0	4.0	3.1	3.6	3.6	4.3	4.2	4.2	4.0
WAIW owners (% of total)	78.6	76.0	84.0	84.4	85.7	82.1	78.3	79.2	79.2	78.0
WAOR owners (% of total)	3.6	4.0	4.0	3.1	0.0	0.0	0.0	0.0	0.0	4.0
All other (% of total)	14.3	16.0	8.0	9.4	10.7	14.3	17.4	16.7	16.7	13.0
Total Groundfish Catch										
Groundfish catch (1,000s of mt)	275	298	350	339	367	382	298	299	330	300
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	38.8	41.6	38.5	43.3	46.1	36.7	36.0	44.6	39.1	33.4
FLAT	41.5	35.8	38.8	33.7	34.7	44.9	45.6	36.2	41.8	46.5
PCOD	8.5	9.1	8.5	11.3	8.7	8.3	10.2	9.4	9.4	9.6
PLCK	11.2	13.4	14.3	11.8	10.5	10.2	8.2	9.8	9.7	10.6
Groundfish Catch by FMP Subarea (% of Total)										
Aleutian Islands	14.3	23.9	22.4	27.1	34.4	18.7	22.9	26.5	21.6	29.4
Bering Sea	66.2	64.3	66.7	62.3	54.7	73.9	68.1	63.2	67.4	60.7
GOA	19.5	11.8	10.9	10.6	10.9	7.4	9.0	10.3	11.0	9.9
Quantity and Value of Processed Product										
Product Quantity (1,000s of mt)	93.7	102.7	110.1	117.7	133.6	141.0	121.1	114.2	120.4	110.7
Gross Product Value ($Millions)	139.7	137.5	155.5	174.8	197.6	161.3	121.7	138.5	151.5	196.6
Groundfish Fishery Employment by Region (FTE)[a]										
Alaska	35	31	38	18	35	29	32	30	32	73
WAIW	728	636	900	929	1,252	1,196	1,031	1,108	947	1,139
Total[b]	764	667	937	947	1,287	1,225	1,062	1,138	979	1,212
Groundfish Fishery Payments to Labor by Region ($Millions)[a]										
Alaska	2.2	2.1	2.3	1.2	2.0	1.3	1.3	1.3	1.7	4.2
WAIW	45.2	43.4	54.3	62.1	71.1	55.7	40.9	47.0	50.2	60.0
Total[b]	47.3	45.6	56.6	63.3	73.1	57.1	42.2	48.2	51.9	64.2

Notes: [a]Includes skippers, fishing crew, processing crew, and home-office staff
[b]Total includes estimates for resident of other regions

Sources: NOAA Fisheries blend data and NOAA Fisheries Weekly Production Report data

Table 3.9-22. Summary of activities of pot catcher-processors, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels and Vessel Ownership by Region										
Number of vessels	14	2	3	6	9	7	5	9	10	7
AKSC owners (% of total)	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AKKO owners (% of total)	0.0	0.0	0.0	16.7	11.1	14.3	20.0	11.1	10.0	14.0
WAIW owners (% of total)	78.6	50.0	100.0	83.3	88.9	85.7	80.0	77.8	90.0	72.0
All other (% of total)	14.3	50.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0	14.0
Total Groundfish Catch										
Groundfish catch (1,000s of mt)	9.3	CR	1.7	4.9	8.0	4.6	3.5	7.6	3.9	5.9
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	4.5	CR	2.9	2.1	1.7	0.9	1.1	1.5	1.8	1.5
FLAT	0.1	CR	CR	0.4	0.9	0.7	2.3	0.5	1.6	3.2
PCOD	95.4	CR	97.1	97.5	97.4	97.6	96.6	98.0	96.6	94.4
PLCK	0.0	CR	0.0	0.0	0.1	0.7	0.0	0.1	0.3	1.0
Groundfish Catch by FMP Subarea (% of Total)										
Aleutian Islands	70.0	0.0	0.6	22.0	47.6	9.3	11.4	15.8	30.6	10.1
Bering Sea	28.9	100.0	99.1	75.6	52.4	90.7	87.7	31.2	44.5	58.6
GOA	1.1	0.0	0.3	2.4	0.0	0.0	0.9	53.0	24.9	31.3
Quantity and Value of Processed Product										
Product quantity (1,000s of mt)	3.8	0.3	0.7	2.2	3.7	2.2	1.5	3.6	1.8	2.1
Gross product value ($Millions)	6.5	0.4	1.2	2.9	6.5	3.2	3.3	9.4	4.9	7.1
Groundfish Fishery Employment by Region (FTE)[a]										
Alaska	1	0	0	3	6	3	4	4	3	9
WAIW	17	CR	9	33	58	30	30	54	39	59
Total[b]	18	0	9	37	64	34	34	58	42	68
Groundfish Fishery Payments to Labor by Region ($Millions)[a]										
Alaska	0.1	0.0	0.0	0.1	0.2	0.1	0.1	0.2	0.1	0.3
WAIW	1.6	CR	0.4	0.8	1.6	0.7	0.9	2.3	1.4	2.1
Total[b]	1.7	0.0	0.4	0.9	1.7	0.8	1.0	2.5	1.5	2.4

Notes: [a]Includes skippers, fishing crew, processing crew, and home-office staff
[b]Total includes estimates for resident of other regions
CR - data can not be presented due to NOAA Fisheries data confidentiality restrictions

Sources: NOAA Fisheries blend data and NOAA Fisheries Weekly Production Report data

Table 3.9-23. Summary of activities of longline catcher-processors, 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Vessels and Vessel Ownership by Region										
Number of vessels	56	53	53	47	43	42	42	39	41	43
AKAPAI owners (% of total)	1.8	0.0	1.9	2.1	2.3	2.4	2.4	2.6	2.4	2.3
AKKO owners (% of total)	1.8	1.9	1.9	2.1	2.3	2.4	4.8	5.1	4.9	4.7
AKSC owners (% of total)	8.9	5.7	5.7	6.4	7.0	9.5	7.1	7.7	7.3	9.3
AKSE owners (% of total)	8.9	9.4	9.4	6.4	7.0	4.8	9.5	10.3	9.8	7.0
WAIW owners (% of total)	64.3	69.8	71.7	74.5	74.4	78.6	76.2	71.8	73.2	72.1
WAOR owners (% of total)	1.8	1.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All other (% of total)	12.5	11.3	7.5	8.5	7.0	2.4	0.0	2.6	2.4	4.7
Total Groundfish Catch										
Groundfish catch (1,000s of mt)	128	96	110	131	123	158	134	122	135	142
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	12.4	16.4	14.1	11.4	9.7	10.3	13.0	14.0	15.1	13.3
FLAT	2.8	8.8	3.7	4.3	5.7	5.3	7.2	4.8	5.6	3.9
PCOD	82.3	72.6	79.5	81.7	82.3	81.5	77.3	78.0	75.7	78.6
PLCK	2.5	2.3	2.6	2.6	2.4	2.9	2.5	3.2	3.6	4.2
Groundfish Catch by FMP Subarea (% of Total)										
Aleutian Islands	19.2	22.6	9.4	4.7	6.3	5.8	12.7	9.5	15.1	16.1
Bering Sea	71.3	67.1	83.6	88.5	87.6	90.3	83.3	82.8	78.2	78.8
GOA	9.4	10.3	7.0	6.8	6.1	3.9	4.0	7.7	6.7	5.1
Quantity and Value of Processed Product										
Product quantity (1,000s of mt)	51.2	35.3	42.4	50.6	48.9	61.2	51.3	48.1	51.5	50.4
Gross product value ($Millions)	96.8	75.3	83.0	89.8	93.0	93.3	108.1	131.1	140.9	158.5
Groundfish Fishery Employment by Region (FTE)[a]										
Alaska	108	84	82	79	94	104	117	121	152	262
WAIW	483	502	457	608	573	683	672	580	661	677
Total[b]	591	586	539	687	667	787	789	701	814	940
Groundfish Fishery Payments to Labor by Region ($Millions)[a]										
Alaska	5.7	3.7	4.4	3.7	4.7	4.7	6.2	8.4	9.9	17.1
WAIW	25.6	21.9	24.7	28.2	29.0	30.8	35.4	40.3	43.1	44.2
Total[b]	31.3	25.5	29.1	31.8	33.8	35.5	41.5	48.7	53.1	61.3

Notes: [a]Includes skippers, fishing crew, processing crew, and home-office staff
[b]Total includes estimates for resident of other regions

Sources: NOAA Fisheries blend data and NOAA Fisheries Weekly Production Report data

Table 3.9-24. A comparison of the activities of inshore processor classes and motherships, 2001.

Processor Class	Number of Facilities	Reported Harvest—Retained and Discarded (1,000s of Metric Tons)				Gross Product Value ($Millions)	Payments to Labor ($Millions)	Total Employment (FTE Positions)
		PLCK	PCOD	FLAT	A-R-S-O			
BSP-SP	6	595.2	21.3	2.8	3.5	414.6	165.5	3076
APA-SP	8	40.7	14.3	1.3	1.4	49.2	19.5	384
K-SP	10	39.8	22.9	16.0	12.1	81.0	31.1	571
SC-SP	14	0.4	1.4	0.3	4.0	23.6	9.3	59
SE-SP	15	0.0	0.1	0.3	5.8	28.4	11.3	36
Floaters	3	0.3	6.0	0.2	0.2	8.2	2.9	69
Motherships	3	140.9	0.4	0.3	0.1	77.4	27.1	294
Total	59	817.3	66.3	21.3	27.2	682.9	266.9	4491

Sources: NOAA Fisheries blend data and NOAA Fisheries Weekly Production Report data

Table 3.9-25. Summary of inshore processor[a] and mothership activities, 1992–2001[b].

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Facilities and Facility Ownership by Region										
Number of facilities	77	69	73	77	67	64	62	61	69	59
AKAPAI owners (% of total)	0.0	0.0	1.4	5.2	6.0	4.7	4.8	4.9	4.3	1.0
AKKO owners (% of total)	7.8	8.7	8.2	6.5	4.5	4.7	3.2	6.6	4.3	6.0
AKSC owners (% of total)	15.6	17.4	19.2	20.8	16.4	23.4	19.4	16.4	18.8	13.0
AKSE owners (% of total)	5.2	5.8	8.2	5.2	9.0	10.9	11.3	9.8	8.7	16.0
WAIW owners (% of total)	64.9	66.7	63.0	62.3	64.2	56.3	58.1	60.7	63.8	58.0
All other (% of total)	6.5	1.4	0.0	0.0	0.0	0.0	3.2	1.6	0.0	8.0
Total Groundfish Catch										
Groundfish catch (1,000s of mt)	844	809	809	802	779	790	755	781	847	932
Ex-Vessel Value of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	264.3	169.6	200.3	254.7	229.0	264.8	181.5	248.4	324.7	299.5
Non-GFSH ($Millions)[c]	561.5	499.4	541.2	470.2	405.5	382.9	371.1	542.4	245.1	NA
GFSH (% of total)	32.0	25.4	27.0	35.1	36.1	40.9	32.8	31.4	57.0	NA
Salmon (% of non-GFSH)	50.3	41.6	39.3	41.8	38.2	34.8	33.8	33.6	50.7	NA
Crab (% of non-GFSH)	31.4	38.7	37.0	35.5	31.8	32.6	43.1	40.8	40.5	NA
Halibut (% of non-GFSH)	10.6	12.5	16.0	14.1	17.5	24.1	16.8	19.5	NA	NA
Other (% of non-GFSH)	7.6	7.2	7.7	8.7	12.6	8.5	6.3	6.1	8.8	NA
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	3.9	4.0	3.6	3.8	4.1	4.1	3.4	3.8	3.9	2.9
FLAT	4.8	2.8	4.0	4.6	4.2	5.4	2.0	2.1	2.5	2.3
PCOD	11.6	10.8	11.2	15.4	17.1	16.4	12.6	12.5	12.1	7.1
PLCK	79.8	82.4	81.2	76.2	74.5	74.0	81.9	81.6	81.4	87.7
Groundfish Catch by FMP Subarea (% of Total)										
BSAI	78.6	76.3	77.5	80.5	81.8	76.0	72.6	76.8	80.8	85.5
GOA	21.4	23.7	22.5	19.5	18.2	24.0	27.4	23.2	19.2	14.5
Ex-Vessel Value Paid to Catcher Vessels by Type (% of Total)										
TCV BSP $\geq$ 125	20.4	19.5	19.1	19.5	20.2	28.8	21.4	25.6	24.4	NA
TCV BSP 60-124	37.8	29.3	30.7	32.7	28.1	23.1	23.7	21.8	29.1	NA
TCV Div. AFA	9.2	10.9	7.7	5.7	4.9	6.2	9.7	10.3	7.4	NA
TCV Non-AFA	4.9	5.5	4.4	4.2	5.1	6.4	6.3	6.6	5.0	NA
TCV < 60	3.3	4.1	4.0	2.9	4.6	4.0	5.6	5.2	4.1	NA
PCV	2.4	2.5	2.3	4.1	5.2	3.7	4.1	5.4	6.4	NA
LCV	5.2	5.3	6.5	11.1	11.4	12.2	9.6	7.3	6.8	NA
FGCV 33-59	16.2	21.9	24.7	19.6	20.0	15.4	19.3	17.6	16.5	NA
FGCV $\leq$ 32	0.5	0.8	0.7	0.3	0.4	0.2	0.4	0.3	0.3	NA
Quantity and Value of Processed Product										
Product (1,000s of mt)	236.9	225.5	240.5	254.2	247.4	245.1	235.2	256.6	294.6	342.6
Gross Product Value ($Millions)	615.4	410.7	505.7	643.3	550.2	560.4	480.9	589.1	693.2	682.9
Groundfish Fishery Employment by Region (FTE Positions)[d]										
Alaska	2,700	2,706	2,951	3,332	3,235	3,332	3,152	3,447	3,874	3,957
WAIW	539	472	478	790	875	597	541	434	666	534
Total[e]	3,239	3,178	3,429	4,122	4,110	3,929	3,693	3,881	4,540	4,491
Groundfish Fishery Payments to Labor by Region ($Millions)[d]										
Alaska	158.2	114.9	141.9	174.3	148.1	150.9	130.2	163.5	183.1	183.7
WAIW	81.9	47.5	58.1	78.1	67.8	68.8	58.3	68.3	88.8	83.2
Total[e]	240.1	162.4	200.0	252.4	215.9	219.7	188.5	231.8	271.9	266.9

Notes: [a]Does not include inshore processors located in other states or GHOST processors.
[b]Includes all groundfish reported by processors including at-sea discards

Table 3.9-25 (cont.). Summary of inshore processor[a] and mothership activities, 1992–2001[b].

[c]Salmon, crab, halibut, and other. Data for 2000 does not include halibut
[d]Includes skippers, fishing crew, processing crew, and home-office staff
[e]Total includes estimates for resident of other regions
NA - data is not available

Sources: NOAA Fisheries blend data, NOAA Fisheries Weekly Production Report data, and ADFG/CFEC fish ticket data.

Table 3.9-26. Summary of activities of Bering Sea pollock inshore plants[a], 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Facilities and Facility Ownership by Region										
Number of facilities	6	6	6	6	6	6	6	6	6	6
WAIW Owners (% of Total)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Groundfish Catch										
Groundfish catch (1,000s of mt)[b]	474	477	493	494	474	462	418	477	544	623
Ex-Vessel Value Of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	123.8	70.4	84.9	109.7	90.6	105.8	69.1	108.3	151.5	157.6
Non-GFSH ($Millions)[c]	68.8	68.5	56.6	52.1	44.6	44.4	53.4	77.9	40.8	NA
GFSH (% of total)	64.3	50.7	60.0	67.8	67.0	70.4	56.4	58.2	78.8	NA
Salmon (% of non-GFSH)	0.0	4.9	8.0	0.0	0.0	0.6	2.0	1.4	0.0	NA
Crab (% of non-GFSH)	95.4	88.6	84.9	89.7	92.8	77.9	92.8	93.4	98.7	NA
Halibut (% of non-GFSH)	3.8	4.9	6.2	9.7	6.4	19.6	4.1	4.0	NA	NA
Other (% of non-GFSH)	0.8	1.5	0.9	0.6	0.7	2.0	1.2	1.1		NA
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	1.1	1.7	1.4	1.9	2.0	2.3	1.4	1.3	0.8	0.6
FLAT	2.1	0.7	2.7	2.7	2.5	4.6	1.0	0.7	0.9	0.5
PCOD	6.2	6.8	8.3	11.2	12.3	12.1	9.4	7.7	7.3	3.4
PLCK	90.6	90.9	87.5	84.3	83.2	81.0	88.2	90.2	91.0	95.6
Groundfish Catch by FMP Subarea (% of Total)										
BSAI	95.0	96.1	98.1	96.1	99.6	96.8	97.5	99.3	98.6	98.7
GOA	5.0	3.9	1.9	3.9	0.4	3.2	2.5	0.7	1.4	1.3
Ex-Vessel Value Paid to Catcher Vessels by Type (% of Total)										
TCV BSP $\geq$ 125	41.7	44.4	43.2	40.9	46.6	51.6	54.3	55.1	51.7	NA
TCV BSP 60-124	46.2	45.7	49.3	44.5	37.0	32.3	28.7	28.1	35.2	NA
TCV Div. AFA	5.5	5.5	2.8	5.1	6.5	7.0	9.7	9.5	5.8	NA
TCV Non-AFA	1.8	1.1	1.1	1.2	1.4	1.0	0.3	0.8	0.7	NA
TCV < 60	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	NA
PCV	1.4	1.0	2.4	4.5	6.1	5.2	5.2	5.3	5.5	NA
LCV	1.8	1.3	0.8	2.5	1.6	2.3	1.4	0.7	0.4	NA
FGCV 33-59	1.4	1.0	0.4	1.1	0.8	0.6	0.4	0.4	0.7	NA
FGCV $\leq$ 32	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	NA
Quantity and Value of Processed Product										
Product (1,000s of mt)	141.0	137.3	160.3	168.2	160.5	155.2	144.4	164.8	199.7	247.9
Gross Product Value ($Millions)	337.4	185.3	259.8	340.4	286.5	283.9	239.7	315.2	390.5	414.6
Groundfish Fishery Employment by Region (FTE Positions)[d]										
Alaska	1,772	1,642	1,987	2,197	2,226	2,099	1,898	2,146	2,765	2,929
WAIW	91	85	103	116	117	110	102	115	145	147
Total[e]	1,863	1,727	2,091	2,313	2,342	2,209	2,000	2,261	2,910	3,076
Groundfish Fishery Payments to Labor by Region ($Millions)[d]										
Alaska	101.2	55.6	77.9	102.1	85.9	85.2	71.9	94.5	117.2	124.1
WAIW	34.7	19.3	27.0	35.8	30.1	29.9	25.7	33.7	40.9	41.4
Total[e]	135.9	74.8	105.0	137.9	116.0	115.0	97.7	128.3	158.0	165.5

Notes: [a]Does not include inshore processors located in other states or GHOST processors.
[b]Includes all groundfish reported by processors including at-sea discards
[c]Salmon, crab, halibut, and other. Data for 2000 does not include halibut
[d]Includes skippers, fishing crew, processing crew, and home-office staff
[e]Total includes estimates for resident of other regions
NA - data is not available

Sources: NOAA Fisheries blend data, NOAA Fisheries Weekly Production Report data, and ADFG/CFEC fish ticket data.

Table 3.9-27. Summary of activities of Alaska Peninsula and Aleutian Islands inshore plants[a], 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Facilities and Facility Ownership by Region										
No. of Facilities	5	6	6	6	5	6	6	8	8	8
AKAPAI Owners (% of Total)	0.0	0.0	16.7	33.3	40.0	33.3	33.3	25.0	25.0	13.0
AKSC Owners (% of Total)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	12.5	13.0
AKSE Owners (% of Total)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0
WAIW Owners (% of Total)	100.0	100.0	83.3	66.7	60.0	66.7	66.7	62.5	62.5	63.0
Total Groundfish Catch										
Groundfish Catch (1,000s of mt)[b]	42	57	58	73	74	70	68	66	46	58
Ex-Vessel Value Of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	16.4	9.9	12.6	20.9	22.8	22.2	16.6	26.3	26.8	25.7
Non-GFSH ($Millions)[c]	107.0	99.2	97.9	95.5	66.4	58.7	75.4	128.4	60.6	NA
GFSH (% of total)	13.3	9.0	11.4	18.0	25.5	27.4	18.1	17.0	30.7	NA
Salmon (% of non-GFSH)	52.4	41.5	27.9	41.9	34.0	27.5	35.2	36.2	46.0	NA
Crab (% of non-GFSH)	42.2	53.1	64.1	54.0	59.0	64.2	61.7	53.9	53.8	NA
Halibut (% of non-GFSH)	4.0	4.8	6.9	3.2	4.9	7.9	2.6	9.7	NA	NA
Other (% of non-GFSH)	1.3	0.6	1.2	0.9	2.1	0.4	0.4	0.2	0.3	NA
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	3.8	2.7	2.1	2.1	2.3	2.0	2.0	3.0	3.7	2.4
FLAT	4.6	2.3	4.5	1.4	2.0	1.6	1.0	2.2	2.1	2.2
PCOD	62.5	39.7	37.5	27.5	42.5	38.2	31.8	29.2	36.1	24.8
PLCK	29.1	55.3	55.9	69.0	53.2	58.3	65.1	65.7	58.1	70.6
Groundfish Catch by FMP Subarea (% of Total)										
BSAI	26.9	51.0	38.5	54.5	37.9	27.1	15.1	32.6	35.1	43.3
GOA	73.1	49.0	61.5	45.5	62.1	72.9	84.9	67.4	64.9	56.7
Ex-Vessel Value Paid to Catcher Vessels by Type (% of Total)										
TCV BSP $\geq$ 125	0	3	3	10	9	4	3	13	3	NA
TCV BSP 60-124	9	11	20	27	12	10	7	9	5	NA
TCV Div. AFA	23	32	17	11	10	17	19	8	13	NA
TCV Non-AFA	9	8	8	5	8	7	9	6	7	NA
TCV < 60	36	36	37	17	30	43	44	37	41	NA
PCV	4	0	3	6	13	5	1	6	8	NA
LCV	8	6	6	14	10	5	7	6	6	NA
FGCV 33-59	10	4	4	9	9	8	10	15	17	NA
FGCV $\leq$ 32	0	0	1	0	0	0	0	0	0	NA
Quantity and Value of Processed Product										
Product (1,000s of mt)	12.1	15.3	12.4	15.0	17.1	21.0	20.8	26.1	17.4	20.0
Gross product value ($Millions)	36.5	32.6	31.5	46.2	45.2	46.6	43.4	61.1	46.7	49.2
Groundfish Fishery Employment by Region (FTE Positions)[d]										
Alaska	267	305	275	302	380	406	384	463	353	372
WAIW	14	16	12	11	12	14	10	15	11	12
Total[e]	281	321	286	312	392	421	395	479	364	384
Groundfish Fishery Payments to Labor by Region ($Millions)[d]										
Alaska	11.0	9.8	10.0	14.0	13.7	14.1	13.1	18.4	14.1	16.4
WAIW	3.8	3.4	2.7	3.2	2.8	3.3	2.3	4.1	3.1	3.1
Total[e]	14.7	13.2	12.7	17.2	16.5	17.3	15.4	23.1	17.6	19.5

Notes: [a]Does not include inshore processors located in other states or GHOST processors
[b]Includes all groundfish reported by processors including at-sea discards.
[c]Salmon, crab, halibut, and other. Data for 2000 does not include halibut
[d]Includes skippers, fishing crew, processing crew, and home-office staff
[e]Total includes estimates for resident of other regions

Table 3.9-27 (cont.). Summary of activities of Alaska Peninsula and Aleutian Islands inshore plants[a], 1992–2001.

NA - data is not available

Sources: NOAA Fisheries blend data, NOAA Fisheries Weekly Production Report data, and ADFG/CFEC fish ticket data.

Table 3.9-28. Summary of activities of Kodiak inshore plants[a], 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Facilities and Facility Ownership by Region										
Number of facilities	15	15	14	16	11	12	10	12	11	10
AKKO owners (% of total)	42.9	42.9	50.0	41.7	30.0	30.0	20.0	33.3	27.3	20.0
AKSC owners (% of total)	7.1	7.1	8.3	8.3	10.0	10.0	10.0	8.3	9.1	10.0
WAIW owners (% of total)	42.9	42.9	41.7	50.0	60.0	60.0	60.0	58.3	63.6	70.0
All other (% of total)	7.1	7.1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
Total Groundfish Catch										
Groundfish catch (1,000s of mt)[b]	107	125	114	82	75	101	115	117	106.0	90.9
Ex-Vessel Value Of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	38.4	31.4	30.1	31.8	30.0	38.8	33.7	45.8	47.4	30.9
Non-GFSH ($Millions)[c]	77.7	68.4	62.5	69.3	50.9	44.0	41.6	54.5	26.4	NA
GFSH (% of total)	33.0	31.4	32.5	31.5	37.1	46.9	44.8	45.7	64.2	NA
Salmon (% of non-GFSH)	64.9	63.1	53.2	67.8	48.3	37.6	68.0	52.5	69.9	NA
Crab (% of non-GFSH)	14.5	12.9	13.0	6.0	6.8	6.3	4.1	8.1	26.6	NA
Halibut (% of non-GFSH)	15.6	17.4	26.9	20.6	32.4	53.1	25.8	37.8	NA	NA
Other (% of non-GFSH)	5.0	6.6	7.0	5.6	12.5	3.0	2.1	1.7	3.5	NA
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	6.3	5.7	4.4	6.3	12.2	9.7	7.7	10.0	13.3	13.3
FLAT	14.2	13.5	11.7	15.3	21.9	17.9	8.3	8.6	13.4	17.6
PCOD	18.3	19.5	16.0	39.2	36.3	32.0	24.7	30.1	25.3	25.2
PLCK	61.2	61.3	68.0	39.2	29.7	40.4	59.3	51.2	48.0	43.8
Groundfish Catch by FMP Subarea (% of Total)										
BSAI	5.2	1.5	0.5	0.4	0.5	0.0	0.2	0.1	0.1	0.1
GOA	94.8	98.5	99.5	99.6	99.5	100.0	99.8	99.9	99.9	99.9
Ex-Vessel Value Paid to Catcher Vessels by Type (% of Total)										
TCV BSP ≥ 125	0.8	1.0	1.4	0.5	0.0	1.9	1.4	0.2	0.0	NA
TCV BSP 60-124	3.9	0.5	3.2	8.4	8.1	3.6	4.5	1.8	2.1	NA
TCV Div. AFA	37.4	39.1	37.9	19.9	12.1	25.8	25.3	29.8	23.8	NA
TCV Non-AFA	20.3	21.9	20.4	23.8	29.0	25.9	27.0	26.8	25.3	NA
TCV < 60	4.8	5.4	7.1	8.3	9.6	5.9	6.0	3.8	1.8	NA
PCV	7.0	7.4	5.4	9.8	9.0	6.4	8.5	10.0	13.6	NA
LCV	7.6	7.8	6.5	8.9	11.3	10.3	7.0	3.9	7.9	NA
FGCV 33-59	17.8	16.7	17.1	20.3	19.3	19.6	19.7	22.9	24.1	NA
FGCV ≤ 32	0.4	0.4	1.0	0.1	1.6	0.6	0.8	0.8	1.4	NA
Quantity and Value of Processed Product										
Product (1,000s of mt)	27.1	31.9	28.3	26.4	22.8	25.3	28.8	31.4	29.8	27.7
Gross product value ($Millions)	80.3	81.7	85.5	92.0	71.3	76.3	77.7	94.7	89.6	81.0
Groundfish Fishery Employment by Region (FTE Positions)[d]										
Alaska	520	602	533	649	487	597	650	698	635	551
WAIW	11	13	11	17	15	19	21	18	18	19
Total[e]	532	616	545	666	502	616	672	716	653	571
Groundfish Fishery Payments to Labor by Region ($Millions)[d]										
Alaska	28.3	28.5	30.2	30.4	23.5	24.8	24.8	30.8	29.1	25.7
WAIW	3.5	3.6	3.7	4.8	4.5	4.8	5.0	5.1	5.1	5.4
Total[e]	32.2	32.5	33.9	35.3	28.0	29.6	30.2	35.8	34.3	31.1

Note: [a]Does not include inshore processors located in other states or GHOST processors
[b]Includes all groundfish reported by processors including at-sea discards
[c]Salmon, crab, halibut, and other. Data for 2000 does not include halibut
[d]Includes skippers, fishing crew, processing crew, and home-office staff
[e]Total includes estimates for resident of other regions
NA - data is not available

Sources: NOAA Fisheries blend data, NOAA Fisheries Weekly Production Report data, and ADFG/CFEC fish ticket data.

Table 3.9-29. Summary of activities of Southcentral Alaska inshore plants[a], 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Facilities and Facility Ownership by Region										
Number of facilities	18	16	19	18	15	21	19	15	17	14
AKSC owners (% of total)	55.6	56.3	52.6	55.6	53.3	66.7	57.9	53.3	64.7	50.0
WAIW owners (% of total)	38.9	43.8	47.4	44.4	46.7	33.3	42.1	46.7	35.3	50.0
Other owners (% of total)	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Groundfish Catch										
Groundfish catch (1,000s of mt)[b]	13	13	12	13	13	17	18	11	10	6
Ex-Vessel Value Of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	17.4	16.2	17.1	27.8	26.2	28.2	20.2	20.7	21.4	18.1
Non-GFSH ($Millions)[c]	117.7	59.0	78.3	60.2	78.6	80.1	54.1	80.3	40.7	NA
GFSH (% of total)	12.9	21.5	18.0	31.6	25.0	26.1	27.2	20.5	34.5	NA
Salmon (% of non-GFSH)	83.2	76.1	71.2	72.1	67.4	69.7	59.6	57.6	99.3	NA
Crab (% of non-GFSH)	1.0	1.8	1.7	0.6	0.6	0.2	0.1	0.0	0.6	NA
Halibut (% of non-GFSH)	9.7	19.0	25.2	22.7	26.1	28.5	40.1	42.3	NA	NA
Other (% of non-GFSH)	6.1	3.1	1.9	4.5	5.9	1.6	0.2	0.1	0.1	NA
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	50.5	56.7	47.9	46.9	42.6	28.2	26.5	42.3	54.3	65.2
FLAT	4.6	6.3	3.2	3.7	4.4	6.2	2.9	8.0	4.0	5.2
PCOD	42.8	36.9	36.5	42.7	41.6	31.0	20.4	30.9	22.5	23.2
PLCK	2.1	0.2	12.4	6.8	11.4	34.7	50.3	18.8	19.2	6.5
Groundfish Catch by FMP Subarea (% of Total)										
BSAI	3.2	0.0	0.0	0.4	3.6	4.3	0.0	0.1	0.0	0.0
GOA	96.8	100.0	100.0	99.6	96.4	95.7	100.0	99.9	100.0	100.0
Ex-Vessel Value Paid to Catcher Vessels by Type (% of Total)										
TCV BSP $\geq$ 125	0.0	0.0	0.8	0.0	0.0	0.0	2.5	0.8	0.0	NA
TCV BSP 60-124	0.0	0.2	0.0	0.5	0.5	0.8	1.6	0.0	0.0	NA
TCV Div. AFA	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.3	0.1	NA
TCV Non-AFA	0.3	0.3	2.1	2.7	2.9	6.1	5.1	5.2	3.8	NA
TCV < 60	0.4	5.1	5.2	2.9	2.9	4.7	3.4	2.5	2.8	NA
PCV	5.4	5.5	3.2	5.6	4.4	3.8	4.5	6.9	7.6	NA
LCV	21.4	15.1	23.8	44.2	45.4	40.3	41.0	39.4	34.1	NA
FGCV 33-59	69.0	68.5	61.2	42.9	42.9	42.6	40.5	43.9	50.8	NA
FGCV $\leq$ 32	3.4	5.4	3.7	1.2	1.0	1.3	1.1	0.9	0.8	NA
Quantity and Value of Processed Product										
Product (1,000s of mt)	6.6	6.6	5.3	7.1	6.9	9.2	9.7	6.6	5.2	4.3
Gross product value ($Millions)	25.7	31.3	28.8	39.9	34.9	40.3	31.7	29.8	32.2	23.6
Groundfish Fishery Employment by Region (FTE Positions)[d]										
Alaska	81	103	91	112	86	177	177	105	79	58
WAIW	2	2	2	2	2	3	4	3	1	1
Total[e]	83	105	93	114	88	180	181	108	81	59
Groundfish Fishery Payments to Labor by Region ($Millions)[d]										
Alaska	8.8	11.1	10.0	14.0	12.0	14.1	10.8	10.2	11.3	8.3
WAIW	1.0	1.2	1.3	1.6	1.7	1.4	1.4	1.5	1.2	1.0
Total[e]	9.9	12.3	11.3	15.6	13.7	15.5	12.3	11.7	12.5	9.3

Note: [a]Does not include inshore processors located in other states or GHOST processors
[b]Includes all groundfish reported by processors including at-sea discards
[c]Salmon, crab, halibut, and other. Data for 2000 does not include halibut
[d]Includes skippers, fishing crew, processing crew, and home-office staff
[e]Total includes estimates for resident of other regions
NA - data is not available

Sources: NOAA Fisheries blend data, NOAA Fisheries Weekly Production Report data, and ADFG/CFEC fish ticket data.

Table 3.9-30. Summary of activities of Southeast Alaska inshore plants[a], 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Facilities and Facility Ownership by Region										
Number of facilities	12	14	16	16	16	14	15	12	13	15
AKSE owners (% of total)	16.7	28.6	37.5	25.0	37.5	42.9	46.7	50.0	46.2	53.0
WAIW owners (% of total)	83.3	71.4	62.5	75.0	62.5	57.1	53.3	50.0	53.8	47.0
Total Groundfish Catch										
Groundfish Catch (1,000s of mt)[b]	7	8	10	6	6	5	5	5	6	6
Ex-Vessel Value Of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	23.3	24.0	36.8	40.3	38.0	40.9	25.4	25.7	32.0	30.9
Non-GFSH ($Millions)[c]	100.2	98.9	124.2	103.3	93.9	100.7	79.2	105.3	51.1	NA
GFSH (% of total)	18.8	19.5	22.8	28.1	28.8	28.9	24.3	19.6	38.5	NA
Salmon (% of non-GFSH)	28.4	29.9	31.0	30.0	28.2	26.9	29.0	30.9	42.9	NA
Crab (% of non-GFSH)	16.4	14.9	13.8	15.7	17.9	19.2	20.3	19.1	21.4	NA
Halibut (% of non-GFSH)	28.4	29.9	31.0	28.6	28.2	28.2	26.1	25.0	NA	NA
Other (% of non-GFSH)	26.9	25.4	24.1	25.7	25.6	25.6	24.6	25.0	35.7	NA
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	92.7	89.0	96.2	94.6	95.9	94.2	93.2	92.2	93.7	93.5
FLAT	5.1	3.9	3.1	4.6	2.8	4.2	4.0	5.3	5.3	4.8
PCOD	2.2	1.8	0.6	0.8	1.2	1.7	2.6	2.5	1.0	1.6
PLCK	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groundfish Catch by FMP Subarea (% of Total)										
BSAI	0.0	5.2	0.0	0.0	0.1	2.5	0.0	0.0	0.0	0.0
GOA	100.0	94.8	100.0	100.0	99.9	97.5	100.0	100.0	100.0	100.0
Ex-Vessel Value Paid to Catcher Vessels by Type (% of Total)										
TCV BSP $\geq$ 125	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA
TCV BSP 60-124	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	NA
TCV Div. AFA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA
TCV Non-AFA	0.0	0.5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	NA
TCV < 60	0.9	1.0	1.3	1.6	1.5	1.6	1.9	2.1	2.4	NA
PCV	0.3	0.4	0.0	0.1	0.1	0.2	0.1	0.0	0.1	NA
LCV	10.8	9.1	12.3	20.2	21.2	22.0	21.6	20.7	19.8	NA
FGCV 33-59	86.7	87.1	85.5	77.7	76.9	75.8	76.2	76.9	77.2	NA
FGCV $\leq$ 32	1.3	1.9	0.9	0.4	0.3	0.1	0.3	0.2	0.5	NA
Quantity and Value of Processed Product										
Product (1,000s of mt)	5.0	5.4	6.4	4.7	4.5	4.2	4.3	3.5	4.2	3.5
Gross product value ($Millions)	27.2	30.5	42.0	40.7	38.6	37.2	28.8	26.9	32.1	28.4
Groundfish Fishery Employment by Region (FTE Positions)[d]										
Alaska	45	49	58	43	42	42	43	34	40	35
WAIW	2	2	2	2	1	1	1	1	1	1
Total[e]	47	51	60	45	43	43	44	35	41	36
Groundfish Fishery Payments to Labor by Region ($Millions)[d]										
Alaska	8.4	9.6	13.4	12.7	12.6	12.5	9.5	9.0	10.9	10.0
WAIW	2.3	2.3	2.7	3.2	2.5	2.2	1.7	1.4	1.8	1.3
Total[e]	10.7	11.9	16.1	15.9	15.2	14.7	11.2	10.4	12.7	11.3

Notes: [a]Does not include inshore processors located in other states or GHOST processors
[b]Includes all groundfish reported by processors including at-sea discards
[c]Salmon, crab, halibut, and other. Data for 2000 does not include halibut
[d]Includes skippers, fishing crew, processing crew, and home-office staff
[e]Total includes estimates for resident of other regions
NA - data is not available

Source: NOAA Fisheries blend data, NOAA Fisheries Weekly Production Report data, and ADFG/CFEC fish ticket data.

Table 3.9-31. Summary of activities of motherships[a], 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Facilities and Facility Ownership by Region										
Number of Facilities	5	3	4	4	3	3	3	3	3	3
WAIW owners (% of total)	100	100	100	100	100	100	100	100	100	100
Total Groundfish Catch										
Groundfish Catch (1,000s of mt)[b]	178	125	117	121	128	129	128	101	116	142
Ex-Vessel Value Of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	40.6	15.0	16.3	23.3	20.3	26.8	16.0	18.8	39.0	32.5
Non-GFSH ($Millions)[c]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	2	0	0	2	0	1	0	0	1	0
FLAT	5	0	1	3	1	1	0	0	0	0
PCOD	2	1	2	4	3	3	0	0	0	0
PLCK	91	99	97	91	96	95	100	100	99	99
Groundfish Catch by FMP Subarea (% of Total)										
BSAI	99	100	100	99	100	100	100	100	100	100
GOA	1	0	0	1	0	0	0	0	0	0
Ex-Vessel Value Paid to Catcher Vessels by Type (% of Total)										
TCV BSP ≥ 125	3	3	1	1	2	3	4	4	2	NA
TCV BSP 60-124	95	97	99	96	98	97	95	93	98	NA
TCV Div. AFA	0	0	0	2	0	0	0	0	0	NA
TCV Non-AFA	2	0	0	0	0	0	0	2	0	NA
TCV < 60	0	0	0	0	0	0	0	0	0	NA
PCV	0	0	0	0	0	0	0	0	0	NA
LCV	0	0	0	0	0	0	0	0	0	NA
FGCV 33-59	0	0	0	0	0	0	0	0	0	NA
FGCV ≤ 32	0	0	0	0	0	0	0	0	0	NA
Quantity and Value of Processed Product										
Product (1,000s of mt)	35.1	26.8	25.8	27.5	31.3	28.4	26.3	21.1	30.6	
Gross product value ($Millions)	92.1	44.1	53.6	74.5	66.5	71.6	58.2	57.9	81.3	77.4
Groundfish Fishery Employment by Region (FTE Positions)[d]										
WAIW	326	330	330	591	663	423	398	232	323	294
Total[e]	326	330	330	591	663	423	398	232	323	294
Groundfish Fishery Payments to Labor by Region ($Millions)[d]										
WAIW	33.2	16.0	19.5	27.4	24.4	26.4	21.9	21.7	29.7	27.1
Total[e]	33.2	16.0	19.5	27.4	24.4	26.4	21.9	21.7	29.7	27.1

Notes: aDoes not include inshore processors located in other states or GHOST processors
[b]Includes all groundfish reported by processors including at-sea discards
[c]Salmon, crab, halibut, and other. Data for 2000 does not include halibut
[d]Includes skippers, fishing crew, processing crew, and home-office staff
[e]Total includes estimates for resident of other regions
NA - data is not available

Sources: NOAA Fisheries blend data, NOAA Fisheries Weekly Production Report data, and ADFG/CFEC fish ticket data.

Table 3.9-32. Summary of activities of floating inshore plants[a], 1992–2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Number of Facilities and Facility Ownership by Region										
Number of facilities	17	10	10	15	12	4	3	5	11	3
AKAPAI owners (% of total)	0.0	0.0	0.0	13.3	16.7	25.0	33.3	20.0	9.1	33.0
AKSC owners (% of total)	5.9	20.0	30.0	33.3	16.7	0.0	0.0	0.0	0.0	0.0
AKSE owners (% of total)	11.8	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0
WAIW owners (% of total)	64.7	80.0	70.0	53.3	66.7	50.0	33.3	60.0	90.9	67.0
Other owners (% of total)	17.6	0.0	0.0	0.0	0.0	0.0	33.3	20.0	0.0	0.0
Total Groundfish Catch										
Groundfish catch (1,000s of mt)[b]	22	4	5	12	10	5	1	3	18	7
Ex-Vessel Value Of Groundfish and Non-Groundfish Retained										
GFSH ($Millions)	4.4	2.8	2.6	0.8	1.1	2.1	0.4	2.8	6.6	3.8
Non-GFSH ($Millions)[c]	90.0	105.3	121.7	89.8	71.1	54.9	67.4	96.0	25.6	NA
GFSH (% of total)	4.7	2.6	2.1	0.9	1.6	3.7	0.7	2.8	20.6	NA
Salmon (% of non-GFSH)	54.9	43.4	43.8	39.0	39.4	31.8	21.4	28.5	61.7	NA
Crab (% of non-GFSH)	40.8	52.4	51.5	53.1	38.7	54.8	68.2	57.2	32.3	NA
Halibut (% of non-GFSH)	1.0	1.4	1.2	0.6	2.0	7.7	7.4	9.6	NA	NA
Other (% of non-GFSH)	3.3	2.8	3.5	7.3	19.9	5.7	3.1	4.7	6.0	NA
Groundfish Catch by Species Group (% of Total)										
A-R-S-O	10.4	20.9	15.8	5.6	6.4	5.5	4.1	2.6	2.9	2.6
FLAT	13.4	4.7	37.9	43.9	17.9	3.1	3.4	2.3	1.1	3.6
PCOD	61.2	66.1	43.3	41.9	70.0	91.4	92.5	69.2	92.5	89.0
PLCK	15.0	8.5	3.2	8.7	5.6	CP	CP	25.9	3.6	4.8
Groundfish Catch by FMP Subarea (% of Total)										
BSAI	28.6	15.3	68.8	76.8	80.1	99.9	99.9	24.7	82.7	99.4
GOA	71.4	84.7	31.2	23.2	19.9	0.1	0.1	75.3	17.3	0.6
Ex-Vessel Value Paid to Catcher Vessels by Type (% of Total)										
TCV BSP ≥ 125	0.1	0.7	0.0	23.0	6.2	9.9	0.0	0.0	2.5	NA
TCV BSP 60-124	1.6	2.1	0.0	7.5	9.4	25.5	0.0	2.4	17.8	NA
TCV Div. AFA	3.2	0.0	0.0	0.0	5.0	17.0	0.0	5.1	14.6	NA
TCV Non-AFA	19.2	7.6	0.0	2.2	0.0	1.7	1.8	13.4	11.5	NA
TCV < 60	23.6	18.9	0.5	0.1	6.4	0.0	4.0	20.7	4.7	NA
PCV	5.3	2.0	4.0	10.3	15.7	37.7	25.8	10.8	31.9	NA
LCV	17.5	14.4	20.1	0.1	19.2	2.7	6.6	6.5	3.4	NA
FGCV 33-59	29.0	53.4	74.4	56.8	38.0	4.9	59.8	40.5	13.3	NA
FGCV ≤ 32	0.5	0.9	0.9	0.2	0.1	0.5	2.0	0.5	0.4	NA
Quantity and Value of Processed Product										
Product (1,000s of mt)	10.0	2.2	2.0	5.4	4.3	1.8	0.8	3.0	7.7	2.8
Gross Product Value ($Millions)	16.2	5.3	4.5	9.6	7.3	4.6	1.4	3.5	20.9	8.2
Groundfish Fishery Employment by Region (FTE Positions)[d]										
Alaska	15	6	7	29	14	11	0	0	1	22
WAIW	93	24	18	52	65	26	5	50	167	47
Total[e]	124	30	25	81	79	37	8	60	168	69
Groundfish Fishery Payments to Labor by Region ($Millions)[d]										
Alaska	0.6	0.4	0.4	1.1	0.4	0.4	0.0	0.0	0.0	0.9
WAIW	3.4	1.7	1.1	1.9	1.8	0.9	0.2	0.8	7.1	2.0
Total[e]	4.6	2.1	1.6	3.0	2.2	1.2	0.4	1.0	7.1	2.9

Table 3.9-32 (cont.). Summary of activities of floating inshore plants[a], 1992–2001.

Note: [a]Does not include inshore processors located in other states or GHOST processors
[b]Includes all groundfish reported by processors including at-sea discards
[c]Salmon, crab, halibut, and other. Data for 2000 does not include halibut
[d]Includes skippers, fishing crew, processing crew, and home-office staff
[e]Total includes estimates for resident of other regions
CP - data is combined with Pacific cod
NA - data is not available

Sources: NOAA Fisheries blend data, NOAA Fisheries Weekly Production Report data, and ADFG/CFEC fish ticket data

Table 3.9-33. Study regions and their acronyms.

AKAPAI	Alaska Peninsula and Aleutian Islands Region. Includes the Aleutians East Borough and the Aleutians West Census Area.
AKKO	Kodiak Island Region. Includes the Kodiak Island Borough and other parts of the Kodiak archipelago.
AKSC	Southcentral Alaska Region. Includes Valdez-Cordova Census Area, Kenai Peninsula Borough, Matanuska-Susitna Borough, and Municipality of Anchorage.
AKSE	Southeast Alaska Region. Includes Yakutat Borough, Skagway-Hoonah-Angoon Borough, Haines Borough, City and Borough of Juneau, City and Borough of Sitka, Wrangell-Petersburg Census Area, Prince of Wales-Outer Ketchikan Census Area, and Ketchikan Gateway Borough.
WAIW	Washington Inland Waters Region. All counties bordering Puget Sound and the Strait of Juan de Fuca, including Clallum, Island, Jefferson, King, Kitsap, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom.
ORCO	Oregon Coast Region. Counties bordering the northern Oregon coast including Lincoln, Tillamook, and Clatsop.

Table 3.9-34. Selected North Pacific groundfish participation measures by region, 2001.

	AKAPAI	AKKO	AKSC	AKSE	WAIW	ORCO	Total
Processor Employment and Payments to Labor							
Employment (estimated	3,525	617	150	106	3,787	0	8,184
Payments to labor ($millions)[2]	149.3	28.9	15.3	14.5	317.0	0.0	525.1
Groundfish Processing by Regional Inshore Plants							
Reported MT (thousands)	674.5	79.9	6.9	6.2	NA	NA	767.5
Product MT (thousands)	267.9	27.7	4.3	3.5	NA	NA	303.4
Utilization rate (percent)	39.72	34.69	62.20	55.99	NA	NA	39.53
Product value ($millions)	490.6	77.6	23.4	27.0	NA	NA	618.6
Value per ton ($)	727	972	3,380	4,333	NA	NA	806
Processors Owned by Regional Residents							
Number of processors owned	4	7	16	10	119	0	156
Reported tons (thousands)	1.96	32.73	18.11	12.82	1,898.77	0.00	1,964.3
Wholesale value ($nillions)	1.56	26.38	24.96	18.64	1,308.67	0.00	1,380.2
Catcher Vessels Owned by Regional Residents							
Number of catcher vessels	70	142	155	210	239	35	851
Retained tons (thousands)	24.4	55.7	15.0	7.1	692.4	86.5	881.2
Ex-vessel value ($millions)	6.4	19.3	10.8	19.1	135.6	18.2	209.4
Employment (persons)	326.5	802	1048.5	1,742	1,238	174.5	5,332
Payments to labor ($millions)	2.56	7.73	4.34	7.65	54.22	7.28	83.77

Notes: [1]Includes all employment at all shoreplants located in the region and all employment of at-sea processors (including floaters) owned by residents. In addition the estimate includes administrative employment of all processors owned by residents.
[2]All payments to labor from at-sea processors (including floaters) are assigned to the owners region. On-site payments to labor from shore plants are assigned to the region in which the plant is located.
FTE - full-time employees
MT - metric tons
NA - data not available

Source: For processing information, NMFS Blend Data and WPR Data, September 2002 and Northern Economics internally derived tables. For harvest information, ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include “ghost” entities, while weight information includes “ghost” entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-35. Groundfish harvests delivered to inshore plants by species group, 2001.

Region	Total Reported Harvest by Species									
	Thousands of Tons					Millions of $				
	ARSO	Flatfish	P Cod	Pollock	Total	ARSO	Flatfish	P Cod	Pollock	Total
AKAPAI	4.95	4.10	35.54	635.91	680.50	9.06	0.60	46.74	432.82	489.23
AKKO	12.21	16.02	22.91	39.36	90.50	12.89	5.34	26.32	29.88	74.44
AKSC	4.05	0.32	1.41	1.90	7.67	18.95	0.03	2.21	2.04	23.22
AKSE	6.82	0.30	0.10	0.00	7.22	26.63	0.00	0.08	0.00	26.72
WAIW	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORCO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	28.03	20.73	59.96	677.17	785.89	67.54	5.97	75.35	464.74	613.61

Notes: NA - data not available

Source: NMFS Blend Data and WPR Data, September 2002

Table 3.9-36. Groundfish wholesale value ($millions) of regionally owned processors by processor class, 2001.

Processor Class	Region						
	AKAPAI	AKKO	AKSC	AKSE	WAIW	ORCO	Total
Catcher/Processors	a	23.60	5.36	10.65	631.82	0.00	671.42
Motherships	0.00	0.00	0.00	0.00	86.94	0.00	86.94
Shoreplants	1.57	2.78	19.57	7.99	589.66	0.00	621.57

Notes: a - Due to the confidentiality of the data presented, this value has been added to shoreplants

Source: Derived tables, Northern Economics (based on NMFS Blend Data and WPR Data, September 2002).

Table 3.9-37. Groundfish retained harvest by catcher vessels owned by residents of various regions by fishery management plan subarea, 2001.

Region	AI	BS	WG	CG	EG	Total
Total Ex-Vessel Value ($ Millions)						
AKAPAI	0.25	0.20	5.77	0.18	0	6.41
AKKO	0.42	5.29	1.57	11.19	0.85	19.31
AKSC	0.44	1.07	1.52	7.12	0.69	10.85
AKSE	0.39	0.12	0.64	3.73	14.24	19.12
WAIW	3.53	109.56	5.20	9.95	7.32	135.55
ORCO	a	11.72	0.20	6.07	0.20	18.19
Total	5.05	127.96	14.90	38.24	23.30	209.43

Notes: a - Due to the confidentiality of the data presented, this value has been added to BS.

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002.

Table 3.9-38. Number of boats and retained catch by weight and value, by species group, and by catcher vessel ownership by region, 2001.

Data	AKAPAI	AKKO	AKSC	AKSE	WAIW	ORCO
ARSO						
Number of catcher vessels	20	95	117	208	182	33
Retained tons (thousands)	0.02	3.84	1.71	5.37	5.44	2.70
Ex-vessel value ($millions)	0.07	5.19	5.38	22.49	19.01	1.26
Flatfish						
Number of catcher vessels	13	37	18	6	101	24
Retained tons (thousands)	0.26	3.93	1.01	0.04	2.56	2.22
Ex-vessel value ($millions)	0.01	0.85	0.32	0.01	0.35	0.44
Pacific Cod						
Number of catcher vessels	70	136	129	97	181	31
Retained tons (thousands)	8.41	14.13	7.41	1.61	27.19	9.53
Ex-vessel value ($millions)	4.21	8.74	5.12	0.60	14.12	5.29
Pollock						
Number of catcher vessels	26	45	60	3	111	26
Retained tons (thousands)	15.68	33.62	4.84	a	657.09	71.80
Ex-vessel value ($millions)	2.12	4.63	0.68	a	102.67	11.21
All Groundfish Species						
Total Number of catcher vessels	70	142	155	210	239	35
Total retained tons (thousands)	24.36	55.53	14.98	7.03	692.28	86.25
Total Ex-vessel value ($millions)	6.41	19.40	11.51	23.10	136.15	18.20

Notes: a - Due to the confidentiality of the data presented, this value has been added to Pacific cod.

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include “ghost” entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-39. Retained harvests by fisheries management plan area and species of regional catcher vessels, 2001.

Region of CV Owner	FMP Area										Total
	Aleutian Islands		Bering Sea		Western Gulf		Central Gulf		Eastern Gulf		
	P cod	Pollock	P cod	Pollock	P cod	Pollock	P cod	Pollock	P cod	Pollock	
Volume (Thousands of Tons)											
AKAPAI	0.47	0.00	0.11	0.66	7.80	13.89	0.03	1.12	0.00	0.00	24.08
AKKO	0.04	0.00	3.53	23.32	1.00	0.00	9.56	10.31	a	a	47.76
AKSC	0.03	0.00	0.54	2.02	1.18	0.40	5.58	2.16	0.07	0.26	12.25
AKSE	0.11	0.00	b	b	1.16	c	0.19	c	0.16	c	1.61
WAIW	3.29	0.00	18.92	634.88	2.78	13.71	2.20	7.76	0.73	c	684.28
ORCO	0.00	0.00	3.85	61.58	a	a	5.68	9.39	0.83	c	81.33
Value ($ Millions)											
AKAPAI	0.25	0.00	0.06	0.09	3.88	1.86	0.01	0.16	0.00	0.00	6.33
AKKO	0.02	0.00	1.84	3.10	0.54	0.00	6.33	1.53	a	a	13.36
AKSC	0.02	0.00	0.30	0.28	0.63	0.05	4.12	0.32	0.05	0.04	5.81
AKSE	0.02	0.00	b	b	0.34	c	0.11	c	0.12	c	0.60
WAIW	1.81	0.00	9.57	99.36	1.42	2.08	1.33	1.11	0.11	c	116.79
ORCO	0.00	0.00	1.97	9.72	a	a	3.32	1.36	0.13	c	16.50

Notes: a - Due to the confidentiality of the data presented, this value has been added to the same species in Central Gulf.
b - Due to the confidentiality of the data presented, this value has been added to Pacific Cod in the Aleutian Islands.
c - Due to the confidentiality of the data presented, this value has been added to Pacific Cod in the same area.
CV - catcher vessel

Source: Spreadsheet from Northern Economics based on ADF&G Fish Tickets and NMFS Observer Data, September 2002.

Table 3.9-40. North Pacific groundfish fishery participation measures for the Alaska Peninsula/Aleutian Islands region, 1992-2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Processor Employment and Payments to Labor										
Employment (estimated FTEs)[1]	2,053	1,947	2,273	2,532	2,645	2,544	2,313	2,648	3,157	3,525
Payment to labor ($millions)[2]	112.9	65.4	88.5	116.2	99.7	99.3	85.1	113.0	131.3	149.3
Groundfish Processing by Regional Inshore Plants										
Reported tons (thousands)	516.5	534.1	551.6	567.0	548.2	532.5	486.4	544.0	590.6	674.5
Product tons (thousands)	153.1	152.7	172.7	183.2	177.7	176.2	165.2	191.0	217.1	267.9
Utilization rate (percent)	29.6	28.6	31.3	32.3	32.4	33.1	34.0	35.1	36.8	39.7
Product value ($millions)	374.0	217.9	291.3	386.6	331.6	330.5	283.1	376.3	437.2	490.6
Value per ton ($)	724	408	528	682	605	621	582	692	740	727
Processors Owned by Regional Residents										
Number of processors owned	1	0	2	6	5	4	4	4	4	4
Reported tons (thousands)	0	*	*	1.89	1.98	1.42	0.90	0.54	0.74	1.96
Wholesale value ($millions)	0	*	*	1.52	1.40	1.18	0.81	0.53	0.83	1.56
Catcher Vessels Owned by Regional Residents										
Number of catcher vessels	61	46	60	71	70	74	76	67	70	70
Retained tons (thousands)	14.1	12.0	14.8	13.4	23.7	28.9	27.8	24.5	20.3	24.4
Ex-vessel value ($millions)	5.74	3.47	4.38	4.98	8.02	9.86	7.39	10.12	9.86	6.41
Employment (persons)	320	201	305	352	351	382	351	306	318	327
Payment to labor ($millions)	2.3	1.39	1.75	1.99	3.21	3.95	2.96	4.05	3.94	2.56

Notes: [1]Includes all employment at all shoreplants located in the region and all employment of at-sea processors (including floaters) owned by residents. In addition the estimate includes administrative employment of all processors owned by residents.
[2]All payments to labor from at-sea processors (including floaters) are assigned to the owners region. On-site payments to labor from shore plants are assigned to the region in which the plant is located.
FTE - full-time employees

Source: For processing information, NMFS Blend Data and WPR Data, September 2002 and Northern Economics (1994) internally derived tables. For harvest information, ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-41. Groundfish reported by Alaska Peninsula/Aleutian Islands region inshore plants by species group, 1999-2001.

Groundfish Reported	Species Group				
	ARSO	Flatfish	P Cod	Pollock	Total
1999 tons (thousands)	8.4	5.0	56.11	474.4	543.92
1999 product value ($millions)	5.58	1.2	81.87	287.66	376.31
2000 tons (thousands)	4.08	7.73	56.73	522.08	590.63
2000 product value ($millions)	6.88	1.60	80.48	348.28	437.24
2001 tons (thousands)	4.95	4.10	35.54	635.91	680.50
2001 products value ($millions)	9.06	0.60	46.74	432.82	489.23

Source: NMFS Blend Data and WPR Data, September 2002.

Table 3.9-42. Groundfish wholesale value ($millions) of processor class owned by residents of the Alaska Peninsula/Aleutian Islands region, 1992-2001.

	Year									
Processor Class	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Catcher/Processors	0.16	0	0.05	0.51	0.41	0.36	0.12	0.08	0.60	a
Motherships	0	0	0	0	0	0	0	0	0	0
Shoreplants	0	0	0.25	1.01	0.99	0.82	0.69	0.45	0.23	1.56

Notes: a - Due to the confidentiality of the data presented, this value has been added to shoreplants.

Source: Derived tables, Northern Economics (1994) adapted from NMFS Blend Data and WPR Data, September 2002.

Table 3.9-43. Groundfish retained harvest ex-vessel value, catcher vessels owned by Alaska Peninsula/Aleutian Islands region residents by fisheries management plan subarea, 1999-2001.

Retained Harvest	FMP Subarea					
	AI	BS	WG	CG	EG	Total
1999 ex-vessel ($millions)	0	0.40	8.65	1.07	a	10.12
2000 ex-vessel ($millions)	0	0.65	9.09	0.12	a	9.86
2001 ex-vessel ($millions)	0.25	0.20	5.77	0.18	0	6.41

Notes: a - Due to confidentiality of the data presented, this value has been added to the Central Gulf.

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002.

Table 3.9-44. Number of boats and retained catch by weight and value, by species group, and by catcher vessel ownership for the Alaska Peninsula/Aleutian Islands region, 1992-2001.

Data	Year									
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
ARSO										
Number of catcher vessels	16	8	11	9	20	24	16	20	19	20
Retained tons (thousands)	0.1	0.1	0.1	0.2	0.4	0.1	0.2	0.1	0	0
Ex-vessel value ($millions)	0.31	0.18	0.26	0.70	0.79	0.59	0.32	0.42	0.05	0.07
Flatfish										
Number of catcher vessels	2	3	7	6	12	24	15	15	15	13
Retained tons (thousands)	0	*	0.1	0	1.7	0.1	0	0	0.1	0.3
Ex-vessel value ($millions)	0	*	0.04	0.01	0.92	0.02	0	0	0	0.01
Pacific Cod										
Number of catcher vessels	60	45	58	70	67	74	73	67	70	70
Retained tons (thousands)	12.3	8.5	10.0	8.3	13.9	17.0	16.3	14.5	11.5	8.4
Ex-vessel value ($millions)	5.21	2.85	3.35	3.38	4.85	6.52	5.53	7.54	7.60	4.21
Pollock										
Number of catcher vessels	12	8	10	12	13	29	23	19	19	26
Retained tons (thousands)	1.6	3.4	4.6	4.9	7.8	11.6	11.2	9.8	8.7	15.7
Ex-vessel value ($millions)	0.22	0.45	0.74	0.88	1.45	2.73	1.55	2.15	2.21	2.12
All Groundfish Species										
Total number of catcher vessels	61	46	60	71	70	74	76	67	70	70
Total retained tons (thousands)	14.1	12.0	14.8	13.4	23.7	28.9	27.8	24.5	20.3	24.4
Total ex-vessel value ($millions)	5.74	3.47	4.38	4.98	8.02	9.86	7.39	10.12	9.86	6.41

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-45. Retained harvests by fisheries management plan area and species of Alaska Peninsula/ Aleutian Islands region catcher vessels, 1992-2001.

Year	Fisheries Management Plan Area										Total
	Aleutian Islands		Bering Sea		Western Gulf		Central Gulf		Eastern Gulf		
	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	
Volume (Thousands of Tons)											
1992	0	0	0.62	0.44	6.18	0.24	4.02	2.43	0.02	0	13.95
1993	0.02	0.06	0.35	3.68	3.12	1.21	1.96	1.52	0.01	0	11.94
1994	0.01	0.06	0.56	4.11	2.74	1.76	2.70	2.64	0.02	0.04	14.63
1995	0	0	0.86	0.23	2.47	2.67	4.66	2.28	0.01	0	13.20
1996	0	0	1.34	0.52	6.79	4.61	6.07	2.32	0.03	0	21.68
1997	0.03	0	1.29	0.24	9.21	3.92	6.25	7.59	0.04	0.07	28.64
1998	0	0	0.47	0.31	8.36	4.18	4.93	9.20	0.03	0.02	27.50
1999	0.12	0	0.46	0.59	9.60	5.86	3.81	3.82	0.02	0.05	24.34
2000	0.22	0	0.44	1.49	8.19	5.38	2.46	1.85	0.02	0.13	20.20
2001	0.47	0	0.11	0.66	7.80	13.89	0.03	1.12	0.00	0.00	24.08
Value ($Millions)											
1992	0	0	0.28	0.09	2.56	0.05	1.80	0.64	0.02	0	5.43
1993	0.01	0.01	0.14	0.62	1.21	0.19	0.82	0.29	0.01	0	3.29
1994	0	0.01	0.24	0.80	1.04	0.36	1.07	0.54	0.01	0.01	4.09
1995	0	0	0.33	0.05	0.92	0.46	2.01	0.48	0.01	0	4.26
1996	0	0	0.50	0.08	2.12	0.81	2.31	0.45	0.03	0	6.30
1997	0.03	0	0.71	0.05	3.24	0.87	2.64	1.66	0.03	0.01	9.25
1998	0	0	0.19	0.04	2.85	0.60	1.96	1.40	0.02	0	7.07
1999	0.07	0	0.26	0.12	4.75	1.25	2.43	0.78	0.01	0.01	9.69
2000	0.15	0	0.28	0.37	5.33	1.34	1.84	0.45	0.02	0.03	9.80
2001	0.25	0	0.06	0.09	3.88	1.86	0.01	0.16	0.00	0.00	6.33

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002.

Table 3.9-46. North Pacific groundfish fishery participation measures for Kodiak Island region, 1992-2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Processor Employment and Payments to Labor										
Employment (estimated FTEs)[1]	562	645	585	708	562	673	749	801	730	617
Payment to labor ($millions)[2]	30.8	30.6	32.4	31.4	25.7	26.2	26.8	33.0	32.1	28.9
Groundfish Processing by Regional Inshore Plants										
Reported tons (thousands)	106.8	124.9	114.4	82.5	74.8	101.1	115.2	116.7	106.0	79.9
Product tons (thousands)	27.1	32.0	28.3	26.4	22.8	25.3	28.8	31.4	29.9	27.7
Utilization rate (percent)	25.4	25.6	24.7	32.0	30.5	25.0	25.0	26.9	28.2	34.7
Product value ($millions)	80.3	81.7	85.5	92.0	71.3	76.3	77.7	94.7	89.6	77.6
Value per ton ($)	752	654	747	1115	953	755	674	811	845	972
Processors Owned by Regional Residents										
Number of processors owned	9	9	9	9	7	6	6	9	7	7
Reported tons (thousands)	67.3	73.3	71.5	33.6	29.9	33.8	30.0	34.3	33.1	32.7
Wholesale value ($millions)	45	41.0	46.1	25.4	22.1	18.3	15.8	24.8	25.5	26.4
Catcher Vessels Owned by Regional Residents										
Number of catcher vessels	172	130	143	145	144	160	153	158	192	142
Retained tons (thousands)	80.3	77.4	75.5	83.2	82.5	90.8	81.0	69.5	62.7	55.7
Ex-vessel value ($millions)	28.5	21.1	22.4	27.5	28.3	39.6	22.7	30.0	30.0	19.3
Employment (persons)	856	623	681	709	724	796	749	797	920	802
Payment to labor ($millions)	11.4	8.5	8.9	11.0	11.3	15.9	9.1	12.0	12.0	7.73

Notes: [1]Includes all employment at all shoreplants located in the region and all employment of at-sea processors (including floaters) owned by residents. In addition the estimate includes administrative employment of all processors owned by residents.
[2]All payments to labor from at-sea processors (including floaters) are assigned to the owners region. On-site payments to labor from shore plants are assigned to the region in which the plant is located.
FTE - full-time employees

Source: For processing information, NMFS Blend Data and WPR Data, September 2002 and Northern Economics (1994) internally derived tables. For harvest information, ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-47. Groundfish reported by Kodiak Island region inshore plants by species group, 1999-2001.

Groundfish Reported	Species Group				
	ARSO	Flatfish	P Cod	Pollock	Total
1999 tons (thousands)	11.69	10.08	35.18	59.75	116.71
1999 product value ($millions)	11	3.34	50.26	30.06	94.65
2000 tons (thousands)	14.13	14.2	26.82	50.82	105.97
2000 product value ($millions)	13.33	8.97	40.06	27.21	89.57
2001 tons (thousand)	12.21	16.02	22.91	39.36	90.50
2001 product value ($millions)	12.89	5.34	26.32	29.88	74.44

Source: NMFS Blend Data and WPR Data, September 2002.

Table 3.9-48. Groundfish wholesale value ($millions) of processor class owned by residents of the Kodiak Island region, 1992-2001.

	Year									
Processor Class	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Catcher-processors	11.12	13.62	14.36	15.81	18.19	15.96	13.40	23.00	22.65	23.60
Motherships	0	0	0	0	0	0	0	0	0	0
Shoreplants	33.91	27.32	31.75	9.59	3.90	2.30	2.35	1.75	2.82	2.78

Source: Derived tables, Northern Economics (1994) adapted from NMFS Blend Data and WPR Data, September 2002.

Table 3.9-49. Groundfish retained harvest ex-vessel value, catcher vessels owned by Kodiak Island region residents by fisheries management plan subarea, 1999-2001.

Retained Harvest	FMP Subarea					
	AI	BS	WG	CG	EG	Total
1999 ex-vessel ($millions)	0.79	4.83	0.78	22.98	0.66	30.04
2000 ex-vessel ($millions)	0.3	4.25	1.12	23.32	1.08	30.07
2001 ex-vessel ($millions)	0.42	5.29	1.57	11.18	0.85	19.31

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002

Table 3.9-50. Number of boats and retained catch by weight and value, by species group, and by catcher vessel ownership for the Kodiak Island region, 1992-2001.

Data	Year									
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
ARSO										
Number of catcher vessels	113	83	106	83	91	111	108	93	99	95
Retained tons (thousands)	2.5	2.2	2.4	1.6	4.2	4.9	4.4	3.5	5.9	3.8
Ex-vessel value ($millions)	4.93	4.37	6.30	4.22	7.29	7.76	4.69	4.48	6.47	5.19
Flatfish										
Number of catcher vessels	38	34	39	45	52	53	46	35	34	37
Retained tons (thousands)	9.7	6.3	4.5	6.0	7.2	11.5	4.5	2.2	5.6	3.9
Ex-vessel value ($millions)	3.33	1.96	1.41	1.74	2.58	7.38	1.28	0.59	1.06	0.85
Pacific Cod										
Number of catcher vessels	149	103	105	136	127	150	144	150	190	136
Retained tons (thousands)	15.4	17.4	16.5	26.3	24.8	30.6	24.5	27.5	18.9	14.1
Ex-vessel value ($millions)	7.36	6.84	6.04	11.74	10.32	14.58	10.00	17.67	14.79	8.74
Pollock										
Number of catcher vessels	64	38	44	46	49	79	69	62	64	45
Retained tons (thousands)	52.8	51.5	52.1	49.2	46.2	43.9	47.6	36.3	32.2	33.6
Ex-vessel value ($millions)	12.85	7.97	8.60	9.84	8.13	9.90	6.76	7.29	7.75	4.63
All Groundfish Species										
Total number of catcher vessels	172	130	143	145	144	160	153	158	192	142
Total retained tons (thousands)	80.3	77.4	75.5	83.2	82.5	90.8	81.0	69.5	62.7	55.5
Total ex-vessel value ($millions)	28.47	21.14	22.35	27.54	28.33	39.63	22.74	30.04	30.07	19.40

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-51. Retained harvests by fisheries management plan area and species of Kodiak Island regional catcher vessels, 1992-2001.

	Fisheries Management Plan Area										
	Aleutian Islands		Bering Sea		Western Gulf		Central Gulf		Eastern Gulf		
Year	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	Total
Volume (Thousands of Tons)											
1992	0.43	0.13	6.15	23.58	6.14	0.75	9.94	20.91	0.10	0	68.14
1993	0.06	0.12	7.46	16.78	3.51	2.59	10.33	27.68	0.32	0.08	68.93
1994	0.02	0.1	7.87	13.45	3.01	2.81	9.55	30.18	0.24	1.46	68.69
1995	0.03	0.28	10.85	37.58	2.53	3.51	11.32	9.34	0.08	0.02	75.54
1996	0.28	0.12	13.80	34.04	3.53	3.73	8.74	6.70	0.08	0.04	71.05
1997	0.47	0.05	14.88	18.65	5.78	3.89	12.99	17.25	0.10	0.35	74.42
1998	0.90	0.04	7.87	22.09	4.27	4.02	10.05	22.63	0.09	0.17	72.11
1999	1.60	0.01	6.70	14.57	4.43	3.30	14.00	18.78	0.10	0.26	63.75
2000	1.87	0	6.30	11.95	3.41	3.02	10.34	13.45	0.10	0.68	51.12
2001	0.04	0	3.53	23.32	1.00	0.00	9.56	10.31	a	a	47.76
Value ($Millions)											
1992	0.17	0.03	2.49	5.04	2.41	0.16	4.63	5.21	0.08	0	20.21
1993	0.02	0.02	2.42	2.28	1.17	0.33	3.95	4.42	0.19	0.01	14.81
1994	0.01	0.02	2.53	2.08	0.93	0.43	3.27	5.03	0.09	0.24	14.64
1995	0.01	0.06	4.25	7.84	1.02	0.66	5.53	2.16	0.04	0	21.58
1996	0.10	0.02	5.09	5.85	1.24	0.71	3.93	1.44	0.07	0.01	18.46
1997	0.26	0.01	6.53	4.17	2.26	0.92	6.17	4.01	0.08	0.07	24.48
1998	0.31	0.01	2.99	3.13	1.58	0.59	4.44	3.64	0.06	0.03	16.77
1999	0.94	0	3.87	3.05	2.43	0.75	9.69	4.11	0.07	0.06	24.97
2000	1.20	0	4.05	2.84	2.21	0.74	8.00	3.24	0.08	0.17	22.55
2001	0.02	0	1.84	3.10	0.54	0.00	6.33	1.53	a	a	13.36

Notes: a - Due to the confidentiality of the data presented, this value has been added to the same species in Central Gulf.

Table 3.9-52. North Pacific groundfish fishery participation measures for the Southcentral Alaska region, 1992-2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Processor Employment and Payments to Labor										
Employment (estimated FTEs)[1]	159	150	135	195	156	260	240	170	148	150
Payment to labor ($millions)[2]	11.9	13.1	12.2	17.1	14.5	16.8	13.1	13.5	14.5	15.3
Groundfish Processing by Regional Inshore Plants										
Reported tons (thousands)	12.86	12.88	11.97	12.82	12.65	16.9	17.69	10.82	10.01	6.9
Product tons (thousands)	6.6	6.62	5.31	7.05	6.86	9.2	9.7	6.64	5.23	4.3
Utilization rate (percent)	51.3	51.4	44.4	55.0	54.2	54.4	54.8	61.4	52.2	62.2
Product value ($millions)	25.68	31.26	28.78	39.91	34.91	40.28	31.68	29.77	32.21	23.4
Value per ton ($)	1,997	2,427	2,404	3,113	2,760	2,383	1,791	2,751	3,218	3,380
Processors Owned by Regional Residents										
Number of processors owned	19	16	19	19	14	19	15	13	16	16
Reported tons (thousands)	19.46	21.03	19.76	22.55	19.96	26.70	24.15	24.40	23.13	18.11
Wholesale value ($millions)	23.79	27.77	25.94	35.47	27.80	32.49	24.47	33.59	35.43	24.96
Catcher Vessels Owned by Regional Residents										
Number of catcher vessels	340	288	303	237	191	197	171	170	198	155
Retained tons (thousands)	32.5	20.6	19.7	18.4	11.3	11.8	11.4	12.4	15.5	15.0
Ex-vessel value ($millions)	17.22	12.21	11.17	12.33	9.17	11.21	7.47	10.31	13.75	10.8
Employment (persons)	1,672	1,315	1,432	1,148	984	1,001	813	820	933	1,049
Payment to labor ($millions)	6.89	4.89	4.47	4.93	3.67	4.48	2.99	4.12	5.5	4.34

Notes: [1]Includes all employment at all shoreplants located in the region and all employment of at-sea processors (including floaters) owned by residents. In addition the estimate includes administrative employment of all processors owned by residents.
[2]All payments to labor from at-sea processors (including floaters) are assigned to the owners region. On-site payments to labor from shore plants are assigned to the region in which the plant is located.
FTE - full-time employees

Source: For processing information, NMFS Blend Data and WPR Data, September 2002 and Northern Economics (1994) internally derived tables. For harvest information, ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-53. Groundfish reported by Southcentral Alaska region inshore plants by species group, 1999-2001.

Groundfish Reported	Species Group				
	ARSO	Flatfish	P Cod	Pollock	Total
1999 tons (thousands)	4.58	0.87	3.34	2.03	10.82
1999 product value ($millions)	20.61	0.21	6.13	2.81	29.77
2000 tons (thousands)	5.44	0.4	2.25	1.92	10.01
2000 product value ($millions)	26.01	0.21	3.85	2.13	32.21
2001 tons (thousands)	4.05	0.32	1.41	1.90	7.67
2001 product value ($millions)	18.95	0.03	2.21	2.04	23.22

Source: NMFS Blend Data and WPR Data, September 2002.

Table 3.9-54. Groundfish wholesale value ($millions) of processor class owned by residents of the Southcentral Alaska region, 1992-2001.

Processor Class	Year									
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Catcher/Processors	3.29	2.87	2.22	2.19	2.2	2.41	1.75	2.04	2.13	5.36
Motherships	0	0	0	0	0	0	0	0	0	0
Shoreplants	20.50	24.9	23.73	33.28	25.60	30.08	22.72	31.56	33.3	19.57

Source: Derived tables, Northern Economics (1994), adapted from NMFS Blend Data and WPR Data, June 2001.

Table 3.9-55. Groundfish retained harvest ex-vessel value, catcher vessels owned by Southcentral Alaska region residents by fisheries management plan subarea, 1999-2001.

Retained Harvest	FMP Subarea					
	AI	BS	WG	CG	EG	Total
1999 ex-vessel ($Millions)	0.34	0.36	1.01	8.19	0.40	10.31
2000 ex-vessel ($Millions)	0.77	0.61	1.83	9.72	0.83	13.75
2001 ex-vessel ($Millions)	0.44	1.07	1.52	7.10	0.68	10.81

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002.

Table 3.9-56. Number of boats and retained catch by weight and value, by species group, and by catcher vessel ownership for the Southcentral Alaska region, 1992-2001.

Data	Year									
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
ARSO										
Number of catcher vessels	299	269	290	207	169	175	145	129	141	117
Retained tons (thousands)	3.5	3.5	2.8	2.0	1.5	1.6	1.2	1.3	1.8	1.7
Ex-vessel value ($millions)	8.14	7.55	7.31	6.91	4.94	6.28	3.47	3.71	5.28	5.38
Flatfish										
Number of catcher vessels	16	12	6	7	16	12	17	7	11	18
Retained tons (thousands)	0.5	0.4	0.8	0.1	0.2	0.1	0.2	0.2	1.0	1.0
Ex-vessel value ($millions)	0.16	0.13	0.16	0.04	0.11	0.12	0.10	0.09	0.20	0.32
Pacific Cod										
Number of catcher vessels	279	162	116	172	139	160	145	151	174	129
Retained tons (thousands)	9.9	6.6	5.0	7.4	7.6	8.8	8.0	8.1	9.1	7.4
Ex-vessel value ($millions)	4.92	2.98	1.81	3.70	3.73	4.51	3.62	5.91	7.34	5.12
Pollock										
Number of catcher vessels	25	16	6	7	15	30	23	31	41	60
Retained tons (thousands)	18.6	10.2	11.1	8.8	2.1	1.3	2.0	2.8	3.6	4.8
Ex-vessel value ($millions)	4	1.56	1.89	1.68	0.39	0.29	0.28	0.60	0.92	0.68
All Groundfish Species										
Total number of catcher vessels	340	288	303	237	191	197	171	170	198	155
Total retained tons (thousands)	32.5	20.6	19.7	18.4	11.3	11.8	11.4	12.4	15.5	15.0
Total ex-vessel value ($millions)	17.22	12.21	11.17	12.33	9.17	11.21	7.47	10.31	13.75	11.51

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-57. Retained harvests by fisheries management plan area and species of Southcentral Alaska regional catcher vessels, 1992-2001.

Year	Fisheries Management Plan Area										Total
	Aleutian Islands		Bering Sea		Western Gulf		Central Gulf		Eastern Gulf		
	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	
Volume (Thousands of Tons)											
1992	0.04	0.30	2.25	17.29	1.20	0.44	5.58	1.16	0.18	0	28.44
1993	0.05	0.11	1.16	6.80	1.12	0.49	4.95	1.68	0.39	0	16.74
1994	0.02	0.11	2.12	7.22	0.85	0.48	3.94	1.13	0.20	0.06	16.12
1995	0.01	0.06	3.49	5.30	0.59	0.31	5.63	0.83	0.05	0	16.28
1996	0.01	0	2.96	0.13	1.09	0.47	4.14	0.73	0.09	0	9.62
1997	0.11	0.01	2.29	2.70	0.94	0.18	3.07	0.69	0.06	0.03	10.10
1998	0.01	0	1.25	0.05	1.24	0.21	4.94	2.22	0.08	0.02	10.02
1999	0.38	0	1.48	0.71	0.94	0.29	5.28	1.70	0.06	0.03	10.87
2000	0.57	0	2.10	0.57	1.27	0.33	5.87	1.83	0.07	0.09	12.70
2001	0.03	0	0.54	2.02	1.18	0.40	5.58	2.16	0.07	0.26	12.25
Value ($Millions)											
1992	0.02	0.08	1.04	3.87	0.54	0.11	2.83	0.29	0.14	0	8.93
1993	0.02	0.02	0.46	0.92	0.40	0.06	2.13	0.26	0.26	0	4.53
1994	0.01	0.02	0.72	1.01	0.25	0.07	1.37	0.17	0.08	0.01	3.71
1995	0	0.01	1.37	0.97	0.22	0.05	2.56	0.17	0.03	0	5.38
1996	0.01	0	1.24	0.02	0.41	0.09	2.09	0.16	0.09	0	4.12
1997	0.1	0	1.57	0.64	0.46	0.05	1.73	0.18	0.06	0.01	4.80
1998	0	0	0.54	0.01	0.49	0.03	2.40	0.36	0.06	0	3.90
1999	0.25	0	0.96	0.16	0.58	0.07	4.04	0.40	0.05	0.01	6.51
2000	0.36	0	1.39	0.14	0.84	0.08	4.91	0.46	0.06	0.02	8.26
2001	0.02	0	0.30	0.28	0.63	0.05	4.12	0.32	0.05	0.04	5.81

Table 3.9-58 North Pacific groundfish fishery participation measures for the Southeast Alaska region, 1992-2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Processor Employment and Payments to Labor										
Employment (estimated FTEs)[1]	128	114	117	93	93	94	121	112	125	106
Payment to labor ($millions)[2]	10.2	11.1	14.9	13.8	14.6	14.2	12.2	12.6	15.7	14.5
Groundfish Processing by Regional Inshore Plants										
Reported tons (thousands)	7.43	8.28	9.53	6.25	5.63	4.8	5.48	4.75	5.84	6.2
Product tons (thousands)	4.96	5.36	6.4	4.68	4.48	4.22	4.31	3.51	4.16	3.5
Utilization rate (percent)	66.8	64.7	67.2	74.9	79.6	87.9	78.6	73.9	71.2	56.0
Product value ($millions)	27.22	30.51	42.01	40.65	38.56	37.16	38.83	26.91	32.08	27.0
Value per ton ($)	3,664	3,685	4,408	6,504	6,849	7,742	7,086	5,665	5,493	4,333
Processors Owned by Regional Residents										
Number of processors wwned	9	9	11	8	13	11	11	10	10	10
Reported tons (thousands)	8.27	8.96	10.18	7.52	9.38	10.66	9.93	11.14	14.37	12.82
Wholesale value ($millions)	6.82	8.09	11.27	7.56	15.50	17.64	15.45	18.12	24.91	18.64
Catcher Vessels Owned by Regional Residents										
Number of catcher vessels	403	356	367	293	283	269	238	235	228	210
Retained tons (thousands)	9.4	9.5	8.9	7.4	7.0	6.6	6.1	6.3	6.5	7.1
Ex-vessel value ($millions)	19.87	19.24	26.44	26.65	25.29	24.42	16.32	17.67	23.51	19.1
Employment (persons)	1,951	1,796	1,801	1,608	1,589	1,508	1,303	1,328	1,238	1,742
Payment to labor ($millions)	7.95	7.70	10.58	10.66	10.12	9.77	6.53	7.07	9.4	7.65

Notes: [1]Includes all employment at all shoreplants located in the region and all employment of at-sea processors (including floaters) owned by residents. In addition the estimate includes administrative employment of all processors owned by residents.
[2]All payments to labor from at-sea processors (including floaters) are assigned to the owners region. On-site payments to labor from shore plants are assigned to the region in which the plant is located.

Source: For processing information, NMFS Blend Data and WPR Data, September 2002 and Northern Economics (1994) internally derived tables. For harvest information, ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-59 Groundfish reported by Southeast Alaska region inshore plants by species group, 1999-2001.

Groundfish Reported	Species Group				
	ARSO	Flatfish	Pacific Cod	Pollock	Total
1999 tons (thousands)	4.38	0.25	0.12	0	4.75
1999 product value ($millions)	26.72	0	0.19	0	26.91
2000 tons (thousands)	5.47	0.31	0.06	0	5.84
2000 product value ($millions)	31.94	0	0.14	0	32.08
2001 tons (thousands)	6.82	0.30	0.10	0	7.22
2001 product value ($millions)	26.63	0	0.08	0	26.72

Source: NMFS Blend Data and WPR Data, September 2002.

Table 3.9-60 Groundfish wholesale value ($millions) of processor class owned by residents of the Southeast Alaska region, 1992-2001.

Processor Class	Year									
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Catcher-Processors	5.85	6.43	6.77	4.79	6.68	5.65	7.10	10.96	13.58	10.65
Motherships	0	0	0	0	0	0	0	0	0	0
Shoreplants	0.97	1.67	4.50	2.78	8.82	11.99	8.36	7.16	11.33	7.99

Source: Derived tables, Northern Economics (1994) adapted from NMFS Blend Data and WPR Data, September 2002.

Table 3.9-61. Groundfish retained harvest ex-vessel value, catcher vessels owned by Southeast Alaska region residents by FMP subarea, 1999-2001.

Retained Harvest	FMP Subarea					
	AI	BS	WG	CG	EG	Total
1999 ex-vessel ($millions)	0.15	0.16	0.70	4.07	12.59	17.67
2000 ex-vessel ($millions)	0.4	0.56	0.56	5.08	16.91	23.51
2001 ex-vessel ($millions)	0.39	0.12	0.64	3.73	14.15	19.03

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002.

Table 3.9-62 Number of boats and retained catch by weight and value, by species group, and by catcher vessel ownership for the Southeast Alaska region, 1992-2001.

Data	Year									
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
ARSO										
Number of catcher vessels	400	350	362	287	278	265	235	229	224	208
Retained tons (thousands)	7.5	8.2	8.1	6.5	5.7	4.9	4.8	4.3	4.7	5.4
Ex-vessel value ($millions)	18.93	18.57	26.13	26.22	24.53	23.53	15.73	16.48	22.27	22.49
Flatfish										
Number of catcher vessels	12	6	6	12	13	9	8	13	11	6
Retained tons (thousands)	0	0.1	0	0	0	0	0.1	0.1	0	0
Ex-vessel value ($millions)	0.01	0.06	0	0	0.02	0.01	0.04	0.03	0.02	0.01
Pacific Cod										
Number of catcher vessels	137	115	72	88	106	107	93	107	95	97
Retained tons (thousands)	1.9	1.2	0.7	0.9	1.2	1.6	1.2	1.9	1.6	1.61
Ex-vessel value ($millions)	0.93	0.62	0.31	0.43	0.73	0.88	0.54	1.15	1.18	0.60
Pollock										
Number of catcher vessels	5	7	2	6	9	15	10	13	7	3
Retained tons (thousands)	0	0	*	0	0	0	0.1	0	0.2	a
Ex-vessel value ($millions)	0	0	0	0	0.01	0.01	0.01	0.01	0.04	a
All Groundfish Species										
Total number of catcher vessels	403	356	367	293	283	269	238	235	228	210
Total retained tons (thousands)	9.4	9.5	8.9	7.4	7.0	6.6	6.1	6.3	6.5	7.0
Total ex-vessel value ($millions)	19.87	19.24	26.44	26.65	25.29	24.42	16.32	17.67	23.51	23.10

Notes: a - Due to the confidentiality of the data presented, this value has been added to Pacific Cod.

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-63 Retained harvests by fisheries management plan area and species of Southeast Alaska regional catcher vessels, 1992-2001.

Year	FMP Area										Total
	Aleutian Islands		Bering Sea		Western Gulf		Central Gulf		Eastern Gulf		
	Pacific Cod	Pollock	Pacific Cod	Pollock	Pacific Cod	Pollock	Pacific Cod	Pollock	Pacific Cod	Pollock	
Volume (Thousands of Tons)											
1992	0.01	0	0.07	0.01	0.32	0.01	1.38	0.04	0.06	0	1.90
1993	0	0	0.02	0	0.21	0.07	0.79	0.05	0.06	0	1.20
1994	0	0	0.07	0	0.09	0.03	0.44	0.04	0.02	0	0.70
1995	0	0	0.09	0	0.08	0.05	0.60	0.02	0.01	0	0.85
1996	0	0	0.04	0.01	0.22	0.10	0.87	0.03	0.03	0	1.29
1997	0.02	0	0.40	0	0.28	0.04	0.81	0.06	0.02	0	1.63
1998	0	0	0.01	0	0.27	0.06	0.75	0.10	0.01	0	1.21
1999	0.06	0	0.07	0.06	0.37	0.13	1.18	0.04	0.02	0	1.94
2000	0.08	0	0.11	0.06	0.41	0.17	0.95	0.02	0.02	0	1.79
2001	0.11	0	b	b	1.16	c	0.19	c	0.16	c	1.61
Value ($Millions)											
1992	0	0	0.05	0	0.14	0	0.68	0.01	0.05	0	0.93
1993	0	0	0.02	0	0.09	0.01	0.43	0.01	0.06	0	0.62
1994	0	0	0.04	0	0.04	0.01	0.21	0.01	0.01	0	0.31
1995	0	0	0.05	0	0.03	0.01	0.33	0.01	0.01	0	0.43
1996	0	0	0.03	0	0.10	0.02	0.54	0.01	0.03	0	0.74
1997	0.02	0	0.29	0	0.12	0.01	0.42	0.01	0.02	0	0.88
1998	0	0	0.01	0	0.11	0.01	0.39	0.02	0.01	0	0.55
1999	0.03	0	0.04	0.01	0.20	0.03	0.83	0.01	0.01	0	1.16
2000	0.04	0	0.07	0.01	0.26	0.04	0.78	0	0.01	0	1.22
2001	0.02	0	b	b	0.34	c	0.11	c	0.12	c	0.60

Notes: b - Due to the confidentiality of the data presented, this value has been added to Pacific Cod in the Aleutian Islands.
c - Due to the confidentiality of the data presented, this value has been added to Pacific Cod in the same area.

Table 3.9-64. North Pacific groundfish fishery participation measures for Washington inland waters region, 1992-2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Processor Employment and Payments to Labor										
Employment (estimated FTEs)[1]	4,928	4,935	4,556	5,385	5,973	4,788	4,780	3,718	3,949	3,787
Payment to labor ($millions)[2]	322.6	227.1	246.0	304.2	276.0	261.3	231.9	245.8	282.9	317.0
Groundfish Processing by Regional Inshore Plants										
Reported tons (thousands)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Product tons (thousands)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Utilization rate (percent)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Product value ($millions)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Value per ton ($)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Processors Owned by Regional Residents										
Number of processors owned	156	142	142	147	138	126	119	109	118	119
Reported tons (thousands)	2,135	1,993	2,051	2.046	1,958	1,943	1,766	1,553	1,714	1,899
Wholesale value ($millions)	1,325	897.7	1,030	1,305	1,149	1,113	979.2	1,120	1,284	1,309
Catcher Vessels Owned by Regional Residents										
Number of catcher vessels	273	220	245	253	234	252	236	262	271	239
Retained tons (thousands)	551.8	522.0	545.4	559.9	551.5	706.9	555.0	547.1	609.7	692.4
Ex-vessel value ($millions)	152.6	90.53	106.6	147.9	127.3	212.3	99.70	140.0	188.0	135.6
Employment (persons)	1,312	1,029	1,129	1,240	1,134	1,253	1,130	1,258	1,311	1,238
Payment to labor ($millions)	61.02	36.21	42.64	59.17	50.91	84.92	39.88	55.99	75.18	54.22

Notes: [1]Includes all employment at all shoreplants located in the region and all employment of at-sea processors (including floaters) owned by residents. In addition the estimate includes administrative employment of all processors owned by residents.
[2]All payments to labor from at-sea processors (including floaters) are assigned to the owners region. On-site payments to labor from shore plants are assigned to the region in which the plant is located.

Source: For processing information, NMFS Blend Data and WPR Data, September 2002 and Northern Economics (1994) internally derived tables. For harvest information, ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-65. Groundfish reported by Washington inland waters region inshore plants by species group, 1999-2001.

Groundfish Reported	Species Group				
	ARSO	Flatfish	P Cod	Pollock	Total
1999 tons (thousands)	NA	NA	NA	NA	NA
1999 product value ($millions)	NA	NA	NA	NA	NA
2000 tons (thousands)	NA	NA	NA	NA	NA
2000 product value ($millions)	NA	NA	NA	NA	NA
2001 tons (thousands)	NA	NA	NA	NA	NA
2001 product value ($millions)	NA	NA	NA	NA	NA

Source: NMFS Blend Data and WPR Data, September 2002.

Table 3.9-66. Groundfish wholesale value ($millions) of processor class owned by residents of the Washington inland waters region, 1992-2001.

	Year									
Processor Class	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Catcher-processors	769.55	545.92	584.92	708.70	638.37	598.18	532.11	571.07	637.79	631.82
Motherships	92.12	44.06	53.56	74.46	66.52	71.58	58.17	57.92	81.25	86.94
Shoreplants	463.51	308.01	391.97	522.23	444.44	443.68	388.96	490.81	564.61	589.66

Source: Derived tables, Northern Economics (1994), adapted from NMFS Blend Data and WPR Data, September 2002.

Table 3.9-67. Groundfish retained harvest ex-vessel value, catcher vessels owned by Washington inland waters region residents by fisheries management plan subarea, 1999-2001.

	FMP Subarea					
Retained Harvest	**AI**	**BS**	**WG**	**CG**	**EG**	**Total**
1999 ex-vessel ($millions)	4.98	106.18	7.69	13.76	7.36	139.97
2000 ex-vessel ($millions)	7.19	151.81	7.71	11.66	9.59	187.96
2001 ex-vessel ($millions)	3.53	109.56	5.20	9.94	7.30	135.53

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002.

Table 3.9-68. Number of boats and retained catch by weight and value, by species group, and by catcher vessel ownership for the Washington inland waters region, 1992-2001.

	Year									
Data	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
ARSO										
Number of catcher vessels	207	178	210	178	185	199	204	205	204	182
Retained tons (thousands)	7.2	4.5	4.7	7.6	6.1	6.3	5.9	6.1	5.7	5.4
Ex-vessel value ($millions)	15.87	9.76	14.08	28.57	23.72	25.75	15.71	16.58	21.57	19.01
Flatfish										
Number of catcher vessels	85	80	85	109	103	104	105	104	123	101
Retained tons (thousands)	15.2	1.9	10.2	15.4	8.6	27.6	2.6	3.4	4.8	2.6
Ex-vessel value ($millions)	5.11	0.71	2.30	3.22	1.42	7.79	0.44	0.50	0.77	0.35
Pacific Cod										
Number of catcher vessels	164	123	115	167	146	161	153	191	206	181
Retained tons (thousands)	36.3	30.5	40.2	48.5	60.8	74.9	38.7	40.8	47.4	27.2
Ex-vessel value ($millions)	13.77	9.72	11.48	17.48	20.87	34.08	12.63	21.82	30.56	14.12
Pollock										
Number of catcher vessels	97	76	78	94	93	103	100	109	129	111
Retained tons (thousands)	493.2	485.2	490.3	488.4	475.9	598.1	507.8	496.9	551.7	657.09
Ex-vessel value ($millions)	117.79	70.33	78.74	98.67	81.27	144.67	70.93	101.07	135.06	102.67
All Groundfish Species										
Total number of catcher vessels	273	220	245	253	234	252	236	262	271	239
Total retained tons (thousands)	551.8	522.0	545.4	559.9	551.5	706.9	555.0	547.1	609.7	692.3
Total ex-vessel value ($millions)	152.55	90.53	106.60	147.91	127.28	212.28	99.70	139.97	188	136.15

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-69. Retained harvests by fisheries management plan area and species of Washington inland wasters regional catcher vessels, 1992-2001.

	Fisheries Management Plan Area										
	Aleutian Islands		Bering Sea		Western Gulf		Central Gulf		Eastern Gulf		
Year	P cod	Pollock	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	Total
Volume (Thousands of Tons)											
1992	0.24	16.71	16.83	446.92	8.13	10.99	9.29	20.33	0.05	0	529.48
1993	1.4	15.42	17.27	441.48	3.72	11.38	6.23	18.11	0.19	0.49	515.69
1994	0.03	17.93	28.98	436.35	2.83	12.49	6.12	21.46	0.16	4.12	530.49
1995	0.26	18.56	34.18	437.37	5.84	17.44	9.83	13.05	0.03	0.31	536.87
1996	2.69	10.13	43.26	449.30	4.02	10.77	9.54	6.62	0.04	0.36	536.72
1997	4.9	12.89	47.70	561.91	7.13	13.47	8.86	12.88	0.04	3.24	673
1998	3.23	7.53	23.21	454.88	4.98	14.62	8.82	23.46	0.04	5.75	546.52
1999	5.49	0.01	21.61	462.51	5.91	10.83	10.13	19.99	0.04	1.15	537.67
2000	5.34	0	24.32	536.78	5.48	4.42	8.26	14.01	0.04	0.47	599.11
2001	3.29	0	18.92	634.88	2.78	13.71	2.20	7.76	0.73	a	684.28
Value ($Millions)											
1992	0.09	4.53	6.14	105.79	3.02	2.90	4.18	4.89	0.03	0	131.57
1993	0.43	2.35	5.19	63.91	1.24	1.61	2.38	2.78	0.10	0.08	80.06
1994	0.01	3.01	8.03	69.92	0.88	2.03	2.07	3.52	0.06	0.69	90.22
1995	0.09	3.85	11.61	87.61	2.09	3.52	4.45	2.82	0.02	0.07	116.12
1996	0.89	1.80	14.49	76.25	1.36	2.00	3.88	1.38	0.02	0.08	102.15
1997	2.2	3.94	20.09	138.49	3.00	3.13	4.11	3.04	0.02	0.72	178.75
1998	1.02	1.10	7.34	62.61	1.66	2.03	3.38	3.44	0.02	0.96	83.56
1999	2.82	0	11.02	92.73	3.01	2.32	6.58	4.16	0.03	0.23	122.89
2000	3.47	0	15.15	132.22	3.63	1.11	6.44	3.45	0.03	0.12	165.62
2001	1.81	0	9.57	99.36	1.42	2.08	1.33	1.11	0.11	a	116.79

Notes: a - Due to the confidentiality of the data presented, this value has been added to Pacific Cod in the same area.

Table 3.9-70. North Pacific groundfish fishery participation measures for Oregon Coast region, 1992-2001.

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Processor Employment and Payments to Labor										
Employment (estimated FTEs)[1]	45	45	53	53	0	0	0	0	0	0
Payment to labor ($millions)[2]	2.69	2.77	3.11	2.19	0	0	0	0	0	0
Groundfish Processing by Regional Inshore Plants										
Reported tons (thousands)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Product tons (thousands)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Utilization rate (percent)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Product value ($millions)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Value per ton ($)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Processors Owned by Regional Residents										
Number of processors owned	2	2	2	2	0	0	0	0	0	0
Reported tons (thousands)	0	*	*	*	0	0	0	0	0	0
Wholesale value ($millions)	0	*	*	*	0	0	0	0	0	0
Catcher Vessels Owned by Regional Residents										
Number of catcher vessels	42	33	38	38	36	36	36	39	42	35
Retained tons (thousands)	73.6	72.4	72.8	84.2	78.6	73.0	76.3	74.7	72.6	86.5
Ex-vessel value ($millions)	22.82	14.89	14.60	22.41	18.98	21.87	15.94	22.78	24.07	18.2
Employment (persons)	201	152	174	178	174	171	172	181	198	175
Payment to labor ($millions)	9.13	5.96	5.84	8.96	7.59	8.75	6.38	9.11	9.63	7.28

Notes: [1]Includes all employment at all shoreplants located in the region and all employment of at-sea processors (including floaters) owned by residents. In addition the estimate includes administrative employment of all processors owned by residents.
[2]All payments to labor from at-sea processors (including floaters) are assigned to the owners region. On-site payments to labor from shore plants are assigned to the region in which the plant is located.
*Data suppressed due to confidentiality restrictions.
FTE - full-time employees
NA - data not available

Source: For processing information, NMFS Blend Data and WPR Data, September 2002 and Northern Economics (1994) internally derived tables. For harvest information, ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-71. Groundfish reported by Oregon Coast region inshore plants by species group, 1992-2001.

Groundfish Reported	Species Group				
	ARSO	Flatfish	P Cod	Pollock	Total
1999 tons (thousands)	NA	NA	NA	NA	NA
1999 product value ($millions)	NA	NA	NA	NA	NA
2000 tons (thousands)	NA	NA	NA	NA	NA
2000 product value ($millions)	NA	NA	NA	NA	NA
2001 tons (thousands)	NA	NA	NA	NA	NA
2001 product value ($millions)	NA	NA	NA	NA	NA

Notes: NA - data not available

Source: NMFS Blend Data and WPR Data, September 2002

Table 3.9-72. Groundfish wholesale value ($millions) of processor class owned by residents of the Oregon Coast region, 1992-2001.

Processor Class	Year									
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Catcher-processors	1.12	1.00	0.52	0.87	0	0	0	0	0	0
Motherships	0	0	0	0	0	0	0	0	0	0
Shoreplants	0	0	0	0	0	0	0	0	0	0

Source: Derived tables, Northern Economics (1994) adapted from NMFS Blend Data and WPR Data, September 2002.

Table 3.9-73. Groundfish retained harvest ex-vessel value, catcher vessels owned by Oregon Coast region residents by fisheries management plan subarea, 1999-2001.

Retained Harvest	FMP Subarea					
	AI	BS	WG	CG	EG	Total
1999 ex-vessel ($millions)	0	13.16	0.34	9.05	0.22	22.78
2000 ex-vessel ($millions)	0.01	14.37	0.50	8.86	0.33	24.07
2001 ex-vessel ($millions)	a	11.72	0.20	6.06	0.20	18.18

Notes: a - Due to the confidentiality of the data presented, this value has been added to the Bering Sea.

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002

Table 3.9-74. Number of boats and retained catch by weight and value, by species group, and by catcher vessel ownership for the Oregon Coast region, 1992-2001.

	Year									
Data	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
ARSO										
Number of catcher vessels	30	27	30	35	27	29	31	37	35	33
Retained tons (thousands)	0.5	0.4	0.3	0.6	1.6	1.4	1.9	1.5	2.4	2.7
Ex-vessel value ($millions)	1.19	0.90	0.82	1.87	1.81	1.56	1.16	1.24	1.68	1.26
Flatfish										
Number of catcher vessels	21	17	17	27	18	22	23	29	27	24
Retained tons (thousands)	1.9	1.3	0.7	2.7	1.4	3.1	2.0	1.7	2.2	2.2
Ex-vessel value ($millions)	0.57	0.41	0.22	0.57	0.54	0.86	0.50	0.35	0.39	0.44
Pacific Cod										
Number of catcher vessels	35	25	24	32	27	30	29	31	35	31
Retained tons (thousands)	14.2	15.4	11.1	18.0	18.8	24.1	19.8	18.5	12.7	9.5
Ex-vessel value ($millions)	6.15	5.16	3.47	6.89	6.58	9.29	6.76	10.23	8.35	5.29
Pollock										
Number of catcher vessels	26	22	20	25	24	24	27	27	26	26
Retained tons (thousands)	57.1	55.2	60.7	62.9	56.8	44.4	52.6	53.0	55.4	71.8
Ex-vessel value ($millions)	14.91	8.42	10.10	13.08	10.04	10.16	7.51	10.96	13.65	11.21
All Groundfish Species										
Total number of catcher vessels	42	33	38	38	36	36	36	39	42	35
Total retained tons (thousands)	73.6	72.4	72.8	84.2	78.6	73.0	76.3	74.7	72.6	86.2
Total ex-vessel value ($millions)	22.82	14.89	14.60	22.41	18.98	21.87	15.94	22.78	24.07	18.20

Source: ADF&G Fish Tickets and NMFS Observer Data, September 2002. Count information does not include "ghost" entities, while weight information includes "ghost" entities in order to minimize instances where data can not be reported due to NMFS confidentiality provisions. In all cases the values for Ghost Vessels are negligible.

Table 3.9-75. Retained harvests by fisheries management plan area and species of Oregon Coast regional catcher vessels, 1992-2001.

	Fisheries Management Plan Area										
	Aleutian Islands		Bering Sea		Western Gulf		Central Gulf		Eastern Gulf		
Year	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	P Cod	Pollock	Total
Volume (Thousands of Tons)											
1992	0.22	1.02	3.57	50.86	1.50	1.22	2.74	10.12	0.01	0	71.25
1993	0.09	0.78	6.01	33.87	0.67	2.06	4.48	22.56	0.02	0.10	70.65
1994	0	1.03	5.21	42.66	0.44	1.78	2.48	16.79	0.03	1.36	71.78
1995	0.04	1.03	7.76	58.86	1.02	2.75	3.52	5.89	0.04	0.02	80.93
1996	0.45	0.22	9.74	54.65	0.69	2.37	2.98	4.42	0	0.07	75.60
1997	0.61	0.14	9.36	39.82	1.02	2.62	4.59	10.11	0.02	0.24	68.52
1998	1.57	0.05	8.70	27.68	1.02	4.59	4.49	24.21	0.03	0.12	72.47
1999	1.68	0.03	6.77	34.11	0.73	2.51	5.72	19.81	0.01	0.10	71.47
2000	1.53	0	5.52	44.18	0.62	2.34	2.51	11.1	0.01	0.29	68.1
2001	0	0	3.85	61.58	a	a	5.68	9.39	0.83	b	81.33
Value ($ Millions)											
1992	0.1	0.33	1.57	13.61	0.65	0.36	1.49	2.95	0	0	21.06
1993	0.03	0.13	2.02	5.17	0.25	0.30	1.74	3.93	0.01	0.02	13.58
1994	0	0.19	1.59	7.19	0.15	0.30	0.90	3.01	0.01	0.24	13.57
1995	0.01	0.23	2.89	12.73	0.40	0.55	1.72	1.40	0.02	0	19.97
1996	0.16	0.04	3.51	9.85	0.25	0.48	1.31	1.00	0	0.02	16.62
1997	0.28	0.03	3.84	9.38	0.44	0.66	2.26	2.51	0.01	0.05	19.44
1998	0.54	0.01	3.07	3.89	0.38	0.67	1.78	3.90	0.01	0.02	14.28
1999	0.93	0.01	3.70	7.27	0.40	0.58	3.83	4.45	0.01	0.02	21.19
2000	1.07	0	3.78	11.28	0.43	0.62	1.85	2.90	0.01	0.08	22.00
2001	0	0	1.97	9.72	a	a	3.32	1.36	0.13	b	16.50

Notes: a - Due to the confidentiality of the data presented, this value has been added to the same species in Central Gulf.
b - Due to the confidentiality of the data presented, this value has been added to Pacific Cod in the same area.

Table 3.9-76. Alaska native percentage of total community population, Alaska community development quota communities, 2000.

Aleutian Pribilof Island Community Development Association		**Coastal Villages Fishing Cooperative (Continued)**	
Akutan	16.4%	Mekoryuk	96.7%
Atka	91.3%	Napakiak	96.6%
False Pass	65.6%	Napaskiak	98.2%
Nelson Lagoon	81.9%	Newtok	96.9%
Nikolski	69.2%	Nightmute	94.7%
Saint George	92.1%	Oscarville	100.0 %
Bristol Bay Economic Development Corporation		Platinum	92.7%
Aleknagik	84.6%	Quinhagak	97.3%
Clark's Point	92.0%	Scammon Bay	97.4%
Dillingham	60.9%	Toksook Bay	97.6%
Egegik	76.7%	Tuntutuliak	98.9%
Ekuk	0.0%	Tununak	96.9%
Ekwok	93.8%	**Norton Sound Economic Development Corporation**	
King Salmon	30.1%	Brevig Mission	92.0%
Levelock	95.1%	Diomede	93.8%
Manokotak	94.7%	Elim	94.9%
Naknek	47.1%	Gambell	95.8%
Pilot Point	86.0%	Golovin	92.4%
Port Heiden	78.2%	Koyuk	94.3%
Portage Creek	86.1%	Nome	58.7%
South Naknek	83.9%	Saint Michael	93.2%
Togiak	92.7%	Savoonga	95.5%
Twin Hills	94.2%	Shaktoolik	94.8%
Ugashik	81.8%	Stebbins	94.7%
Central Bering Sea Fishermen's Association		Teller	92.5%
Saint Paul	86.5%	Unalakleet	87.7%
Coastal Villages Fishing Cooperative		Wales	90.1%
Chefornak	98.0%	White Mountain	86.2%
Chevak	95.9%	**Yukon Delta Fisheries Development Association**	
Eek	96.8%	Alakanuk	97.9%
Goodnews Bay	93.9%	Emmonak	93.9%
Hooper Bay	95.8%	Grayling	91.8%
Kipnuk	98.0%	Kotlik	96.1%
Kongiganak	97.2%	Mountain Village	93.5%
Kwigillingok	97.9%	Nunam Iqua	93.9%
		Total All Villages	**86.8%**

Source: U.S. Census Bureau Census 2000

Table 3.9-77. Community development quota group communities, populations and administrative locations.

CDQ Group	Member Communities		2000 Population[1]	Office Locations
APICDA	Akutan Atka False Pass Nelson Lagoon	Nikolski St. George Unalaska[2]	1,143	Juneau Unalaska Staff also in Homer and Anchorage
BBEDC	Aleknagik Ckark's Point Dillingham Egegik Ekuk Ekwok King Salmon/Savinoski Levelock Manokotak	Naknek Pilot Point Portage Creek Port Heiden South Naknek Togiak Twin Hills Ugashik	5,932	Dillingham Juneau Seattle
CBSFA	St. Paul		532	St. Paul Anchorage
CVRF	Chefornak Chevak Eek Goodnews Bay Hooper Bay Kipnuk Kongiganak Kwigillinook Mekoryuk Mountain Village Napakiak	Napaskiak Newtok Nightmute Oscarville Platinum Quinhagak Scammon Bay Toksook Bay Tuntutuliak Tununak	7,855	Anchorage Bethel
NSEDC	Brevig Mission Diomede/Ignaluk Elim Gambell Golovin Koyuk Nome Savoonga	Shaktoolik St. Michael Stebbins Teller Unalakleet Wales White Mountain	8,488	Anchorage Various
YDFDA	Alakanuk Emmonak Grayling	Kotlik Sheldon Point	3,123	Seattle Seward

Notes: [1]Estimates may include individuals who are not year-round residents.
[2]While not a qualified CDQ community, Unalaska is an *ex-officio* member of APICDA.

Source: DCED 2001, U.S. Census, 2000.

Table 3.9-78. Community development quota allocation percentages by species and group, 2001-2002.

Species (and area, if applicable)	Percent of CDQ Allocation by Group						
	APICDA	BBEDC	CBSFA	CVRF	NSEDC	YDFDA	Total
Pollock							
Bering Sea/Aleutian Islands/Bogoslof	14	21	4	24	23	14	100
Cod							
Pacific Cod	16	20	10	17	18	19	100
Sablefish & Turbot							
Sablefish, Hook & Line – Aleutian Islands	15	20	0	30	20	15	100
Turbot-Aleutian Islands	16	20	5	21	20	18	100
Sablefish, Hook & Line – Bering Sea	15	22	18	0	20	25	100
Turbot – Bering Sea	20	22	7	15	15	21	100
Atka mackerel							
Eastern	30	15	8	15	14	18	100
Central	30	15	8	15	14	18	100
Western	30	15	8	15	14	18	100
Yellowfin sole	28	24	8	6	7	27	100
Flatfish							
Other Flatfish	25	23	9	10	10	23	100
Rocksole	24	23	8	11	11	23	100
Flathead	20	20	10	15	15	20	100
Other Species	18	20	10	16	16	20	100
Other Rockfish							
O. Rockfish – Bering Sea	25	21	7	12	13	22	100
O. Rockfish – Aleutian Islands	23	17	7	18	17	18	100
Arrowtooth	24	22	9	11	10	24	100
Pacific Ocean Perch Complex							
True POP – Bering Sea	18	21	7	18	18	18	100
Other POP – Bering Sea	23	18	8	16	16	19	100
True POP – Aleutian Islands							
Eastern	30	15	8	15	14	18	100
Central	30	15	8	15	14	18	100
Western	30	15	8	15	14	18	100
Sharp/Northern – Aleutian Islands	30	15	8	15	14	18	100
Short/Rougheye – Aleutian Islands	22	18	7	18	17	18	100
Sablefish, Trawl – Aleutian Islands	24	23	9	10	10	24	100
Sablefish, Trawl – Bering Sea	17	20	10	17	18	18	100
Halibut							
4B	100	0	0	0	0	0	100
4C	10	0	90	0	0	0	100
4D	0	26	0	24	30	20	100
4E	0	30	0	70	0	0	100

Table 3.9-78 (cont.). Community development quota allocation percentages by species and group, 2001-2002.

Species (and area, if applicable)	Percent of CDQ Allocation by Group						
	APICDA	BBEDC	CBSFA	CVRF	NSEDC	YDFDA	Total
Crab							
Bristol Bay Red King	18	18	10	18	18	18	100
Norton Sound Red King	0	0	0	0	50	50	100
Pribilof Red & Blue King	0	0	100	0	0	0	100
St. Matthew Blue King	50	12	0	12	14	12	100
Bering Sea *C. Opilio* Tanner	10	19	19	17	18	17	100
Bering Sea *C. Bairdi* Tanner	10	19	19	17	18	17	100
Prohibited Species							
Halibut	22	22	9	12	12	23	100
Chinook salmon	15	21	4	23	23	14	100
Other salmon	15	21	5	23	22	14	100
Opilio	24	22	9	11	10	24	100
C. Bairdi – Zone 1	26	24	8	8	8	26	100
C. Bairdi – Zone 2	23	22	9	12	11	23	100
Red King Crab	29	23	8	7	7	26	100

Source: DCED (2001).

Table 3.9-79. Community development quota allocation amounts by species and group, 2001.

CDQ Species	2001 TAC	2001 CDQ Allocation	CDQ Group Amounts (Metric Tons)					
			APICDA	BBEDC	CBSFA	CVRF	NSEDC	YDFDA
BS FG Sablefish	780	156	23	34	28	0	31	39
AI FG Sablefish	1,875	375	56	75	0	113	75	56
BS Sablefish	780	59	10	12	6	10	11	11
AI Sablefish	625	47	11	11	4	5	5	11
BS Pollock - total	1,400,000	140,000	19,600	29,400	5,600	33,600	32,200	19,600
AI Pollock	2,000	200	28	42	8	48	46	28
Bogoslof Pollock	1,000	100	14	21	4	24	23	14
Pacific Cod	188,000	14,100	2,256	2,820	1,410	2,397	2,538	2,679
WAI Atka Mackerel	27,900	2,093	628	314	167	314	293	377
CAI Atka Mackerel	33,600	2,520	756	378	202	378	353	454
EAI/BS Atka Mackerel	7,800	585	176	88	47	88	82	105
Yellowfin Sole	113,000	8,475	2,373	2,034	678	509	593	2,288
Rock Sole	75,000	5,625	1,350	1,294	450	619	619	1,294
BS Greenland Turbot	5,628	422	84	93	30	63	63	89
AI Greenland Turbot	2,772	208	33	42	10	44	42	37
Arrowtooth Flounder	22,011	1,651	396	363	149	182	165	396
Flathead Sole	40,000	3,000	600	600	300	450	450	600
Other Flatfish	28,000	2,100	525	483	189	210	210	483
BS Pac Ocean Perch	1,730	130	23	27	9	23	23	23
WAI Pac Ocean Perch	4,740	356	107	53	28	53	50	64
CAI Pac Ocean Perch	2,560	192	58	29	15	29	27	35
EAI Pac Ocean Perch	2,900	218	65	33	17	33	31	39
BS Other Red Rockfish	135	10	2	2	1	2	2	2
AI Sharpchin/Northern	6,745	506	152	76	40	76	71	91
AI Shortraker/Rougheye	912	68	15	12	5	12	12	12
BS Other Rockfish	361	27	7	6	2	3	4	6
AI Other Rockfish	676	51	12	9	4	9	9	9
Other Species	26,500	1,988	358	398	199	318	318	398
Prohibited Species								
Zone 1 Red King Crab (number*)	97,000	7,275	2,110	1,673	582	509	509	1,892
Zone 1 *Bairdi* Tanner Crab (number*)	730,000	54,750	14,235	13,140	4,380	4,380	4,380	14,235
Zone 3 *Bairdi* Tanner Crab (number*)	2,070,000	155,250	35,708	34,155	13,973	18,630	17,078	35,708
Opilio Crab (number*)	4,350,000	326,250	78,300	71,775	29,363	35,888	32,625	78,300
Pacific Halibut (metric tons)	4,575	343	75,460	75,460	30,870	41,160	41,160	78,890
Chinook Salmon (number*)	41,000	3,075	461	646	123	707	707	431
Non-Chinook Salmon (number*)	42,000	3,150	473	662	158	725	693	441

Notes: *For prohibited species listed (other than halibut), take is measured in number of individuals rather than by weight.

Table 3.9-80. Harvest quantity of community development quota allocations by species, 1993-2000.

Year	Reported Metric Tons (Thousands)							
	AMCK	FLAT	OTHR	PCOD	PLCK	ROCK	SABL	Total
1993	0.75	0.76	0.20	0.45	126.23	0.04	0.02	128.44
1994	0.00	1.02	0.13	1.77	137.51	0.02	0.00	140.45
1995	0.01	0.40	0.19	0.87	97.39	0.03	0.00	98.90
1996	0.00	0.56	0.10	0.75	92.77	0.01	0.00	94.20
1997	0.02	0.64	0.36	0.44	87.58	0.07	0.09	89.21
1998	1.22	1.31	0.71	2.49	83.97	0.45	0.10	90.24
1999	2.59	4.52	1.93	11.63	100.16	0.96	0.15	121.95
2000	4.79	1.79	3.05	13.48	113.71	1.19	0.16	138.18

Source: NMFS Blend and WPR Data, June 2001.

Table 3.9-81. Wholesale value of community development quota allocations by species, 1993-2000.

Year	$Millions							
	AMCK	FLAT	OTHR	PCOD	PLCK	ROCK	SABL	Total
1993	0.69	0.16	0.00	0.16	47.06	0.03	0.05	48.14
1994	0.00	0.10	0.00	0.59	60.36	0.00	0.00	61.05
1995	0.00	0.00	0.00	0.12	56.82	0.00	0.00	56.94
1996	0.00	0.01	0.00	0.08	51.71	0.00	0.00	51.80
1997	0.00	0.43	0.00	0.10	50.66	0.02	0.48	51.68
1998	0.43	0.65	0.00	2.00	43.10	0.16	0.35	46.70
1999	1.08	1.60	0.06	13.39	76.70	0.47	0.78	94.07
2000	2.06	0.72	0.03	16.01	91.66	0.55	0.77	111.80

Source: NMFS Blend and WPR Data, June 2001.

Table 3.9-82. Wholesale value[1] of community development quota allocations by target fishery and month, 1999-2000.

Year	Month	$Millions							
		AMCK	FLAT	OTHR	PCOD	PLCK	ROCK	SABL	Total
1999	Jan	0.00	0.00	0.00	0.01	2.01	0.00	0.00	2.02
	Feb	0.00	0.00	0.00	0.00	28.87	0.00	0.00	28.87
	Mar	0.00	0.11	0.00	0.00	14.08	0.00	0.00	14.20
	Apr	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.52
	May	0.47	0.07	0.00	2.96	0.00	0.07	0.01	3.58
	Jun	0.70	0.05	0.00	0.89	0.00	0.05	0.18	1.86
	Jul	0.14	0.14	0.01	0.01	8.15	0.04	0.15	8.65
	Aug	0.04	0.02	0.02	1.46	4.21	0.07	0.13	5.95
	Sep	0.16	0.37	0.00	2.24	12.52	0.00	0.15	15.43
	Oct	0.01	0.28	0.00	0.85	4.10	0.00	0.12	5.36
	Nov	0.16	0.99	0.00	3.01	2.70	0.02	0.00	6.88
	Dec	0.00	0.09	0.00	0.67	0.00	0.00	0.00	0.76
2000	Jan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Feb	0.00	0.00	0.00	0.00	23.18	0.00	0.00	23.18
	Mar	0.00	0.00	0.00	3.67	23.88	0.00	0.00	27.55
	Apr	0.00	0.05	0.00	5.71	2.59	0.00	0.06	8.41
	May	0.81	0.09	0.00	1.50	0.00	0.00	0.11	2.52
	Jun	0.25	0.50	0.00	0.24	0.00	0.00	0.00	0.99
	Jul	0.89	0.19	0.00	0.62	7.37	0.00	0.13	9.21
	Aug	0.39	0.02	0.00	1.41	10.79	0.00	0.00	12.61
	Sep	0.00	0.00	0.01	0.39	12.16	0.00	0.18	12.73
	Oct	0.00	0.00	0.00	0.00	10.79	0.00	0.07	10.86
	Nov	0.55	0.00	0.00	0.22	0.93	0.05	0.01	1.75
	Dec	0.02	0.00	0.00	1.81	0.00	0.16	0.00	1.99

Notes: [1]Value shown is the total value of all species caught by the target fishery.

Source: NMFS Blend and WPR Data, June 2001.

Table 3.9-83. Vessel acquisitions by community development quota groups as of 2000.

CDQ Group	Vessel Acquisitions (percent ownership in parentheses and vessel class in brackets)
APICDA	• Starbound (20%) 240' pollock factory trawler [FT-CP] • Bering Prowler (25%) 124' longline vessel harvesting Pacific cod and sablefish [L-CP] • Prowler (25%) 114' longline vessel harvesting Pacific cod and sablefish [L-CP] • Golden Dawn (25%) 148' catcher vessel harvesting Pacific cod, pollock and crab [TCV BSP = 125] • Ocean Prowler (20%) 155' longline-processing vessel harvesting Pacific cod and sablefish [L-CP] • Farwest Leader (25%) 105' pot vessel harvesting crab and Pacific cod [PCV] • Stardust (100%) 56' longline vessel harvesting Pacific cod and halibut [FGCV 33-59] • Bonanza (100%) 38' longline vessel harvesting halibut [FGCV 33-59] • AP#1, AP#2, AP#3 (100%) 36' longline vessels harvesting halibut and Pacific cod [GHOST or unclassified] • AP#4, AP#5 (100%) 35.5' longline vessels harvesting halibut and Pacific cod [GHOST or unclassified] • Konrad 1 (75%) 58' trawler/pot/tender vessel harvesting Pacific cod and pollock, salmon tender [TCV < 60] • Nikka D (100%) 28' vessel harvesting halibut [unclassified] • Agusta D (100%) 28' sportfishing charter vessel [unclassified] • Grand Aleutian (100%) 32' sportfishing charter vessel [unclassified]
BBEDC	• Arctic Fjord (20%) 270' pollock factory trawler [ST-CP] • Bristol Leader (50%) 167' longline vessel harvesting Pacific cod, halibut and sablefish [L-CP] • Neahkahnie (20%) 110' pollock catcher-processor [TCV BSP 60-124] • Northern Mariner (45%) crab vessel [PCV} • Bristol Mariner (45%) 125' crab vessel [PCV] • Nordic Mariner (45%) 121' crab vessel [PCV] • Cascade Mariner (40%) 100' crab vessel [unclassified]
CBSFA	• American Seafoods, LP (22.5%) which owns the following 270-340' catcher processors harvesting pollock, Pacific cod, yellowfin sole and rock sole: American Dynasty [ST-CP], Katie Ann [FT-CP], Northern Eagle [ST-CP], Ocean Rover [ST-CP], Northern Jaeger [ST-CP], American Triumph [ST-CP] and Northern Hawk [ST-CP] • Zolotoi (20%) 98' crab vessel [PCV] • Ocean Cape (35%) 98' crab vessel [FGCV 33-59]
CVRF	• American Seafoods, LP (22.5%) which owns the following 270-340' catcher processors harvesting pollock, Pacific cod, yellowfin sole and rock sole: American Dynasty [ST-CP], Katie Ann [FT-CP], Northern Eagle [ST-CP], Ocean Rover [ST-CP], Northern Jaeger [ST-CP], American Triumph [ST-CP] and Northern Hawk [ST-CP] • Ocean Prowler (20%) 155' longline-processing vessel harvesting Pacific cod and sablefish [L-CP] • Ocean Harvester (45%) 58' longline vessel harvesting halibut and Pacific cod [LCV] • Silver Spray (50%) 116' crab vessel and Pacific cod freezer boat [P-CP]
NSEDC	• Glacier Fish Company (50%) which owns the following 201-276' catcher processors harvesting pollock and Pacific cod: Northern Glacier [FT-CP] and Pacific Glacier [ST-CP] • Norton Sound (49%) 139' longline vessel [L-CP] • Golovin Bay (100%) tender [unclassified] • Norton Bay (100%) tender [unclassified]
YDFDA	• Emmonak Leader (75%) 103' catcher vessel harvesting pollock [TCV BSP 60-124] • Alakanuk Beauty (75%) 105' catcher vessel harvesting pollock [TCV BSP 60-124] • Golden Alaska (19.6%) 308' pollock mothership [MS] • Blue Dolphin (100%) 47' longline/crab vessel [FGCV 33-59] • Lisa Marie (100%) 78' trawl/pot/longline vessel [PCV]

Source: DCED (2001)

Table 3.9-84. Inshore processing plant acquisitions by community development quota groups as of 2000.

CDQ Group	Inshore Plant Acquisitions (percent ownership in parentheses)
APICDA	• Atka Pride Seafoods, Inc. (100%) processes halibut • Bering Pacific Seafoods (50%) processes Pacific cod, salmon and other species
NSEDC	• Norton Sound Seafood Products (100%) processes mainly salmon • Norton Sound Crab Company (100%) processes mainly crab

Source: DCED (2001).

Table 3.9-85. Quantity of groundfish processed by catcher/processor vessels and onshore plants in which community development quota groups currently have an equity interest, 1999-2000.

Year	Source of Harvest	AMCK	FLAT	ROCK	OTHR	PCOD	PLCK	SABL	Total
1999	Non-CDQ (1,000 MT)	0.00	10.46	0.09	2.63	18.79	211.14	0.33	243.45
	CDQ (1,000 MT)	0.00	0.52	0.03	0.86	5.42	66.55	0.05	73.43
	CDQ Tons as % of Total	15.4%	4.7%	23.0%	24.6%	22.4%	24.0%	13.8%	23.2%
2000	Non-CDQ (1,000 MT)	0.00	11.80	0.09	4.14	15.44	240.57	0.26	272.31
	CDQ (1,000 MT)	0.01	0.85	0.03	2.09	8.22	91.78	0.05	103.02
	CDQ Tons as % of Total	98.8%	6.7%	22.8%	33.5%	34.7%	27.6%	16.1%	27.4%

Notes: CDQ - community development quota
MT - metric tons

Source: NMFS Blend Data, June 2001; DCED (2001).

Table 3.9-86. Wholesale product value of groundfish processed by catcher-processor vessels and inshore plants in which community development quota groups currently have an equity interest, 1999-2000.

Year	Source of Harvests	AMCK	FLAT	ROCK	OTHR	PCOD	PLCK	SABL	Total
1999	Non-CDQ ($Millions)	0.00	2.16	0.09	0.03	19.99	161.10	1.45	184.82
	CDQ ($Millions)	0.00	0.17	0.01	0.04	6.15	50.46	0.23	57.06
	CDQ Value as % of Total	0.0%	7.3%	11.5%	58.9%	23.5%	23.9%	13.5%	23.6%
2000	Non-CDQ ($Millions)	0.00	2.20	0.10	0.07	17.77	192.91	1.19	214.25
	CDQ ($Millions)	0.00	0.21	0.01	0.01	9.66	73.64	0.23	83.77
	CDQ Value as % of Total	77.1%	8.8%	9.0%	17.4%	35.2%	27.6%	16.4%	28.1%

Notes: CDQ - community development quota

Source: NMFS Blend Data, June 2001; DCED (2001).

Table 3.9-87. Quantity and ex-vessel value of groundfish harvested by catcher vessels in which community development quota groups currently have an equity interest, 1999-2000.

Year	AMCK	FLAT	ROCK	OTHR	PCOD	PLCK	SABL	Total
Retained Tons (Thousands)								
1999	0.04	0.04	0.01	0.00	2.17	30.13	0.14	32.54
2000	0.00	0.03	0.01	0.01	2.04	30.97	0.11	33.16
Ex-vessel Value ($Millions)								
1999	0.00	0.02	0.02	0.00	1.14	5.84	0.57	7.59
2000	0.00	0.01	0.01	0.00	1.34	7.18	0.55	9.09

Source: NMFS Blend Data and Weekly Reports, June 2001; DCED (2001)

Table 3.9-88. Community development quota employment and wages for all groups, 1993-2000[1].

	1993	1994	1995	1996	1997	1998	1999	2000
Number of Persons Working								
Management/Administration	26	48	58	63	63	79	96	155
CDQ Pollock-Related	186	213	228	261	227	443	244	297
Other Fisheries	64	276	393	691	629	634	786	1146
Other Employment	95	531	157	138	130	194	213	236
Total	371	1068	836	1153	1049	1350	1339	1834
Total Wages ($)								
Management/Administration	586,537	1,012,125	1,218,892	1,636,860	1,803,766	2,284,792	2,661,976	3,084,757
CDQ Pollock-Related	1,000,360	1,280,695	1,866,619	1,686,104	2,660,938	2,649,001	2,149,062	1,741,871
Other Fisheries	609,058	1,000,103	1,132,824	2,280,554	2,756,688	2,075,495	4,201,775	5,959,516
Other Employment	0	1,791,479	1,350,766	723,724	887,338	1,167,173	1,573,358	1,723,054
Total	2,195,955	5,084,402	5,569,101	6,327,242	8,108,730	8,176,461	10,586,171	12,509,198

Notes: [1]Employment figures may not represent full-time positions. In addition, some double-counting of employment and wages may have occurred in the compilation of data for quarterly reports.

Source: DCED (2001)

Table 3.9-89. Community development quota wages compared with total adjusted gross income in community development quota communities, 1997-1999.

Year	Total Adjusted Gross Income	CDQ Wages*	CDQ Wages as a Percentage of Total Adjusted Gross Income
1997	$242,200,000	$8,108,730	3.3%
1998	$252,600,000	$8,176,461	3.2%
1999	$259,800,000	$10,586,171	4.1%

Notes: *Includes management and administration wages
CDQ - community development quota

Sources: DCED (2001); Internal Revenue Service

Table 3.9-90. Community development quota wages compared with total adjusted gross income in community development quota communities, by community development quota, 1997-1999.

	APICDA	BBEDC	CBSFA	CVRF	NSEDC	YDFDA
1997						
CDQ Wages*	$1,343,950	$1,480,979	$223,201	$1,193,590	$1,252,493	$1,831,355
Total Adjusted Gross Income	$11,115,000	$74,730,000	$8,517,000	$33,381,000	$97,171,000	$17,256,000
CDQ Wages as a percentage of Total Adjusted Gross Income	12.09%	1.98%	2.62%	3.58%	1.29%	10.61%
1998						
CDQ Wages*	$1,061,750	$1,317,694	$714,288	$1,645,402	$1,663,439	$1,773,888
Total Adjusted Gross Income	$10,209,000	$80,655,000	$8,010,000	$35,719,000	$100,375,00	$17,659,000
CDQ Wages as a percentage of Total Adjusted Gross Income	10.40%	1.63%	8.92%	4.61%	1.66%	10.05%

Notes: *- Includes management and administration wages
CDQ - community development quota

Sources: DCED (2001); Internal Revenue Service; Regional Economic Information System

Table 3.9-91. Documented total community subsistence harvest and relative dependence on Steller Sea Lion harvest[1], Alaskan coastal communities.

Community	Region	Year	Total Community Subsistence Harvest (edible pounds)	Steller Sea Lion		
				Number Harvested	Edible pounds	% Community Harvest
Alakanuk	W	1980	431,904	9	1,200	0.3%
Quinhagek	W	1982	536,584	16	2,286	0.4%
Sitka	SE	1996	1,749,772	2	400	0.0%
Chenega Bay	SC	1993	27,809	12	997	3.6%
Nanwalek	SC	1997	42,593	5	1,048	2.5%
Tatitluk	SC	1997	322,915	19	3,712	1.1%
Akhiok	SW	1992	25,735	3	600	2.3%
Akutan	SW	1990	47,397	38	7,688	16.2%
Aleknagik	SW	1989	54,079	2	221	0.4%
Atka	SW	1994	37,307	44	8,700	23.3%
False Pass	SW	1988	28,586	1	220	0.8%
Iliamna	SW	1991	82,915	1	130	0.2%
Ivanof Bay	SW	1989	15,677	1	150	1.0%
Manokotak	SW	1985	118,337	16	1,639	1.4%
Nikolski	SW	1990	36,945	26	5,143	13.9%
Old Harbor	SW	1997	88,851	37	7,442	8.4%
Ouzinkie	SW	1997	55,015	1	264	0.5%
Perryville	SW	1989	45,729	11	2,067	4.5%
Port Lions	SW	1993	78,371	2	356	0.5%
Saint George	SW	1994	11,330	3	556	4.9%
Saint Paul	SW	1994	131,814	141	28,214	21.4%
Unalaska	SW	1994	355,081	72	14,423	4.1%

Notes: [1]Numbers are for the "most typical" year for which information is available. ADF&G does only limited surveys and subsistence use can vary greatly from year-to-year. Communities with documented use but no harvest are not included. Numbers differ from, and are not included in, ADF&G 1997a; both are estimates based on samples.

Source: ADF&G CPDB, 2001b.

Table 3.9-92. Estimated subsistence take of Steller Sea Lions, by area in Alaska.

Area	Year							
	1992	1993	1994	1995	1996	1997	1998	2000[6]
Southeast Alaska	6	1	5	0	0	0	8	2[1]
North Pacific Rim	32	35	26	31	14	6	29	17[2]
Upper Kenai-Cook Inlet	10	11	1	0	3	0	0	0[3]
Kodiak Island	58	58	61	137	60	38	18	19
South Alaska Peninsula	2	6	6	8	5	8	9	14
Aleutian Islands	135	124	122	96	58	52	37	76[4]
Pribilof Islands	297	245	193	68	46	56	78	78[5]
South Bristol Bay	0	0	0	0	0	0	0	0
North Bristol Bay	8	7	1	0	0	4	0	0
TOTAL	548	487	415	340	186	164	179	206

Notes: [1]Harvest from Hydaburg for 2000 based on harvest from 1998.
[2]Harvest from Valdez for 2000 based on harvest from 1998.
[3]Harvest for entire region (Anchorage, Homer, Kenai, Tyonek) for 2000 based on harvest from 1998.
[4]Harvest for Atka and Nikolski for 2000 based on harvest for 1998.
[5]Harvest for entire region (St. George and St. Paul) for 2000 based on harvest for 1998.
[6]See text for discussion of 2000 estimates based on 1998 harvest

Source: ADF&G 2001a, values rounded to nearest integer.

Table 3.9-93. Estimated subsistence take of Steller Sea Lions, Aleutian and Pribilof communities[1,2].

Community	Year							
	1992	1993	1994	1995	1996	1997	1998	2000
Atka	39	25	54	40	17	12	17	17[3]
Akutan	30	23	16	6	16	6	6	5
Ivanof Bay	0	4	0	0	2	2	2	0
King Cove	1	1	4	5	0	4	4	4
Nikolski	8	6	0	0	3	3	1	1[1]
Perryville	1	0	1	3	3	2	1	5
Saint George	70	19	20	8	8	28	20	20[1]
Saint Paul	227	227	173	60	38	28	58	58[1]
Sand Point	0	0	0	0	0	0	2	5
Unalaska	59	43	42	47	22	30	13	53
TOTAL	434	344	309	166	109	115	122	168

Notes: [1]Numbers in this table have been rounded to the nearest integer.
[2]Numbers differ from, and are not included in, ADF&G CPDB, 2002. Both are estimates based on samples.
[3]Harvest for 2000 is assumed to be the same as for 1998 (see text).

Source: ADF&G 1995, 1996, 1997a, 1997b, 1998, 1999, 2001a.

Table 3.9-94. Estimated take of Steller sea lions, Kodiak and South Central Alaska communities[1,2].

Community	Year							
	1992	1993	1994	1995	1996	1997	1998	2000
Tatitlek	13	5	16	3	5	4	22	2
Akhiok	4	0	3	2	7	8	3	3
Kodiak City	0	13	1	2	3	3	1	2
Larsen Bay	1	0	2	3	0	0	0	0
Old Harbor	46	33	48	113	50	26	13	13
Ouzinkie	3	8	7	16	0	0	0	0
Port Lions	3	5	0	0	0	1	1	0
Total	70	64	77	139	65	42	40	20

Notes: [1]Numbers in this table have been rounded to the nearest integer.
[2]Numbers differ from, and are not included in, ADF&G CPDB, 2002. Both are estimates based on samples.

Source: ADF&G 1995, 1996, 1997a, 1997b, 1998, 1999, 2001a.

Table 3.9-95. 1999 subsistence salmon harvests by community Yukon Management area.

Community	Households/ Permits Total	Community	Households/ Permits Total
Alakanuk	128	Kotlik	90
Alatna	12	Koyukuk	38
Allakaket	54	Manley Hot Springs	16
Anvik	40	Marshall	68
Beaver	32	Minto	65
Bettles	20	Mountain Village	151
Birch Creek	14	Nenana	33
Central	12	Nulato	100
Chalkyitsik	35	Nunam Iqua (Sheldon's Point)	35
Circle	21	Pilot Station	95
Eagle	65	Pitka's Point	26
Emmonak	157	Rampart	29
Fairbanks	95	Ruby	73
Fort Yukon	173	Russian Mission	57
Galena	183	Saint Mary's	118
Grayling	51	Scammon Bay	76
Healy	8	Shageluk	32
Holy Cross	66	Stevens Village	31
Hooper Bay	194	Tanana	122
Hughes	24	Venetie	54
Huslia	84	Other Alaska Communities	54
Kaltag	57	**Totals**	**2,888**

Table 3.9-96. Historic subsistence salmon harvests: Yukon Management area.

Year	Estimated Salmon Harvest				
	Chinook	Summer Chum	Fall Chum	Coho	Total
1990	48,587	115,609	167,900	43,460	375,556
1991	46,773	118,540	145,524	37,388	348,225
1992	47,077	142,192	107,808	51,980	349,057
1993	63,915	125,574	76,882	15,812	282,183
1994	53,902	124,807	123,565	41,775	344,049
1995	50,620	136,083	130,860	28,377	345,940
1996	45,671	124,738	129,258	30,404	330,071
1997	57,117	112,820	95,141	23,945	289,023
1998	54,124	87,366	62,901	18,121	222,512
1999	50,515	79,250	83,420	19,984	233,169
1975-1999 Average	42,113	184,387	136,889	29,713	365,499
1990-1999 Average	51,830	116,698	112,326	31,125	311,978
1995-1999 Average	51,609	108,051	100,316	24,166	284,143

Table 3.9-97. 1999 subsistence salmon harvests by community, Kuskokwim area.

Community	Households/ Permits Total	Community	Households/ Permits Total
Akiachak	119	Napakiak	73
Akiak	58	Napaskiak	74
Aniak	163	Newtok	80
Atmautluak	53	Nightmute	67
Bethel	1,508	Nikolai	29
Chefornak	94	Nunapitchuk	100
Chuathbaluk	28	Oscarville	15
Crooked Creek	30	Platinum	19
Eek	67	Quinhagak	132
Goodnews Bay	53	Red Devil	18
Kalskag (Upper)	53	Sleetmute	35
Kasigluk	136	Stony River	16
Kipnuk	176	Takotna	14
Kongiganak	71	Telida	2
Kwethluk	142	Toksook Bay	133
Kwigillingok	95	Tuluksak	72
Lime Village	17	Tuntutuliak	74
Lower Kalskag	63	Tununak	109
McGrath	100	**Totals**	**4,180**
Mekoryuk	92		

Table 3.9-98. Historic subsistence salmon harvest, Kuskokwim area.

Year	Estimated Salmon Harvest					
	Chinook	Sockeye	Chum	Coho	"Small Salmon"	Total Salmon
1990	92,678	39,662	131,469	50,713	221,844	314,522
1991	90,224	56,404	96,308	55,581	208,293	298,517
1992	68,665	34,159	99,576	44,496	178,231	246,896
1993	91,721	51,363	61,726	35,295	148,384	240,105
1994	98,378	39,279	76,951	36,504	152,734	251,112
1995	100,159	28,622	68,942	39,165	136,729	236,888
1996	81,598	35,036	90,238	34,698	159,972	241,570
1997	85,506	41,270	40,976	30,714	112,960	198,466
1998	86,115	37,578	67,665	27,239	132,482	218,597
1999	77,660	49,388	47,612	27,753	124,753	202,413
1960-1999 Average	57,887	NA	NA	NA	186,232	244,118
1990-1999 Average	87,270	41,276	78,146	38,216	157,638	244,909
1995-1999 Average	86,208	38,379	63,087	31,914	133,379	219,587

Notes: NA - data not available

Table 3.9-99. Ethnic composition of population for selected Alaska Peninsula/Aleutian Islands region communities, 2000.

	Unalaska		Akutan		King Cove		Sand Point	
Race/Ethnicity	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
White	1,893	44.2%	168	23.6%	119	15.0%	264	27.7%
Black or African American	157	3.7%	15	2.2%	13	1.6%	14	1.5%
Native American/Alaska Native	330	7.7%	112	15.7%	370	46.7%	403	42.3%
Native Hawaiian/Other Pacific Islander	24	0.6%	2	0.3%	1	0.1%	3	0.3%
Asian	1,312	30.6%	275	38.6%	212	26.8%	221	23.2%
Some Other Race	399	9.3%	130	18.2%	47	5.9%	21	2.2%
Two Or More Races	168	3.9%	11	1.5%	30	3.8%	26	2.7%
Total	4,283	100%	713	100%	792	100%	952	100%
Hispanic[1]	551	12.9%	148	20.8%	59	7.4%	129	13.6%

Notes: [1]Hispanic is an ethnic category and may include individuals of any race and, therefore, is not included in the total as this would result in double counting).

Source: U.S. Bureau of Census.

Table 3.9-100. Household income information for selected Alaska Peninsula/Aleutian Island region communities, 2000.

Community	Total Housing Units	Vacant Housing Units	Total House-holds	Average Persons Per House-hold	Median House-hold Income	Family House-holds	Average Family Size	Median Family Income
Akutan	38	4	34	2.21	$33,750	18	3.00	$43,125
King Cove	207	37	170	2.90	$45,893	117	3.53	$47,188
Sand Point	282	53	229	2.67	$55,417	156	3.17	$58,000
Unalaska	988	154	834	2.51	$69,539	476	3.27	$80,829

Source: U.S. Bureau of Census.

Table 3.9-101. Employment and poverty information for selected Alaska Peninsula/Aleutian Island region communities, 1990.

Community	Total Persons Employed	Unemployed	Percent Unemployment	Percent Adults Not Working	Not Seeking Employment	Percent Poverty
Akutan	527	2	0.4%	7.4%	40	16.6%
King Cove	276	5	1.8%	24.0%	82	10.0%
Sand Point	438	13	2.9%	32.1%	194	12.5%
Unalaska	2,518	26	1.0%	7.8%	186	15.3%

Source: U.S. Bureau of Census

Table 3.9-102. Employment and poverty information, selected Alaska Peninsula/Aleutian Island region communities, 2000.

Community	Total Persons Employed	Unemployed	Percent Unemployment	Percent Adults Not Working	Not Seeking Employment	Percent Poverty
Akutan	97	505	78.9%	84.84%	38	45.5%
King Cove	450	31	4.7%	31.50%	176	11.9%
Sand Point	427	190	22.8%	48.67%	215	16.0%
Unalaska	2,675	414	11.1%	27.93%	625	12.5%

Source: U.S. Bureau of Census

Table 3.9-103. Ethnicity and group quarters housing information, Unalaska, 1990.

Race/Ethnicity	Total Population		Group Quarters Population		Non-Group Quarters Population	
	Number	Percent	Number	Percent	Number	Percent
White	1,917	62.06%	870	53.90%	1,047	70.98%
Black	63	2.04%	55	3.41%	8	0.54%
American Indian, Eskimo, Aleut	259	8.38%	20	1.24%	239	16.20%
Asian or Pacific Islander	593	19.20%	434	26.89%	159	10.78%
Other race	257	8.32%	235	14.56%	22	1.49%
Total Population	3,089	100%	1,614	100%	1,475	100%
Hispanic origin, any race	394	12.75%	337	20.88%	57	3.86%
Total Minority Population	1,252	40.53%	795	49.26%	457	30.98%
Total Non-Minority Population (White Non-Hispanic)	1,837	59.47%	819	50.74%	1,018	69.02%

Source: Census 1990 STF2

Table 3.9-104. Ethnicity and group quarters housing information, Unalaska, 2000.

Race/Ethnicity	Total Population		Group Quarters Population		Non-Group Quarters Population	
	Number	Percent	Number	Percent	Number	Percent
White	1,893	44.19%	665	30.34%	1,228	58.73%
Black or African American	157	3.67%	146	6.66%	11	0.53%
Alaska Native/Native American	330	7.71%	62	2.83%	268	12.82%
Native Hawaiian/Other Pacific Islander	24	0.56%	22	1.00%	2	0.10%
Asian	1,312	30.63%	931	42.47%	381	18.22%
Some Other Race	399	9.32%	318	14.51%	81	3.87%
Two Or More Races	168	3.92%	48	2.19%	120	5.74%
Unknown	0	0%	0	0%	0	0%
Total	4,283	100.00%	2,192	100.00%	2,091	100.00%
Hispanic[1]	551	12.86%	372	16.97%	179	8.56%

Notes: [1]Hispanic is an ethnic category and may include individuals of any race (and therefore is not included in the total as this would result in double counting). Hispanic group quarter populations data from the 2000 Census were not broken down by individual racial categories. As a consequence, the total minority population (all populations other than non-Hispanic Whites) cannot be calculated as it could for 1990 data.

Source: U.S. Census, 2000

Table 3.9-105. Population by age and sex for Unalaska: 1970, 1980, 1990, and 2000.

	1970		1980		1990		2000	
	N	%	N	%	N	%	N	%
Male	98	55%	858	65%	2,194	71%	2,830	66%
Female	80	45%	464	35%	895	29%	1,453	34%
Total	178	100%	1,322	100%	3,089	100%	4,283	100%
Median Age	26.3 years		26.8 years		30.3 years		36.5 years	

Source: U.S. Bureau of Census

Table 3.9-106. Ethnicity and group quarters housing information, Akutan, 1990.

Race/Ethnicity	Total Population		Group Quarters Population		Non-Group Quarters Population	
	Number	Percent	Number	Percent	Number	Percent
White	227	37.52%	212	42.32%	15	17.05%
Black	6	0.99%	6	1.20%	0	0.00%
American Indian, Eskimo, Aleut	80	13.22%	7	1.40%	73	82.95%
Asian or Pacific Islander	247	40.83%	247	49.30%	0	0.00%
Other race	29	4.79%	29	5.79%	0	0.00%
Total Population	589	100%	501	100%	88	100%
Hispanic origin, any race	45	7.44%	45	8.98%	0	0.00%
Total Minority Population	342	56.53%	298	59.48%	73	82.95%
Total Non-Minority Population (White Non-Hispanic)	247	40.83%	203	40.52%	15	17.05%

Source: Census 1990 STF2

Table 3.9-107. Ethnicity and group quarters housing information, Akutan, 2000.

Race/Ethnicity	Total Population		Group Quarters Population		Non-Group Quarters Population	
	Number	Percent	Number	Percent	Number	Percent
White	168	23.56%	158	24.76%	10	13.33%
Black or African American	15	2.10%	15	2.35%	0	0%
Alaska Native/Native American	112	15.71%	47	7.37%	65	86.66%
Native Hawaiian/Other Pacific Islander	2	0.28%	2	0.31%	0	0%
Asian	275	38.57%	275	43.10%	0	0%
Some Other Race	130	18.23%	130	20.38%	0	0%
Two Or More Races	11	1.54%	11	1.72%	0	0%
Unknown	0	0%	0	0%	0	0%
Total	713	100.00%	638	100.00%	75	100.00%
Hispanic[1]	148	20.76%	148	23.20%	0	0%

Notes: [1]Hispanic is an ethnic category and may include individuals of any race (and therefore is not included in the total as this would result in double counting).

Source: U.S. Census, 2000

Table 3.9-108. Population by age and sex, Akutan: 1990 and 2000.

	1990		2000	
	N	%	N	%
Male	449	76%	549	77%
Female	140	24%	164	23%
Total	589	100%	713	100%
Median Age	NA		40.2 years	

Notes: NA - data not available

Source: U.S. Bureau of Census

Table 3.9-109. Ethnicity and group quarters housing information, King Cove, 1990.

	Total Population		Group Quarters Population		Non-Group Quarters Population	
Race/Ethnicity	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
White	127	28.16%	57	30.16%	70	26.72%
Black	6	1.33%	6	3.17%	0	0.00%
American Indian, Eskimo, Aleut	177	39.25%	1	0.53%	176	67.18%
Asian or Pacific Islander	125	27.72%	109	57.67%	16	6.11%
Other race	16	3.55%	16	8.47%	0	0.00%
Total Population	451	100%	189	100%	262	100%
Hispanic origin, any race	53	11.75%	53	28.04%	0	0.00%
Total Minority Population	331	73.39%	139	73.54%	192	73.28%
Total Non-Minority Population (White Non-Hispanic)	120	26.61%	50	26.46%	70	26.72%

Source: Census 1990 STF2

Table 3.9-110. Ethnicity and group quarters housing information, King Cove, 2000.

Race/Ethnicity	Total Population		Group Quarters Population		Non-Group Quarters Population	
	Number	Percent	Number	Percent	Number	Percent
White	119	15.02%	37	12.37%	82	16.63%
Black or African American	13	1.64%	0	0%	0	0%
Alaska Native/Native American	370	46.72%	1	0.33%	369	74.85%
Native Hawaiian/Other Pacific Islander	1	0.13%	0	0%	0	0%
Asian	212	26.77%	192	64.21%	20	4.06%
Some Other Race	47	5.93%	0	0%	0	0%
Two Or More Races	30	3.79%	0	0%	0	0%
Unknown	0	0%	69	23.07%	22	4.46%
Total	792	100.00%	299	100.00%	493	100.00%
Hispanic[1]	59	74.49%	52	17.39%	7	1.42%

Notes: [1]Hispanic is an ethnic category and may include individuals of any race (and therefore is not included in the total as this would result in double counting).

Source: U.S. Census, 2000

Table 3.9-111. Population by age and sex for King Cove: 1990 and 2000.

	1990		2000	
	N	%	N	%
Male	292	65%	472	60%
Female	159	35%	320	40%
Total	451	100%	792	100%
Median Age	NA		34.9 Years	

Notes: NA - data not available

Source: U.S. Bureau of Census

Table 3.9-112. Ethnicity and group quarters housing information for Sand Point, 1990.

Race/Ethnicity	Total Population		Group Quarters Population		Non-Group Quarters Population	
	Number	Percent	Number	Percent	Number	Percent
White	284	32.35%	48	25.40%	236	34.25%
Black	4	0.46%	4	2.12%	0	0.00%
American Indian, Eskimo, Aleut	433	49.32%	3	1.59%	430	62.41%
Asian or Pacific Islander	87	9.91%	80	42.33%	7	1.02%
Other race	70	7.97%	54	28.57%	16	2.32%
Total Population	878	100%	189	100%	689	100%
Hispanic origin, any race	78	8.88%	58	30.69%	20	2.90%
Total Minority Population	601	68.45%	146	77.24%	455	66.04%
Total Non-Minority Population (White Non-Hispanic)	277	31.55%	43	22.76%	234	33.96%

Source: Census 1990 STF2

Table 3.9-113. Ethnicity and group quarters housing information, Sand Point, 2000.

Race/Ethnicity	Total Population		Group Quarters Population		Non-Group Quarters Population	
	Number	Percent	Number	Percent	Number	Percent
White	264	27.73%	104	30.59%	160	26.14%
Black or African American	14	1.47%	0	0%	0	0%
Alaska Native/Native American	403	42.33%	0	0%	403	65.85%
Native Hawaiian/Other Pacific Islander	3	0.32%	0	0%	0	0%
Asian	221	23.21%	209	61.47%	12	1.96%
Some Other Race	21	2.21%	0	0%	0	0%
Two Or More Races	26	2.73%	0	0%	0	0%
Unknown	0	0%	27	7.94%	37	6.04%
Total	952	100.00%	340	100.00%	612	100.00%
Hispanic[1]	129	13.55%	90	26.47%	39	6.37%

Notes: [1]Hispanic is an ethnic category and may include individuals of any race (and therefore is not included in the total as this would result in double counting).

Source: U.S. Census, 2000

Table 3.9-114. Population by age and sex for Sand Point: 1990 and 2000.

	1990		2000	
	N	%	N	%
Male	557	63%	593	62%
Female	321	37%	359	38%
Total	878	100%	952	100%
Median Age	NA		36.5 Years	

Notes: NA - data not available

Source: U.S. Bureau of Census

Table 3.9-115. Ethnic composition of population Kodiak City, 2000.

Race/Ethnicity	2000	
	N	%
White	2,939	46.4%
Black or African American	44	0.7%
Native American/Alaska Native	663	10.5%
Native Hawaiian/Other Pacific Islander	59	0.9%
Asian	2,010	31.7%
Some other race	276	4.3%
Two or more races	343	5.4%
Total	6,334	100%
Hispanic[1]	541	8.5%

Notes: [1]Hispanic is an ethnic category and may include individuals of any race (and therefore is not included in the total as this would result in double counting).

Source: U.S. Bureau of Census

Table 3.9-116. Household income information, selected Kodiak region communities, 2000.

Community	Total Housing Units	Vacant Housing Units	Total Households	Average Persons Per Household	Median Household Income	Family Households	Average Family Size	Median Family Income
Kodiak	2,255	259	1,996	3.10	$55,142	1,362	3.64	$60,484
Kodiak Island Borough	5,159	735	4,424	3.07	$54,636	3,257	3.52	$58,834

Source: U.S. Bureau of the Census

Table 3.9-117. Employment and poverty information, selected Kodiak region communities, 2000.

Community	Total Persons Employed	Unemployed	Percent Unemployment	Percent Adults not Working	Not Seeking Employment	Percent Poverty
Kodiak	3,053	160	3.6	29.62	1,170	7.4
Kodiak Island Borough	6,131	335	3.4	29.27	2,532	6.6

Source: U.S. Bureau of the Census

Table 3.9-118. Ethnicity and group quarters housing information for Kodiak, 1990.

Race/Ethnicity	Total Population		Group Quarters Population		Non-Group Quarters Population	
	Number	Percent	Number	Percent	Number	Percent
White	4,028	63.28%	192	53.93%	3,836	63.84%
Black	29	0.46%	3	0.84%	26	0.43%
American Indian, Eskimo, Aleut	811	12.74%	21	5.90%	790	13.15%
Asian or Pacific Islander	1,282	20.14%	118	33.15%	1,164	19.37%
Other race	197	3.10%	22	6.18%	175	2.91%
Total Population	6,365	100%	356	100%	6,009	100%
Hispanic origin, any race	407	6.39%	42	11.80%	365	6.07%
Total Minority Population	2,429	38.16%	181	50.84%	2,248	37.41%
Total Non-Minority Population (White Non-Hispanic)	3,936	61.84%	175	49.16%	3,761	62.59%

Source: Census 1990 STF2

Table 3.9-119. Ethnicity and group quarters housing information for Kodiak, 2000.

Race/Ethnicity	Total Population		Group Quarters Population		Non-Group Quarters Population	
	Number	Percent	Number	Percent	Number	Percent
White	2,939	46.40%	69	54.33%	2,861	46.23%
Black or African American	44	0.69%	0	0%	0	0%
Alaska Native/Native American	663	10.47%	10	7.87%	644	10.41%
Native Hawaiian/Other Pacific Islander	59	0.93%	0	0%	0	0%
Asian	2,010	31.73%	28	22.05%	1,982	32.03%
Some other race	276	4.36%	8	6.30%	268	4.33%
Two or more races	343	5.42%	5	3.94%	338	5.46%
Unknown	0	0%	7	5.51%	95	1.53%
Total	6,334	100.00%	127	100.00%	6,188	100.00%
Hispanic[1]	541	8.54%	17	13.39%	524	8.47%

Notes: [1]Hispanic is an ethnic category and may include individuals of any race (and therefore is not included in the total as this would result in double counting).

Source: U.S. Census, 2000

Table 3.9-120. Population by age and sex, Kodiak City: 1990 and 2000.

	1990		2000	
	N	%	N	%
Male	3,496	55%	3379	53%
Female	2,869	45%	2955	47%
Total	6,363	100%	6334	100%
Median Age	NA		33.5 years	

Source: U.S. Bureau of the Census

Table 3.9-121. Ethnic composition of population, Seattle-Tacoma CMSA, 1990 and 2000.

Race/Ethnicity	1990		2000	
	N	%	N	%
White	2,214,579	86.5%	2,819,296	79.3%
Black or African American	121,702	4.8%	165,938	4.7%
Native American/Alaska Native	32,980	1.3%	41,731	1.2%
Asian/Pacific Islands[1]	164,386	6.4%	300,533	8.5%
Other[2]	25,517	1.0%	227,263	6.4%
Total	2,559,164	100%	3,554,760	100%
Hispanic[3]	71,069	2.8%	184,297	5.2%
Total minority population	383,198	15.0%	816,858	23.0%
Total non-minority population	2,175,966	85.0%	2,737,902	77.0%

Notes: [1]In the 2000 census, this was split into Native Hawaiian and Other Pacific Islander (pop 19,837 (0.6%)) and Asian (pop 280,696 (7.9%))
[2]In the 2000 census, this category was Some Other Race (pop 79,353 (2.2%)) and Two or More Races (pop 147,910 (4.2%)).
[3]Hispanic is an ethnic category and may include individuals of any race (and therefore is not included in the total as this would result in double counting).

Source: U.S. Bureau of Census.

Table 3.9-122. Ethnic composition of workforce for catcher/processor entities reporting detailed demographic information, 2000.

Race/Ethnicity	2000	
	Number of Workers	Percentage of Workers
White non-Hispanic	704	36.9%
Hispanic	585	30.7%
Black or African American	121	6.3%
Alaska Native/Native American	164	8.6%
Asian/Pacific Islands	310	16.3%
Other	22	1.2%
Total	1,906	100.0%

Source: Individual catcher-processor entities contacted through the At-Sea Processors Association, 2001

Table 3.9-123. Percent of total weight of primary products obtained from Alaska groundfish fisheries by species or species group, 1992-2001.

Species	Year	Fillets	Whole/H&G/Kirimi	H&G&Roe/Roe	Meal/Oil/Other	Minced	Surimi	Total Product Weight (1,000s mt)
		(Percent of Total Product Weight)						
ARSO	1992	0.1	97.5	0.0	0.9	0.2	1.3	64.2
	1993	0.1	99.0	0.0	0.9	0.0	0.0	72.9
	1994	0.1	96.5	0.0	1.0	0.0	2.3	61.3
	1995	0.4	96.4	0.0	1.1	0.0	2.1	62.8
	1996	0.6	97.5	0.0	0.7	0.0	1.1	83.2
	1997	0.9	93.6	0.0	2.2	0.0	3.3	55.4
	1998	2.0	94.4	0.0	1.5	0.0	2.2	51.0
	1999	1.5	96.1	0.6	1.2	0.0	0.5	59.5
	2000	2.6	94.8	0.0	2.0	0.0	0.6	49.0
	2001	2.3	94.5	0.0	2.6	0.0	0.6	51.1
FLAT	1992	3.8	82.4	11.4	2.0	0.0	0.4	83.6
	1993	2.5	82.8	13.0	1.6	0.0	0.0	81.4
	1994	1.7	83.3	13.0	1.5	0.0	0.5	92.8
	1995	2.2	86.1	8.5	2.5	0.0	0.7	95.3
	1996	2.6	85.2	9.2	3.0	0.0	0.0	92.3
	1997	1.5	86.7	8.7	1.7	0.0	1.4	126.2
	1998	1.4	88.4	9.0	1.3	0.0	0.0	82.4
	1999	1.3	83.7	12.7	2.0	0.0	0.3	57.1
	2000	2.4	84.9	10.5	1.6	0.0	0.6	73.0
	2001	2.3	82.6	11.7	3.4	0.0	0.0	59.0
PCOD	1992	13.6	72.9	1.8	9.0	2.4	0.3	110.0
	1993	16.8	64.7	2.4	13.4	2.7	0.1	74.5
	1994	16.1	68.1	2.1	11.3	2.4	0.1	82.6
	1995	17.7	60.1	3.3	15.1	2.6	1.3	108.6
	1996	17.1	59.4	3.4	17.3	2.6	0.2	112.9
	1997	19.9	60.3	3.5	12.7	2.4	1.1	123.2
	1998	18.2	65.0	3.5	10.9	1.3	1.2	100.7
	1999	16.3	66.7	2.5	12.9	0.8	0.7	106.5
	2000	15.3	68.8	3.4	11.2	0.7	0.5	110.1
	2001	10.0	73.8	3.2	12.0	0.7	0.4	93.3

Table 3.9-123 (cont.). Percent of total weight of primary products obtained from Alaska groundfish fisheries by species or species group, 1992-2001.

Species	Year	Fillets	Whole/H&G/Kirimi	H&G&Roe/Roe	Meal/Oil/Other	Minced	Surimi	Total Product Weight (1,000s mt)
		(Percent of Total Product Weight)						
PLCK	1992	13.7	2.4	5.6	21.7	4.7	52.0	318.2
	1993	21.5	1.8	3.8	20.6	5.2	47.3	318.3
	1994	17.9	0.7	3.6	20.1	4.0	53.7	335.2
	1995	17.9	1.1	4.8	19.8	2.9	53.5	333.2
	1996	19.2	1.2	4.6	19.2	4.5	51.2	314.0
	1997	15.4	1.3	6.3	19.7	3.2	54.1	295.5
	1998	21.0	3.2	4.0	19.7	5.5	46.6	317.4
	1999	18.7	3.8	3.7	21.7	3.1	49.0	313.1
	2000	17.2	3.8	4.2	19.6	3.6	51.7	369.4
	2001	23.8	3.2	5.0	20.5	6.5	41.0	452.8

Notes: mt - metric tons

Source: NOAA Fisheries Weekly Production Reports.

Table 3.9-124. Percent of total wholesale value of primary products obtained from Alaska groundfish fisheries by species or species group, 1992-2001.

Species	Year	Fillets	Whole/H&G/Kirimi	H&G&Roe/Roe	Meal/Oil/Other	Minced	Surimi	Total Wholesale Value
		Percent of Total Product Wholesale Value						$Millions
ARSO	1992	0.2	98.3	0.0	0.3	0.0	1.2	172.8
	1993	0.2	99.4	0.0	0.5	0.0	0.0	179.3
	1994	0.2	97.8	0.0	0.7	0.0	1.3	165.7
	1995	0.8	97.4	0.0	0.4	0.0	1.4	186.1
	1996	1.0	98.2	0.0	0.3	0.0	0.5	192.5
	1997	1.5	96.1	0.0	0.6	0.0	1.8	151.9
	1998	4.3	93.9	0.0	1.1	0.0	0.8	103.7
	1999	2.6	96.1	0.1	1.0	0.0	0.3	115.4
	2000	4.1	94.5	0.0	1.1	0.0	0.4	122.7
	2001	3.2	94.2	0.0	2.3	0.0	0.3	132.1
FLAT	1992	9.9	60.2	28.4	0.7	0.0	0.8	105.6
	1993	8.2	67.3	23.9	0.7	0.0	0.0	115.4
	1994	5.4	59.7	33.5	0.4	0.0	0.9	135.2
	1995	7.5	68.6	22.1	0.9	0.0	0.9	136.9
	1996	8.7	67.1	23.5	0.6	0.0	0.0	135.2
	1997	5.7	71.8	19.7	0.7	0.0	2.0	134.5
	1998	6.8	74.1	18.3	0.7	0.0	0.0	85.4
	1999	4.3	70.6	23.2	0.7	0.0	1.1	72.6
	2000	9.3	69.4	19.2	0.7	0.0	1.4	92.2
	2001	7.1	68.4	22.6	1.9	0.0	0.0	66.1
PCOD	1992	28.9	56.5	1.7	11.0	1.3	0.6	223.9
	1993	34.5	48.4	2.4	13.6	1.1	0.0	145.4
	1994	31.0	57.8	1.8	8.3	1.0	0.1	153.1
	1995	36.3	44.8	2.7	13.8	1.0	1.4	217.8
	1996	32.1	47.8	2.7	16.2	1.1	0.1	225.1
	1997	43.6	42.6	2.7	9.0	1.2	0.9	226.1
	1998	32.7	56.3	2.1	7.8	0.5	0.6	228.6
	1999	31.2	57.4	1.8	9.0	0.3	0.3	306.4
	2000	29.3	60.0	2.7	7.5	0.3	0.2	314.2
	2001	15.4	66.8	5.5	11.8	0.3	0.2	235.3

Table 3.9-124 (cont.). Percent of total wholesale value of primary products obtained from Alaska groundfish fisheries by species or species group, 1992-2001.

Species	Year	Fillets	Whole/H&G/Kirimi	H&G&Roe/Roe	Meal/Oil/Other	Minced	Surimi	Total Wholesale Value
		Percent of Total Product Wholesale Value						$Millions
PLCK	1992	12.2	0.6	22.0	3.6	1.8	59.8	925.4
	1993	23.9	0.3	22.7	5.3	2.6	45.2	555.5
	1994	19.3	0.3	20.0	4.5	1.7	54.2	674.7
	1995	17.5	0.4	25.4	4.0	1.1	51.7	850.3
	1996	22.5	0.5	25.7	5.1	2.3	44.0	678.5
	1997	16.6	0.4	24.0	4.8	1.4	52.9	686.9
	1998	29.2	1.0	13.3	8.2	3.2	45.1	632.9
	1999	26.4	1.0	19.4	5.5	1.5	46.2	720.7
	2000	22.7	1.1	20.9	4.8	1.7	48.7	863.6
	2001	22.6	1.2	35.4	6.0	4.0	30.8	970.1

Source: NOAA Fisheries Weekly Production Reports.

Table 3.9-125. Categories of possible economic values assigned to a species or ecosystem.

Economic Value	Description
Use value	
Consumptive direct use value	Value derived from extractive activities.
Non-consumptive direct use value	Value gained through activities such as observing a species or ecosystem.
Scientific value	Value stemming from new information about medicine, genetics or other areas of scientific research resulting from the study of a species or ecosystem.
Indirect value	Value of the ecological functions and services of a species or ecosystem that indirectly provides support and protection to people, economic activity, and property.
Non-use value	
Bequest value	Value derived from the knowledge that a species or ecosystem will be preserved for future generations.
Existence value	Value emanating from the satisfaction of knowing that a particular species or ecosystem survives in a natural state.

Sources: Bishop 1987; Cocheba 1987; Mendelsohn 1985; Mitchell and Carson 1989; Pearce and Moran 1994; Randall 1986.

Table 3.9-126. Past/present effects table for harvesting and processing sector.

Catcher Vessels

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Number and type of vessels	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s) Changes in economic conditions in coastal communities (e.g., construction and operation of marine transportation facilities)	Domestic and foreign private sector investment in groundfish fisheries Consolidation occurs in sablefish and halibut longline fleets and BSAI pollock fleet	In mid-1970s, State of Alaska implemented limited entry program for salmon and other state-managed fisheries 1980 American Fisheries Promotion Act required that allocations of fish quotas to foreign nations be based on nations' contributions to development of U.S. fishing industry U.S. Fishing Vessel/Fisheries Obligation Guarantee Program lowered capital investment costs In 1983, Secretary of Commerce disapproved proposed moratorium on new vessels entering Alaska halibut fishery In 1995, halibut longline fishery IFQ program created incentives for a reduction in fleet size 1996 Sustainable Fisheries Act established Fishing Capacity Reduction Program 1996 Sustainable Fisheries Act directed National Academy of Sciences to convene Committee to Review Individual Fishing Quotas	1976 Magnuson Act and FMP measures phased out foreign fishing activities by establishing total allowable level of foreign fishing (TALFF), domestic annual processing (DAP), and domestic annual harvesting (DAH) In 1992, BSAI and GOA pollock TAC and GOA Pacific cod TAC allocated between inshore and offshore sectors In 1994, BSAI Pacific cod TAC allocated among harvesting sectors In 1995, sablefish longline fishery IFQ program created incentives for a reduction in fleet size In 1995, moratorium established on new harvesting vessels entering groundfish fisheries 1998 North Pacific License Limitation Program partially stabilized groundfish fisheries and defines potential classes of persons eligible for fishing privileges under future rationalization programs	The number of catcher vessels in the groundfish fisheries was 917 in 2001. 100 vessels were AFA-eligible. Vessel type / Number TCV BSP ≥ 125: 29 TCV BSP 60-124: 51 TCV Div. AFA: 20 TCV Non-AFA: 42 TCV < 60: 44 PCV: 89 LCV: 72 FGCV 33-59: 514 FGCV ≤32: 56 Significant excess capacity remained in some Alaska groundfish fisheries

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Number and type of vessels (cont.)	See previous row	See previous row	1996 Sustainable Fisheries Act established a moratorium on IFQ programs. Moratorium expires in 2002. In 1999, FAO Committee on Fisheries established International Plan of Action for the Management of Fishing Capacity	1998 American Fisheries Act authorizes the creation of various cooperatives of Alaska pollock producers	See previous row
Vessel ownership	Changes in economic conditions in coastal communities (e.g., construction and operation of marine transportation facilities)	Regional private sector investment in groundfish fisheries Transfer of salmon licenses from Alaska to non-Alaska residents Transfer of sablefish and halibut longline fishery quota shares from non-Alaska to Alaska residents	In mid-1970s, State of Alaska implemented limited entry program for salmon and other state-managed fisheries In 1995, NPFMC established halibut longline fishery IFQ program 1987 Commercial Fishing Industry Vessel Anti-Reflagging Act required fishing and processing vessels to have at least 50% U.S. ownership 1998 American Fisheries Act required fishing and processing vessels to have at least 75% U.S. ownership	National Standard 4 of Magnuson-Stevens Act prohibits management measures from discriminating between residents of different states Western Alaska CDQ program encouraged investment by Alaska residents in groundfish fisheries In 1995, sablefish longline fishery IFQ program established	In 2001, 40% of the catcher vessels were owned by residents of the Southcentral Alaska (AKSC) and Southeast Alaska (AKSE) Regions; 26% of vessel owners were from the Washington Inland Waters (WAIW) Region.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Groundfish caught and retained by species group	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Collapse of GOA rockfish fishery in 1970s		In 2000, injunction issued by U.S. District Court prohibited fishing with trawl gear in Steller sea lion critical habitat	In 1970s and 1980s, prohibited species catch limits established that constrain harvests in some groundfish fisheries In 1984, BSAI OY cap implemented and framework procedure established for the determination and apportionment of amounts of groundfish specified for total allowable catch (TAC), domestic annual harvest (DAH), reserves, and total allowable level of foreign fishing (TALFF) 1998 American Fisheries Act allocated BSAI pollock quota as follows - 10% to the western Alaska CDQ program, with the remainder allocated 50% to inshore sector, 40% to offshore sector and 10% to mothership sector	In 2001, the quantity of groundfish landed by catcher vessels and retained by processors was 909 thousand mt. with an ex-vessel value of $287 million. Species group — Percent of total groundfish ex-vessel value A-R-S-O — 18.2 FLAT — 1.3 PCOD — 12.4 PLCK — 68.2

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Groundfish caught and retained by FMP subarea			In 2000, injunction issued by U.S. District Court prohibited fishing with trawl gear in Steller sea lion critical habitat	In 1984, BSAI OY cap implemented and framework procedure established for the determination and apportionment of amounts of groundfish specified for total allowable catch (TAC) In 1980s and 1990s, no-trawl zones established to protect crab fisheries In 1990s and 2000s, area closures established to protect Steller sea lions In 1996, use of trawl gear in SE Alaska groundfish fisheries prohibited In 1999, AI pollock TAC reduced and target fishery closed to protect Steller sea lions	FMP subarea — Percent of total groundfish landed AI — 2.3 BS — 58.1 WG — 7.1 CG — 19.5 EG — 13.0

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Ex-vessel value of groundfish retained	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s)	Domestic and foreign private sector investment in groundfish fisheries IFQ program allows catcher vessels participating in sablefish longline fishery to increase their bargaining power with processors and to time harvests to meet specific market demands Establishment of cooperatives in the BSAI pollock fishery leads to improvements in product quality	Implementation of HACCP regulations and international standards related to seafood quality (e.g., ISO 9001 2000)	In 1995, sablefish longline fishery IFQ program established 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	In 2001, the ex-vessel value of the groundfish landed by catcher vessels and retained by processors was $287 million.
Dependence on groundfish fisheries	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s; collapse of salmon fisheries in late 1990s)		Establishment of limited access programs in non-groundfish fisheries in Alaska and elsewhere		In 1999, groundfish accounted for 50% of the ex-vessel value of the landings of catcher vessels participating in groundfish fisheries.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Employment	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s; collapse of salmon fisheries in late 1990s)	Domestic and foreign private sector investment in groundfish fisheries Consolidation occurs in sablefish and halibut longline fleets and BSAI pollock fleet		In 1995, sablefish longline fishery IFQ program established 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	In 2001, the catcher vessel sector created 1,997 FTE positions.
Payments to labor	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s; collapse of salmon fisheries in late 1990s)	Domestic and foreign private sector investment in groundfish fisheries Consolidation occurs in sablefish and halibut longline fleets and BSAI pollock fleet		In 1995, sablefish longline fishery IFQ program established 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	In 2001, the catcher vessel sector generated $115 million in labor income.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Average costs	Changes in marine diesel fuel prices Changes in fishing technology Changes in state, borough and community taxes levied on fish landings	Consolidation occurs in sablefish and halibut longline fleets and BSAI pollock fleet and operating efficiency of these fleets increases	Various permit and license fees established by the State of Alaska	North Pacific Groundfish Observer Program established Magnuson-Stevens Act authorized NOAA Fisheries to collect a fee to recover the costs directly related to the management and enforcement of an IFQ program 1988 Commercial Fishing Industry Vessel Safety Act and other safety initiatives implemented In 1995, sablefish longline fishery IFQ program established In 1980s and 1990s, no-trawl zones established to protect crab fisheries In 1990s and 2000s, area closures established to protect Steller sea lions 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	Firm-level cost data are unavailable.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Safety of human life at sea		Activities organized by fishing vessel owner associations (e.g., North Pacific Fishing Vessel Owners' Association) have improved vessel safety With the end of race for fish, participants in sablefish longline fishery and BSAI pollock fishery adopt safer fishing practices	1988 Commercial Fishing Industry Vessel Safety Act and other safety initiatives implemented USCG "Ready for Sea" program implemented	In 1995, sablefish longline fishery IFQ program established 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	An average of 16 persons were lost annually in Alaska fisheries in the 1990s.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Catcher-Processors

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Number and type of vessels	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., Changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s) Changes in economic conditions in coastal communities (e.g., construction and operation of marine transportation facilities)	Domestic and foreign private sector investment in groundfish fisheries Consolidation occurs in BSAI pollock fleet	1980 American Fisheries Promotion Act required that allocations of fish quotas to foreign nations be based on nations' contributions to development of U.S. fishing industry U.S. Fishing Vessel/Fisheries Obligation Guarantee Program lowered capital investment costs 1996 Sustainable Fisheries Act established Fishing Capacity Reduction Program 1996 Sustainable Fisheries Act directed National Academy of Sciences to convene Committee to Review Individual Fishing Quotas 1996 Sustainable Fisheries Act established a moratorium on IFQ programs. Moratorium expired in 2002. In 1999, FAO Committee on Fisheries established International Plan of Action for the Management of Fishing Capacity	1976 Magnuson Act and FMP measures phased out foreign fishing activities by establishing total allowable level of foreign fishing (TALFF), domestic annual processing (DAP), and domestic annual harvesting (DAH) In 1991, pollock roe is prohibited as a primary product In 1992, BSAI and GOA pollock TAC and GOA Pacific cod TAC allocated between inshore and offshore sectors In 1994, BSAI Pacific cod TAC allocated among harvesting sectors In 1995, moratorium established on new harvesting vessels entering groundfish fisheries	The number of catcher processors in the groundfish fisheries was 89 in 2001. 16 vessels were AFA-eligible. Vessel type — Number ST-CP — 12 FT-CP — 4 HT-CP — 23 P-CP — 7 L-CP — 43 Significant excess capacity remained in some Alaska groundfish fisheries

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Number and type of vessels (cont.)	See previous row	See previous row	See previous row	1998 North Pacific License Limitation Program partially stabilized groundfish fisheries and defines potential classes of persons eligible for fishing privileges under future rationalization programs 1998 American Fisheries Act authorized the buy-out of nine catcher processors 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	See previous row
Vessel ownership	Changes in economic conditions in coastal communities (e.g., construction and operation of marine transportation facilities)	Regional private sector investment in groundfish fisheries	1987 Commercial Fishing Industry Vessel Anti-Reflagging Act required fishing and processing vessels to have at least 50% U.S. ownership 1998 American Fisheries Act required fishing and processing vessels to have at least 75% U.S. ownership	National Standard 4 of Magnuson-Stevens Act prohibits management measures from discriminating between residents of different states Western Alaska CDQ program encouraged investment by Alaska residents in groundfish fisheries	In 2001, 79% of vessel owners were from the Washington Inland Waters (WAIW) Region

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Groundfish caught by species group	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Collapse of GOA rockfish fishery in 1970s		In 2000, injunction issued by U.S. District Court prohibited fishing with trawl gear in Steller sea lion critical habitat	In 1970s and 1980s, prohibited species catch limits established that constrain harvests in some groundfish fisheries In 1984, BSAI OY cap implemented and framework procedure established for the determination and apportionment of amounts of groundfish specified for total allowable catch (TAC), domestic annual harvest (DAH), reserves, and total allowable level of foreign fishing (TALFF) In 1991, pollock roe is prohibited as a primary product 1998 American Fisheries Act allocated BSAI pollock quota as follows - 10% to the western Alaska CDQ program, with the remainder allocated 50% to inshore sector, 40% to offshore sector and 10% to mothership sector 1998 American Fisheries Act restricted AFA-eligible vessels from shifting their	In 2001, the quantity of groundfish caught by catcher processors was 1,066 thousand mt. Species group — Percent of groundfish caught A-R-S-O — 11.6 FLAT — 10.8 PCOD — 24.7 PLCK — 53.0

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Groundfish caught by FMP subarea			In 2000, injunction issued by U.S. District Court prohibited fishing with trawl gear in Steller sea lion critical habitat	In 1984, BSAI OY cap implemented and framework procedure established for the determination and apportionment of amounts of groundfish specified for total allowable catch (TAC) In 1980s and 1990s, no-trawl zones established to protect crab fisheries In 1990s and 2000s, area closures established to protect Steller sea lions In 1996, use of trawl gear in SE Alaska groundfish fisheries prohibited In 1999, AI pollock TAC reduced and target fishery closed to protect Steller sea lions	FMP subarea — Percent of total groundfish caught BSAI — 97.1 GOA — 2.9

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Quantity and value of groundfish products	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s)	Domestic and foreign private sector investment in groundfish fisheries Under IFQ program, freezer longline vessels participating in sablefish longline fishery allows them to time harvests to meet specific market demands Establishment of cooperatives in the BSAI pollock fishery leads to increased production of higher-valued products		In 1995, sablefish longline fishery IFQ program established In 1998, IR/IU regulations established for pollock and Pacific cod 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	In 2001, catcher processors produced 314 thousand mt of product with a gross product value of $744 million
Product quality	Changes in domestic and foreign demand for groundfish products Changes in processing technology	Under IFQ program, freezer longline vessels participating in sablefish longline fishery allows them to time harvests to meet specific market demands Establishment of cooperatives in the BSAI pollock fishery leads to improvements in product quality	Implementation of HACCP regulations and international standards related to seafood quality (e.g., ISO 9001 2000)	In 1995, sablefish longline fishery IFQ program established 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	In 2001, average product value was $2,369/mt

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Product utilization rates	Changes in processing technology	Establishment of cooperatives in the BSAI pollock fishery leads to improvements in product utilization		In 1998, IR/IU regulations established for pollock and Pacific cod 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	In 2001, the average product utilization rate for catcher processors was around 30%.
Dependence on groundfish fisheries	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s; collapse of salmon fisheries in late 1990s)		Establishment of limited access programs in non-groundfish fisheries in Alaska and elsewhere Changes in regulations in Pacific whiting fishery		In 2001, groundfish accounted for most of the gross product value of the fish processed by catcher processors (specific data unavailable)

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Employment	Changes in processing technology Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s; collapse of salmon fisheries in late 1990s)	Domestic and foreign private sector investment in groundfish fisheries Consolidation occurs in BSAI pollock fleet	Changes in U.S. Immigration and Naturalization Service regulations	1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers 1998 American Fisheries Act authorized the buy-out of nine catcher processors Western Alaska CDQ program increased employment of Alaska residents in groundfish fisheries	In 2001, the catcher processor sector created 3,877 FTE positions.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Payments to labor	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s; collapse of salmon fisheries in late 1990s)	Domestic and foreign private sector investment in groundfish fisheries Consolidation occurs in BSAI pollock fleet	Changes in U.S. Immigration and Naturalization Service regulations Changes in U.S. minimum wage level	1998 American Fisheries Act authorizes the creation of various cooperatives of Alaska pollock producers	In 2001, the catcher processor sector generated $266 million in labor income.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Average costs	Changes in marine diesel fuel prices Changes in fishing and processing technology Changes in state, borough and community taxes levied on fish landings	Consolidation occurs in BSAI pollock fleet and operating efficiency of these fleets increases	Various permit and license fees established by the State of Alaska 1988 Commercial Fishing Industry Vessel Safety Act and other safety initiatives implemented	In 1970s and 1980s, prohibited species catch limits established North Pacific Groundfish Observer Program established 1988 Commercial Fishing Industry Vessel Safety Act and other safety initiatives implemented In 1992, a catcher vessel operational area (CVOA) was established in the Bering Sea In 1980s and 1990s, no-trawl zones established to protect crab fisheries In 1990s and 2000s, area closures established to protect Steller sea lions In 1998, IR/IU regulations established for pollock and Pacific cod 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	Firm-level cost data are unavailable.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Safety of human life at sea		Activities organized by fishing vessel owner associations (e.g., North Pacific Fishing Vessel Owners' Association) have improved vessel safety With the end of race for fish, participants in BSAI pollock fishery adopt safer fishing practices	1988 Commercial Fishing Industry Vessel Safety Act and other safety initiatives implemented USCG "Ready for Sea" program implemented	1998 American Fisheries Act authorizes the creation of various cooperatives of Alaska pollock producers	An average of 16 persons were lost annually in Alaska fisheries in the 1990s.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Inshore Processors and Motherships

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Number and type of facilities/vessels	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s)	Domestic and foreign private sector investment in groundfish fisheries Consolidation of sablefish and halibut longline fleets and BSAI pollock fleet	In mid-1970s, State of Alaska implemented limited entry program for salmon and other state-managed fisheries 1980 American Fisheries Promotion Act required that allocations of fish quotas to foreign nations be based on nations' contributions to development of U.S. fishing industry 1996 Sustainable Fisheries Act established Fishing Capacity Reduction Program 1996 Sustainable Fisheries Act directed National Academy of Sciences to convene Committee to Review Individual Fishing Quotas In 1999, FAO Committee on Fisheries established International Plan of Action for the Management of Fishing Capacity	1976 Magnuson Act and FMP measures phased out foreign fishing activities by establishing total allowable level of foreign fishing (TALFF), domestic annual processing (DAP), and domestic annual harvesting (DAH) In 1992, BSAI and GOA pollock TAC and GOA Pacific cod TAC allocated between inshore and offshore sectors In 1995, sablefish longline fishery IFQ program supports establishment of small processors 1998 American Fisheries Act allocated BSAI pollock quota as follows - 10% to the western Alaska CDQ program, with the remainder allocated 50% to inshore sector, 40% to offshore sector and 10% to mothership sector	In 2001, there were 53 shore plants, 3 motherships, and 3 floating inshore processors in the groundfish fisheries Vessel/facility type — Number BSP-SP — 6 APA-SP — 8 K-SP — 10 SC-SP — 14 SE-SP — 15 Motherships — 3 Floaters — 3 Significant excess capacity remained in some Alaska groundfish fisheries

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Facility/vessel ownership			1987 Commercial Fishing Industry Vessel Anti-Reflagging Act required fishing and processing vessels to have at least 50% U.S. ownership 1998 American Fisheries Act required fishing and processing vessels to have at least 75% U.S. ownership	National Standard 4 of Magnuson-Stevens Act prohibits management measures from discriminating between residents of different states	In 2001, 29% of the facilities/vessels were owned by residents of the Southcentral Alaska (AKSC) and Southeast Alaska (AKSE) Regions. 58 percent of facility/vessel owners were from the Washington Inland Waters (WAIW) Region
Groundfish retained by species group	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Collapse of GOA rockfish fishery in 1970s		In 2000, injunction issued by U.S. District Court prohibited fishing with trawl gear in Steller sea lion critical habitat	In 1970s and 1980s, prohibited species catch limits established that constrain harvests in some groundfish fisheries In 1984, BSAI OY cap implemented and framework procedure established for the determination and apportionment of amounts of groundfish specified for total allowable catch (TAC), domestic annual harvest (DAH), reserves, and total allowable level of foreign fishing (TALFF)	In 2001, the quantity of groundfish caught by inshore processors and motherships was 932 thousand mt. Species group — Percent of total groundfish catch A-R-S-O — 10.3 FLAT — 1.1 PCOD — 11.8 PLCK — 76.7

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Groundfish retained by FMP subarea			In 2000, injunction issued by U.S. District Court prohibited fishing with trawl gear in Steller sea lion critical habitat		FMP subarea — Percent of total groundfish catch BSAI — 85.5 GOA — 14.5
Quantity and value of groundfish seafood products	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s)	Domestic and foreign private sector investment in groundfish fisheries Establishment of various cooperatives of catcher vessels leads to improvements in product quality		In 1998, IR/IU regulations established for pollock and Pacific cod	In 2001, inshore processors and motherships produced 343 thousand mt of product with a gross product value of $683 million.
Product quality	Changes in domestic and foreign demand for groundfish products Changes in processing technology	Establishment of cooperatives in the BSAI pollock fishery leads to improvements in product quality	Implementation of HACCP regulations and international standards related to seafood quality (e.g., ISO 9001 2000)	1998 American Fisheries Act authorizes the creation of various cooperatives of Alaska pollock producers	In 2001, average product value was $1,991/mt

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Product utilization rates	Changes in processing technology	Establishment of cooperatives in the BSAI pollock fishery leads to improvements in product utilization		In 1992, BSAI and GOA pollock TAC and GOA Pacific cod TAC allocated between inshore and offshore sectors In 1998, IR/IU regulations established for pollock and Pacific cod 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	In 2001, the average product recovery rate for inshore processors and motherships was around 37%.
Dependence on groundfish fisheries	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s; collapse of salmon fisheries in late 1990s)			In 1992, BSAI and GOA pollock TAC and GOA Pacific cod TAC allocated between inshore and offshore sectors 1998 American Fisheries Act allocated BSAI pollock quota as follows - 10% to the western Alaska CDQ program, with the remainder allocated 50% to inshore sector, 40% to offshore sector and 10% to mothership sector	In 1999, groundfish accounted for 31% of the gross product value of the fish processed by inshore processors and motherships.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Employment	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s; collapse of salmon fisheries in late 1990s) Changes in processing technology	Domestic and foreign private sector investment in groundfish fisheries	Changes in U.S. Immigration and Naturalization Service regulations Changes in U.S. minimum wage level	1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	In 2001, the inshore processor and mothership sectors created 4,491FTE positions.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Payments to labor	Changes in domestic and foreign demand for groundfish products (e.g., development of Japanese surimi market and processing technology during 1980s; collapse of Atlantic cod fisheries in 1990s) Changes in economic conditions in other Alaska fisheries (e.g., collapse of BSAI and Kodiak Island crab fisheries in 1980s and 1990s; high profits in salmon fisheries in late 1980s-early 1990s; collapse of salmon fisheries in late 1990s)	Domestic and foreign private sector investment in groundfish fisheries	Changes in U.S. Immigration and Naturalization Service regulations Changes in U.S. minimum wage level	1998 American Fisheries Act authorizes the creation of various cooperatives of Alaska pollock producers	In 2001, the inshore processor and mothership sectors generated $267 million in labor income.

Table 3.9-126 (cont.). Past/present effects table for harvesting and processing sector.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Average costs	Changes in fuel and utility prices Changes in processing technology Changes in state, borough and community taxes levied on fish landings		Implementation of regulations related to product quality, environmental pollution, and occupational safety	North Pacific Groundfish Observer Program established In 1995, sablefish longline fishery IFQ program established 1998 American Fisheries Act authorizes the creation of various cooperatives of Alaska pollock producers	Firm-level cost data are unavailable.

Notes:
AFA - American Fisheries Act
AI - Aleutian Islands
AKSC - Alaska Southcentral
AKSE - Alaska Southeast
APA - Alaska Peninsula and Aleutian Islands regions
A-R-S-O - Atka mackerel, rockfish, sablefish and other groundfish
BS - Bering Sea
BSAI - Bering Sea and Aleutian Islands
BSP - Bering Sea pollock
CDQ - community development quota
CG - central Gulf of Alaska
CP - catcher processor
CV - catcher vessel
CVOA - catcher vessel operational area
DAH - domestic annual harvest
DAP - domestic annual processing
EG - eastern Gulf of Alaska
FAO - Food and Agriculture Organization
FGCV - fixed gear catcher vessel
FLAT - flatfish
FMP - fishery management plan
FT - fillet trawl
GOA - Gulf of Alaska
HACCP - hazard analysis and critical control point
HT - head-and-gut
IFQ - individual fishing quota
IR/IU - improved retention/improved utilization
ISO - International Organization for Standardization
K - Kodiak Island region
L - longline
LCV - longline catcher vessel
mt - metric ton
NOAA Fisheries - National Marine Fisheries Service
NPFMC - North Pacific Fisheries Management Council
OY - optimum yield
P - pot
PCOD - Pacific cod
PCV - pot catcher vessel
SP - shore plant
ST - surimi trawl
TALFF - total allowable level of foreign fishing
TCV - trawl catcher vessel
USCG - United States Coast Guard
WAIW - Washington Inland Waters
FTE - full-time equivalent

Table 3.9-127. Past/present effects table for regional socioeconomics (including regions and communities, community development quota programs, subsistence and environmental justice issues.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Population	Population of relevant coastal Alaska communities influenced by wide variety of events external to fishing in 20th century. Especially in AKAPAI and Kodiak regions, World War II brought large numbers of outsiders to the area, altering fishing community population dynamics. General growth of Alaska from Territorial days through statehood and beyond fostered development of ports that became commercial fishing centers.	Commercial fishing influenced establishment or growth of communities in different ways. Some fishing ports, like Unalaska, grew out of a traditional community; others, like King Cove (1911) and Sand Point (1898), were established or coalesced around fishing operations. In the AKAPAI region especially, Native/non-Native population dynamic strongly influenced by commercial fishing. Communities with more commercial fishing development have become less Alaska Native over time. Similarly, communities with substantial commercial fisheries development have a greater male/female ratio imbalance due largely to presence of predominantly male processing workforces. Another groundfish related influx of a relatively large numbers of workers in relation to local population in smaller communities began in the 1980s with onshore pollock processing.	Engagement in groundfish fisheries spans much of coastal Alaska and parts of the Pacific Northwest. Influence of fishery on community population negligible in larger areas such as Seattle and Anchorage, but profound in small communities with a large industry presence, such as Akutan. Changes in management of non-groundfish fisheries influenced temporal distribution of influx of fishing related workers in rural Alaska fishing communities. These changes (coupled with changes in resource abundance or demand) served to amplify or diminish impacts of groundfish related worker influxes.	Americanization of the groundfish fishery fostered population growth due to influx of processing workers to rural Alaska communities with shore plants. Inshore allocations resulting from inshore/offshore splits and AFA continued conditions for onshore processing worker demand. Rationalization of BSAI pollock fishery under AFA conditions diminished need for surges in workforce during race-for-fish period.	Population varies considerably between regions; communities engaged include small rural communities and major metropolitan areas. 2000 populations were: AKAPAI 6,000 Kodiak Island 14,000 AKSC 367,000 AKSE 75,000 WAIW 3.9 million ORCO 105,000

Table 3.9-127 (cont.). Past/present effects table for regional socioeconomics (including regions and communities, CDQ programs, subsistence and environmental justice issues.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Processing Ownership and Activity	Groundfish processing takes place in a number of different types of facilities, with widely different histories, and this also varies widely by species. Cod processing traces it origins to the founding of a number of communities active in the fishery today; pollock processing, which today is a fundamental operation for a number of plants, has a significant onshore volume history dating back less than 20 years. Integration of processing with local community social and economic structures varies by community and region. In general, larger processors in smaller communities evolve as enclave style developments, with this pattern most prominent in AKAPAI region.	Capital in processing firms is international; within groundfish processing (as well as a number of other fisheries), much of product flows to Japan, vertical integration results in significant overseas ownership. For the larger firms, groundfish processing ownership (or management, if ownership is overseas) is concentrated in WAIW region. Activity takes place in numerous coastal Alaska communities, but highest volume of activity occurs in AKAPAI area. Local activity, despite lack of local ownership, is critical to municipal revenues for a number of rural Alaska communities. Groundfish processing varies considerably from region to region. With Americanization of the Bering Sea groundfish fisheries, in general, high volume, low value per unit species came to be proportionally more important to processing in the west regions of Alaska, and low volume, high value per unit species are more important to the east.	Location of onshore processing plants (and floaters) results from balance of efficiency due to proximity to fishing grounds with increased operational costs associated in remote locations and decreased services availability.	Inshore/offshore provisions provide designated quota allocation to entities operating in coastal Alaska. AFA provisions effectively preclude entry of new processors into pollock processing, but no community level impacts are apparent to date.	Product value and value per ton for in-region processing (2001): AKAPAI: $490.6m, $727 Kodiak: $77.6m, $972 Southcentral: $23.4m, $3,380 Southeast: $27.0m, $4,333

Table 3.9-127 (cont.). Past/present effects table for regional socioeconomics (including regions and communities, CDQ programs, subsistence and environmental justice issues.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Catcher Vessel Ownership and Activity	In general terms, fleets in smaller communities have higher proportion of smaller vessel classes, and these vessels are less specialized than larger vessel classes. Engagement in these communities may be relatively high, but dependence on groundfish tends to be balanced with participation in a number of other fisheries.	Fleet is dispersed among a large number of communities in Alaska and the Pacific Northwest. Concentration of harvest capacity is present in Seattle area; trend is particularly evident with the increasing size of BSAI groundfish vessels and increasing capital requirements.	Growth of larger volume processing plants make deliveries from smallest vessels in local fleets uneconomic in some communities.	License limitation has not had a major impact on the distribution of the fleet. Pollock co-ops under AFA serves to reduce effort, but substantial consolidation forecast has not yet been realized.	Regional catcher vessels and ex-vessel values (2001): AKAPAI - 70 vessels, $6.4m Kodiak - 142 vessels, $19.3m Southcentral - 155 vessels, $10.8m Southeast - 210 vessels, $19.1m WAIW - 239 vessels, $135.6m ORCO - 35 vessels, $18.2m
Tax and Revenue	Local fish taxes become an important source of local revenue from groundfish activity for a number of communities, especially in AKAPAI region. None of the regionally important groundfish communities in Southcentral or Southeast Alaska have a local or borough fish tax that applies to groundfish. State shared fish tax provides groundfish related revenues to state as well as communities with groundfish related activity.	In addition to local and state fish taxes associated with landings in the communities, the Fisheries Resource Landing tax, instituted to capture revenue from at-sea processing activity (and targeted at pollock especially) began to increase revenues to communities in the late 1990s. This tax has been most beneficial to AKAPAI communities.	Changes in other fisheries have an impact on the relative value of groundfish associated revenues to communities. For example, with the sharp decline in BSAI crab revenues in the past few years, the importance of groundfish as a revenue source increased proportionately in communities where processing of both takes place.	Onshore delivery requirements arising out of inshore/offshore amendments and AFA provisions have stabilized (and increased) proportion of landings of pollock subject to local taxation.	Groundfish a significant component of local government revenues in a number of communities, especially in Unalaska/Dutch Harbor and the communities of the Aleutians East Borough.

Table 3.9-127 (cont.). Past/present effects table for regional socioeconomics (including regions and communities, CDQ programs, subsistence and environmental justice issues.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Employment and Income	Commercial fishing often one of the very few (if not only) viable source of private sector employment and income in small coastal Alaska communities.	Processing workforces for larger plants not typically drawn from local labor pool (workers most often recruited from Pacific Northwest). Groundfish processing employment heavily concentrated in AKAPAI (shore processing) and WAIW (at-sea processing) regions. Kodiak employment intermediate, but relatively few total positions attributable to groundfish are found in Southcentral and Southeast Alaska regions due to relatively low volumes processed and more complete integration of groundfish operations with other plant operations. Employment on catcher vessels drawn communities with residential fleets, and more evenly distributed between regions than processing employment. Much higher income per position for WAIW and Oregon coast regions than for other regions, reflecting the concentration of larger vessels classes.	Nature of employment changes with the pollock fishery decreasing from a near year-round fishery following Americanization to relatively short seasons by the early 1990s. Pollock roe demand still dictates conditions similar to "race for fish" operations during peak roe season, even under rationalized conditions with AFA.	Pollock rationalization (though co-ops) under AFA conditions has resulted in less peak demand for processing employment; processing operations have responded by adjusting worker schedules to use smaller, more stable workforce. Employment in support service businesses may have decreased in some communities with the elimination of the race-for-fish in the pollock fishery, but quantitative information is not available.	Estimated processor employment (FTEs) and payments to labor (2001): AKAPAI - 3,525, $149.3m Kodiak - 617, $28.9m Southcentral - 150, $15.3m Southeast - 106, $14.5m WAIW - 3,787, $317.0m ORCO - none Estimated catcher vessel employment (FTEs) and payments to labor (2001): AKAPAI - 327, $2.56m Kodiak - 802, $7.73m Southcentral - 1,049, $4.34m Southeast - 1,742, $7.65m WAIW - 1,238, $54.22m ORCO - 175, $7.28m

Table 3.9-127 (cont.). Past/present effects table for regional socioeconomics (including regions and communities, CDQ programs, subsistence and environmental justice issues.

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Environmental Justice	Growth of groundfish fishery takes place in a number of predominantly Alaska Native communities	Relatively mobile processing workforces comprised largely of individuals from minority populations, substantially changes demographics of some communities.	1994 Executive Order 12898 on Environmental Justice requires analysis of minority populations and low income populations; projects subject to NEPA begin to include EJ analysis.	Establishment of CDQ program in 1992 (and subsequent expansion in later years) provides positive benefit to minority and low-income populations.	Alaska Native populations directly participate in commercial groundfish fisheries primarily through harvest sector, and through the CDQ program. Additionally, a number of otherwise predominantly Alaska Native communities are the location of shore processing plants. Additional potential Alaska Native EJ issues are associated with subsistence. Minority (but non-Native) populations comprise vast majority of processing workforce in larger groundfish plants.

Notes: AFA - American Fisheries Act
AKAPAI - Alaska Peninsula and Aleutian Islands
AKSC - Alaska Southcentral region
AKSE - Alaska Southeast region
BSAI - Bering Sea and Aleutian Islands
CDQ - community development quota
EJ - environmental justice
FMP - fishery management plan
FTE - full-time equivalent
m - million
NEPA - National Environmental Policy Act
ORCO - Oregon Coast
WAIW - Washington Inland Waters

Table 3.9-128. Past/present effects table for market channels and value of the Bering Sea and Gulf of Alaska marine ecosystems (including non-consumptive and non-use benefits).

Market Channels and Benefits to U.S. Consumers

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Product quantity	Alaska Seafood Marketing Institute product promotion activities Research demonstrating health benefits of seafood consumption Public awareness of health benefits of seafood consumption Aquaculture development increases overall demand for seafood, but products (e.g., farmed catfish) may compete with groundfish products		See external management actions listed above related to groundfish caught or products produced	See internal management actions listed above related to groundfish caught or products produced	In 2001, 656 thousand mt of primary product were produced with a wholesale value of $1.4 billion. By decreasing both the quantity and quality of groundfish products available to consumers, the race for fish, which continues in some groundfish fisheries, prevents some potential consumer benefits from being attained
Product year-round availability		Under IFQ program, participants in sablefish longline fishery distribute their catch throughout the year		In 1995, sablefish longline fishery IFQ program established	Groundfish fisheries provide high and relatively stable levels of seafood products to domestic and foreign markets

Table 3.9-128 (cont.). Past/present effects table for market channels and value of the Bering Sea and Gulf of Alaska marine ecosystems (including non-consumptive and non-use benefits).

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Product quality	Changes in processing technology	IFQ program allows participants in sablefish longline fishery to time harvests to meet specific market demands Establishment of cooperatives in the BSAI pollock fishery leads to improvements in product quality	Implementation of HACCP regulations and international standards related to seafood quality (e.g., ISO 9001 2000)	In 1995, sablefish longline fishery IFQ program established 1998 American Fisheries Act authorized the creation of various cooperatives of Alaska pollock producers	In 2001, average product value was $2,174/mt By decreasing both the quantity and quality of groundfish products available to consumers, the race for fish, which continues in some groundfish fisheries, prevents some potential consumer benefits from being attained

Table 3.9-128 (cont.). Past/present effects table for market channels and value of the Bering Sea and Gulf of Alaska marine ecosystems (including non-consumptive and non-use benefits).

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Product diversity	Alaska Seafood Marketing Institute product promotion activities Research demonstrating health benefits of seafood consumption Public awareness of health benefits of seafood consumption Aquaculture development increases overall demand for seafood products Changes in processing technology		See external management actions listed above related to groundfish caught or products produced	See internal management actions listed above related to groundfish caught or products produced	Groundfish fisheries provide a relatively high diversity of seafood products to domestic and foreign markets

Table 3.9-128 (cont.). Past/present effects table for market channels and value of the Bering Sea and Gulf of Alaska marine ecosystems (including non-consumptive and non-use benefits).

Value of the Bering Sea and Gulf of Alaska marine ecosystems (including non-consumptive and non-use benefits)

Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions		Comparative Baseline
	External	Internal	External	Internal	
Benefits (including non-market and non-consumptive benefits) derived from marine ecosystems and associated species	Increased public awareness of marine ecosystems (e.g., BSAI and GOA marine ecosystems) and associated endangered species (e.g., Steller sea lions) Increased participation in recreational fishing and eco-tourism activities Lawsuit brought by environmental groups challenging NOAA Fisheries for failing to meet the requirements of the Endangered Species Act in its management of Alaska groundfish fisheries		In 2000, injunction issued by U.S. District Court prohibited fishing with trawl gear in Steller sea lion critical habitat		A contingent valuation study found that the value of an expanded recovery program for Steller sea lions was positive and substantial Evidence suggests that the benefits (including non-market and non-consumptive benefits) derived from the BSAI and GOA ecosystems as a whole are substantial

Notes: BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
GOA - Gulf of Alaska
HACCP - hazard analysis and critical control point
IFQ - individual fishing quota
ISO - International Organization for Standardization
mt - metric ton
NOAA Fisheries - National Marine Fisheries Service
HACCP - hazard analysis and critical control point
IFQ - individual fishing quota
ISO - International Organization for Standardization

Table 3.10-1. Russian mercantile records of eighteenth century fur harvests in the Bering Sea and Aleutian Islands.

Vessel	Year Dispatched	Year Returned	Sea Otter Pelts	Fox Pelts	Fur Seal Pelts
St. Nikolai	1769	1773	2,450	1,127	
St. Andrei	1769	1773	1,200	3,008	
St. Prokop	1769	1773	250[1]	60[1]	
Alexandr Nevski	1770	1774	2,340	1,130	
St. Pavel	1770	1774	1,900	4,883	
St. Vladimir[2]	1772	1779	4,372	3,949	1,725
Arkhangel St. Mikhail	1776	1777	3,720	2,024	143
St. Nikolai[3]	1778	1785	2,521	3,300	
Kliment[4]	1778	1785	1,118	830	
St. Ioann Rylskoi	1780	1786	900		18,000
St. Georgiy	1781	1789	2,720	8,000	31,000

Notes: [1]"No reason for the ill-success of this venture has been transmitted" (Bancroft 1886, note 25, p. 169).
[2]Cargo also included pelts of 92 river otters, 1 wolverine, 3 wolves, 18 mink, and 12,600 lb (350 Russian lb) of walrus ivory.
[3]Cargo also included pelts of 230 river otters. This vessel, completed in 1778, was not the *St. Nikolai* that sailed in 1769.
[4]Cargo also included pelts of 500 river otters.
Source: adapted from Bancroft (1886)

Table 3.10-2. Fur seal harvests from the Pribilof Islands, 1817-1837.

Year	St. Paul Harvest	St. George Harvest	Total	% change (+/-)
1817	47,860	12,328	60,188	
1818	45,932	13,924	59,856	-0.6
1819	40,300	11,924	52,224	-12.8
1820	39,700	10,520	50,220	-3.8
1821	35,750	9,245	44,995	-10.4
1822	28,150*	8,319	36,469	-19.0
1823	24,100*	5,773	29,874	-18.1
1824	19,850*	5,550	25,400	-15.0
1825	24,600	5,500	30,100	+18.5
1826	23,250	0**	23,250	-22.8
1827	19,700	0**	19,700	-15.3
1828	18,450	4,778	23,228	+17.9
1829	17,150	3,661	20,811	-10.4
1830	15,200	2,834	18,034	-13.3
1831	12,950	3,084	16,034	-11.1
1832	13,150	3,206	16,446	+2.6
1833	13,200	3,212	16,412	-0.2
1834	12,700	3,051	15,751	-4.0
1835	4,052***	2,528	6,580	-58.2***
1836	4,040***	2,550	6,590	+0.2***
1837	4,200***	2,582	6,802	+3.2
Total	464,259	114,665	578,224	-88.7

Notes: * - In 1822, 1823, and 1824, respectively, the following numbers of St. Paul seals were released to encourage a population increase: 2,700, 6,000, and 2,500.
** - To encourage a population increase, St. George seals were not harvested in 1826 and 1827.
*** - In 1835, 1836, and 1837, respectively, the following numbers of St. Paul seals were released to encourage a population increase: 8,000, 7,750, and 7,000.

Source: adapted from Veniaminov 1840

Table 3.10-3. Bering Sea and Aleutian Islands and Gulf of Alaska ecosystem past/present effects.

Internal Effect Indicators	Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions	
		External	Internal	External	Internal
Catch/bycatch of forage and herring Population trends in pollock and Atka mackerel, Bering Sea herring	• Pelagic forage availability	• State of Alaska directed capelin and herring fishery (1960s–present) • Subsistence • Foreign groundfish fishery pre-MSA (1960s–1976) forage fish bycatch and directed pollock and Atka mackerel catch • State of Alaska groundfish fisheries forage fish bycatch • Climate variability effects on recruitment and distribution	• JV groundfish fishery forage fish bycatch and pollock and Atka mackerel catch • Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries) and pollock and Atka mackerel catch	• State of Alaska capelin and herring fishery regulations	• Annual ABC and TAC limits • BSAI and GOA FMP Amendment 36/39 – protect forage fish from developing into a commercial fishery, forage fish established as bycatch only • B20 rule for prey species
Degree of spatial/temporal concentration of fishery on herring, pollock, Atka mackerel, forage species	• Spatial and temporal concentration of fishery impact on forage	• State of Alaska directed capelin and herring fishery (1960s–present) by area and season • Subsistence removals by area and season • Foreign groundfish fishery pre-MSA (1960s–1976) forage fish and herring bycatch and directed pollock and Atka mackerel catch by area and season • State of Alaska groundfish fisheries forage fish bycatch by area and season • Climate variability effects on recruitment and distribution	• JV groundfish fishery forage fish and herring bycatch and pollock and Atka mackerel catch by area and season • Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries), herring bycatch and pollock and Atka mackerel catch by area and season	• State of Alaska capelin and herring fishery regulations • State of Alaska time/area closures	• BSAI and GOA groundfish fishery time/area closures • BSAI and GOA groundfish fishery seasonal/spatial TAC allocations • Marine mammal buffer zones, SSL closures • Split Aleutian Islands into three management areas

Table 3.10-3 (cont.). Bering Sea and Aleutian Islands and Gulf of Alaska ecosystem past/present effects.

Internal Effect Indicators	Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions	
		External	Internal	External	Internal
Trophic level of the catch Population status of harvested, sensitive top predator species (whales, pinnipeds, seabirds) relative to minimum biologically acceptable limits Shark, seabird and pinniped bycatch	• Removal of top predators	• Commercial whaling and seal harvests • Shark, pinniped, and seabird bycatch in State of Alaska fisheries • Foreign groundfish fishery shark, pinniped and seabird bycatch • Climate variability effects on top predator species recruitment and distribution • Subsistence mammal harvest	• JV groundfish fishery shark, seabird and pinniped bycatch • Domestic groundfish fishery shark, seabird and pinniped bycatch	• State of Alaska fishery regulations • MMPA provisions	• Annual ABC and TAC limits • Seabird avoidance measures
Total catch levels	• Introduction of nonnative species	• Commercial shipping • Climate variability effects on probability of successful introduction	• JV groundfish fishery ballast • Domestic groundfish fishery ballast	• International laws regarding ballast water exchange	• Annual ABC and TAC limits
Discard and offal production, scavenger population trends, bottom gear effort	• Energy re-direction	• State of Alaska directed fisheries discards, offal production, and bottom gear effort • Subsistence discards and offal • Foreign groundfish fishery pre-MSA (1960s–1976) discards, offal, and bottom gear effort • Halibut fishery discards and offal • Climate variability effects on energy cycling	• JV groundfish fishery discards, offal production, and bottom gear effort • Domestic groundfish fishery discards, offal production, and bottom gear effort	• EPA and State of Alaska water quality regulations	• IR/IU • Annual ABC/TAC limits • Reduced wastage of cod and rockfish in sablefish fishery • Inshore/offshore • Ban pollock roe stripping • Reduce regulatory discard of halibut and salmon • Bottom gear restrictions and mesh size changes
Total catch removals and mass balance model measures of system maturity	• Energy removal	• State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on system production	• JV groundfish fishery removals • Domestic groundfish fishery removals	• State of Alaska fishery regulations	• PSC limits • Annual ABC/TAC limits • OY cap • Initiate and improve observer program

Table 3.10-3 (cont.). Bering Sea and Aleutian Islands and Gulf of Alaska ecosystem past/present effects.

Internal Effect Indicators	Direct/Indirect Effect	Past/Present Events		Past/Present Management Actions	
		External	Internal	External	Internal
Population levels of target, nontarget species relative to minimum biologically acceptable limits Bycatch amounts of sensitive species that lack population estimates Number of ESA listed marine species Area closures	• Species Diversity	• State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on species level diversity	• JV groundfish fishery removals • Domestic groundfish fishery removals	• State of Alaska fishery regulations • Endangered Species Act provisions	• Annual ABC/TAC limits • Initiate and improve observer program • PSC limits • Prohibit sale of coral and sponge • Area closures
Guild diversity or size diversity changes linked to fishing removals Bottom gear effort HAPC biota bycatch	• Functional Diversity	• State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on trophic diversity	• JV groundfish fishery removals • Domestic groundfish fishery removals	• State of Alaska fishery regulations	• Annual ABC/TAC limits • Prohibit sale of coral and sponge • Bottom gear restrictions
Degree of fishing on spawning aggregations or larger fish Older age group abundances of target groundfish stocks	• Genetic Diversity	• State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on genetic diversity	• JV groundfish fishery removals • Domestic groundfish fishery removals	• State of Alaska fishery regulations	• Protection of Aleutian Basin spawning pollock stock • Seasonal TAC allocations for pollock

Comparative Baseline:

- Pelagic forage availability shows BSAI pollock and Atka mackerel above MSST, GOA pollock at low abundance levels, Bering Sea herring is stable, biomass estimates for forage species are not available but bycatch estimates in groundfish fisheries are above average and relative abundance indices from bottom trawl surveys indicate possible increase in eulachon and capelin in the GOA.
- Spatial and temporal concentration of fisheries on forage - Seasonal and temporal catch allocations of pollock and Atka mackerel and SSL closures have spread out fishing removals in space and time though recent results show Bering Sea pollock fisheries increasing catch in fur seal foraging habitat.
- Removal of top predators - Historical whaling has resulted in low present day abundance of whale species in the North Pacific. Shark bycatch rates are

Table 3.10-3 (cont.). Bering Sea and Aleutian Islands and Gulf of Alaska ecosystem past/present effects.

variable by region and present day groundfish fishery impacts are unknown. There is no evidence that present levels of seabird and mammal bycatch in groundfish fisheries are an important source of mortality for most species.

- Introduction of nonnative species - Total groundfish fishery catch levels (and thus level of ballast water and hull fouling organisms release by fishing vessels) have been stable. No evidence of groundfish fishery related successful introductions of nonnative species.
- Energy re-direction - Target species discards have decreased since IR/IU. Scavenger populations (skates, gulls, etc.) do not show relationship to discard levels. Bottom trawl effort (and thus unobserved benthic organism mortality and increased availability to predators due to trawl disturbance) has decreased over time.
- Energy removal - Total groundfish catches have been relatively stable. Mass balance models indicate total amount of energy removed is a very small proportion of total biomass and that biomass and energy flow are distributed fairly well throughout the system. Bering Sea is a relatively mature (i.e., undisturbed) system compared to other shelf systems.
- Species diversity - Species level diversity has not been well-assessed. Indicators of assessed species abundance show most target species are above MSST, number of endangered/threatened marine species is not linked to present fishery removals although historical whaling has been the cause of the listing status of most whales, bycatch levels of many nontarget (nonspecified) species are unknown.
- Guild diversity - Trophic guild diversity changes are mostly related to climate induced recruitment changes and not to fishing. Bottom gear effort, which is an indicator of benthic community guild disturbance, has been decreasing. HAPC biota, a group of benthic organisms that might be considered a structural habitat guild, do not show fishing-related declines and some groups (sponge, sea anemone, and sea pens) show increasing or relative high abundance indices in recent bottom trawl surveys of the BSAI and GOA.
- Genetic diversity - There has been heavy exploitation of certain spawning aggregations historically (Bogoslof pollock) but present day spatial/temporal management of groundfish has tended to reduce fishing pressure on spawning aggregations. There is unknown effects on the genetic diversity of stocks that might have distinct genetic components occurring at finer spatial scales than the present groundfish fishery management regions.

Notes: External - Natural, climatic, and human controlled events and actions not directly associated with the NOAA Fisheries Alaska groundfish fisheries.
Internal - Events and actions directly associated with the NOAA Fisheries Alaska groundfish fisheries.

ABC - acceptable biological catch
BSAI - Bering Sea and Aleutian Islands
EPA - Environmental Protection Agency
ESA - Endangered Species Act
FMP - fisheries management plan
GOA - Gulf of Alaska
HAPC - habitat areas of particular concern
IR/IU - improved retention and improved utilization
JV - joint venture
MSA - Magnuson-Stevens Act
MSST - maximum stock size threshold
N/A - not applicable
OY - optimum yield
PSC - prohibited species catch
SSL - Steller sea lion
TAC - total allowable catch

Chapter 4
Tables

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Table 4.0-1. Comparison of fisheries management plan frameworks.

Target Species

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	**2.1**	**2.2**	**3.1**	**3.2**	**4.1**	**4.2**
• 35 target species groups (stocks or stock complexes) were analyzed; 32 are considered here and 3 (BSAI squid, BSAI Other species, GOA Other species) are considered in the Squid and Other species section of the table • 17 of the stocks or stock complexes have age-structured models and are analyzed in Tiers 1-3; 14 are managed in Tiers 4-5; and 1 is managed in Tier 6 (for further detail on the tier system, see Appendix F-1) • Stocks in Tiers 1-3: EBS and GOA Walleye Pollock, BSAI and GOA P. cod, BSAI/GOA sablefish, BSAI Atka mackerel, BSAI yellowfin sole, BSAI rock sole, BSAI flathead sole, BSAI and GOA arrowtooth flounder, BSAI Greenland turbot, BSAI Alaska plaice, BSAI and GOA Pacific ocean perch, GOA thornyhead rockfish, GOA northern rockfish • Stocks in Tiers 4-6: GOA Atka mackerel, GOA shallow water flatfish complex, GOA deep water flatfish complex, BSAI other flatfish, GOA rex sole, BSAI northern rockfish, BSAI and GOA shortraker/rougheye rockfish, BS and AI Other rockfish, GOA Other slope rockfish, GOA pelagic shelf rockfish, GOA demersal shelf rockfish, AI pollock, GOA flathead sole • "Unknown" is rated for stocks for which existing survey methodology is unable assess the appropriate life history parameters (i.e., natural mortality and maturity schedule), reliable species-level identification in the catch, and a reliable biomass estimate EXTERNALS: • several stocks may be externally impacted by the halibut fishery [landed fish are accounted for, but no observers so don't know how much discarded] • all stocks are potentially affected by a regime shift, however the directional impact cannot be predicted.						
Mortality	• The intent of this FMP is not to allow overfishing for any of the groundfish target species • Overfishing is not expected to occur for 33 out of 32 stocks or stock complexes, and cannot be determined for GOA Atka mackerel as the biomass is not known; this fishery is purposely managed as a small bycatch fishery • the BSAI OY cap and PSC caps are constraints to the expansion of the fishery • Unknowns in mortality indicate Tier 6 species	• With the exception of demersal shelf rockfish, overfishing is not expected to occur under this alternative; management of stocks does not allow the fishing mortality rate to exceed the overfishing level • Catch is expected to increase for most species under Alternative 2		• As with Alternative 1, overfishing is not expected to occur under this alternative; management of stocks does not allow the fishing mortality rate to exceed the overfishing level		• As with Alternative 1, overfishing is not expected to occur under this alternative; management of stocks does not allow the fishing mortality rate to exceed the overfishing level • Catch is expected to decrease for most species under Alternative 4	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Mortality Continued		• A general caveat for FMP 2.1 is that this harvest policy imposes a more aggressive harvest policy during periods of poor recruitment and associated declines in spawning biomass. The harvest policy was not successful in maintaining stocks above the MSST. • The risk of inadvertantly overfishing is greater because the buffer between OFL and ABC has been deleted • Relaxing the OY cap by setting the cap at the sum of OFLs, and PSC caps, will allow an increase in fishing mortality	• Fishing mortality will expand as a result of setting the OY cap at the sum of ABCs • PSC caps remain a constraint to expansion of the fishery	• Catch is expected to be similar to Alternative 1 for most species • The BSAI OY cap and PSC caps are constraints to the expansion of the fishery • Breaking sharks and skates out from the "other species" management category was not modelled, but if implemented may act as a constraint on the fisheries	• Catch is expected to be less than Alternative 1 due to conservative harvest strategy that replace the OY cap • The uncertainty correction factor, F_{60} for rockfish, and PSC caps are constraints to the expansion of the fishery	• more conservative harvest strategy for SSL prey species and rockfish • Reduced bycatch and PSC are constraints on fishing mortality • Setting ABCs for species managed in complexes at the lowest single species ABC would constrain fishing mortality	• Catch is reduced to zero for all species
Biomass	• 17 of the stocks or stock complexes are not overfished or approaching being overfished; the remainder are unknown • for 17 stocks, current levels of spawning biomass will tend towards levels that maintain the ability of the stock to sustain itself above the MSST • Unknowns indicate no MSSTs (Tier 4,5,6 stocks)	• With the exception of demersal shelf rockfish, Tier 4, 5, 6 stocks remain unknown		• For all 17 age-structured stocks whose biomass is known, the comparison of the impacts to the baseline case is similar to that in Alternative 1 • Tier 4, 5, 6 stocks remain unknown		• For most age-structured stocks whose biomass is known, the comparison of the impacts to the baseline case is similar to that in Alternative 1 • Tier 4, 5, 6 stocks remain unknown	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Biomass (Cont.)		• Under this example FMP, stocks are expected to tend toward biomass levels at or near B_{MSY}. In the next 5 years, 6 stocks are expected to fall below their MSSTs because the condition of the stock in 2002 would not be capable of sustaining the stock above the MSST if harvest levels were increased to F_{MSY} or the proxy thereof. • The impacts of FMP 2.1 on demersal shelf rockfish are significant adverse.	• The biomass of all 17 age-structured stocks remains at or above MSST, and the comparison of the impacts to the baseline case is simiilar to that in Alternative 1. • The impacts of FMP 2.2. on demersal shelf rockfish are conditionally significant adverse.			• BSAI, cod BSAI Atka mackerel, BSAI POP have a significant increase in biomass	• EBS pollock, BSAI and GOA P. Cod, BSAI Atka mackerel, BSAI POP have a significant increase in biomass

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Spatial/ Temporal Concentration of Catch, Prey Availability, Habitat Suitability	• Time and area restrictions on harvest reduce potential for problems due to spatial or temporal concentration of catch for most stocks • None of the age-structured (Tiers 1-3) stocks had a detectable trend in growth that can be attributed to fishing effects on prey species • None of the age-structured stocks had a detectable trend in growth or reproduction that can be attributed to fishing effects on habitat • Gear allocations and trawl restrictions reduce trawl impacts on habitat • Unknown's indicate stocks in Tiers 4, 5 and 6 where these stocks lack and MSST and/or knowledge of life history parameters • Rockfish species managed in Tier 3 are sustainable under this harvest strategy	• The difference in time, area and gear restrictions in Alternative 2 causes different impacts to spatial and temporal concentration of catch, prey availability and changes to habitat • Stocks or stock complexes in Tiers 4, 5 and 6 remain unknown due to lack of MSST and/or life history parameters		• For all age-structured stocks, the comparison of the impacts to the baseline case is similar to that in Alternative 1 • Time and area restrictions on harvest (under FMP 3.1, the same as FMP 1; restrictions are extended under FMP 3.2) help to diffuse impacts of spatial and temporal concentration of catch • Stocks or stock complexes in Tiers 4, 5 and 6 remain unknown due to lack of MSST and/or life history parameters		• For most age-structured stocks, the comparison of the impacts to the baseline case is similar to that in Alternative 1 • For Alternative 4, impacts on spatial/temporal concentration of catch is expected to be significantly beneficial for BSAI Atka mackerel and BSAI POP • Stocks or stock complexes in Tiers 4, 5 and 6 remain unknown due to lack of MSST and/or life history parameters	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Spatial/ Temporal Concentration of Catch, Prey Availability, Habitat Suitability (Continued)		• The impacts of trawling in regions that have previously been closed are unknown • For Atka mackerel and P. cod, it is unknown whether the spatial/ temporal concentration of catch and the change in habitat would affect the ability of the stocks to maintain themselves at or above MSST • For sablefish, the spatial/ temporal concentration is not affecting the ability of the stock to maintain itself at or above MSST, but the change in habitat effect is unknown • For EBS pollock, the spatial/ temporal concentration of catch is still restricted due to SSL protection measures; habitat impacts are considered insignificant as pollock occupy pelagic habitats • For Greenland turbot, spatial/ temporal concentration of catch would not affect genetic diversity or reproductive success, and impacts on habitat suitability are expected to be insignificant	• For age-structured stocks whose biomass remains at or above MSST, the comparison of the impacts to the baseline case is similar to that in Alternative 1				

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Spatial/ Temporal Concentration of Catch, Prey Availability, Habitat Suitability (Continued)		• For demersal shelf rockfish, the impact of spatial/ temporal concentration of catch on genetic diversity and reproductive success, and the impacts on habitat suitability.					

Prohibited Species

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
• All species within this category are managed by other agencies (federal management is deferred); directed fishery management plans incorporate bycatch mortality from the groundfish fisheries • PSC limits exist for halibut in the GOA and halibut, herring, salmon and crab in the BSAI; PSC limits are apportioned by area, gear type, and season • Herring limits are variable based on biomass; halibut limits are stair-stepped; crab limits are variable based on biomass with upper and lower caps; salmon limits incorporate fixed caps EXTERNALS: • Allocation implications of groundfish bycatch mortality on directed commercial fisheries are discussed in the Socioeconomic section • Halibut, salmon, herring and crab stocks are all affected by state commercial, recreational (for salmon in the GOA) and subsistence fisheries • Herring stocks are more vulnerable to marine pollution as they are nearshore spawners; lingering effects from the EVOS in the GOA may still exist • State hatchery programs exist for salmon stocks in the GOA; land management practices may impact freshwater spawning habitat for salmon • Some crab stocks in the BSAI are overfished; rebuilding plans are either in effect or under development for St Matthew and Pribilof Islands blue king crab, and BSAI opilio tanner crab stocks • All prohibited species stocks are potentially affected by regime shifts, however the directional impact cannot be predicted						
Pacific Halibut Stock Levels	• If changes to the baseline condition of the stock occur, quotas set by the IPHC for the directed fishery will be adjusted accordingly and account for all removals of halibut by other fisheries. • Harvest practices under this alternative are expected to have insignificant impacts on prey availability and reproductive success of halibut.	• At the Alternative 2 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1		• At the Alternative 3 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1		• At the Alternative 4 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
		• FMP 2.1 repeals the Observer Program for non-AFA fisheries, which would result in an absence of data with which to account for groundfish fishery removals • in the long-term (beyond the 5-year scope of this analysis), unregulated discards of halibut may affect stock levels					
Pacific Salmon or Steelhead Trout Stock Levels	• Projected groundfish bycatch removals under this alternative are not expected to significantly impact salmon stocks when compared to the baseline condition. However, some Pacific salmon stocks are currently depressed. • Reproductive/recruitment success and stock composition are unknown. • Potential competition for prey with groundfish fisheries and changes to genetic structure of salmon populations are unknown due to lack of bycatch and stock composition data.	• Reproductive success of BSAI salmon stocks may be adversely impacted by potential increases in bycatch of adult salmon under this alternative. Potential effects on GOA stocks are unknown.		• At the Alternative 3 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1		• Projected decreases in groundfish bycatch under this alternative may have conditionally significant beneficial impacts on BSAI and GOA salmon stocks. Although bycatch is expected to decrease under this alternative, potential population-level effects of this decrease cannot be determined. • Reproductive success of BSAI salmon stocks may benefit from projected decreases in bycatch of adult salmon under this alternative by allowing for a greater number of spawning adults to reach destined spawning grounds. Potential effects on GOA stocks are unknown.	• Elimination of groundfish bycatch under this alternative may benefit BSAI and GOA salmon stocks due to their currently depressed status and lack of recovery shown to date. However, the magnitude of this effect cannot be determined. • Beneficial effects of this alternative on reproductive success of BSAI salmon stocks are considered conditionally significant by allowing for a greater number of spawning adults to reach destined spawning grounds. Potential effects on GOA stocks are unknown.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
	• No direct interaction between groundfish fisheries and freshwater salmon spawning habitat occurs.	• Projected groundfish bycatch under this alternative may have conditionally significant adverse impacts on BSAI and GOA salmon stocks due to their currently depressed status and the lack of recovery shown to date.	• Projected groundfish bycatch under this alternative may have conditionally significant adverse impacts on BSAI salmon stocks due to their currently depressed status and lack of recovery shown to date. Potential effects on GOA stocks are insignificant based on minimal projected increases in bycatch that would result from this alternative.				
Pacific Herring Stock Levels	• Groundfish bycatch removals are expected to have insignificant impacts on mortality and reproductive success of herring. • Harvest practices are expected to have insignificant impacts on prey availability for herring. • Changes to herring habitat due to groundfish fishery management are insignificant; lingering contamination from EVOS in the GOA on certain herring habitat exists, but effects are unknown.	• At the Alternative 2 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1		• At the Alternative 3 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1		• At the Alternative 4 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Crab Stock Levels (Opilio Tanner, other Tanner, Red, Blue and Golden King)	• Effects on mortality and biomass of GOA red king crab stocks and all BSAI crab stocks (except golden king) are insignificant when compared to current baseline condition. Potential effects on BSAI golden king crab stocks and GOA crab stocks (other than red king crab) are unknown although some of these stocks are currently considered depressed. • Changes to BSAI and GOA crab habitat due to groundfish fishery management are insignificant. It is inferred that current crab management and rebuilding plans are mitigating past habitat disruption and providing protection for crab stocks. • Potential impacts of harvest practices on crab prey availability are unknown due to lack of information on prey composition; potential effects on reproductive success of BSAI and GOA crab stocks are unknown.	• Effects of FMP 2.1 on mortality and biomass of GOA crab stocks (except golden and blue king) and BSAI crab stocks (except golden king) are considered significantly adverse to the sustainability of these stocks. Potential effects on BSAI and GOA golden king crab stocks and GOA blue king crab stocks are unknown although they are considered generally depressed. • Removal of current trawl closures and protection areas for crab habitat under this FMP may have adverse implications on many GOA and BSAI crab stocks; the possible adverse effects to habitat could indirectly affect the reproductive success of crab stocks by negatively impacting essential fish habitat.	• FMP 2.2 is considered to have a conditionally significant adverse effect on mortality and biomass of bairdi Tanner, opilio Tanner, red king, and blue king crab stocks in BSAI given the potential for increased bycatch of these species combined with the apparent lack of recovery for these stocks to date; effects on mortality and biomass of BSAI and GOA golden king crab as current stock status is unknown due to lack of survey information. • Potential impacts on crab habitat are insignificant, and effects on reproductive success are unknown.	• Although bycatch of crab could decrease under this alternative, and additional protection measures to crab habitat could assist a possible recovery of depressed stocks, these changes are not expected to significantly affect BSAI crab at the population level. • Effects on reproductive success of BSAI and GOA crab stocks are unknown.		• Alternative 4 has conditionally significant beneficial effects on bairdi Tanner, opilio Tanner, red king, and blue king crab stocks in BSAI as the decrease in bycatch of crab, and potential for additional protection to crab habitat may result in possible recovery of depressed stocks. However, the rating is conditional as no signs of recovery for these stocks have yet been seen under current management and rebuilding plans. • Potential effects of Alternative 4 on GOA stocks cannot be determined. • Effects on reproductive success of BSAI and GOA crab stocks are unknown.	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

Squid and Other Species

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
• BSAI manages squid, and "Other species" categories (latter includes skates, sharks, sculpin and octopi); GOA manages "Other species" category that includes squid, skates, sharks, sculpin and octopi • in BSAI, managed in Tier 6; in GOA, 5 percent of the sum of all of the groundfish ABCs = "other species" TAC EXTERNAL: • human-controlled and climatic effects may impact the 'other species' complex, but current stock status is unknown so potential effects cannot be determined.							
	• No comparative baseline exists and potential impacts/changes to stock sustainability are unknown.	• No comparative baseline exists and impacts of Alternative 2, as with Alternative 1, are unable to be determined.		• No comparative baseline exists and impacts of Alternative 3, as with Alternative 1, are unable to be determined.		• No comparative baseline exists and impacts of Alternative 4, as with Alternative 1, are unable to be determined.	

Forage Fish Species

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
• management category that includes osmeridae, myctophidae, bathylagidae, ammodytidae, trichodontidae, pholidae, stichaeidae, gonostomatidae, and euphausiacae • special management where not allowed to keep more than 2% of the landed catch EXTERNAL: • forage fish are more likely to be sensitive to marine pollution as they utilize inshore areas for spawning or foraging that are likely to be more impacted by oil spills than other areas • all stocks are potentially affected by a regime shifts, however the directional impact cannot be predicted							
	• Insignificant fishing mortality because the level of catch is very small • Fishery independent surveys for forage fish have not been implemented therefore biomass estimates remain uncertain, however preliminary estimates for ecosystem models suggest that standing stocks of forage fish are stable	• Removes the ban on a directed forage fish fishery. • If a fishery were to be developed, for biological and economic reasons the most likely forage species group to be exploited would be the smelts (Osmeridae). • If an intensive, directed fishery for smelt was developed a negative impact on forage fish populations would be possible.	• The comparison of impacts to the baseline case is similar to Alternative 1	• The comparison of impacts to the baseline case is similar to Alternative 1		• The comparison of impacts to the baseline case is similar to Alternative 1	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
	• No comparative baseline exists to determine prey availability, habitat suitability and spatial temporal catch distribution impacts	However on the large scale, due to economic factors, it is unlikely that a fishery with enough intensity would be able to developed sufficiently to reduce forage fish populations to below a sustainable level. • It is possible that a fishery could create localized forage fish depletions that could place competitive stress on predator populations (seabirds, marine mammals, groundfish).					

Non-specified Species

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
• management category consists of many species. This document only analyzes impacts to grenadiers; grenadiers make up the largest proportion of non-specified species bycatch. • although coral species are included in the non-specified species management category, impacts are summarized under the EFH section of this document. EXTERNAL: • human-controlled and climatic effects may impact non-specified species, but current stock status is unknown so potential effects cannot be determined.							
	• No comparative baseline exists and potential impacts/changes to stock sustainability are unknown.	• No comparative baseline exists and potential impacts of Alternative 2, as with Alternative 1, are unknown.		• No comparative baseline exists and potential impacts of Alternative 3, as with Alternative 1, are unknown.		• No comparative baseline exists and potential impacts of Alternative 4, as with Alternative 1, are unknown.	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

Habitat

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
• Careful placement of closures are needed for habitat to benefit; small closures within heavily fished areas can benefit habitat and reduce unintended consequences of displaced effort, while closures that encompass heavily fished areas could result in displaced effort causing more habitat impacts • The potential effects of the groundfish fisheries used to compare the alternatives were the mortality of and damage to living habitat, changes to benthic community diversity, and changes to the geographic diversity of impacts and protection. • Specific impacts are very difficult to predict. Evaluation of effects requires detailed information on the distribution and abundance of habitat types, the life history of living habitat, habitat recovery rates, and the natural disturbance regime. This information is generally incomplete. • Qualitative judgements as to the significance of effects were made after considering information on 1) bycatch of living habitat derived from the multi-species projection model; 2) the results of a habitat impacts model for estimates of the equilibrium levels of living habitat in fishable and currently fished areas; 3) estimates of the amount of area by habitat type and geographic zone closed year round to bottom trawling for all species; and 4) evaluation of the spatial distribution of bottom trawl closures relative to fishing intensity and habitat types. • This analysis does not include impacts of the alternatives on non-living habitat.							
Direct Mortality of Benthic Organisms: Impact to Habitat Features	• BS: Insignificant relative to the baseline; conditionally significant adverse when cumulative impacts are considered because large areas of intense fishing being fished at rate to potentially reduce bioshelter habitat to low % of unfished level. • AI: Insignificant relative to the baseline, conditionally significant adverse because coral habitat may still be decreasing to low equilibrium level. • GOA: Insignificant relative to the baseline, conditionally significant adverse when cumulative impacts are considered because areas of intense fishing are being fished at rate to potentially reduce bioshelter habitat to low percent of unfished level.	• BS: Significant adverse, opens up currently unfished habitat and increases effort as necessary to take increased TACs • AI: Significant adverse, increases effort necessary to take increased TACs • GOA: Significant adverse, opens up currently unfished habitat and increases effort as necessary to take increased TACs.	• BS: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered • AI: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered • GOA: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered	• BS: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered • AI: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered • GOA: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered	• BS: Insignificant/ Conditionally Significant Beneficial, closed areas are lightly fished, not much effort diverted, one would expect only slight decrease in impact from this closure distribution. Reduction in ABCs may provide benefit. Could be significantly improved with strategically placed, smaller closure areas. • AI: Significant Beneficial, closures often bisect fishing concentrations which is good strategy; reduction in ABCs, due to $F_{60\%}$ and implementation of uncertainty correction, should provide benefit.	• BS: Significant Beneficial, closure of an entire major fishing area, requiring displacement of effort to take catch from low density, lightly impacted area. Reduction in TAC and restrictions to trawling likely to compensate. • AI: Significant Beneficial, high proportion, most of the region is closed. • GOA: Significant Beneficial, most of the region closed, however, all heavily fished areas are closed and effort transferred to lightly fished areas. Reduction in TAC and restrictions to trawling likely to compensate.	• BS, AI, GOA: Significant Beneficial, benthic organisms will begin to increase in abundance toward the unfished equilibrium from their baseline levels. Returning to equilibrium levels may take an extremely long time for species like tree corals.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
					• GOA: Significant Adverse / Insignificant, many closures encompass high fishing concentrations, resulting in much higher effort in current lightly fished areas. Reduction in ABCs may not compensate for probable increase in effort/catch. Could be significantly improved with strategically placed closures.		
Benthic Community Structure: Benthic Community Diversity	• BS, AI, GOA: Insignificant change relative to baseline; conditionally significant adverse, when historical fishing considered along with continued fishing at FMP 1 levels. Closure areas are mostly in one habitat type.	• BS: Significant Adverse, lack of closure areas and increased effort would reduce diversity. • AI: Significant Adverse, increased impact from increased effort would decrease diversity. • GOA: Significant Adverse, lack of closure areas and increased effort would reduce diversity.	• BS, AI, GOA: Insignificant change relative to baseline; conditionally significant adverse, when historical fishing considered along with continued fishing at FMP 1 levels. Closure areas are mostly in one habitat type.	• BS, AI, GOA: Insignificant change relative to baseline; conditionally significant adverse, when historical fishing considered along with continued fishing at FMP 1 levels. Closure areas are mostly in one habitat type.	• BS: Conditionally Significant Beneficial*, may be some gain in diversity by closing lightly fished areas and effort reduction due to any reduction in catch. • AI: Significant Beneficial • GOA: Insignificant**, transferring impact from already heavily impacted area to lightly impacted area may not provide gain in overall diversity.	• BS, AI, GOA: Significant Beneficial. Benthic community may progress toward unfished level and composition. Some species may recover extremely slowly or not all, depending on life history requirements.	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Benthic Community Structure: Geographic Diversity of Impacts and Protection	• BS: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. • AI: Insignificant relative to baseline; when cumulative impacts considered, conditionally significant adverse as very little closure area, restricted to small radius around SSL habitat haulouts. • GOA: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types.	• BS: Conditionally Significant / Significant Adverse; baseline closure area, with boundary that abuts an area of intermediate fishing intensity and provides some diversity of impact, is eliminated in 2.1. • AI: Insignificant, baseline has no closed area boundaries to eliminate. • GOA: Conditionally Significant / Significant Adverse, baseline closure area, with boundary that abuts an area of intermediate fishing intensity and provides some diversity of impact, is eliminated in 2.1.	• BS: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. • AI: Insignificant relative to baseline, when cumulative impacts considered, conditionally significant adverse as very little closure area, restricted to small radius around SSL habitat haulouts. • GOA: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types.	• BS: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. • AI: Insignificant relative to baseline, when cumulative impacts considered, conditionally significant adverse as very little closure area, restricted to small radius around SSL habitat haulouts. • GOA: Insignificant relative to baseline, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types.	• BS: Significant Beneficial, one closure boundary bisects a high F concentration providing diversity. Could be significantly improved with smaller closure areas strategically located. • AI: Significant Beneficial, some closure areas bisect high F clusters. Closures placed somewhat randomly along the AI. • GOA: Insignificant, closures encompass habitat units and high F clusters, leaving little contrast or diversity in impact levels within habitat. Could be significantly improved with smaller closure areas strategically located.	• BS: Significant Beneficial, one closure area bisects an area of intense fishing providing diversity of impact in that habitat. Very little impact diversity within habitats elsewhere. • AI: Significant / Conditionally Significant Beneficial, all areas of intense fishing are encompassed by closures, providing little impact diversity. Some contrast in impact may occur when effort is confined to the few remaining open areas. • GOA: Insignificant, closure areas encompass all areas of intense fishing. Reallocated effort to open areas may not provide strong contrast in fishing impacts.	• The predicted change to geographic diversity of impacts is not applicable in a scenario where no fishing occurs.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

Seabirds

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
• the potential effects of the groundfish fishery that were used to compare the alternatives included incidental take in fishing gear and vessel strikes, changes in prey availability and offal, and changes in benthic habitat that affect the food web • significance criteria were based on whether the proposed action would be likely to result in population level effects, which are defined as changes in the population trend outside the range of natural fluctuations. Although the number of individual seabirds that would be expected to be taken under the Alternative FMPs varies considerably, this difference may not be discernible by looking at a shared rating. • except for the supplemental food provided by the fisheries in the form of offal, the effects of the fisheries are all considered adverse to individual birds. Low levels of incidental take are better for conservation purposes than high levels of take, but no amount of incidental take can be considered beneficial to a seabird population. The significance ratings for incidental take are therefore only insignificant or adverse. EXTERNAL: • potential effects that are the result of vessel traffic rather than fishing effort, such as oil spills, plastic pollution, and introduction of nest predators • similar effects from other U.S. and foreign fisheries, subsistence and commercial harvests • pollution from marine and terrestrial sources, conservation efforts for particular species and seabirds in general, and natural events such as						
Incidental Take	• Incidental take of surface-feeding seabirds substantially reduced from baseline levels due to new mitigation measures on longline fleet.	• Incidental take of seabirds on longline gear likely to remain near baseline levels due retention of existing avoidance regulations and similar longline effort under both FMP bookends. Incidental take from trawls expected to vary from substantial to moderate increases above baseline levels in proportion to increased trawl effort under the different bookends.		• Incidental take of albatross, fulmars, shearwaters, and gulls substantially reduced from baseline levels due to new mitigation measures on longline fleet. • New mitigation measures for trawl fleet likely to reduce collisions with trawl third wires.		• Incidental take of albatross, fulmars, shearwaters, and gulls greatly reduced from baseline levels due to new mitigation measures on longline fleet and greatly reduced fishing effort. • New mitigation measures for trawl fleet and greatly reduced fishing effort likely to substantially reduce collisions with trawl third wires.	
Risk to ESA-listed Species	• Risk of exceeding ESA threshold for mortality of short-tailed albatross reduced from baseline level.	• Risk of exceeding ESA threshold for mortality of short-tailed albatross increased above baseline level under both bookends.		• Risk of exceeding ESA threshold for mortality of short-tailed albatross reduced from baseline level due to longline and trawl mitigation measures.		• Risk of exceeding ESA threshold for mortality of short-tailed albatross greatly reduced from baseline level due to longline and trawl mitigation measures and reduced fishing effort.	
Population-level effects	• Groundfish fishery not expected to have population level effects on any species through mortality, changes in food availability, or benthic habitat.	• Potential effects on northern fulmars range from colony level effects through increased mortality around the Pribilof Islands to less serious effects, similar to the baseline. • Potential effects on piscivorous species, including species of management concern, range from substantial to minimal, depending on the development of a directed forage fish fishery and increases in trawl effort.		• Groundfish fishery not expected to have population level effects on any species through mortality, changes in food availability, or benthic habitat.		• Groundfish fishery not expected to have population level effects on any species through mortality, changes in food availability, or benthic habitat.	
Cumulative effects	• conditionally significant adverse for short-tailed albatross through mortality, with a potential catastrophic contribution from volcanic eruptions on Torishima Island • significant adverse for Laysan and black-footed albatross through mortality, mostly in foreign longline fisheries • conditionally significant adverse for both shearwaters through mortality, with major contributions from harvest on breeding grounds in southern hemisphere • conditionally significant adverse for red-legged kittiwakes because of concentrated population distribution and declining population on Pribilof colony. Mechanisms for decline under investigation. • significant adverse for marbled and Kittlitz's murrelets because of substantial population declines with major contributions of mortality from coastal net fisheries • insignificant for all other species through mortality, prey availability, and benthic habitat						

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

Marine Mammals

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
• Marine mammal species groups were aggregated in this comparison table to combine marine mammal species which are consumers of groundfish (with the exception of the western stock of Steller sea lions which was separated from this group) and marine mammal species that do not consume groundfish of commercial size as a primary component of their diet as the effects are similar within the alternatives for all of the species included in each of these categories. • Species in the groundfish consuming category include the eastern stock of Steller sea lions, harbor seals, and northern fur seals. Species groups in the non-groundfish consuming category include transient killer whales, other pinnipeds, other toothed whales, and sea otters. • As defined here, "effects" refers to effects expected to occur at the population level.							
Western stock of Steller sea lions: Incidental Take/ Entanglement in Marine Debris	• The groundfish fishery does not result in increased levels of incidental takes such that population level effects would occur and is determined to be insignificant to the western stock of Steller sea lions. • Cumulatively, significant adverse population level effects are expected on western Steller sea lions due to additional external effects including subsistence harvest, takes in state and other fisheries, and marine pollution. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock of Steller sea lion recovery and survival in the wild.	• No change from effects described under FMP 1		• No change from effects described under FMP 1		• No change from effects described under FMP 1	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Western stock of Steller sea lions: Harvest of Prey Species	• The groundfish fishery is determined to be insignificant to Steller sea lions under this FMP scenario. • Cumulatively, significant adverse population level effects are expected on western Steller sea lions due to additional external effects including state and other fisheries, harvest of prey in the past, and marine pollution. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock of Steller sea lion recovery and survival in the wild.	• The groundfish fishery will result in significant adverse population level effects due to increased catch of all key groundfish prey species (EBS and GOA pollock, BSAI and GOA P. Cod, and AI Atka mackerel)	• The groundfish fishery will have conditionally significant adverse effects on Steller sea lions due to increased catch of EBS pollock, BSAI P. cod, and AI Atka mackerel. • Considering past and external effects on the prey field, such as state and other fisheries, and past harvest of prey, significant adverse effects on Steller sea lions are expected	• No change from effects described under FMP 1		• The groundfish fishery will result in significant beneficial population level effects on Steller sea lions due to decreased catch of EBS and GOA pollock, BSAI and GOA P. Cod, and AI Atka mackerel. • Cumulatively, this FMP may result in significant beneficial population level effects on Steller sea lions due to the overall improvement in the prey field which may occur under this regime.	• No change from effects described under FMP 1 for Steller sea lion stocks

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Western stock of Steller sea lions: Spatial/ Temporal Concentration	• Measures to decrease competition between Steller sea lions and fisheries by dispersing the fisheries over time and space have been retained under this FMP; additional effects to marine mammals that consume groundfish are not expected under this FMP. • Cumulatively, with past and external effects, significant adverse effects on Steller sea lions may still occur due to state and other fisheries. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock of Steller sea lion recovery and survival in the wild.	• Measures to decrease competition between Steller sea lions and fisheries by dispersing the fisheries over time and space have been retained under this FMP; however other area closures are repealed and significant adverse effects to this species may occur due to these changes, especially when past and external effects of state and other fisheries are considered	• No change from effects described under FMP 1	• No change from effects described under FMP 1	• Measures to decrease competition between Steller sea lions and fisheries by dispersing the fisheries over time and space have been retained under this FMP; 'conditionally significant' benefits to Steller sea lions may occur due to closures out to 15nm and designation of MPAs under this FMP even when past and external effects are taken into account	• Under this FMP spatial and temporal protective measures are substantially increased in addition to Steller sea lion protective measures; therefore, significant beneficial effects are expected when considering this FMP and past and external effects	• This FMP eliminates spatial and temporal competition between marine mammal species and fisheries at least in the short term; over the long term, fisheries would not be permitted until they could be shown to be inconsequential to the western stock of Steller sea lions, thus this FMP is expected to result in significant beneficial effects in regards to spatial and temporal concentration
Western stock of Steller sea lions: Disturbance	• This groundfish fishery is insignificant in regarding disturbance of Steller sea lions	• This groundfish fishery is expected to result in conditionally significant effects if disturbance increases due to opening new areas and increasing TAC	• No change from effects described under FMP 1	• No change from effects described under FMP 1		• No change from effects described under FMP 1	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Groundfish Consumers: Incidental Take/ Entanglement in Marine Debris	• The groundfish fishery does not result in increased levels of incidental take such that population level effects would occur and is determined to be insignificant to marine mammals. • Cumulatively, conditionally significant adverse effects are expected for northern fur seals and harbor seals due to their past and present population declines; effects on the eastern stock of Steller sea lions will be insignificant	• No change from effects described under FMP 1		• No change from effects described under FMP 1		• No change from effects described under FMP 1	
Groundfish Consumers: Harvest of Prey Species	• The groundfish fishery is determined to be insignificant to these marine mammals under this FMP scenario. • Cumulatively, significant adverse population level effects are expected on northern fur seals and harbor seals due to their past and present population declines	• The groundfish fishery will result in significant adverse population level effects due to increased catch of all key groundfish prey species (EBS and GOA pollock, BSAI and GOA P. Cod, and AI Atka Mackerel)	• The groundfish fishery will have conditionally significant adverse effects on these marine mammal species due to increased catch of EBS pollock, BSAI P. cod, and AI atka mackerel. • Considering past and external effects on the prey field, such as state and other fisheries, and their past and present population	• No change from effects described under FMP 1		• The groundfish fishery will result in significant beneficial population level effects on these marine mammal species due to decreased catch of EBS and GOA pollock, BSAI and GOA P. Cod, and AI Atka mackerel.	• The groundfish fishery is expected to result in conditionally significant beneficial effects on fur and harbor seals as catch of these key prey species is eliminated (at least in the short term); the effect is conditional due to the uncertainty of the dependance of northern fur seals on the size class of pollock harvested in the groundfish fishery

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Groundfish Consumers: Harvest of Prey Species (Cont.)	and additional external effects from state and other fisheries, past harvest of prey, and marine pollution.		declines, conditionally significant adverse effects on northern fur seals and harbor seals are expected; cumulatively, these effects are determined to be insignificant for the eastern stock of Steller sea lions			• Cumulatively, this FMP may result in significant beneficial population level effects on these marine mammal species due to the overall improvement in the prey field which may occur under this regime.	
Groundfish Consumers: Spatial/ Temporal Concentration	• Steller sea lion protective measures disperse the fisheries over time and space and have been retained under this FMP; these protective measures provide benefits to other marine mammals that consume groundfish; the groundfish fishery is expected to be insignificant to species in this category. • With past and external effects, significant adverse effects may still occur to northern fur seals and harbor seals due to their past and present population declines although effects are expected to be insignificant to the eastern stock of Steller sea lions	• Measures to decrease competition between Steller sea lions and fisheries by dispersing the fisheries over time and space have been retained under this FMP; however other area closures are repealed and adverse effects to these species may occur due to these changes, especially when past and external effects are considered	• No change from effects described under FMP 1	• No change from effects described under FMP 1	• Measures to decrease competition between Steller sea lions and fisheries by dispersing the fisheries over time and space have been retained under this FMP; additional benefits to marine mammals that consume groundfish may occur due to closures out to 15nm and designation of MPAs under this FMP even when past and external effects are taken into account; although no change is expected for the eastern stock of Steller sea lions	• Under this FMP spatial and temporal protective measures are substantially increased in addition to Steller sea lion protective measures; therefore, significant beneficial effects are expected when considering this FMP and past and external effects	• This FMP eliminates spatial and temporal competition between marine mammal species and fisheries at least in the short term; over the long term, fisheries would not be permitted until they could be shown to be inconsequential to marine mammal species in this group, thus this FMP is expected to result in significant beneficial effects in regards to spatial and temporal concentration

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Groundfish Consumers: Disturbance	• This groundfish fishery is insignificant regarding disturbance to these marine mammal species	• This groundfish fishery is expected to result in conditionally significant adverse effects if disturbance increases due to opening new areas and increasing TAC	• No change from effects described under FMP 1	• No change from effects described under FMP 1		• No change from effects described under FMP 1	
Non-Groundfish consumers: Incidental Take/Entanglement in Marine Debris	• The groundfish fishery under this FMP does not result in increased levels of incidental take such that population level effects would occur and is determined to be insignificant to marine mammals. • Cumulatively, the effect of incidental take and entanglement was determined to be insignificant for almost all species within this group. For some species in the "other pinniped" group, spotted, ringed, bearded and ribbon seal, conditionally significant adverse effects could occur due to high substance harvest level without an accurate population size for these species. For sea otters and endangered whales, conditionally significant adverse effects could occur due to recent	• No change from effects described under FMP 1.		• No change from effects described under FMP 1.		• No change from effects described under FMP 1.	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Non-Groundfish consumers: Incidental Take/Entanglement in Marine Debris (Cont.)	declines or endangered status. Groundfish fisheries' contribution to any of these cumulative effects is very low.						
Non-groundfish Consumers: Harvest of Prey Species	• The groundfish fishery is determined to be insignificant to these marine mammals for prey availability under this FMP. • Cumulatively, effect on availability of prey is insignificant at the population level for all of these species primarily due to limited prey overlap with species caught by the groundfish fisheries.	• No change from effects described under FMP 1		• No change from effects described under FMP 1		• No change from effects described under FMP 1	
Non-groundfish Consumers: Spatial/ Temporal Concentration	• Steller sea lion protection measures disperse the fisheries over time and space and have been retained under this FMP; these protective measures provide benefits to other marine mammals; the groundfish fishery is expected to be insignificant to species in this category.	• No change from effects described under FMP 1		• No change from effects described under FMP 1		• No change from effects described under FMP 1	• Closure of the fishery in the short-term would provide benefits to marine mammals • the impact of the groundfish fishery is expected to be insignificant to species in this group • Cumulatively, the spatial and temporal concentration of the groundfish fisheries under the FMP is found to be insignificant for all species in this group.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Non-groundfish Consumers: Spatial/ Temporal Concentration (Cont.)	• Cumulatively, the spatial and temporal concentration of the groundfish fisheries under the FMP is found to be insignificant for all species in this group.						
Non-groundfish Consumers: Disturbance	• This impacts of disturbance by the groundfish fishery of these marine mammal species is insignificant • Cumulatively, disturance is found to be insignificant for all species in this group as there is no change from the baseline level of disturbance.	• The groundfish fishery under this FMP is expected to result in conditionally significant adverse effects on all species in this group except sea otters, if disturbance increases due to opening new areas and increasing harvest levels. • Cumulatively, disturbance is found to be conditionally significant adverse for all species in this group, resulting in potential population level effects. This is conditional on the actual location and timing of new disturbance.	• No change from effects described under FMP 1	• No change from effects described under FMP 1		• No change from effects described under FMP 1	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

Socioeconomic

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	**2.1**	**2.2**	**3.1**	**3.2**	**4.1**	**4.2**
Assessment of socioeconomic impacts considers important factors including: • Impacts on harvesting and processing sectors, including 1) CVs, 2) CPs, and 3) inshore processors and motherships; using catches of all groundfish species, groundfish ex-vessel value and product value, groundfish employment and payments to labor, excess capacity, product quality, product utilization rates, average costs, and fishing vessels safety as variables • Impacts of groundfish alternatives on other non-groundfish directed commercial fisheries, such as halibut, salmon, crab and herring • Regional impacts, on 6 regions (AKAPAI, AKKO, AKSC, AKSE, ORCO, WAIW, using processing, harvesting, payments to labor, and employment variables • Community Development Quota-related impacts, including changes to the CDQ program and changes to the CDQ species TACs • Subsistence-related impacts on groundfish, Steller sea lion and salmon subsistence, as well as opportunities for practicing subsistence • Environmental justice impacts resulting from changes in fishing activity, or impacts to the CDQ program or subsistence • Impacts on consumer benefits (U.S. consumers of groundfish products) • Impacts on benefits from marine ecosystems (other than those benefits related to commercial groundfish fisheries) including non-market (existence value and option value, etc.) and other uses of the ecosystem such as recreational fishing or tourism							
Significance Thresholds: • In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. • The same threshold is roughly used to assess changes in qualitative indicators (e.g., fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgment of the socioeconomic analysts.							
Harvesting and processing sectors: Catch, value, employment and income	• Under FMP 1, projected changes in groundfish harvests are insignificant, except P. cod, sablefish and rockfish catch increases significantly due to a TAC increase • Changes in total groundfish ex-vessel value, product value, employment, and payments to labor are insignificant	• Under FMP 2.1, the higher TACs and elimination of PSC limits cause harvests of all groundfish species to increase significantly.	• Under FMP 2.2, the higher TACs cause harvests of pollock and P. cod to increase significantly, but catches of flatfish and the A-R-S-O complex as a whole will not change significantly.	• Under FMP 3.1, projected changes in groundfish harvests are insignificant, except P. cod, sablefish and rockfish catch increases significantly due to a TAC increase.	• Under FMP 3.2, P. cod catch increases significantly due to a TAC increase and catches of sablefish and rockfish decrease significantly because of a more conservative TAC.	• Under FMP 4.1, the lower TACs cause harvests of groundfish species to decrease significantly, except catches of flatfish are not expected to change significantly.	• Under FMP 4.2 while vessels and processing facilities across and within various classes differ in their dependence on groundfish fisheries, the suspension of the groundfish fisheries is expected to have a significant negative effect on the average vessel and plant in all classes in terms of catches of all

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Harvesting and processing sectors: Catch, value, employment, and income (Cont.p	- The total ex-vessel value of groundfish landed by CVs and the total groundfish product value of CPs and inshore processors/ motherships are expected to increase but not significantly. - Increased P. cod harvests by smaller trawl CVs and pot CVs account for much of the increase in groundfish ex-vessel value - Increased P. cod harvests by head-and-gut trawl CPs, longline CPs and pot CPs account for much of the increase in product value for CPs - Increased deliveries of P. cod to BS pollock, AKAPAI and AKKO shore plants, and floating inshore processors, account for much of the increase in groundfish product value for inshore processors					• The decreases lead to significant decreases in total groundfish ex-vessel value, product value, employment, and payments to labor. - Decreases in ex-vessel value are significant for all classes of Cvs. - Decreases in product value are significant for all classes of CPs, inshore processors and motherships.	groundfish species, groundfish ex-vessel value and product value, groundfish employment and payments to labor.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Catch, value, employment and income (Cont.)		• These increases lead to significant increases in total groundfish ex-vessel value, product value, employment, and payments to labor. - Increases in ex-vessel value are significant for all classes of CVs. - Increased pollock harvests by the three classes of AFA-eligible trawl CVs account for much of the increase in groundfish ex-vessel value. - Increases in product value are significant for all classes of CPs, inshore processors and motherships. - Increased harvests of pollock by surimi trawl CPs and fillet trawl CPs account for much of the increase in product value for CPs, while increased deliveries of pollock and P. cod to BS pollock shore plants account for much of the increase in product value for inshore processors.		• Changes in total groundfish ex-vessel value, product value, employment, and payments to labor are insignificant. - The total ex-vessel value of groundfish landed by CVs and the total groundfish product value of CPs and inshore processors/motherships are expected to increase but not significantly. - Increased P. cod harvests by smaller trawl CVs and pot CVs account for much of the increase in groundfish ex-vessel value. - Increased P. cod harvests by head-and-gut trawl CPs, longline CPs and pot CPs account for much of the increase in product value for CPs. - Increased deliveries of P. cod to BS pollock, AKAPAI and AKKO shore plants, and floating inshore processors, account for much of the increase in groundfish product value for inshore processors.			
					- Longline vessels are expected to experience a significant reduction in ex-vessel value due to the decrease in the catch of sablefish and rockfish. - Decreased deliveries of rockfish and sablefish will have a significant negative impact on the product value of AKSE and AKSC shore plants.		

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Harvesting and processing sectors: Excess capacity, product quality and utilization, costs, vessel safety	• FMP 1 is expected to reuslt in insignificant changes in product quality, product utilization rates, excess capacity, average coasts, and fishing vessel safety for all harvesting and processing sectors.	• The repeat of overcapacity measures is expected to result in significantly higher excess capacity and higher average costs in the harvesting sector, but excess capacity and average costsw are expected to be significantly lower for inshore processors as a rsult of increased throughput. • Elimination of area closures could result in a significatn improvement in fishing vessel safety, while internsification of the race for fish could result in a significant reduction in vessel safety. • Change in product quality and product utilization rates are expected to be insignificant, except the quality of sablefish may be adversely affected by the resumption of the race for fish.	• FMP 2.2 is expected to result in insignificant changes in product quality, product utilization rates, excess capacity, average costs, and fishing vessel safety for all harvesting and processing sectors, except excess capacity and average costs are expected to be significantly lower for inshore processors as a result of increased throughput.	• FMP 3.1 is expected to result in a conditionally significant increase in product quality, product utilization rates and fishing vessel safety and a conditionally significant decrease in excess capacity and average costs for all harvesting and processing sectors, depending on the extent to which additional fisheries are rationalized.	• As the result of comprehensive rationalization of the fisheries, FMP 3.2 Is expected to result in a significant decrease in excess capacity in the harvesting and processing sectors. • Rationalization is expected to result in a significant increase in product quality and a significant decrease in average costs and increase in fishing vessel safety, while the additional area closures are predicted to result in a significant decrease in product quality and a significant increase in average costs and decrease in fishing vessel safety.	• The reduced TACs are expected to result in a significant increase in excess capacity and average costs. The expanded area closures are expected to result in a significant increase in average costs and reduction in fishing vessel safety. • As the result of the area closures, product quality for Cps is expected to experience a conditionally significant decrease while product quality for inshore processors is expected to experience a significant decrease. • In contract, FMP 4.1 is expected to result in a conditionally significant increase in product utilization rates as a result of the extension of ir/iu regulations to all target fisheries.	• Under FMP 4.2, the suspension of the groundfish fisheries is expected to have a significant negative effect on the average vessel and plant in all classes in terms of excess capacity, product quality, product utilization rates, and average costs. In the absence of the groundfish fisheries, fishing vessel safety is expected to significantly improve.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Effects on other commercial fisheries (halibut, salmon, crab, and herring)	• Effects on Prohibited Species harvested in other commercial fisheries (salmon, crab, and herring) are expected to be insignificant, resulting in insignificant cumulative effects on these commercial fisheries.	• The repeal of bycatch restrictions, coupled with elimination of observers and a more aggressive fishing policy, is likely to result in significant increases in catch of Prohibited Species. • Increased halibut bycatch could result in a decrease in commercial halibut catch of up to 20%. • Increases in bycatch of herring and crab would adversely effect those commercial fisheries. • In the case of salmon, significant increases in salmon bycatch would contribute to the continued suspension of commercial salmon fishing in western Alaska, and could adversely effect commercial fishing for Chinook salmon in the Gulf of Alaska.	• Prohibited Species Catch limits are the same as Alternative 1, and cumulative effects on Prohibited Species harvested in other commercial fisheries (salmon, crab, and herring) are expected to be insignificant	• Reductions in bycatch of Prohibited Species by 10 percent, while not having a significant effect on status those stocks, would have some beneficial effects on availability to the commercial halibut fishery. • Cumulative effects of reduced bycatch on salmon, herring, and commercial fisheries are expected to be insignificant.	• Reductions in bycatch of Prohibited Species by 10 to 30 percent, while not having a significant effect on status those stocks, would have some beneficial effects on availability to the commercial halibut fishery. • Cumulative effects of reduced bycatch on salmon, herring, and commercial fisheries are expected to be insignificant.	• Reductions in bycatch of Prohibited Species by 50 percent, while not having a significant effect on status those stocks, would have beneficial effects on their availability to other commercial fisheries. • Halibut available to commercial harvest could increase by up to 5%. • The reduction in bycatch of salmon would not likely contribute enough to re-establish western Alaska commercial fisheries, but would make additional catch available to GOA commercial fisheries. • Additional herring would be available to commercial fishing but would be considered insignificant. • Based on other external factors that affect the status of crab stocks and availability for commercial fishing in is uncertain whether more crab would become available for commercial fishing.	• Suspension of the groundfish fishery would temporarily eliminate prohibited species catch. • Current halibut bycatch would be potentially available to commercial harvest, representing up to 10% of the current catch. • Elimination of salmon bycatch by itself would not likely contribute enough to re-establish western Alaska commercial fisheries, but would make additional catch available to GOA commercial fisheries. • Additional herring would be available to commercial fishing but would be considered insignificant. • Based on other external factors that affect the status of crab stocks and availability for commercial fishing in is uncertain whether more crab would become available for commercial fishing.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Regional impacts	• Under FMP 1, impacts to most sectors in most regions are insignificant, for the reasons outlined under harvesting and processing sectors. • Exceptions are seen for in-region processing in the AKKO region, in-region deliveries for the AKKO and AKSC owned harvest fleets, extra-region deliveries for the AKSC-owned harvest fleet, and total direct, indirect, and induced labor income and FTEs in the AKKO and AKSC regions.	• Under FMP 2.1, no significant negative impacts are experienced by any sector in any region, except for regionally owned at-sea processors for the AKSE region (and this is a relatively small sector). • With the exception of the AKSE region (where impacts are insignificant), all regions experience significant positive impacts in total direct, indirect, and induced labor income and FTEs. • In-region processing volume and value increases significantly for all Alaska regions. • All regions experience significant positive benefits for extra-region CV deliveries, as do all regions for in-region deliveries, except for the AKAPAI and the ORCO regions (where the change is insignificant).	• Under FMP 2.2, no significant negative impacts are experienced by any sector in any region. • All regions experience significant benefits to total direct, indirect, and induced labor income and FTEs, except for the AKKO and AKSE regions, where the change is insignificant. • In-region processing does not experience significant change, except in the AKAPAI region and the AKKO region, where significant beneficial impacts are seen. • Regionally owned at-sea processors would experience significant positive benefits in the AKKO, AKSC, and AKSE regions, and change would be insignificant in the other regions. • Catcher vessel extra-regional deliveries would be significant and beneficial for all regions except for the AKAPAI and AKSC regions.	• Under FMP 3.1, change is insignificant for all harvester, processor, income, and employment variables in all regions, with the following exceptions: in the AKSC region, change in all variables listed is beneficial and significant, and in the AKSE region, impacts to regionally owned at-sea processors is beneficial and significant (although this is a small sector).	• Under FMP 3.2, for all regions except AKAPAI and AKSE, change is insignificant for all processor, harvester, income, and employment variables. • Within the AKAPAI region, in-region deliveries by regionally owned CVs decline significantly, but this is a small sector. • In the AKSE region, change to regionally owned at-sea processors is insignificant, but in-region processing, extra- and in-region catcher vessel deliveries, and total direct, indirect, and induced labor income and FTEs all decline significantly from baseline conditions.	• Under FMP 4.1, for all regions outside of the ORCO region, significant negative impacts would be experienced in all processing, vessel, labor income, and employment categories, except for regionally owned at-sea processors in the AKAPAI region, and in-region processing in the WAIW region (and in both of these exceptions the sectors are very small).	• Under FMP 4.2, except for the ORCO region, all regions experience significant negative impacts for all processing, harvesting, payments to labor, and employment variables. • In the ORCO region, significant negative impacts are experienced in extra region deliveries by regionally owned CVs, as well as in total direct, indirect, and included labor income and FTEs; all other variables for the ORCO region have extremely low (or zero) baseline values and do not change significantly under this alternative.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Regional impacts (Cont.)			• In-region deliveries do not change significantly in any region except for AKSC and the WAIW region, where the change is beneficial and significant.	• Impacts to coastal Alaska communities, particularly in the AKAPAI and AKKO regions, resulting from consolidation (for direct fishery sectors) and other changes accompanying the change from a race-for-fish to a rationalized fishery (especially for support service sectors) would be conditionally significant. This would be driven by yet-to-be-designed consolidation restrictions and community protection features of the alternative.			
					• Additionally, Alaska coastal communities with small vessel fleets would experience conditionally significant impacts from the expansion of MPA set-asides; level of impact would be conditional based on the efficacy of features designed to respect traditional fishing grounds and maintain open area access for coastal communities.		
CDQ program and region	• Under FMP 1, CDQ quota increases as a percentage of TAC, resulting in a beneficial impact to the program and region.	• Under Alternative 2, the multi-species CDQ program may be repealed resulting in adverse impacts, but the CDQ program would benefit from expanded pollock TAC. Net effect is unknown.		• Under Alternative 3, the CDQ program would continue to operate as it does under base case conditions and no significant impacts are foreseen.		• Under Alternative 4, steep declines in the fishery would result in significant negative impacts to the CDQ program and region.	
Subsistence	• FMP 1 is predicted to have no significant effects on the level of benefits from subsistence use of groundfish or Steller sea lions. • Impacts on subsistence salmon fisheries are predicted to be insignificant, as are indirect impacts to subsistence (income and joint production opportunities).	• Under FMP 2.1, no significant changes to subsistence use of groundfish are predicted. • Increased TAC and changes in protection measures would have an unknown impact on subsistence use of Steller sea lions. • Increased bycatch would have an unknown impact on subsistence salmon fisheries. • Increased catcher vessel activity may increase indirect subsistence activity, but impacts are not predicted to be significant.	• Under FMP 2.2, no significant changes to subsistence use of groundfish are predicted. • Increased TAC combined with retention of Steller sea lion protection measures would likely have an insignificant impact on subsistence use of Steller sea lions. • Bycatch measures are expected to result in no significant impacts subsistence salmon fisheries. • Increased catcher vessel activity may increase indirect subsistence activity, but impacts are not predicted to be significant.	• Under FMP 3.1, no significant changes to the subsistence use of groundfish or Steller sea lions are predicted. • Salmon bycatch would likely be decreased but the impacts of this reduction on subsistence salmon fishing are unknown. • Catcher vessel activity increases are not predicted to result in significant beneficial impacts to indirect subsistence opportunities.		• Under FMP 4.1, steep declines in the commercial groundfish fishery would have unknown impacts on the subsistence groundfish fishery. • Steller sea lion populations may benefit from pelagic forage availability, but impacts to Steller subsistence use is unknown. • Impact of reduced salmon bycatch on subsistence salmon fisheries is unknown. • Reduction of catcher vessel activity is expected to result in significant negative impacts to indirect subsistence opportunities (both joint production and income).	• Effects are similar to those described for FMP 4.1, although potential increased benefits to Steller sea lion populations may result in additional benefits to Steller sea lion subsistence use. This impact, however, is not predicted to be significant.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Environmental justice issues	• Under FMP 1, no significant environmental justice impacts are predicted from changes in fishery activity in any of the regions, nor are any adverse changes anticipated to the CDQ program or subsistence activities that would result in environmental justice impacts.	• Under FMP 2.1, no significant environmental justice impacts are predicted from changes in direct fishery activity in any of the regions. • While impacts to the CDQ program and subsistence activities are unknown to a degree, it is not considered likely that these changes would rise to the level of disproportionate high and adverse impacts that would trigger environmental justice concerns. • No environmental justice concerns associated with subsistence activities are predicted.		• Under FMP 3.1, no significant environmental justice impacts are predicted from changes in direct fishery activity in any of the regions. • No environmental justice concerns associated with either the CDQ program or subsistence activities are predicted.	• Under FMP 3.2, environmental justice impacts to the catcher vessel fleet in the AKAPAI region would be conditionally significant depending upon the specific design of MPA and rationalization features of this alternative. • No other changes in direct fishery sector activity are predicted to result in environmental justice impacts due to the demographics of the specific sectors. • No environmental justice concerns associated with either the CDQ program or subsistence activities are predicted.	• Under FMP 4.1, significant environmental justice issues would result from declines in the fishery. • These would be seen in Alaska Native communities in the AKAPAI region through loss of revenues and fishing related activities. • Catcher vessel and processor related loss of employment and income would be an environmental justice issue in this region, as would processor related loss of employment and income in the AKKO and WAIW regions, if not elsewhere. • Impacts to the CDQ program and region would be environmental justice impacts. • Indirect impacts to subsistence activities would also be considered environmental justice impacts.	
Consumer benefits	• Under FMP 1, changes in benefits to U.S. consumers of groundfish products would be insignificant.	• Effects as described in FMP 1		• Effects as described in FMP 1		• Effects as described in FMP 1	• FMP 4.2 would have a conditionally significant negative effect on benefits to U.S. consumers of groundfish products due to the possible decrease in the supply of these products.
Benefits from marine ecosystems (other than those benefits related to commercial groundfish fisheries)	• FMP 1 is predicted to have no significant effects relative to the comparative baseline on the level of benefits the Bering Sea and GOA marine ecosystems and associated species provide.	• FMP 2.1 is predicted to have a significant negative impact on the levels of many of the benefits these ecosystems and associated species generate.	• FMP 2.2 is predicted to have a conditionally significant negative impact on the levels of some of the benefits these ecosystems and associated species generate.	• Effects as described in FMP 1	• FMP 3.2 is predicted to significantly increase the levels of some of the benefits these marine ecosystems and associated species provide relative to the comparative baseline.	• FMP 4.1 is predicted to significantly increase the levels of some of the benefits these marine ecosystems and associated species provide relative to the comparative baseline.	• FMP 4.2 is predicted to significantly increase the levels of some of the benefits these marine ecosystems and associated species provide relative to the comparative baseline.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

Ecosystem

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Assessment of ecosystem impacts considers important factors influencing: • predator/prey relationships: 1) pelagic forage availability because pelagic forage form the central part of BSAI and GOA food webs, channeling energy from the bottom of the food web to the many species at the top that rely on pelagic forage, 2) spatial/temporal concentration of fishery removals of forage have the potential to affect top predators such as marine mammals and seabirds that make feeding forays from land, 3) Top predators receive energy from lower trophic levels and provide energy storage and stabilization effects on marine food webs, their removal may increase variability and instability in the ecosystem. • Energy removal and re-direction by fisheries could affect total ecosystem production levels and characteristics that influence energy cycling. • Diversity of various ecosystem characteristics such as species diversity, functional diversity, and genetic diversity helps maintain stability in ecosystem functioning and provide a kind of ecological "insurance" to protect ecosystem functioning.						
Significance Thresholds for ecosystem effects relate fishing induced changes that are sufficient to bring any population below minimum biologically acceptable limits (minimum stock size thresholds for target species, status listing of others) or to prevent a population that is already below a limit from recovering. Some ecosystem level thresholds are defined as changes in system level characteristics that are outside the range of natural variability. • In cases where thresholds cannot be defined quantitatively, indicators of change are used to determine direction and magnitude of the fishing effect. Some indicators include population trends of indicator species relative to fishing effects, degree of fishery concentration, trophic level of the catch, total catch, bycatch, discards, and offal production levels, bottom gear effort, amount and location of area closures. Indicator species include a variety of target and nontarget forage species, target, nontarget and PSC species that are top predators, scavenger species, and HAP biota (organisms that form structural bottom habitat: corals, serpens/whips, sponges, and anemones). • See Section 4.1 for details on the significance thresholds for ecosystem effects and quantitative indicators used in the analysis.						
Predatory/prey relationships: Change in [pelagic forage availability	• The groundfish fishery does not significantly impact pelagic forage availability as evidenced by either positive or small negative total biomass changes in target species that are forage (pollock and Atka mackerel) and small bycatch levels of other forage species, including herring.	• The amount of decline in targert species that are pelagic forage (BSAI walleye pollock and Atka mackerel) and the potential for a forage fish fishery to be initiated produce a significant adverse impact on forage availability to some marine mammals and potentially adverse effects on seabirds.	• The amount of decline in targert species that are pelagic forage (BSAI walleye pollock and Atka mackerel) produce a significant adverse impact on forage availability to Steller sea lion and harbor seals and potentially adverse effects on northern fur seals.	• Effects as described in FMP 1.		• This alternative produces relatively large increases in forage species that are targets of groundfish fisheries and thus provides significant benefits to Steller sea lions and harbor seals and northern fur seals. • External factors such as lar4ge oil spills in forage spawning times or areas and a climatic regime shift could moderate the beneficial effect of these forage biomass increases.	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Predatory/prey relationships: Change in [pelagic forage availability (Cont.)	• Cumulatively, oil spills could have a conditionally significant impact on forage species that use inshore habitat. Cllomate exerts an important positive or negative effect on forage species biomass levels, depending on the climatic regime.	• Cumulatively, oil spills could augment the significant impact if it involved key spawning times or areas of forage species. Climate exerts an important positive or negative effect on forage species biomass levels, depending on the climatic regime.	• Cumulatively, oil spills could have a conditionally significant impact on forage species that use inshore habitat. Cllomate exerts an important positive or negative effect on forage species biomass levels, depending on the climatic regime.				
Predator/prey relationships: Spatial and temporal concentration of forage	• Spatial and temporal concentrations of fishery removals on forage (pollock, Atka mackerel, herring, managed forage species category) do not change significantly from the baseline. • External effects such as the herring fishery, subsistence removals, oil spills, and climate variability could potentially converge and cause a significant adverse impact on spatial/temporal availability of forage.	• Spatial and temporal concentrations of fishery removals on forage have the potential to increase adverse impacts in this alternative due to opening of some previously closed areas that might be in proximity to areas used by mammals. • Non-federal forage fisheries, oils spills, and climate change could interact with these patterns to continue the potential for adverse impacts.	• Effects as described in FMP 1	• Effects as described in FMP 1	• Area closures in this alternative have the potential to reduce the spatial/temporal concentration of fisheries in foraging areas of Steller sea lions, northern fur seals, and harbor seals and thus make thus make target species prey more available to these mammals. • External effects such as herring fishery, subsistence fishing, oil spills and climate change could offset this conditionally beneficial effect.	• Areas opened to fishing in this alternative would be designed to reduce the spatial/temporal concentration of fisheries in foraging areas of mammals and thus causing a significant beneficial change in prey availability for Steller sea lions and harbor seals and a potentially beneficial change in prey for northern fur seals. • External effects such as herring fishery, subsistence fishing, oil spills and climate change could offset these beneficial effects.	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Predator/prey relationships: Removal of top predators	• There are no significant impacts to most top predator populations in this FMP because of low direct takes of seabirds and marine mammals, bycatch limits on halibut, and overfishing limits on target species top predators such as Greenland turbot and arrowtooth flounder. There are unknown impacts on shark species due to uncertainty about abundance. • Conditionally significant adverse impacts could occur from external factors such as subsistence harvest of mammals, international longline bycatch of seabirds, oil spills effects, and climate regime shifts.	• Increases in trawling and the opening of areas around the Pribilof Islands could lead to a conditionally significant adverse impact on seabirds such as short-tailed albatross and fulmars. Effects on sharks are unknown and trophic level of the catch indicates insignificant impacts on other top predators such as pinnipeds, whales, target and PSC species. • External effects such as Western Bering Sea fisheries, international and halibut longline takes of seabirds, subsistence harvests of marine mammals, oil spills, and climate shifts could potentially act to push the biomass of one or more top predator species below minimum biologically acceptable limits.	• Effects as described in FMP 1	• Effects as described in FMP 1		• There are significant positive impacts to top predator populations in this FMP relative to the baseline because of increased protection measures for seabirds, breaking sharks out of the other species group and TAC based on the least abundant member of this group, bycatch limits on halibut, and overfishing limits on target species top predators such as Greenland turbot and arrowtooth flounder. • External effects would not be sufficient to change these impacts.	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Predator/prey relationships: Introduction of non-native species	• The potential for non-native species introductions via ballast water exchange or hull-fouling organism release from fishing vessels that come from areas already infested with invasive species are unchanged relative to the baseline. • Commercial shipping, particularly oil tankers, escaped Atlantic salmon from farming, and future climate warming could all act keep the possibility of successful introduction of non-native species similar to the baseline.	• Potential for non-native species introductions via ballast water exchange or hull-fouling organism release from fishing vessels that come from areas already infested with invasive species are increased relative to the baseline. • These conditionally significant adverse effects in combination with commercial shipping, particularly oil tankers, escaped Atlantic salmon from farming, and future climate warming could all act to increase the possibility of successful introduction of non-native species.	• Effects as described in FMP 1	• Effects as described in FMP 1		• The largely decreased catch under this alternative would likely ensure that exotic species introductions via ballast water exchange or hull fouling organisms of fishing vessels would not occur. • However, ballast water from commercial shipping still have the potential to produce successful introductions.	
Energy removal	• Total groundfish fishery catches are estimated to remove less than 1% of the total system energy. • Energy removals from other fisheries are not likely to increase this level to the point where long-term changes in system biomass, production, or energy cycling outside the range of natural variability.	• The large increases in catch removals relative to the baseline in this alternative could result in long-term changes in system biomass, production, or energy cycling that are outside the range of natural variability.	• Effects as described in FMP 1	• Effects as described in FMP 1		• The large decreases in catch removals relative to the baseline in this alternative could result in long-term changes in system biomass, production, or energy cycling that are more within the range of natural variability.	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Energy redirection	• Discards, offal, or gear-related mortality from groundfish fisheries do not appear to produce significant adverse impacts via redirection of energy in marine ecosystems of the BSAI and GOA, as evidenced by lack of scavenger population increases and lack of local water quality degradation in the vicinity of groundfish processing facilities.	• The large increases in discards relative to the baseline in this alternative could result in long term changes in system biomass, production, or energy cycling that are outside the range of natural variability.	• Effects as described in FMP 1	• Effects as described in FMP 1		• The large decreases in discards relative to the baseline in this alternative could result in long term changes in system biomass, production, or energy cycling that are more within the range of natural variability.	
Functional (trophic) diversity	• Diversity of species groups with similar trophic roles does not appear to be impacted by groundfish fisheries based on qualitative analysis of diversity changes relative to fishery removals and bottom effort changes that might disturb benthic trophic guilds. • Introductions of Atlantic salmon or other exotic species, subsistence harvest of marine mammals, and future climate regime shifts could significantly alter trophic guild diversity beyond the range of natural variability.	• This alternative has the potential to affect trophic guild diversity by fishing more heavily on target species that tend to be dominant members of their trophic guilds, such as walleye pollock and Atka mackerel. • External factors such as salmon farming, subsistence harvests of marine mammals, introduced exotic species through commercial shipping, and future climate regime shifts have the potential to alter the diversity of species within a trophic guild beyond the range of natural variability.	• Effects as described in FMP 1	• Effects as described in FMP 1		• This alternative will positively affect trophic guild diversity by fishing less heavily on target species that tend to be dominant members of their trophic guilds, such as walleye pollock and Atka mackerel. • External factors such as salmon farming, subsistence harvests of marine mammals, introduced exotic species through commercial shipping, and future climate regime shifts have the potential to alter the diversity of species within a trophic guild beyond the range of natura variability.	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Species diversity	• Catch amounts of target, prohibited species, seabirds, and marine mammals are insufficient to bring these species below minimum population thresholds, It is unknown wh4ether bycatch amounts of species with vulnerable life history characteristics, for which species level biomass estimates (e.g., skates, sharks, and grenadiers) is lacking, are at levels that might cause significant adverse impacts. • International longline catches, subsistence harvest of marine mammals, and introduced non-native species hae the potential to ahve a significantly adverse impact on species diverisity.	• This alternative has the potential to affect species diversity by bringing several species below minimum population thresholds or preventing others from recovery, including corals and seabirds. Some target species are significantly adversely affected while the effects on some such as sharks, are unknown. • External factors such as seabird bycatch in other fisheries, subsistence harvest of marine mammals, and introduced exotic species may act in combination with the adverse direct effects of FMP 2.1, to significantly adversely affect species diversity.	• Effects as described in FMP 1.	• Effects as described in FMP 1.		• Catch amounts of target, prohibited species, seabi4rds, and marine mammals are largely decreased in this alternative relative tot he baseline and would provide a significant positive effect on species diversity. Setting TAC for groups based on the least abundant species in the complex and breaking species out of the complex when possible would prevent skates, sharks, and grenadiers from reading minimum population thresholds. • External effects would not be sufficient to change this determination.	• Catch amounts of target, prohibited species, seabi4rds, and marine mammals are largely decreased in this alternative relative tot he baseline and would provide a significant positive effect on species diversity. • Catch amounts of target, prohibited species, seabi4rds, and marine mammals are largely decreased in this alternative relative tot he baseline and would provide a significant positive effect on species diversity. • External effects would not be sufficient to change this determination.

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Functional (structural habitat) diversity	• Living organisms such as corals, seapens, whips, sponges, and anemones provide structural habitat for other marine life. The long-lived nature of some of these organisms and the lack of understanding of amounts needed to serve their functional role means that bottom gear damage from groundfish fisheries co0uld potentially cause adverse impacts on this guild of organisms. The magnitude of the effect of fishing associated with Alternative 1 is similar to the baseline. • The additive effects of the scallop fishery, large petroleum spill affect a broad area of bottom habitat and/or climate regime shifts that reduce the population abundance or distribution of bottom-dwelling organisms that provide structural habitat could combine to cause significant adverse impacts.	• Living organisms such as corals, seapens, whips, sponges, and anemones provide structural habitat for other marine life. The long-lived nature of some of these organisms and the lack of understanding of amounts needed to serve their functional role means that the increased bottom habitat damage from groundfish fisheries in this alternative would cause significant adverse impacts to this guild of organisms. • the significant adverse effect of bottom fishing associated with Alternative 2 could be intensified by the additive effects of the scallop fishery, large petroleum spill affect a broad area of bottom habitat and/or climate regime shifts that reduce the population abundance or distribution of bottom-dwelling organisms that provide structural habitat	• Effects as described in FMP 1.	• Effects as described in FMP 1.	• The area closures in this alternative have been designed with corals in mind and will ensure a broad spatial distribution of corals in the Aleutian Islands, in particular. Groundfish fisheries will thus have an insignificant impact on structural habitat diversity. • The additive effects of other factors such as the small incremental effect of scallop dredging, a large petroleum spill affecting bottom habitat, and/or climate regime shift that reduces the population size of bottom dwelling organisms that provide structural habitat could create a potential significant impact.	• Effects as described in FMP 1.	

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

	Alternative 1[a]	Alternative 2[b]		Alternative 3[c]		Alternative 4[d]	
	FMP 1	2.1	2.2	3.1	3.2	4.1	4.2
Genetic diversity	• Effects on genetic diversity through heavy exploitation of spawning aggregations or systematic targeting of older age classes is insignificant for most species in this alternative although the impacts on some species remains unknown. • Salmon farming release of fish that might interbreed with natural salmon stocks, exotic species introductions, and subsistence harvests of local marine mammal stocks could potentially cause significant adverse impacts.	• Effects as described in FMP 1		• Effects as described in FMP 1		• Effects as described in FMP 1	

Table Caveats:

- All significance ratings referred to in the table are ratings in relation to the comparative baseline described in Chapter 3 and summarized in Section 4.4.
- the model used to analyze each of these example FMPs projects catch for a 5-year period. 10- and 20-year projections were also modeled, but these were not used in the analysis as the reliability of these projections weakens the further out they go (see Section 4.1.5 for further detail on the model).
- All stocks are potentially affected by a regime shift, however the directional impact cannot be predicted. However, these environmental impacts potentially can over ride management impacts for all alternatives. Environmental impacts are often a driving force in population dynamics of the target species. Retrospective studies reveal that impacts of shifts in climate forcing and their influences on ocean conditions may overwhelm the positive or negative impacts of commercial harvest. (For further information, refer to Section 3.10.)

FMP-specific notes:

2.1 - Difficult to anticipate how the fleet would redistribute into areas that have been closed as there is no data on these areas
3.2 - Although the constraining cap on OY is removed, other constraints bring the catch quota down
- Benefits of closures are directly proportionate to the specific location of the closures
- Nearshore closures could lead to substantial reductions in catch of managed species that were not modeled in this PSEIS

4.1 - Nearshore closures, and least abundant species aggregate TAC management for stock complexes, could lead to substantial reductions in catch of managed species that were not modeled in this PSEIS
4.2 - This example FMP assumes that the fisheries would not be opened within the 5-year period of the projection model

Notes: [a]A detailed summary of Alternative 1 can be found in section 4.5.11
[b]A detailed summary of Alternative 2 can be found in section 4.6.11
[c]A detailed summary of Alternative 3 can be found in section 4.7.11

Table 4.0-1 (cont.). Comparison of fisheries management plan frameworks.

[d]A detailed summary of Alternative 4 can be found in section 4.8.11
ABC - acceptable biological catch
AFA - American Fisheries Act
AI - Aleutian Islands
AKSC - Alaska Southcentral
AKPAI - Alaska Peninsula and Aleutian Islands
B_{MSY} - long-term average biomass that would be achieved with F_{MSY}
BSAI - Bering Sea and Aleutian Islands
CP - catcher-processor
CV - catcher vessel
EBS - eastern Bering Sea
ESA - Endangered Species Act
EVOS - Exxon Valdez oil spill
F - fishing mortality rate
FMP -fisheries management plan
F_{MSY} - fishing mortality rate at which long-term average yield would be maximized
FTE - full time equivalent
GOA - Gulf of Alaska
KODI - Kodiak Island
MSST - minimum sustainable stock threshold
nm - nautical mile
OFL - overfishing level
ORCO - Oregon coast
OY - optimum yield
P. cod - Pacific cod
POP - Pacific Ocean perch
PSC - prohibited species catch
SEAK - Southeast Alaska
SSL - Steller sea lion
TAC - total allowable catch
WAIW - Washington Inland waters

Table 4.1-1. Significance criteria for target species, other species, forage fish species, non-specified species, Pacific halibut, and Pacific herring.

Effect	Rating			
	Significant Negative	Unknown	Insignificant	Significant Positive
Fishing mortality	Reasonably expected to jeopardize the capacity of the stock to produce MSY on a continuing basis: mean F (2003-2007) > F_{OFL}.	Fishing mortality rate or F_{OFL} is unknown.	Reasonably expected not to jeopardize the capacity of the stock to produce MSY on a continuing basis: mean F (2003-2007) ≤ F_{OFL}.	Not applicable
Change in biomass level	Evidence that biomass will tend toward levels that jeopardize the ability of the stock to sustain itself at or above the MSST.	MSST is unknown.	Evidence that biomass will tend toward levels that maintain the ability of the stock to sustain itself above the MSST.	Evidence that biomass will tend toward levels that enhance the ability of the stock to sustain itself at or above the MSST.
Spatial/temporal concentration of catch: Leads to change in genetic structure of population	Evidence of genetic sub-population structure and evidence that the concentration of harvest will lead to a detectable reduction in genetic diversity such that it jeopardizes the ability of the stock to sustain itself at or above the MSST.	Evidence is insufficient to conclude whether concentration of harvest will lead to a detectable change in genetic diversity that materially impacts the stock's ability to sustain itself at or above the MSST.	Evidence that the concentration of harvest will not be sufficient to alter the genetic sub-population structure such that it jeopardizes the ability of the stock to sustain itself at or above the MSST.	Evidence of genetic sub-population structure and evidence that the concentration of harvest leads to a detectable increase in genetic diversity such that it enhances the ability of the stock to sustain itself at or above the MSST.
Spatial/temporal concentration of catch: Leads to change in reproductive success	Evidence that the concentration of harvest will lead to a detectable decrease in reproductive success such that it jeopardizes the ability of the stock to sustain itself at or above the MSST.	Evidence is insufficient to conclude whether concentration of harvest will lead to a detectable change in reproductive success that materially impacts the stock's ability to sustain itself at or above the MSST.	Evidence that the concentration of harvest will not change reproductive success such that it jeopardizes the ability of the stock to sustain itself at or above the MSST.	Evidence that the concentration of harvest will lead to a detectable increase in reproductive success such that it enhances the ability of the stock to sustain itself at or above the MSST.
Prey availability	Evidence that future harvest levels and distribution of harvest will lead to a change in prey availability such that it jeopardizes the ability of the stock to sustain itself at or above the MSST.	Evidence is insufficient to conclude whether future harvest levels and distribution of harvest will lead to a change in prey availability that materially impacts the stock's ability to sustain itself at or above the MSST.	Evidence that future harvest levels and distribution of harvest will not lead to a change in prey availability such that it jeopardizes the ability of the stock to sustain itself at or above the MSST.	Evidence that future harvest levels and distribution of harvest will lead to a change in prey availability such that it enhances the ability of the stock to sustain itself at or above the MSST.
Habitat suitability (e.g., spawning, nursery, settlement habitat, etc.) as impacted by fishing	Evidence that future levels of habitat disturbance will lead to a decrease in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself at or above the MSST.	Evidence is insufficient to conclude whether future levels of habitat disturbance will lead to a change in spawning or rearing success that materially impacts the ability of the stock to sustain itself at or above the MSST.	Evidence that future levels of habitat disturbance will not lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself at or above the MSST.	Evidence that future levels of habitat disturbance will lead to an increase in spawning or rearing success such that it enhances the ability of the stock to sustain itself at or above the MSST.

Notes: F - fishing mortality rate
F_{OFL}- fishing mortality rate above which overfishing is defined to occur
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.1-2. Significance criteria for crab.

Effects	Score		
	S-/CS-	I	U
Mortality	Level of mortality likely to impede recovery of population or impact sustainability of stock at or above MSST.	Level of mortality resulting in no population level effect on species.	Insufficient information available for abundance estimates necessary to determine current stock status and identification of population level effects.
Change in biomass	Changes to biomass resulting in population level effects such that stock is not sustainable over time.	Change in biomass resulting in no population level effect on species.	Insufficient information available for biomass estimates necessary to determine current stock status and establish baseline condition.
Change in reproductive success	Declines in level of recruitment success and adult mortality that result in population level impacts or stock levels below MSST.	No significant change exerting population level effects.	Insufficient information available on current reproductive status of stocks and relationship to recruitment success.
Changes in habitat	Disruption or damage of habitat such that crab survival or recruitment result in population level effects and the inability for stock to sustain over time.	Impact to habitat unlikely to result in population level effects.	Insufficient information on the magnitude of habitat changes or inability to determine current status of essential crab habitat.
Change in genetic structure of population	Changes to genetic structure of population such that population level impacts occur.	No significant change exerting in population level effects.	Insufficient information available on current genetic composition of stocks needed to establish baseline condition.

Notes: CS- - Conditionally significant adverse
CS+ - Conditionally significant beneficial
I - Insignificant
MSST - minimum stock size threshold
S- - Significant adverse
S+ - Significant beneficial
U - Unknown

Table 4.1-3. Significance criteria for salmon.

Effects	Score			
	S-/CS-	I	S+/CS+	U
Mortality	Level of mortality likely to result in decreased escapement, and to impede recovery of depressed populations or impact sustainability of stock over time.	Level of mortality that is not detectable in natal streams and results in no population level effect on species.	Reduction in level of mortality, resulting in stock rebuilding and improved escapement.	Insufficient catch information and biomass estimates available necessary to determine current stock status.
Changes in spawning habitat	Disruption or damage of spawning habitat such that escapement declines, resulting in population level effects and the inability for stock to sustain or recover over time.	Impact to spawning habitat that is unlikely to result in population level effects and the inability for stocks to sustain over time.	Changes and/or improvements to spawning habitat that may result in population gains and improve recovery of depressed stocks.	Insufficient information on the magnitude of spawning habitat changes or inability to determine current status of essential salmon spawning habitat.
Change in prey availability	Prey abundance decreases such that salmon foraging success declines to unsustainable levels and results in population level effects.	Prey abundance maintained at a level that results in no population level effect on species.	Changes to prey availability that may result in population gains and improved escapement.	Insufficient information available on abundance of key prey species or the scope of fishery impact on salmon prey structure.
Change in genetic structure of population	Changes to genetic structure of population such that population level impacts occur.	No significant change from natural variability.	Not applicable	Insufficient information available on current genetic composition of stocks needed to establish baseline condition.
Change in reproductive success	Lack of reproductive success that results in population level impacts and the inability for recovery of depressed stocks.	No significant change from natural variability.	Increased strength of runs and number of spawning adults such that population gain occurs and recovery of depressed stocks results.	Insufficient information available on current reproductive status of stocks.

Notes: CS- - Conditionally significant adverse
CS+ - Conditionally significant beneficial
I - Insignificant
S- - Significant adverse
S+ - Significant beneficial
U - Unknown

Table 4.1-4. Significance criteria for habitat.

Effect	Rating			
	S-/CS-	I	S+/CS+	U
Level of mortality and damage to living habitat	Likely to increase substantially from baseline; continued long-term irreversible impacts to longlived slow growing species	Likely to be similar to baseline	Likely to decrease substantially from baseline	Insufficient information available on baseline habitat data
Benthic community diversity	Likely to decrease substantially from baseline	Likely to be similar to baseline	Likely to increase from baseline	Insufficient information available on baseline diversity data
Geographic diversity of impacts	Likely to decrease substantially from baseline	Likely to be the same as baseline	Likely to increase substantially from baseline	Not applicable

Notes: CS- - Conditionally significant adverse
CS+ - Conditionally significant beneficial
I - Insignificant
S- - Significant adverse
S+ - Significant beneficial
U - Unknown

Table 4.1-5. Significance criteria for seabirds.

Effect	Rating			
	S-/CS-	I	S+/CS+	U
Incidental take in gear and vessel strikes	Level of take increases substantially from baseline and/or level of take likely to have population level effect on species.	Level of take similar or less than baseline and/or level of take not likely to have population level effect on species.	Not applicable	Insufficient information available on take rates or population levels.
Prey availability and fishery wastes	Food availability decreased substantially from baseline such that seabird survival or reproductive success is likely to be decreased.	Food availability similar to baseline and such that seabird survival or reproductive success is likely not affected.	Food availability increased substantially from baseline such that seabird survival or reproductive success is likely to be increased.	Insufficient information available on abundance of key prey species or the scope of fishery impact on prey.
Benthic habitat	Impact to benthic habitat decreases seabird prey base substantially from baseline such that seabird survival or reproductive success is likely to be decreased.	Impact to benthic habitat similar to baseline such that seabird survival or reproductive success is likely not affected.	Not applicable	Insufficient information on the scope or mechanism of benthic habitat impacts on food web.

Notes: CS- - Conditionally significant adverse
CS+ - Conditionally significant beneficial
I - Insignificant
S- - Significant adverse
S+ - Significant beneficial
U - Unknown

Table 4.1-6. Significance criteria for marine mammals.

Effects	Ratings			
	S-/CS-	I	S+/CS+	U
Incidental take/ entanglement in marine debris	Level of take which would be expected to result in at least a 10 percent delay in recovery.	Level of take below that which would have an effect on population trajectories; negligible impact.	Not applicable	Insufficient information available on take rates.
Harvest of prey species	Projected fishing mortality rate of prey species at least 20 percent higher than baseline.	Projected fishing mortality rate of prey species similar to baseline.	Projected fishing mortality rate of prey species at least 20 percent lower than baseline.	Insufficient information available on key prey species.
Spatial/ temporal concentration of fishery	Spatial and temporal concentration of the fishery increases substantially in key areas relative to the baseline such that marine mammal survival and/or reproductive success is likely to decrease.	Similar spatial and temporal concentration in key areas relative to baseline.	Spatial and temporal concentration of the fishery decreases substantially in key areas relative to the baseline such that marine mammal survival and/or reproductive success is likely to increase.	Insufficient information as to what constitutes a key area
Disturbance	Much more disturbance.	Similar level of disturbance as that which was occurring in the baseline (2002).	Much less disturbance.	Insufficient information as to what constitutes disturbance.

Notes: CS- - Conditionally significant adverse
CS+ - Conditionally significant beneficial
I - Insignificant
S- - Significant adverse
S+ - Significant beneficial
U - Unknown

Table 4.1-7. Significance criteria for ecosystem effects.

Issue	Effect	Significance Threshold	Indicators
Predator-prey relationships	Pelagic forage availability	Fishery induced changes outside the natural level of abundance or variability for a prey species relative to predator demands	• Population trends in pelagic forage biomass (quantitative - pollock, Atka mackerel, catch/bycatch trends of forage species, squid and herring)
	Spatial and temporal concentration of fishery impact on forage	Fishery concentration levels high enough to impair the long term viability of ecologically important, nonresource species such as marine mammals and birds	• Degree of spatial/temporal concentration of fishery on pollock, Atka mackerel, herring, squid and forage species (qualitative)
	Removal of top predators	Catch levels high enough to cause the biomass of one or more top level predator species to fall below minimum biologically acceptable limits	• Trophic level of the catch • Sensitive top predator bycatch levels (quantitative: sharks, birds; qualitative: pinnipeds) • Population status of top predator species (whales, pinnipeds, seabirds) relative to minimum biologically acceptable limits
	Introduction of nonnative species	Fishery vessel ballast water and hull fouling organism exchange levels high enough to cause viable introduction of one or more nonnative species, invasive species	• Total catch levels
Energy flow and balance	Energy re-direction	Long-term changes in system biomass, respiration, production or energy cycling that are outside the range of natural variability due to fishery discarding and offal production practices	• Trends in discard and offal production levels (quantitative for discards) • Scavenger population trends relative to discard and offal production levels (qualitative) • Bottom gear effort (qualitative measure of unobserved gear mortality particularly on bottom organisms)
	Energy removal	Long-term changes in system-level biomass, respiration, production or energy cycling that are outside the range of natural variability due to fishery removals of energy	• Trends in total retained catch levels (quantitative)

Table 4.1-7 (cont.). Significance criteria for ecosystem effects.

Issue	Effect	Significance Threshold	Indicators
Diversity	Species diversity	Catch removals high enough to cause the biomass of one or more species (target, nontarget) to fall below or to be kept from recovering from levels below minimum biologically acceptable limits	• Population levels of target, nontarget species relative to MSST or ESA listing thresholds, linked to fishing removals (qualitative) • Bycatch amounts of sensitive (low potential population turnover rates) species that lack population estimates (quantitative: sharks, birds, HAPC biota) • Number of ESA listed marine species • Area closures
	Functional (trophic, structural habitat) diversity	Catch removals high enough to cause a change in functional diversity outside the range of natural variability observed for the system	• Guild diversity or size diversity changes linked to fishing removals (qualitative) • Bottom gear effort (measure of benthic guild disturbance) • HAPC biota bycatch
	Genetic diversity	Catch removals high enough to cause a loss or change in one or more genetic components of a stock that would cause the stock biomass to fall below minimum biologically acceptable limits	• Degree of fishing on spawning aggregations or larger fish (qualitative) • Older age group abundances of target groundfish stocks

Notes: CS- - Conditionally significant adverse
CS+ - Conditionally significant beneficial
ESA - Endangered Species Act
HAPC - habitat areas of particular concern
I - Insignificant
MSST - minimum stock size threshold
S- - Significant adverse
S+ - Significant beneficial
U - Unknown

Table 4.1-8. Average bycatch (mt) of living substrates in the Bering Sea and Aleutian Islands by fishery during 1997-2001.

Fishery	anemone	coral	sponge	tunicate	seapen/whip
Bering Sea					
BTR Flathead sole	25.4	0.5	5.8	114.5	0.0
BTR Greenland turbot	1.0	0.0	0.0	0.1	0.0
BTR Other Flatfish	0.4	0.1	0.3	4.7	0.0
BTR Pacific cod	11.6	0.9	42.1	19.1	0.2
BTR rock sole	30.8	11.5	133.2	42.0	0.1
BTR sablefish	0.2	0.0	0.0	0.0	0.0
BTR Yellowfin sole	17.8	26.9	45.4	912.4	0.0
HAL Greenland turbot	0.1	0.0	0.0	0.0	0.0
HAL Pacific cod	114.6	1.1	1.0	1.0	3.5
HAL Sabefish	0.3	0.0	0.0	0.0	0.0
Pot Pacific cod	0.0	0.1	0.3	0.0	0.0
Pelagic trawl pollock	2.9	0.0	0.1	0.0	1.2
Aleutian Islands					
BTR Atka mackerel	0.3	9.3	58.0	0.6	0.0
BTR Pacific cod	0.2	4.4	20.0	0.4	0.1
BTR Pacific ocean perch	0.0	11.1	40.6	0.0	0.0
HAL Greenland turbot	0.0	0.1	0.0	0.0	0.0
HAL Pacific cod	0.5	2.3	4.5	0.0	0.1
HAL Sablefish	0.0	0.6	0.2	0.0	0.0
POT Pacific cod	0.0	0.0	1.0	0.0	0.0
PTR pollock	0.0	0.0	0.0	0.0	0.0
Total	**206.1**	**69.1**	**352.6**	**1094.9**	**5.2**

Notes: BTR - bottom trawl
HAL - hook and line
kg - kilograms
PTR - pelagic trawl

Table 4.1-9. Average bycatch (kg) of living substrates in the Gulf of Alaska by fishery during 1999-2001.

Fishery	anemone	coral	sponge	tunicate	seapen/whip
Gulf of Alaska					
BTR Aggregated rockfish	0.3	2.8	0.7	0.1	0.0
BTR Arrowtooth flounder	0.1	0.1	0.2	0.1	0.0
BTR Deepwater flatfish	0.4	1.0	0.5	0.1	0.0
BTR Flathead sole	0.2	0.0	0.1	0.0	0.0
BTR Pacific cod	4.9	0.0	0.8	0.2	0.5
BTR pollock	0.0	0.7	0.0	0.0	0.0
BTR Pacific ocean perch	0.2	0.6	1.4	0.0	0.0
BTR Rex sole	0.3	0.2	0.4	0.3	0.0
BTR Shallow water flatfish	5.8	0.0	0.4	0.7	0.1
BTR Shortraker rougheye	0.0	0.0	0.0	0.0	0.0
HAL Pacific cod	3.8	0.0	0.0	0.1	0.7
HAL Sablefish	0.2	0.1	0.1	0.1	0.1
Pot Pacific cod	0.0	0.0	1.1	0.0	0.0
PTR pollock	0.1	0.1	0.0	0.0	0.0
PTR Pacific ocean perch	0.0	0.0	0.0	0.0	0.0
Total	**16.5**	**5.7**	**5.7**	**1.8**	**1.5**

Notes: BTR - bottom trawl
HAL - hook-and-line
kg - kilograms
PTR - pelagic trawl

Table 4.1-10. Stepwise procedure for cumulative effects analysis.

Recommendations from CEQ (1997)	Approach Used in This Analysis
A. Scoping: Identify Issues, Actions, and Boundaries	
1. Identify the significant cumulative effects issues associated with the proposed action (and alternatives), and define the assessment goals.	1. Conduct a historical review of the BSAI and GOA FMP amendments, and summarize predicted direct and indirect effects of the alternatives as discussed in Sections 4.5 through 4.9 of the PSEIS.
2. Establish the geographic scope for the analysis.	2. Geographic scope is defined as the GOA and BSAI groundfish fisheries.
3. Establish the time frame for the analysis.	3. The time frame is established as 1980 (incorporating the past 20 years of incremental fisheries management) through 2007.
4. Identify other actions affecting the resources, ecosystems, and human communities of concern.	4. Systematically review FMP amendments and information provided in Chapters 3 and 4 of the PSEIS. Review environmental impact statements, reports, resource studies, and the peer-reviewed literature, and confer with expert contributors to the PSEIS to identify other actions and issues of concern.
B. Organizing: Characterize and Consolidate Issues	
5. Characterize the resources, ecosystems, and human communities identified during scoping in terms of their response to change and capacity to withstand stresses.	5. Identify and characterize potentially affected resources, organizing them into ten resource categories: Target Groundfish Species, Prohibited Catch Species, Other Species, Forage Fish, Non-specified Species, Essential Fish Habitat, Seabirds, Marine Mammals, Socioeconomics, and Ecosystem. Delineate the component parts of each resource category so that they are consistent with the "Effects of the Alternatives" sections in Chapter 4. For example, Marine Mammals includes Steller sea lion, fur seals, harbor seals, other pinnipeds, baleen whales, toothed whales, and sea otter.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds	6. From PSEIS Chapters 3 and 4, identify and evaluate all of the potential direct and indirect effects of the alternatives on the specified resource category components (Tier 1). Then prepare one matrix per resource category component per alternative that compares each direct or indirect effect (rows) with each type of external influence (columns) (Tier 2).
7. Define a baseline condition for the resources, ecosystems, and human communities.	7. The baseline condition is defined as the comparative baseline presented in Chapter 3.
C. Screening: Identify Potential Cumulative Effects	
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.	8. In each Tier 2 matrix cell, indicate the cumulative cause-and-effect relationship (if any) between each type of direct or indirect effect and each type of external influence, e.g., Other Fisheries, Subsistence, Commercial Shipping, Climate, etc.
D. Evaluating: Rank by Magnitude and Probability	
9. Determine the magnitude and significance of cumulative effects.	9. In the Tier 2 matrix for each alternative, include the significance scoring for each direct or indirect effect and show how it would be influenced (made more or less significant) by the corresponding cumulative effect (if any). In the final column, state whether the identified cumulative effect is conditionally significant (yes or no). Explain the rationale for each conditionally significant evaluation in the text.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.	Any of the eight alternatives would be in compliance with applicable laws, regulations, and permits and would incorporate appropriate mitigation measures.
11. Monitor the cumulative effects of the selected alternative and adapt management.	Monitoring and adaptive management would be conducted in conjunction with any alternative.

Notes: BSAI - Bering Sea and Aleutian Islands
CEQ - Council on Environmental Quality
FMP - fisheries management plan
GOA - Gulf of Alaska
PSEIS - Preliminary Supplemental Environmental Impact Statement

Table 4.1-11. Potential external actions.

	PAST	PRESENT	REASONABLY FORESEEABLE
Human-Controlled External Actions			
Other commercial fisheries	• Foreign groundfish fisheries • Joint venture fisheries • IPHC halibut longline fishery • State groundfish fishery • State salmon fisheries • Federal/State crab fisheries • State herring fishery • State shrimp fishery	• IPHC halibut longline fishery • State groundfish fishery • State salmon fisheries • Federal/State crab fisheries • State herring fishery • State shrimp fishery	• IPHC halibut longline fishery • State groundfish fishery • State salmon fisheries • Federal/State crab fisheries • State herring fishery • State shrimp fishery
Scientific research and surveys	• Oceanographic • Biological	• Oceanographic • Biological	• Oceanographic • Biological
Invasive species	• Non-native species	• Non-native species	• Non-native species
Global and industrial pollutants	• Marine spills and pollution • Marine debris • Bioaccumulation	• Marine spills and pollution • Marine debris • Bioaccumulation	• Marine spills and pollution • Marine debris • Bioaccumulation
Subsistence activities	• Fishing • Sealing	• Fishing • Sealing	• Fishing • Sealing
Commercial wildlife harvest	• Commercial whaling • Commercial sealing	• None	• None
Fish farms	• Salmon	• Salmon	• Salmon • Sablefish, halibut
Commercial shipping	• Cargo and fuel	• Cargo and fuel	• Cargo and fuel
Other economic development	• Military activity • Infrastructure development	• Military activity • Infrastructure development • Tourism	• Military activity • Infrastructure development • Tourism
Tax revenues generated	• State revenue sharing • Federal payment in lieu of taxes	• State revenue sharing • Federal payment in lieu of taxes	• State revenue sharing • Federal payment in lieu of taxes
Natural Events			
Climate variability	• Pacific decadal oscillation/regime shift • Short-term variability	• Pacific decadal oscillation/regime shift • Short-term variability	• Pacific decadal oscillation/regime shift • Short-term variability
Weather/seasonal events	• Erosion/deposition • increased turbidity	• Erosion/deposition • increased turbidity	• Erosion/deposition • increased turbidity

Notes: IPHC - International Pacific Halibut Commission

Table 4.1-12. Cumulative effects analysis for Chinook and other salmon in the Bering Sea and Aleutian Islands: Fisheries Management Plan 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	Land management practices	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts of bycatch and state fisheries could hinder recovery.	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impact of bycatch and subsistence fisheries could hinder recovery.	**Not a contributing factor-** significant impacts causing direct mortality is not expected.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally Significant Adverse-** given the poor stock status of salmon runs in western Alaska* and the combined bycatch potential of BSAI and GOA, sustainability of depressed salmon stocks could be impacted.
Change in Spawning Habitat	**I**	**Yes**	**Not a Contributing Factor**: no direct interaction between groundfish fisheries and salmon spawning habitat occurs because Pacific salmon species spawn in freshwater.	**Unknown**: potential interactions and effects have not been determined.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Not a contributing factor**- not expected to significantly change physical habitat.	**Unknown-**watersheds used by spawning salmon are managed by various agencies and groups and are influenced by land management practices as well.
Change in prey availability	**U**	**Not Determined**	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Not a contributing factor-** significant impacts causing change in prey structure and/or availability are not expected.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment.	**Unknown-** potential changes to prey availability for salmon have not been determined and effects are unknown.
Change in genetic structure of population	**U**	**Not Determined**	**Unknown**: composition of bycatch has not been determined	**Unknown**: composition of bycatch has not been determined	**Not a contributing factor-** significant impacts causing change in genetic structure of stock are not expected.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** bycatch composition has not been determined and current stock composition for all species of salmon is unknown.

Table 4.1-12 (cont.). Cumulative effects analysis for Chinook and other salmon in the Bering Sea and Aleutian Islands: Fisheries Management Plan 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	Land management practices	Long-term Climate Change and Regime Shift	
Change in reproductive success	**U**	**Yes**	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts of bycatch and state fisheries could hinder recovery.	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impact of bycatch and subsistence fisheries could hinder recovery.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** given the poor stock status of salmon runs in western Alaska* and the combined bycatch potential of BSAI and GOA, sustainability of depressed salmon stocks could be impacted. Salmon reproductive success depends on spawning adults reaching destined spawning habitat.

Notes: *Incorporates Kuskokwim, Nushagak, and Yukon Rivers also referred to as the AYK region (Arctic-Yukon-Kuskokwim-region).
BSAI - Bering Sea and Aleutian Island
FMP - fisheries management plan
GOA - Gulf of Alaska
I - insignificant
U - unknown

Table 4.1-13. List of species (or species group) abbreviations detailed for the simulation-projection model, the category, and the type of information available.

GOA			
Abbreviation	**Species or species group**	**Assessment type**	**Species category**
PLCK	pollock	Age-structured	FMP
PCOD	Pacific cod	Age-structured	FMP
DEEP	deep flatfish	Survey abundance	FMP
REXS	rex sole	Survey abundance	FMP
SHAL	shallow flatfish	Survey abundance	FMP
FSOL	flathead sole	Age-structured	FMP
ARTH	arrowtooth	Age-structured	FMP
SABL	sablefish	Age-structured	FMP
ORCK	other rockfish	Survey abundance	FMP
NRCK	northern rockfish	Age-structured	FMP
POP	Pacific ocean perch	Age-structured	FMP
PRCK	pelagic shelf rockfish	Survey abundance	FMP
DRCK	demersal shelf rockfish	Survey abundance	FMP
SRKR	shortraker/rougheye	Survey abundance	FMP
THDS	thornyheads	Age-structured	FMP
ATKA	atka mackerel	Survey abundance	FMP
HALM	halibut mortality	na	PSC
BAIR	bairdi	na	PSC
RKNG	red king crab	na	PSC
CHIN	chinook	na	PSC
OSAL	other salmon	na	PSC
HERR	herring	na	PSC
OTAN	other tanner crab	na	PSC
OKNG	other king crab	na	PSC
OTHR	other spp	na	Other non-specified
sculpin	sculpins	na	Other non-specified
gunnel	gunnels	na	Other non-specified
sticheidae	sticheidae	na	Other non-specified
sandfish	sandfish	na	Other non-specified
grenadier	grenadiers	na	Other non-specified
crabs	crabs	na	Other non-specified
starfish	starfish	na	Other non-specified
jellyfish	jellyfish	na	Other non-specified
invertunid	unidentified invertebrates	na	Other non-specified
seapen/whip	seapen/whip	na	Other non-specified
sponge	sponges	na	Other non-specified
anemone	anemones	na	Other non-specified
tunicate	tunicates	na	Other non-specified
benthinv	benthic invertebrates	na	Other non-specified
echinoderm	echinoderms	na	Other non-specified
otherfish	otherfish	na	Other non-specified
birds	birds	na	Other non-specified
smelts	smelts	na	Other non-specified
shark	shark	na	Other non-specified
salmonshk	salmon shark	na	Other non-specified
dogfish	dogfish	na	Other non-specified
sleepershk	sleeper shark	na	Other non-specified
skates	skates	na	Other non-specified
lanternfish	lanternfish	na	Other non-specified
sandlance	sandlance	na	Other non-specified
octopus	octopus	na	Other non-specified
SQUD	squid	na	Other non-specified
coral	coral	na	Other non-specified
shrimp	shrimp	na	Other non-specified

Table 4.1-13. (cont.). List of species (or species group) abbreviations detailed for the simulation-projectic model, the category, and the type of information available.

BSAI			
Abbreviation	**Species or species group**	**Assessment type**	**Species category**
PLCK	Eastern Bering Sea pollock	Age-structured	FMP
AIPLCK	Aleutian Islands pollock	Survey abundance	FMP
PCOD	Pacific cod	Age-structured	FMP
YSOL	yellowfin sole	Age-structured	FMP
GTRB	Greenland turbot	Age-structured	FMP
ARTH	arrowtooth	Age-structured	FMP
RSOL	rock sole	Age-structured	FMP
FSOL	flathead sole	Age-structured	FMP
AKPLC	Alaska plaice	Age-structured	FMP
OFLT	other flatfish	Survey abundance	FMP
SABL	sablefish	Age-structured	FMP
BSAIPOP	Pacific ocean perch	Age-structured	FMP
AIORCK	Aleutian Islands Other rockfish	Survey abundance	FMP
BSORCK	Bering Sea Other rockfish	Survey abundance	FMP
BSAINrthrn	northern rockfish	Survey abundance	FMP
BSAISRKR	shortraker/rougheye	Survey abundance	FMP
ATKA	Atka mackerel	Age-structured	FMP
SQUD	squid	Survey abundance	FMP
BSAIOTHSPP	other species	Survey abundance	FMP
HALM	halibut mortality	na	PSC
BAIR	bairdi crab	na	PSC
RKNG	red king crab	na	PSC
CHIN	chinook	na	PSC
OSAL	other salmon	na	PSC
HERR	herring	na	PSC
OTAN	other tanner crab	na	PSC
OKNG	other king crab	na	PSC
sculpin	sculpin	na	Other non-specified
gunnel	gunnel	na	Other non-specified
sticheidae	sticheidae	na	Other non-specified
sandfish	sandfish	na	Other non-specified
grenadier	grenadier	na	Other non-specified
crabs	crabs	na	Other non-specified
starfish	starfish	na	Other non-specified
jellyfish	jellyfish	na	Other non-specified
invertunid	invertunid	na	Other non-specified
seapen/whip	seapen/whip	na	Other non-specified
sponge	sponge	na	Other non-specified
anemone	anemone	na	Other non-specified
tunicate	tunicate	na	Other non-specified
benthinv	benthinv	na	Other non-specified
echinoderm	echinoderm	na	Other non-specified
otherfish	otherfish	na	Other non-specified
birds	birds	na	Other non-specified
smelts	smelts	na	Other non-specified
shark	shark	na	Other non-specified
salmonshk	salmonshk	na	Other non-specified
dogfish	dogfish	na	Other non-specified
sleepershk	sleepershk	na	Other non-specified
skates	skates	na	Other non-specified
lanternfish	lanternfish	na	Other non-specified
sandlance	sandlance	na	Other non-specified
octopus	octopus	na	Other non-specified
squid	squid	na	Other non-specified
coral	coral	na	Other non-specified
shrimp	shrimp	na	Other non-specified

Notes: BSAI – Bering Sea and Aleutian Island
EBS – eastern Bering Sea
FMP – fishery management plan
GOA – Gulf of Alaska
na – not available
PSC – prohibited species catch

Table 4.1-14 List of fishery abbreviations used in the model and their relationship to target species, gear, and area of operation for the Gulf of Alaska.

Fishery Abbreviation	Area	Gear	Target species
C_BTR_ARCK	Central Gulf of Alaska	Bottom trawl	Aggregate rockfish
C_BTR_DEEP	Central Gulf of Alaska	Bottom trawl	Deep flatfish
C_BTR_FSOL	Central Gulf of Alaska	Bottom trawl	Flathead sole
C_BTR_PCOD	Central Gulf of Alaska	Bottom trawl	Pacific cod
C_BTR_PLCK	Central Gulf of Alaska	Bottom trawl	Pollock
C_BTR_POP	Central Gulf of Alaska	Bottom trawl	Pacific Ocean Perch
C_BTR_REXS	Central Gulf of Alaska	Bottom trawl	Rex sole
C_BTR_SHAL	Central Gulf of Alaska	Bottom trawl	Shallow flatfish
C_BTR_SRKR	Central Gulf of Alaska	Bottom trawl	Shortraker/rougheye
C_HAL_PCOD	Central Gulf of Alaska	Longline	Pacific cod
C_HAL_SABL	Central Gulf of Alaska	Longline	Sablefish
C_POT_PCOD	Central Gulf of Alaska	Pot	Pacific cod
C_PTR_PLCK	Central Gulf of Alaska	Pelagic trawl	Pollock
C_PTR_POP	Central Gulf of Alaska	Pelagic trawl	Pacific Ocean Perch
E_BTR_DEEP	Eastern Gulf of Alaska	Bottom trawl	Deep flatfish
E_BTR_POP	Eastern Gulf of Alaska	Bottom trawl	Pacific Ocean Perch
E_HAL_PCOD	Eastern Gulf of Alaska	Longline	Pacific cod
E_HAL_SABL	Eastern Gulf of Alaska	Longline	Sablefish
E_POT_PCOD	Eastern Gulf of Alaska	Pot	Pacific cod
E_PTR_PLCK	Eastern Gulf of Alaska	Pelagic trawl	Pollock
E_PTR_POP	Eastern Gulf of Alaska	Pelagic trawl	Pacific Ocean Perch
W_BTR_ARCK	Western Gulf of Alaska	Bottom trawl	Aggregate rockfish
W_BTR_ARTH	Western Gulf of Alaska	Bottom trawl	Arrowtooth flounder
W_BTR_FSOL	Western Gulf of Alaska	Bottom trawl	Flathead sole
W_BTR_PCOD	Western Gulf of Alaska	Bottom trawl	Pacific cod
W_BTR_POP	Western Gulf of Alaska	Bottom trawl	Pacific Ocean Perch
W_BTR_REXS	Western Gulf of Alaska	Bottom trawl	Rex sole
W_BTR_SHAL	Western Gulf of Alaska	Bottom trawl	Shallow flatfish
W_HAL_PCOD	Western Gulf of Alaska	Longline	Pacific cod
W_HAL_SABL	Western Gulf of Alaska	Longline	Sablefish
W_POT_PCOD	Western Gulf of Alaska	Pot	Pacific cod
W_PTR_PLCK	Western Gulf of Alaska	Pelagic trawl	Pollock

Table 4.1-15 List of fishery abbreviations used in the model and their relationship to target species, gear, and area of operation for the Bering Sea and Aleutian Islands.

Fishery Abbreviation	Area	Gear	Target species
B_BTR_FSOL	Eastern Bering Sea	Bottom trawl	Flathead sole
B_BTR_GTRB	Eastern Bering Sea	Bottom trawl	Greenland turbot
B_BTR_OFLT	Eastern Bering Sea	Bottom trawl	Other Flatfish
B_BTR_PCOD	Eastern Bering Sea	Bottom trawl	Pacific cod
B_BTR_RSOL	Eastern Bering Sea	Bottom trawl	Rock sole
B_BTR_SABL	Eastern Bering Sea	Bottom trawl	Sablefish
B_BTR_YSOL	Eastern Bering Sea	Bottom trawl	Yellowfin sole
B_HAL_GTRB	Eastern Bering Sea	Longline	Greenland turbot
B_HAL_PCOD	Eastern Bering Sea	Longline	Pacific cod
B_HAL_SABL	Eastern Bering Sea	Longline	Sablefish
B_POT_PCOD	Eastern Bering Sea	Pot	Pacific cod
B_PTR_PLCK	Eastern Bering Sea	Pelagic trawl	Pollock
C_BTR_ATKA	Central Aleutian Islands	Bottom trawl	Atka mackerel
C_BTR_PCOD	Central Aleutian Islands	Bottom trawl	Pacific cod
C_BTR_POP	Central Aleutian Islands	Bottom trawl	Pacific Ocean Perch
C_HAL_GTRB	Central Aleutian Islands	Longline	Greenland turbot
C_HAL_PCOD	Central Aleutian Islands	Longline	Pacific cod
C_HAL_SABL	Central Aleutian Islands	Longline	Sablefish
C_POT_PCOD	Central Aleutian Islands	Pot	Pacific cod
C_PTR_PLCK	Central Aleutian Islands	Pelagic trawl	Pollock
E_BTR_ATKA	Eastern Aleutian Islands	Bottom trawl	Atka mackerel
E_BTR_PCOD	Eastern Aleutian Islands	Bottom trawl	Pacific cod
E_BTR_POP	Eastern Aleutian Islands	Bottom trawl	Pacific Ocean Perch
E_HAL_GTRB	Eastern Aleutian Islands	Longline	Greenland turbot
E_HAL_PCOD	Eastern Aleutian Islands	Longline	Pacific cod
E_HAL_SABL	Eastern Aleutian Islands	Longline	Sablefish
E_POT_PCOD	Eastern Aleutian Islands	Pot	Pacific cod
E_PTR_PLCK	Eastern Aleutian Islands	Pelagic trawl	Pollock
W_BTR_ATKA	Western Aleutian Islands	Bottom trawl	Atka mackerel
W_BTR_PCOD	Western Aleutian Islands	Bottom trawl	Pacific cod
W_BTR_POP	Western Aleutian Islands	Bottom trawl	Pacific Ocean Perch
W_HAL_PCOD	Western Aleutian Islands	Longline	Pacific cod
W_HAL_SABL	Western Aleutian Islands	Longline	Sablefish
W_POT_PCOD	Western Aleutian Islands	Pot	Pacific cod
W_PTR_PLCK	Western Aleutian Islands	Pelagic trawl	Pollock

Table 4.1-16. Gulf of Alaska retention rates by fishery and stock for all alternatives except 3.2.

	PLCK	PCOD	DEEP	REXS	SHAL	FSOL	ATF	SABL	ORCK	NRCK	POP	PRCK	DRCK	SRKR	THDS	ATKA	OTHR
C_BTR_NRCK	0.452	0.813	0.697	0.657	0.951	0.525	0.206	0.739	0.476	0.982	0.768	0.988		0.761	0.900	0.979	0.005
C_BTR_DEEP	0.354	0.703	0.997	0.980	0.858	0.906	0.285	0.616	0.716	0.194	0.070	0.520		0.388	0.786		0.062
C_BTR_FSOL	0.929	0.813	0.978	0.979	0.951	0.997	0.174	0.901		0.814	0.935	0.805		1.000	1.000		0.154
C_BTR_PCOD	0.780	0.990	0.598	0.905	0.889	0.817	0.159	0.263	0.025	0.286	0.057	0.453		0.595	0.406	0.001	0.054
C_BTR_PLCK	0.977	0.997	0.844	0.978	0.929	0.917	0.148	0.192		0.072	0.022	0.412		0.993	1.000		0.345
C_BTR_POP	0.335	0.863	0.584	0.610	0.770	0.745	0.255	0.828	0.232	0.886	0.948	0.901		0.920	0.900		0.085
C_BTR_REXS	0.723	0.875	0.084	0.990	0.384	0.737	0.042	0.448	0.003	0.017	0.090	0.062		0.744	0.886		0.000
C_BTR_SHAL	0.618	0.619	0.987	0.967	0.958	0.989	0.291	0.297	0.291	0.965	0.264	0.930		0.599	0.883		0.374
C_BTR_SRKR	0.618	0.619	0.987	0.967	0.958	0.989	0.291	0.297	0.291	0.965	0.264	0.930		0.599	0.883		0.374
C_HAL_PCOD	0.361	0.992	0.095		0.034	0.010	0.000	0.528	0.891	0.155	1.000	0.569		0.117	0.530		0.025
C_HAL_SABL	0.011	0.734	0.027		0.024		0.014	0.975	0.783		0.493	0.775		0.481	0.921		0.033
C_POT_PCOD	0.434	0.992	0.611	1.000	0.584	1.000	0.002	0.017	0.917		0.639	0.008					0.388
C_PTR_PLCK	0.995	0.989	0.919	0.693	0.589	0.809	0.823	0.612	1.000	0.370	0.753	1.000		0.238	1.000	1.000	0.450
C_PTR_POP	0.227	0.891	0.973	0.947	1.000	1.000	0.105	0.990	0.606	0.893	0.996	0.953		0.978	0.983		
E_BTR_DEEP	0.753	0.318	0.999	0.967	0.029	0.200	0.095	0.500	0.569		0.685	0.081		0.545	0.846		0.173
E_BTR_POP	0.201	0.918	0.051	0.606		0.078	0.100	0.964	0.844	0.991	0.995	0.990		0.995	0.966		0.012
E_HAL_PCOD	0.517	0.985	0.438		0.189		0.011	0.737	0.995		1.000	0.865	0.981	0.913	0.983		0.129
E_HAL_SABL	0.023	0.453	0.075		0.081		0.002	0.983	0.645		0.661	0.685	0.974	0.709	0.958	1.000	0.023
E_POT_PCOD	0.348	0.993							1.000			0.028					0.315
E_PTR_PLCK	0.998	0.821					0.530	1.000	1.000		1.000	1.000		0.965			0.306
E_PTR_POP	0.157							1.000	0.461		0.990	0.904		0.789			
W_BTR_ARCK					1.000												
W_BTR_ARTH	0.336	0.898	0.072	0.971	0.788	0.754	0.698	0.343		0.170	0.026	0.441		0.402	0.795	0.628	0.003
W_BTR_FSOL	0.694	0.673	0.465	0.916	0.778	0.841	0.054	0.874			0.029			0.817	0.948	0.888	0.000
W_BTR_PCOD	0.436	0.994	0.103	0.892	0.240	0.556	0.006	0.124		0.005	0.079	0.000		0.078	0.402	0.267	0.000
W_BTR_POP	0.639	0.995	0.688	0.849	0.711	0.603	0.849	0.987	0.746	0.860	0.984	0.956		0.708	0.872	0.921	0.014
W_BTR_REXS	0.587	0.724	0.335	0.978	0.541	0.494	0.079	0.525		0.008	0.280	0.228		0.365	0.774	0.613	0.003
W_BTR_SHAL	0.714	0.824		0.941	0.794	0.880	0.003										0.314
W_HAL_PCOD	0.805	0.990	0.642		0.043	0.005	0.017	0.814	0.496	0.029	0.364	0.524		0.271	0.938		0.008
W_HAL_SABL	0.120	0.703	0.470		0.030		0.063	0.977	0.543		0.614	0.333		0.435	0.836		0.012
W_POT_PCOD	0.435	0.995			0.012	1.000	0.002		0.282	0.002						0.047	0.048
W_PTR_PLCK	0.995	0.986	1.000	0.617	0.176	0.872	0.652	0.025	1.000	0.224	0.812	1.000		0.035		1.000	0.031

Table 4.1-17. Bering Sea and Aleutian Island retention rates by fishery and stock for all alternatives except 3.2.

Fishery	PLCK	AIPLCK	PCOD	YSOL	GTURB	ARTH	RSOL	FSOL	AKPLC	OFLT	SABL	POP	AIORCK	BSORCK	NRCK	SRKR	ATKA
B_BTR_FSOL	0.426		0.952	0.599	0.849	0.188	0.318	0.868	0.098	0.271	0.837	0.709		0.841	0.025	0.871	0.983
B_BTR_GTRB	0.440		0.939	0.527	0.930	0.443	0.336	0.970	0.482	0.958	0.972	0.859		0.993		1.000	0.923
B_BTR_OFLT	0.509		0.976	0.650	0.477	0.176	0.407	0.808	0.545	0.839	0.659	0.576		0.571		0.912	0.628
B_BTR_PCOD	0.355		0.994	0.254	0.388	0.173	0.244	0.441	0.016	0.205	0.635	0.160		0.114	0.058	0.329	0.552
B_BTR_RSOL	0.500		0.965	0.722	0.803	0.304	0.589	0.643	0.103	0.078	0.564	0.727		0.625		0.920	0.428
B_BTR_SABL	0.717				0.141	0.297		0.984		0.971	1.000			0.776		1.000	
B_BTR_YSOL	0.619		0.938	0.861	0.728	0.484	0.377	0.775	0.183	0.051	0.929	0.352		0.556			0.988
B_HAL_GTRB	0.717		0.933		0.966	0.042		0.288			0.771	0.018		0.951		0.777	
B_HAL_PCOD	0.819		0.978	0.035	0.762	0.076	0.017	0.056	0.595	0.010	0.320	0.169		0.228		0.449	0.027
B_HAL_SABL			0.147		0.297	0.005		0.150			0.981			0.697		0.121	
B_POT_PCOD	0.594		0.997	0.025	0.200	0.042	0.042	0.605		0.649	0.857	0.467		0.024		0.070	0.029
B_PTR_PLCK	0.997		0.957	0.349	0.430	0.444	0.359	0.449	0.135	0.840	0.809	0.591		0.241	0.110	0.616	0.329
C_BTR_ATKA		0.891	0.988		0.769	0.575	0.278			0.181	0.142	0.449	0.100		0.050	0.585	0.896
C_BTR_PCOD		0.759	0.996		0.232	0.066	0.233	0.194		0.306	1.000	0.213	0.063		0.005	0.455	0.657
C_BTR_POP		0.685	0.982		0.998	0.427	0.650	0.039		0.992	0.979	0.972	0.599		0.112	0.926	0.814
C_HAL_GTRB			0.246		0.973	0.001					0.880	0.636	0.624			0.362	
C_HAL_PCOD		0.617	0.961		0.445	0.052					0.846	0.004	0.044			0.167	0.163
C_HAL_SABL		0.636	0.747		0.661	0.175	0.035				0.992		0.964		1.000	0.501	0.500
C_POT_PCOD			0.995			0.041	0.025				1.000		0.089			0.317	0.130
C_PTR_PLCK		1.000	0.885		0.796		1.000					0.483				0.584	1.000
E_BTR_ATKA		0.843	0.991	0.028	0.913	0.425	0.336	0.562		0.668	0.943	0.581	0.208		0.071	0.810	0.962
E_BTR_PCOD		0.147	0.987		0.081	0.050	0.106	0.030		0.047	0.358	0.118	0.044		0.003	0.226	0.264
E_BTR_POP		0.547	0.998		0.934	0.623	0.077	0.266		0.639	0.997	0.968	0.798		0.276	0.794	0.763
E_HAL_GTRB		0.384	0.784		0.938	0.013					0.880	0.182	0.816			0.591	
E_HAL_PCOD		0.823	0.977		0.778	0.005	0.032	0.013			0.819	0.198	0.183		0.012	0.232	0.001
E_HAL_SABL		0.192	0.680		0.518	0.070		0.648		0.898	0.971	0.967	0.871			0.471	
E_POT_PCOD		0.061	0.995	0.243	0.570	0.001				0.875	0.931		0.021				0.126
E_PTR_PLCK		1.000										0.974					
W_BTR_ATKA		0.817	0.990		0.576	0.535	0.083	0.303		0.402	1.000	0.474	0.094		0.024	0.623	0.953
W_BTR_PCOD		0.235	0.996		1.000	0.008	0.041	0.071				0.008	0.002				0.583
W_BTR_POP		0.935	1.000		0.908	0.529	0.480	0.721		0.787	1.000	0.966	0.522		0.568	0.988	0.795
W_HAL_PCOD		0.670	0.986		0.703	0.002		0.007			0.387	0.005	0.153			0.355	0.446
W_HAL_SABL			0.968		0.831						0.995		0.913			0.082	
W_POT_PCOD			0.998										0.123				0.066
W_PTR_PLCK		1.000	1.000				1.000	1.000				0.178				0.146	

Table 4.1-18. Average ex-vessel value ($/ton) for groundfish species by gear type for the Gulf of Alaska.

Species group	Bottom trawl	Longline	Pot
Alaska plaice	$264		
Atka mackerel	$355		$381
Arrowtooth flounder	$68	$202	$68
Deepwater flatfish	$264	$264	
Demersal shelf rockfish		$2,431	
Flathead sole	$263	$266	
Northern rockfish	$111	$111	$111
Other rockfish	$187	$896	$1,063
Other species	$601	$888	$807
Pacific cod	$568	$726	$625
Pelagic shelf rockfish	$152	$258	$916
Pollock	$279	$172	$207
Rex sole	$952	$877	
Sablefish	$3,900	$4,957	$4,957
Shallow-water flatfish	$398	$475	$485
Skates	$136	$184	
Squid	$89		
Shortraker/rougheye rockfish	$779	$621	$539
Thornyhead rockfish	$1,307	$1,818	$1,818
Pacific ocean perch	$110	$659	

Table 4.1-19. Average ex-vessel value ($/ton) for groundfish species by gear type for the Bering Sea and Aleutian Islands.

Species group	Bottom trawl	Longline	Pot
Alaska plaice	$201		
Atka mackerel	$398	$403	$349
Arrowtooth flounder	$202	$202	$33
Flathead sole	$365	$374	$36
Greenland turbot	$366	$440	$240
Northern rockfish	$162		
Other flatfish	$216	$201	$27
Other rockfish	$197	$194	$42
Other species	$194	$162	$33
Pacific cod	$480	$449	$536
Pollock	$237	$237	$147
Rock sole	$475	$475	$31
Sablefish	$3,900	$4,093	$3,918
Skates	$118	$118	$118
Squid	$89		
Shortraker/rougheye rockfish	$659	$894	$26
Thornyhead rockfish	$1,213	$1,434	$1,168
Pacific ocean perch	$197	$194	$194
Yellowfin sole	$216	$216	$27

Table 4.1-20. Summary description of main model differences among alternatives.

Alternative	Catch-composition data modifications	Constraint modification	ABC/TAC/Biology	Retention rate	Ex-vessel value
1	1997-2001 average except for all fisheries except the EBS pollock and the AI Atka mackerel fisheries use values from 2000 & 2001 only.	Baseline assumptions	Amendment 56 with added Steller sea lion protection measures and Author's recommendation (e.g., Dorn's adjustment to GOA pollock)	As estimated in 2001	As estimated in 2001
2.1	Same as Alt 1 but with pre-IFQ catch-composition rates for sablefish fisheries and earlier estimates of halibut mortality	OY set to sum of ABC's No PSC limits	F_{ABC} set to F_{OFL} ($F_{35\%}$) No reduction in F as stock drops below $B_{40\%}$		Same as Alt 1
2.2	Same as Alt 1	OY set to sum of ABC's	Same as Alt 1	Same as Alt 1	Same as Alt 1
3.1	Same as Alt 1	Halibut mortality PSC reduced by 10 percent	Same as Alt 1	Same as Alt 1	Same as Alt 1
3.2	Same as Alt 1 but with improved bycatch of discarded species—i.e., C = R + D * 0.8 where C is the catch of a particular species in a particular fishery and R and D are estimated retained and discarded species respectively	OY set to sum of ABC's Halibut mortality limit reduced by 30%	For all rockfish species: $F_{ABC} = F_{60\%}$ Risk averse adjustment: $F_{Har} = F_{msy}$ * Adjustment $F_{ABC} = \min(F_{Har}, F_{40\%}, F_{OFL\_Alt1})$ For rockfish species $F_{ABC\_RF} = \min(F_{60\%}, F_{Har})$	Same as Alt 1	Same as Alt 1
4.1	Same as Alt 1	OY set to sum of ABC's Fisheries with more than 33 percent bycatch (not counting P cod, pollock, and arrowtooth) are eliminated Halibut mortality limit reduced by 50 percent	Uncertainty corrections based on survey CVs and $F_{ABC} = F_{75\%}$ for all prey species and rockfish	Full retention	Same as Alt 1
4.2	No bycatch	No constraints	No fishing	No retention	$0

Notes: ABC – acceptable biological catch
AI – Aleutian Island
Alt – Alternative
CV – catcher vessel
EBS – eastern Bering Sea
GOA – Gulf of Alaska
IFQ – individual fishing quota
OY – optimum yield
PSC – prohibited species catch
TAC – total allowable catch

Table 4.1-21. Alternative 3.2 Gulf of Alaska retention rates by stock/species group and fishery abbreviation.

Fishery	PLCK	PCOD	DEEP	FHS	REXS	SHAL	ATF	SABL	ORCK	NRCK	POP	PRCK	DRCK	SRKR	THDS	ATKA	OTHR
C_BTR_ARCK	0.561	0.851	0.758	0.726	0.961	0.620	0.365	0.792	0.581	0.985	0.814	0.990		0.809	0.920	0.984	0.204
C_BTR_DEEP	0.483	0.762	0.998	0.984	0.887	0.925	0.428	0.692	0.773	0.356	0.256	0.616		0.510	0.829		0.249
C_BTR_FSOL	0.943	0.851	0.982	0.983	0.960	0.997	0.340	0.921		0.851	0.948	0.844		1.000	1.000		0.323
C_BTR_PCOD	0.824	0.992	0.679	0.924	0.911	0.853	0.327	0.410	0.220	0.429	0.245	0.562		0.676	0.525	0.201	0.243
C_BTR_PLCK	0.982	0.998	0.875	0.983	0.943	0.934	0.319	0.353		0.258	0.218	0.529		0.995	1.000		0.476
C_BTR_POP	0.468	0.890	0.667	0.688	0.816	0.796	0.404	0.862	0.385	0.909	0.958	0.921		0.936	0.920		0.268
C_BTR_REXS	0.778	0.900	0.267	0.992	0.507	0.790	0.234	0.558	0.202	0.214	0.272	0.250		0.795	0.909		0.200
C_BTR_SHAL	0.695	0.695	0.990	0.973	0.966	0.991	0.433	0.438	0.433	0.972	0.411	0.944		0.679	0.906		0.499
C_BTR_SRKR	0.695	0.695	0.990	0.973	0.966	0.991	0.433	0.438	0.433	0.972	0.411	0.944		0.679	0.906		0.499
C_HAL_PCOD	0.489	0.994	0.276		0.227	0.208	0.200	0.622	0.913	0.324	1.000	0.655		0.294	0.624		0.220
C_HAL_SABL	0.208	0.787	0.222		0.219		0.211	0.980	0.826		0.594	0.820		0.584	0.937		0.226
C_POT_PCOD	0.547	0.993	0.689	1.000	0.667	1.000	0.202	0.214	0.933		0.711	0.206					0.511
C_BTR_PLCK	0.996	0.991	0.935	0.755	0.671	0.847	0.858	0.690	1.000	0.496	0.803	1.000		0.390	1.000	1.000	0.560
C_BTR_POP	0.381	0.913	0.978	0.958	1.000	1.000	0.284	0.992	0.685	0.914	0.996	0.963		0.982	0.986		
E_BTR_DEEP	0.802	0.454	0.999	0.974	0.224	0.360	0.276	0.600	0.655		0.748	0.265		0.636	0.877		0.338
E_BTR_POP	0.361	0.934	0.241	0.685		0.263	0.280	0.971	0.875	0.993	0.996	0.992		0.996	0.973		0.210
E_HAL_PCOD	0.614	0.988	0.551		0.351		0.209	0.790	0.996		1.000	0.892	0.985	0.931	0.987		0.303
E_HAL_SABL	0.218	0.563	0.260		0.265		0.201	0.986	0.716		0.729	0.748	0.979	0.767	0.966	1.000	0.219
E_POT_PCOD	0.478	0.994							1.000			0.222					0.452
E_BTR_PLCK	0.998	0.857					0.624	1.000	1.000		1.000	1.000		0.972			0.445
E_BTR_POP	0.325							1.000	0.569		0.992	0.923		0.831			
W_BTR_ARCK					1.000												
W_BTR_ARTH	0.469	0.918	0.258	0.977	0.830	0.803	0.759	0.474		0.336	0.221	0.553		0.522	0.836	0.702	0.202
W_BTR_FSOL	0.756	0.738	0.572	0.932	0.822	0.873	0.243	0.899			0.223			0.854	0.958	0.910	0.200
W_BTR_PCOD	0.549	0.995	0.282	0.913	0.392	0.645	0.205	0.299		0.204	0.263	0.200		0.262	0.521	0.413	0.200
W_BTR_POP	0.711	0.996	0.750	0.879	0.769	0.683	0.879	0.990	0.797	0.888	0.987	0.965		0.766	0.897	0.937	0.212
W_BTR_REXS	0.669	0.780	0.468	0.982	0.633	0.595	0.263	0.620		0.206	0.424	0.382		0.492	0.819	0.691	0.202
W_BTR_SHAL	0.771	0.859		0.953	0.835	0.904	0.203										0.452
W_HAL_PCOD	0.844	0.992	0.713		0.234	0.204	0.214	0.851	0.597	0.223	0.491	0.619		0.417	0.951		0.206
W_HAL_SABL	0.296	0.762	0.576		0.224		0.251	0.982	0.634		0.691	0.466		0.548	0.868		0.210
W_POT_PCOD	0.548	0.996			0.209	1.000	0.202		0.426	0.202						0.238	0.239
W_BTR_PLCK	0.996	0.988	1.000	0.694	0.341	0.898	0.722	0.220	1.000	0.379	0.850	1.000		0.228		1.000	0.225

Table 4.1-22. Bering Sea and Aleutian Island retention rates by stock/species group and fishery.

Fishery	PLCK	AIP LCK	PCOD	YSOL	GTURB	ARTH	RSOL	FSOL	AKPLC	OFLT	SABL	POP	AIO RCK	BSO RCK	NRCK	SRKR	ATKA
B_BTR_FSOL	0.541		0.961	0.679	0.880	0.351	0.454	0.894	0.278	0.416	0.870	0.767		0.873	0.220	0.897	0.986
B_BTR_GTRB	0.552		0.951	0.622	0.944	0.555	0.468	0.976	0.585	0.966	0.978	0.887		0.994		1.000	0.938
B_BTR_OFLT	0.607		0.981	0.720	0.581	0.340	0.526	0.847	0.636	0.871	0.727	0.661		0.657		0.929	0.702
B_BTR_PCOD	0.484		0.996	0.403	0.511	0.338	0.395	0.553	0.213	0.364	0.708	0.328		0.292	0.247	0.463	0.641
B_BTR_RSOL	0.600		0.972	0.778	0.842	0.443	0.671	0.715	0.283	0.262	0.651	0.782		0.700	0.200	0.936	0.542
B_BTR_SABL	0.773				0.313	0.438		0.987		0.977	1.000	0.200		0.821		1.000	
B_BTR_YSOL	0.695		0.951	0.889	0.783	0.587	0.501	0.820	0.346	0.240	0.944	0.481		0.645			0.990
B_HAL_GTRB	0.774		0.946		0.973	0.233		0.431			0.817	0.215		0.961		0.822	
B_HAL_PCOD	0.855		0.982	0.228	0.810	0.261	0.213	0.245	0.676	0.208	0.456	0.335		0.382		0.559	0.222
B_HAL_SABL	0.200		0.318	0.200	0.438	0.204	0.200	0.320			0.985			0.758		0.297	
B_POT_PCOD	0.675		0.998	0.220	0.360	0.233	0.234	0.684		0.719	0.886	0.574		0.219		0.256	0.223
B_PTR_PLCK	0.998		0.966	0.479	0.544	0.555	0.487	0.559	0.308	0.872	0.847	0.673		0.393	0.288	0.693	0.463
C_BTR_ATKA		0.913	0.990		0.815	0.660	0.422			0.345	0.314	0.559	0.280		0.240	0.668	0.917
C_BTR_PCOD		0.807	0.997		0.386	0.253	0.386	0.355		0.445	1.000	0.370	0.250		0.204	0.564	0.726
C_BTR_POP		0.748	0.985		0.998	0.541	0.720	0.231		0.993	0.983	0.977	0.679		0.289	0.941	0.851
C_HAL_GTRB			0.397		0.979	0.201					0.904	0.709	0.699		0.200	0.490	
C_HAL_PCOD		0.694	0.969		0.556	0.241					0.877	0.203	0.235		0.200	0.334	0.330
C_HAL_SABL		0.709	0.798		0.729	0.340	0.228				0.994		0.971		1.000	0.601	0.600
C_POT_PCOD			0.996		0.200	0.232	0.220				1.000		0.271			0.454	0.304
C_PTR_PLCK		1.000	0.908		0.837	0.200	1.000					0.587				0.667	1.000
E_BTR_ATKA		0.874	0.992	0.223	0.930	0.540	0.469	0.650		0.735	0.955	0.664	0.366		0.257	0.848	0.969
E_BTR_PCOD		0.318	0.989		0.265	0.240	0.285	0.224		0.238	0.486	0.294	0.235		0.202	0.381	0.411
E_BTR_POP		0.638	0.998		0.948	0.698	0.261	0.413		0.711	0.997	0.975	0.838		0.421	0.835	0.810
E_HAL_GTRB		0.507	0.828		0.950	0.210	0.200				0.904	0.345	0.852			0.673	
E_HAL_PCOD		0.858	0.981		0.822	0.204	0.226	0.211			0.855	0.359	0.346		0.209	0.386	0.201
E_HAL_SABL		0.354	0.744		0.614	0.256		0.718		0.919	0.977	0.974	0.897			0.577	
E_POT_PCOD		0.249	0.996	0.394	0.656	0.201				0.900	0.945		0.217				0.301
E_PTR_PLCK		1.000	0.200		0.200	0.200						0.979	0.200				
W_BTR_ATKA		0.854	0.992		0.661	0.628	0.266	0.442		0.522	1.000	0.580	0.275		0.219	0.699	0.962
W_BTR_PCOD		0.388	0.997		1.000	0.207	0.233	0.257				0.206	0.202				0.667
W_BTR_POP		0.948	1.000		0.926	0.623	0.584	0.777		0.829	1.000	0.973	0.617		0.654	0.990	0.836
W_HAL_PCOD		0.736	0.989		0.762	0.202		0.206		0.200	0.510	0.204	0.322			0.484	0.557
W_HAL_SABL			0.975		0.865						0.996		0.930			0.265	
W_POT_PCOD			0.998										0.298				0.253
W_PTR_PLCK		1.000	1.000				1.000	1.000				0.343				0.317	

Table 4.1-23. Results of incorporating current stock size uncertainty and uncertainty in future recruitment to derive a risk-averse adjustment to F_{msy} estimates. These are applied to develop the Alternative 3.2 maximum permissible ABC calculations used for the multi-species model.

Stock	Geometric Mean (Risk Neutral) *F*	Harmonic Mean (Risk Averse) *F*	Adjustment factor (applied to $F_{msy}=F_{35\%}$)
BSAI Atka mackerel	0.455	0.269	0.592
BSAI Pacific ocean perch	0.054	0.052	0.961
BS arrowtooth flounder	0.300	0.279	0.930
BS Flathead sole	0.350	0.279	0.798
BSAI Pacific cod	0.321	0.241	0.751
BS rocksole	0.177	0.145	0.821
BS pollock	0.532	0.331	0.622
BS yellowfin sole	0.125	0.114	0.916
BSAI Greenland turbot	0.484	0.313	0.646
GOA arrowtooth flounder	0.211	0.193	0.913
GOA Flathead sole	0.372	0.242	0.651
GOA northern rockfish	0.061	0.054	0.885
GOA Pacific ocean perch	0.057	0.037	0.648
Sablefish	0.141	0.069	0.491
GOA Pacific cod	0.401	0.287	0.718*
GOA thornyhead rockfish			0.831**
GOA pollock			0.671***

Notes: *BSAI P cod maturity-at-age
**Average of all rockfish stocks
***Average P cod, pollock, and Atka mackerel

Additional notes: For species assessments where multiple fisheries are explicitly included selectivity and fishery average-weights-at-age were computed as weighted mean values: $S_a = \sum_{g=1}^{n_{fsh}} s_{a,g} r_g$ and $W_a = \sum_{g=1}^{n_{fsh}} w_{a,g} r_g$

with $\sum_{g=1}^{n_g} r_g = 1$

where r_f is the proportion of fishing mortality attributed to each fishery *f*. Since covariance matrices were unavailable from three assessments, an average correlation matrix was computed based on related species i.e., for P cod, the average correlation matrix was computed from pollock and Atka mackerel. For Greenland turbot, a CV of 19 percent was assumed for 2003 numbers at age with a diagonal covariance matrix. For these three stocks, (BSAI P cod, GOA P cod, and Greenland turbot) the sensitivity of these assumptions appeared to be relatively minor. For ATF and flathead sole the natural mortality assumed for females was used for both sexes. Average weight and selectivity at age was computed as a simple mean over both sexes.

Table 4.1-24. Stock size uncertainty adjustments to Max(F_{ABC}) estimates developed for Alternative 4.1. These are based on assessment uncertainty (measurement error) from survey data and use the lower 90 percent confidence bound.

Gulf of Alaska	Max(F_{ABC}) Adjustment	Bering Sea and Aleutian Islands	Max(F_{ABC}) Adjustment
Pollock	0.734	EBS Pollock	0.688
Pacific cod	0.779	Aleutian Islands pollock	0.624
Deepwater flatfish	0.865	Pacific cod	0.866
Rex sole	0.857	Yellowfin sole	0.847
Shallow flatfish	0.786	Greenland turbot	0.605
Flathead sole	0.827	Arrowtooth flounder	0.827
Arrowtooth flounder	0.868	Rocksole	0.879
Sablefish	0.849	Flathead sole	0.829
Pacific ocean perch	0.615	Alaska Plaice	0.828
Shortraker/Rougheye	0.788	Sablefish	0.849
Other slope rockfish	0.708	BSAI Pacific ocean perch	0.710
Northern rockfish	0.523	Aleutian Islands other rockfish	0.572
Pelagic shelf rockfish	0.537	BS other rockfish	0.740
Demersal shelf rockfish	0.814	BSAI northern rockfish	0.780
Thornyhead rockfish	0.814	BSAI Shortraker/Rougheye rockfish	0.594
Atka mackerel			0.543

Notes: BSAI – Bering Sea and Aleutian Island
EBS – eastern Bering Sea

Table 4.1-25. Equilibrium impact levels as a function of fishing intensity and two plausible sets of sensitivity parameters (*qh*) and recovery rates (rho) for biostructure habitat features. and.

Effort Levels	Impact Levels (Biostructure)	
f **= area swept/25 km^2**	***E*** **(Scenario 1[a])** **rho = 0.50** ***qh*** **= 0.10**	***E*** **(Scenario 2[b])** **rho = 0.067** ***qh*** **= 0.25**
0.00	0.000	0.000
0.10	0.020	0.278
0.25	0.049	0.499
0.50	0.095	0.680
1.00	0.181	0.828
2.00	0.328	0.925

Notes: [a] Scenario 1 combines low sensitivity and fast recovery rate (2 years) to estimate low impact
[b] Scenario 2 combines higher sensitivity and slow recovery rate (15 years) to estimate a higher impact rate for a given fishing intensity
km^2 - kilometer squared

Table 4.1-26. Frequency distribution of fishing intensity intervals, corresponding level of impact for each interval, and mean impact levels as proportion of fished area and proportion of the fishable area for two scenarios of habitat sensitivity (qh) and recovery rate (rho) for the Bering Sea and Aleutian Islands and Gulf of Alaska.

Effort Levels *f* = area swept/25 km^2	Frequency - number of 5x5 km blocks	Area - square miles	Percent of fished area	Impact Levels (Biostructure)	
				E (Scenario 1) rho = 0.50 *qh* = 0.10	*E* (Scenario 2) rho = 0.067 *qh* = 0.25
Bering Sea					
0.00 to 0.10	2,857	27,641	40%	0.000 to 0.020	0.000 to 0.278
0.10 to 0.25	1,610	15,577	23%	0.020 to 0.049	0.278 to 0.499
0.25 to 0.50	1,003	9,704	14%	0.049 to 0.095	0.499 to 0.680
0.50 to 1.00	822	7,953	12%	0.095 to 0.181	0.680 to 0.828
1.00 to 2.00	552	5,341	8%	0.181 to 0.328	0.828 to 0.925
2.00 to 17.00	277	2,680	4%	0.328 to 0.949	0.925 to 1.000
Total Fished Area = 7121		Mean impact (midpt) as proportion of fished areas		0.082	0.419
EEZ <1000m = 31,995		Mean impact (midpt) as proportion of EEZ <1000m		0.018	0.093
Aleutian Islands					
0.00 to 0.10	512	4,954	58%	0.000 to 0.020	0.000 to 0.278
0.10 to 0.25	155	1,500	18%	0.020 to 0.049	0.278 to 0.499
0.25 to 0.50	96	929	11%	0.049 to 0.095	0.499 to 0.680
0.50 to 1.00	58	561	7%	0.095 to 0.181	0.680 to 0.828
1.00 to 2.00	40	387	5%	0.181 to 0.328	0.828 to 0.925
2.00 to 9.00	22	213	2%	0.328 to 0.816	0.925 to .997
Total Fished Area = 883		Mean impact (midpt) as proportion of fished areas		0.054	0.326
EEZ <1000m = 4,215		Mean impact (midpt) as proportion of EEZ <1000m		0.011	0.068
Gulf of Alaska					
0.00 to 0.10	1,753	16,960	62%	0.000 to 0.020	0.000 to 0.278
0.10 to 0.25	559	5,408	20%	0.020 to 0.049	0.278 to 0.499
0.25 to 0.50	265	2,564	9%	0.049 to 0.095	0.499 to 0.680
0.50 to 1.00	162	1,567	6%	0.095 to 0.181	0.680 to 0.828
1.00 to 2.00	58	561	2%	0.181 to 0.328	0.828 to 0.925
2.00 to 6.00	30	290	1%	0.328 to 0.686	0.925 to 0.990
Total Fished Area = 2,827		Mean impact (midpt) as proportion of fished areas		0.038	0.290
EEZ <1000m = 11,947		Mean impact (midpt) as proportion of EEZ <1000m		0.009	0.069

Notes: EEZ - Exclusive Economic Zone
km^2 - kilometer squared
m - meter

Table 4.1-27. Sector model step 1 – 2001 conditions and 2003 sector model results.

Sector	2001 Conditions for BS Pollock Trawl Harvest				
	Catch (Percent)	Retention (Percent)	Product Value (Per total mt)	Payments to Labor (Percent of $)	Employment (FTE/$ million)
Surimi trawl CPs	35.3	99.8	604.4	35.0	4.3
Fillet trawl CPs	7.6	99.1	723.7	39.9	4.5
Head-and-gut trawl CPs	2.2	54.6	402.2	32.7	6.2
Bering Sea pollock shore plants	43.5	98.1	635.7	39.9	7.4
Alaska Peninsula Aleutian Island shore plants	1.2	97.8	579.3	39.6	7.8
Floaters	0.0	54.8	324.7	35.7	8.5
Motherships	10.2	99.8	548.9	35.0	3.8
All Processors	**100.0**	**74.5**	**616.7**	**37.7**	**5.7**
Sector	**2003 Sector Model Results for BS Pollock Trawl Harvests**				
Surimi trawl CPs	519.3	518.0	313.8	109.8	1,342.8
Fillet trawl CPs	112.3	111.3	81.3	32.4	364.0
Head-and-gut trawl CPs	32.0	17.5	12.9	4.2	79.3
Bering Sea pollock shore plants	640.8	628.8	407.4	162.6	3,022.4
Alaska Peninsula Aleutian Island shore plants	18.1	17.7	10.5	4.1	81.8
Floaters	0.5	0.3	0.2	0.1	1.4
Motherships	149.6	149.2	82.1	28.7	311.6
All Processors	**1,472.5**	**1,442.7**	**908.1**	**342.0**	**5,203.4**

Notes: BS - Bering Sea
CP - catcher-processor
FTE - full time equivalent
mt - metric ton

Table 4.1-28. Step 2a – matrix relating processing sector retained catches to the catcher vessel sector.

Processing Sector	Percentage of Total Delivered by CVs	BS Pollock Trawl	BS Pollock Trawl	Diversified AFA Trawl CV	Non-AFA Trawl CV	Trawl CV<60	Total
		Percent of Processing Sector Deliveries by CV Sectors					
Surimi trawl CPs	0.2	23.4	76.6	0.0	0.0	0.0	100.0
Fillet trawl CPs	0.7	0.0	81.8	18.2	0.0	0.0	100.0
Bering Sea Pollock shore plants	100.0	61.5	34.8	3.4	0.2	0.0	100.0
Alaska Peninsula Aleutian Island shore plants	100.0	39.9	42.3	17.1	0.2	0.4	100.0
Floaters	100.0	8.9	56.9	33.3	0.9	0.0	100.0
Motherships	100.0	0.2	98.3	0.8	0.7	0.0	100.0
Total percent of pollock delivered	**53.6**	**49.4**	**47.0**	**3.3**	**0.3**	**0.0**	**100.0**

Notes: ' - feet
AFA - American Fisheries Act
BS - Bering Sea
CP - catcher processor
CV - catcher vessel

Table 4.1-29. Step 2b – translation of 2001 catcher vessel conditions to FMP 1 for 2003 Bering Sea trawl pollock.

Catcher Vessel Sector	Retained Catch (Percent)	Ex-vessel ($/mt)	Payments to Labor (Percent of $)	Employment (FTE/$Million)
				2001 CV Conditions for BS Trawl Pollock
BS Pollock Trawl CV >125'	49.40	237.00	40.00	1.83
BS Pollock Trawl CV 60'-124'	46.99	237.00	40.00	3.17
Diversified AFA Trawl CV	3.26	237.00	40.00	5.95
Non-AFA Trawl CV	0.32	237.00	40.00	8.65
Trawl CV < 60	0.04	237.00	40.00	13.93
Total	**100.00**	**237.00**	**40.00**	**2.62**
2003 CV Model Output under FMP 1 for BS Trawl Pollock				
BS Pollock Trawl CV >125'	390.03	92.44	36.97	169.11
BS Pollock Trawl CV 60'-124'	371.00	87.93	35.17	278.40
Diversified AFA Trawl CV	25.76	6.11	2.44	36.32
Non-AFA Trawl CV	2.50	0.59	0.24	5.13
Trawl CV < 60	0.29	0.07	0.03	0.97
Total	**789.58**	**187.13**	**74.85**	**489.93**

Notes: AFA - American Fisheries Act
BS - Bering Sea
CV - catcher vessel
FMP - fishery management plan
FTE - full time equivalent
mt - metric ton

Table 4.1-30. Regional ownership of vessels harvesting Bering Sea trawl pollock in 2001.

Sector	Alaska Peninsula/ Aleutian Islands	Kodiak	S. Central Alaska	S. Eastern Alaska	Washington Inland Waters	Oregon Coast	Other	Total
CPs and At-Sea Processors	**Percent of Sector's BS Trawl Pollock in 2001 Assigned to Regions**							
Surimi trawl CPs	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
Fillet trawl CPs	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
Head-and-gut trawl CPs	0.0	7.5	0.0	0.0	80.7	0.0	11.8	100.0
Floaters	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
Motherships	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
Catcher Vessels	**Percent of Sector's BS Trawl Pollock in 2001 Assigned to Regions**							
BS pollock trawl CV > 125'	0.0	0.0	0.0	0.0	96.1	0.0	3.9	100.0
BS pollock trawl CV 60'-124'	0.0	4.8	0.0	0.0	78.0	14.8	2.4	100.0
Diversified AFA trawl CV	0.0	27.4	9.8	0.0	32.9	19.6	10.3	100.0
Non-AFA trawl CV	10.7	12.5	2.5	0.0	16.1	31.0	27.2	100.0
Trawl CV<60	57.4	3.7	0.1	3.8	34.4	0.0	0.6	100.0

Notes: AFA - American Fisheries Act
BS - Bering Sea
CP - catcher-processor
CV - catcher vessel

Table 4.1-31. Assignment of sector pollock harvests to regions for FMP 1 and 2003.

Sector	Alaska Peninsula/ Aleutian Islands	Kodiak	S. Central Alaska	S. Eastern Alaska	Washington Inland Waters	Oregon Coast	Other	Total
CPs and At-Sea Processors	**FMP 1 BS Trawl Pollock in 2003 by Region (1,000 mt)**							
Surimi trawl CPs	0.0	0.0	0.0	0.0	518.0	0.0	0.0	518.0
Fillet trawl CPs	0.0	0.0	0.0	0.0	111.3	0.0	0.0	111.3
Head-and-gut trawl CPs	0.0	1.3	0.0	0.0	14.1	0.0	2.1	17.5
Floaters	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.3
Motherships	0.0	0.0	0.0	0.0	149.2	0.0	0.0	149.2
Catcher Vessels	**Percent of BS Trawl Pollock in 2001**							
BS pollock trawl CV>125'	0.0	0.0	0.0	0.0	374.8	0.0	15.2	390.0
BS pollock trawl CV 60'-124'	0.0	17.9	0.0	0.0	289.2	54.9	9.0	371.0
Diversified AFA trawl CV	0.0	7.1	2.5	0.0	8.5	5.1	2.7	25.8
Non-AFA trawl CV	0.3	0.3	0.1	0.0	0.4	0.8	0.7	2.5
Trawl CV<60	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.3

Notes: AFA - American Fisheries Act
BS - Bering Sea
CP - catcher-processor
CV - catcher vessel
FMP - fishery management plan
mt - metric ton

Table 4.1-32. Value of Bering Sea pollock under FMP 1 for 2003 by sector, region and delivery location.

Region	Delivery Location	BS Pollock Trawl CV>125'	BS Pollock Trawl CV 60'-124'	Diversified AFA Trawl CV	Non-AFA Trawl CV	Trawl CV <60'	Total
		Ex-vessel Value of Bering Sea Pollock Deliveries ($ Millions)					
Alaska Peninsula/Aleutian Islands Region	In-region				0.03	0.04	0.07
	Extra-regional				0.02		0.02
Alaska Peninsula/Aleutian Islands Region Total					0.06	0.04	0.10
Kodiak	In-region						
	Extra-regional		3.79	1.71	0.08	0.00	5.59
Kodiak Total			3.79	1.71	0.08	0.00	5.59
South Central Alaska Region	In-region						
	Extra-regional			0.57	0.01	0.00	0.59
South Central Alaska Total				0.57	0.01	0.00	0.59
Southeastern Alaska Region	In-region						
	Extra-regional					0.00	0.00
Southeastern Alaska Total						0.00	0.00
Washington Inland Waters Region	In-region	0.07	26.13	0.11	0.04		26.35
	Extra-regional	88.42	40.43	1.99	0.06	0.02	130.92
Washington Inland Waters Region Total		88.49	66.56	2.10	0.10	0.02	157.27
Oregon Coast Region	In-region						
	Extra-regional		14.94	1.13	0.18		16.25
Oregon Coast Total			14.94	1.13	0.18		16.25
Other Areas	In-region						
	Extra-regional	3.95	2.63	0.60	0.16	0.00	7.34
Other Areas Total		3.95	2.63	0.60	0.16	0.00	7.34
Total of All Regions		***92.44***	***87.93***	***6.11***	***0.59***	***0.07***	***187.13***

Notes: AFA - American Fisheries Act
BS - Bering Sea
CV - catcher vessel

Table 4.1-33. Regional income and employment multipliers used in the sector model.

Region	Additional Income ($)	Additional Employment (FTE)
	Per $Million in Total Output	
Alaska Peninsula/Aleutian Islands Region	80,412	2.60
Kodiak	126,147	4.90
Southcentral Alaska	180,920	7.00
Southeastern Alaska	185,591	7.90
Washington Inland Waters Region	234,800	5.80
Oregon Coast	186,400	7.00
Other Regions	235,700	6.30

Notes: FTE - full time equivalent

Table 4.1-34. Region impact of the Bering Sea pollock trawl fishery, Alaska Peninsula/Aleutian Islands region for FMP 1 in 2003.

Alaska Peninsula/Aleutian Islands Region	Value of Sales ($Millions)	Labor Income ($ Millions)	Employment (FTE)
In-region processing	417.8	166.8	3,104.2
Regionally owned at-sea processors	0.0	0.0	0.0
Extra-regional deliveries of regionally-owned catcher vessels	0.0	0.0	0.2
In-region deliveries of regionally-owned catcher vessels[a]	0.1	0.0	0.9
Indirect and induced income and labor impacts[b,c]		33.6	1,086.4
Total direct, indirect, and induced labor income and FTEs		200.4	4,191.7

Notes: [a]Output, income and FTEs of in-region deliveries of regionally-owned catcher vessels are excluded from total direct, indirect and induced impacts, because they are implicitly included within the multiplier for in-region processing impacts.
[b]Indirect and Induced labor income is calculated by multiplying total output by the regional labor income multiplier ($0.08 million in additional indirect and induced income are generated per $million in total output).
[c]Indirect and Induced labor FTE are calculated by multiplying total output by the regional labor FTE multiplier (2.6 additional indirect and induced FTE are generated per $Million in total output).
FTE - full time equivalent

Table 4.2-1. Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
TAC-setting process	- Set ABC < OFL	- Set ABC = OFL	- Set ABC < OFL (No changes from Alt 1)	- Set ABC < OFL (No changes from Alt 1)	- No changes from Alt 1	- Set ABC < OFL (No changes from Alt 1)	- No changes from Alt 1
	- Sum of TAC has to be within OY range	- Sum of TAC has to be within OY range (No changes from Alt 1)	- No changes from Alt 1	- Set TAC =< ABC for all targets and "other spp." category	- Same as 3.1	- No changes from Alt 1	- TAC = 0 for all species unless fisheries are proven to have no adverse effect on the environment
	- OY specified as range for BSAI: 1.4 - 2.0 mill MT and OY specified as range for GOA: 116,000 - 800,000 MT; BSAI OY cap: if the sum of TAC > 2 mill MT then TAC will be adjusted down	- OY specified as range; OY cap = sum of OFL	- OY specified as range; OY cap = sum of ABCs	- OY specified as range for BSAI: 1.4 - 2.0 mill MT and OY specified as range for GOA: 116,000 - 800,000 MT; BSAI OY cap: if the sum of TAC > 2 mill mt then TAC will be adjusted down (No changes from Alt 1)	- No OY range in plan; OY = TAC which is =< ABC - TAC is fishery specific	- No OY range in plan; OY = TAC which is =< ABC - TAC is fishery specific	- OY = 0; No fishery
	- B_{20} rule for prey species (pollock, P. cod, Atka mackerel)	- No changes from Alt 1	- No changes from Alt 1	- B_{20} rule for prey species (pollock, P. cod, Atka mackerel) (No changes from Alt 1)	- Revise harvest control rule by incorporating a constant buffer for prey species (pollock, P. cod, Atka mackerel)	- Set F_{75} for prey species (pollock, P. cod, Atka mackerel)	- TAC = 0 for all species

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
TAC-setting process (continued)	- ABC tier system (Amendment 56)	- OFL management (Amendment 56 OFL definitions with inflection points removed in tiers 1-3)	- No changes from Alt 1	- Review F_{40} and adapt ABC tier system where F_{40} is maximum permissible for stocks without estimate of MSY	- When possible, biological reference points based on species specific production patterns and ecosystem considerations (will use F_{60} for rockfish as proxy for analysis)	- Set $F_{60\text{-}80}$ for vulnerable (e.g., long-life, slow-growing) species (will use F_{75} for rockfish as proxy)	- TAC = 0 for all species
	- No directed fishery for forage fish (forage fish ban; Amendment 36/39)	- No forage fish ban	- No changes from Alt 1	- No directed fishery for forage fish (forage fish ban, Amendment 36/39; No changes from Alt 1)	- No changes from Alt 1	- No directed fishery for forage fish (forage fish ban, Amendment 36/39; No changes from Alt 1)	- Same as 4.1
	- Specify MSSTs for Tier 1-3 stocks	- No changes from Alt 1	- No changes from Alt 1	- Identify minimum required elements, resources, cost and a realistic time frame necessary to establish MSSTs for additional stocks and prioritize a list of candidate stocks	- Initiate analysis of MSSTs for priority stocks based on the timeframe determined by additional availability of required resources	- Adopt MSSTs appropriate to the harvest policy for each stock, with B_{40} as the limit (rather than the target)	- No changes from Alt 1
	- Set group TAC for “other species”	- No changes from Alt 1	- No changes from Alt 1	- Break sharks and skates out of "other species" group for TAC setting (Amendment 63/63)	- Break sharks and skates and additional groups out of "other species" group for TAC setting	- Least Abundant Species Aggregate TAC: e.g., TAC of species complex is based on the TAC of the least abundant member of the group	- TAC = 0 for all species

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
TAC-setting process (continued)				- Develop criteria for breaking out a species from a species complex	- Develop criteria to bring a non-specified species into a managed category	- where possible, break species out of the complex	
	- Precautionary adjustments exist, but vary with uncertainty only in Tier 1	- OFL management only	- No changes from Alt 1	- Conduct F_{40} review and adopt appropriate measures	- Develop, implement and update as necessary, procedures to account for uncertainty in estimating ABC	- Incorporate survey variance and uncertainty in ABC by a survey coefficient of variation for each stock	- In the face of uncertainty, set TAC = 0 for all species unless fisheries are proven to have no adverse effect on the environment
	- Develop ecosystem indicators for future use in TAC-setting	- No ecosystem indicators	- No changes from Alt 1	- Develop criteria for using key ecosystem indicators in TAC-setting	- Adopt, update as necessary, and use ecosystem indicators in TAC-setting	- Evaluate a range of ABCs using the lower bound of a confidence limit toaddress uncertainties in stock assessment advice	
Spatial/Temporal Management of TAC	- Target species closures when harvest limit reached	- No changes from Alt 1	- No changes from Alt 1	- No changes from Alt 1	- No changes from Alt 1	- No changes from Alt 1	- Harvest limit = 0
	- Species TAC distributed spatially for all BSAI and GOA species except "other spp."	- No changes from Alt 1	- No changes from Alt 1	- No changes from Alt 1	- Species TAC distributed spatially for all BSAI and GOA species except "other spp." (No changes from Alt 1)	- Distribute TAC spatially for all species except "other spp.", and distribute on smaller scales for all possible species (for analytical purposes, use BS pollock as proxy)	- TAC = 0 for all species
					- Develop objectives and criteria for allocating TAC in space and time		

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
MPAs and EFH	- EO13158 description and evaluation of potential MPA areas	- No MPAs	- No changes from Alt 1	- Develop MPA efficacy methodology including program goals, objectives and criteria for establishing MPAs and no take marine reserves	- 0-20% of BS, AI, GOA as MPAs and no-take marine reserves (e.g., 5% = no take, 15% = MPA) across a range of habitat types	- Establish 20-50% of the management area as no take MPAs covering the full range of marine habitats	- 100% closure areas
	- Maintain current closed/restricted areas such as: Walrus Island closures, RKC savings area, Bogoslof area, Pribilof Island closure, Nearshore Bristol Bay closures, Kodiak Type I-III areas, eastern GOA trawl closures	- Repeal current closed/restricted areas such as: Walrus Island closures, RKC savings area, Bogoslof area, Pribilof Island closure, Nearshore Bristol Bay closures, Kodiak Type I-III areas, eastern GOA trawl closures (except those included in SSL measures)	- No changes from Alt 1	- MPAs may include no take areas - Review existing closures such as Sitka Pinnacles to see if these areas qualify for MPAs under established criteria -Could include restrictions of specific gear types or fisheries	- no take areas allow no fishing and serve as research control areas - could encompass existing closures	Example areas in BSAI include: Submarine canyons: Unimak Pass, old Crab Pot sanctuary (into area 512), near Pribilof Islands, AI (SSL CH), SW of St. George, Misty Moon, RKC savings area	
	- Sitka Pinnacles marine reserve	- Repeal Sitka Pinnacles marine reserve	- No changes from Alt 1		- GOA selected sites for slope rockfish closures - BS EFH closures - No bottom contact MPA BSAI/GOA	Example areas in GOA include: Davidson Bank, Shumagin Islands, and region around Kodiak Island (previous crab closure areas), Gulf Shelf breaks, Sitka Pinnacles	
	- Identify and designate EFH and HAPC	- No changes from Alt 1	- No changes from Alt 1	- Identify and designate EFH and HAPC (No changes from Alt 1)	- Identify and designate EFH and HAPC (No changes from Alt 1)	- Establish AI Special Management Area to protect coral/live bottom habitats	- 100% closure areas

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
MPAs and EFH (continued)					- EFH mitigation measures listed above	- Establish 20-50% of the spawning areas as spawning area reserves for exploited species that are fished intensively at spawning time [may be same areas as for MPAs identified above]	- 100% closure areas
SSL Measures	- 2002 SSL closures: no fishing in Seguam Pass, 3nm no transit zones around rookeries; trawl and fixed gear closures in nearshore and critical habitat areas	- No changes from Alt 1	- No changes from Alt 1	- 2002 SSL closures: no fishing in Seguam Pass; 3nm no transit zones around rookeries; trawl and fixed gear closures in nearshore and critical habitat areas (No changes from Alt 1)	- Continue 2002 SSL closures except establish frameworked buffer zones that are based on distance from shore using existing telemetry data; as new data becomes available, buffer zones would be modified accordingly; for purposes of analysis, a 15 mile buffer zone will be used.	- Comprehensive trawl exclusion zones to protect all designated SSL critical habitat	- 100% closure areas
	-AI Closures until 2003			- AI Closures (same as Alt 1)	- Extend AI Closures		
	- B_{20} rule for prey species (pollock, P. cod, Atka mackerel)	- No changes from Alt 1	- No changes from Alt 1	- B_{20} rule for prey species (pollock, P. cod, Atka mackerel). (No changes from Alt 1)	- Revise harvest control rule by incorporating a constant buffer for prey species (pollock, P. cod, Atka mackerel)	- Set F_{75} for prey species (pollock, P. cod, Atka mackerel)	- TAC = 0 for all species

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Bycatch and Incidental Catch Restrictions	- PSC limits for herring, crab, halibut and salmon in BSAI, and for halibut in GOA	- Eliminate PSC limits	- PSC limits as for Alt 1. - Where sufficient stock status information is available, adjustable PSC limits established based on a percentage of the annual stock status	- BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (0-10%) (for purposes of analysis will use 10%)	- BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (10-30%) (for purposes of analysis will use 30%)	- BSAI: Reduce PSC limits for herring, crab, salmon, halibut by 30-50% (for purposes of analysis will use 50%)	- PSC limit = 0; No fishery
				- GOA: Establish PSC limits on salmon NTE a 25,000 fish cap for Chinook and a 20,500 fish cap for "other salmon"; establish PSC limits on crab and herring based on biomass or other fishery data;	- GOA: Establish PSC limits on salmon NTE a 25,000 fish cap for Chinook and a 20,500 fish cap for "other salmon"; establish PSC limits on crab and herring based on biomass or other fishery data; reduce all by 0-10% (for purposes of analysis will use 10%)	- GOA: Establish PSC limits on salmon NTE a 25,000 fish cap for Chinook and a 20,500 fish cap for "other salmon"; establish PSC limits on crab and herring based on biomass or other fishery data; reduce all by 30-50% (for purposes of analysis will use 50%)	
				- Reduce GOA halibut PSC limit 0-10% (for purposes of analysis will use 10%)	- Reduce GOA halibut PSC limit 10-30% (for purposes of analysis will use 30%)	- Reduce GOA halibut PSC limit 30-50% (for purposes of analysis will use 50%)	

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Bycatch and Incidental Catch Restrictions (Cont.)				- For those PSC species where annual population estimates exist, the Team will explore a mortality rate-based approach to setting limits	- For those PSC species where annual population estimates exist, the Team will explore a mortality rate-based approach to setting limits	- For those PSC species where annual population estimates exist, the Team will explore a mortality rate-based approach to setting limits	
	- IR/IU for pollock, P.cod	- Repeal IR/IU	- No changes from Alt 1	- No changes from Alt 1	- No changes from Alt 1	- Extend IR/IU to all target species	- No incidental catch
	- Current bycatch and incidental catch restrictions	- No bycatch restrictions	- Same as 2.1	- Review effectiveness of Coop-managed PSC reduction	- Incentive program for incidental catch and bycatch reduction, e.g.:	-Reduce bycatch:	- No incidental catch
	- VIP			- Repeal VIP program	(a) Individual Bycatch Quota (b) Harvest Priority (10% of TAC reserved to reward clean fishing) (c) bycatch reduction standards established (d) Coop managed Harvest Priority (0-10% TAC or PSC reserved to reward clean fishing) (e) HMAP	BSAI: reduce all by 30-50% GOA: reduce all by 30-50%	
	- Demersal Shelf Rockfish (DSR) full-retention			- Control bycatch by closing hotspot areas when bycatch limits are attained		- Bycatch limits for non-target stocks as information becomes available	- No bycatch

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Bycatch and Incidental Catch Restrictions (Cont.)	- Crab trawl closures - Cook Inlet prohibition for bottom trawl	- Eliminate all closure areas (except SSL measures) and no Cook Inlet trawl ban	- No changes from Alt 1	- No changes from Alt 1	- Develop appropriate closure areas in GOA to address bycatch for halibut and/or crab	- Establish gear closure areas and marine reserves to reduce and avoid bycatch	- 100% closure areas
	- Inseason bycatch management measures:	- Eliminate all inseason bycatch measures	- No changes from Alt 1	- No changes from Alt 1	- Repeal or modify MRBs and establish a system of caps and quotas	- No changes from Alt 1	- No inseason mgmt measures (no fishing)
	(a) establishment of fishing seasons for bycatch management						
	(b) herring closures for areas (not fishery)						
Seabird Measures	- Take of more than 4 short-tailed albatross within 2 years triggers consultation	- Take of more than 4 short-tailed albatross within 2 years triggers consultation (No changes from Alt 1)	- No changes from Alt 1	- Take of more than 4 short-tailed albatross within 2 years triggers consultation (No changes from Alt 1)	- No changes from Alt 1	- Set protection measures for all seabird species	- 100% protection of seabirds from fishing
	- Seabird avoidance measures, including those approved in 2001	- No 2001 seabird avoidance measures	- Same as 2.1	- Cooperate with USFWS to develop scientifically-based fishing methods that reduce incidental take for all threatened or endangered species and other albatrosses	- Cooperate with USFWS to develop scientifically-based fishing methods that reduce incidental take for all seabird species	- Cooperate with USFWS to develop scientifically-based fishing methods that reduce incidental take to levels approaching zero for all threatened or endangered species and for USFWS's list of species of management concern	- Zero incidental take; No fishery

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Gear Restrictions and Allocations	- Retain existing no-trawl zones and fixed gear restrictions; Bottom trawl ban in BSAI for pollock	- Eliminate all trawl closure areas and trawl and fixed gear restrictions (except SSL measures)	- No changes from Alt 1	- BSAI prohibition on bottom trawl for pollock	- BSAI and GOA prohibition on bottom trawl for pollock	- Prohibit trawling in all fisheries that can be prosecuted with other gear types (e.g., fisheries with > 25% bycatch)	- Prohibit all fishing
	- No pot fishing in GOA for sablefish			- No changes from Alt 1	- Restrict fishing to areas where fishing has previously been concentrated - see MPA/EFH measures	- Restrict bottom trawling for flatfish to specific areas: No trawling in areas identified (previous) as MPAs	- Prohibit all fishing
	- Retain existing gear restrictions and allocations			- No changes from Alt 1	- No changes from Alt 1		
	- Sablefish and P.cod allocated by gear in BSAI; sablefish allocated by gear in GOA			- No changes from Alt 1	- No changes from Alt 1	- SEE GEAR RESTRICTIONS ABOVE	- Close fisheries with bycatch
Overcapacity	- LLP and moratorium	- Eliminate LLP and moratorium	- No changes from Alt 1	- LLP and moratorium (No changes from Alt 1)	- No changes from Alt 1	- AFA and CDQ	- Zero fishing effort; No fishery
	- AFA Coops	- AFA Coops (No changes from Alt 1)	- No changes from Alt 1	- Rights-based managemenfishery by fishery basis as needed	- Rationalize all fisheries (all GOA, BSAI non-pollock/sablefish)	- LLP and moratorium - IFQ sablefish	
	- CDQ Program	- Repeal CDQ except for pollock and crab	- No changes from Alt 1	(a) IFQs (b) Coops	- Ensure CDQ program maximizes benefits in rural communities		

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Overcapacity (Cont.)	- Sablefish IFQ	- Eliminate Sablefish IFQ	- No changes from Alt 1	(i) community-based (ii) sector-based		- Effort-based regulations	
	- Community quota shares for sablefish	- No community quota share for sablefish	- No changes from Alt 1	(c) CDQs (d) Other community-based programs (e.g., halibut community share program as applied to other species)		i.e., trip, gear size limits, vessel size and hp limits, limits on tender vessels, seasonal exclusive area registration	
		- No further work on rationalization	- No changes from Alt 1				
Alaska Native Issues	- Incorporation of traditional knowledge through existing literature - AFSC anthropologist position	- No changes from Alt 1	- No changes from Alt 1	- Develop and implement procedures to incorporate traditional knowledge into fisheries management	- Incorporate additional traditional knowledge from research	- Initiate cooperative research programs for data gathering and monitoring in order to enhance use of traditional knowledge in fishery management	
	- AP and Council representation	- No changes from Alt 1	- No changes from Alt 1	- Increase consultation with Alaska Native and encourage increased participation	- Increase consultation with and representation of Alaska Natives in fishery management	- Increase consultation with and encourage participation of subsistence users (native and non-native)	
	- Allow for subsistence uses consistent with Federal Law	- No changes from Alt 1	- No changes from Alt 1			- Provide for traditional Native subsistence uses of fish and wildlife within protected areas	- No fishing including subsistence in the EEZ
Observer Program	- Fixed 0/30/100% coverage	- Repeal all observer programs except AFA and CDQ	- No changes from Alt 1	- Observer coverage same as Alt 1 or modified based on data and compliance needs, and should be scientifically-based	- Extend to 100% > 60' CDQ & AFA to stay the same as Alt 1	- Expand level of observer coverage	- Same as 4.1

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Observer Program (Cont.)	- 100% for AFA & CDQ catcher boats > 60 ft. and 200% for AFA & CDQ catcher processors and motherships			e.g., random placement, flexibility, variable rate		(a) 100% coverage on vessels (vessels <60' = 30% coverage) (b) 100% hauls are observed	
	- Industry pays for employment related costs	- No changes from Alt 1	- No changes from Alt 1	- Address conflict of interest	- Same as 3.1	- Address conflict of interest	- Same as 4.1
	- OMNI rule	- No changes from Alt 1	- No changes from Alt 1	(a) Federal contract funding (annual appropriation); use of contract hires vs. Federal employees		(a) Federal contract funding (annual appropriation)	
	- ATLAS rule	- No changes from Alt 1	- No changes from Alt 1	(b) Research Plan (e.g., fee-based)		(b) Research Plan (e.g., fee-based)	
	- 2003 Regulation package	- No changes from Alt 1	- No changes from Alt 1	(c) TAC set aside		(c) TAC set aside	
				- Improve sampling stations	- Same as 3.1		
				- Improve species identification for non-target	- Same as 3.1		
				- Develop uncertainty estimates for target species data	- Expand uncertainty estimates to all possible stocks	- Expand uncertainty estimates to all possible stocks (same as Alt 3.2)	
Data and Reporting Requirements	- Current reporting requirements - AFA requires all C-P and Motherships to weigh all pollock catch on NMFS-approved scales - All CDQ Groundfish catch to be weighed on NMFS-approved scales	- No changes from Alt 1 - No at-sea weighing of catch required except under AFA C-Ps	- No changes from Alt 1	- Collect and verify economic data through independent third party (accounting firm/other)	- Mandatory economic data reporting by vessels and processors, i.e. earnings, expenditure and employment data	- Requirement of motion-compensated scales to weigh all catches at sea or at shore-based processing plants	- No fishing

Table 4.2-1 (cont.). Comparison of FMP frameworks.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Data and Reporting Requirements (Cont.)	- Mandatory VMS for Atka mackerel fleet, pollock and P. cod	- No VMS	- No changes from Alt 1	- No changes from Alt 1	- Mandatory VMS for Atka mackerel fleet, pollock and P. cod, and all vessels over 125'	- Mandatory VMS for all groundfish vessels	- No fishing
				- Modify VMS to incorporate new technology and system providers	- Same as 3.1		

Notes:
ABC - acceptable biological catch
AFA - American Fisheries Act
AFSC - Alaska Fisheries Science Center
AI - Aleutian Islands
Alt - Alternative
AP - Advisory Panel
BS - Bering Sea
BSAI - Bering Sea and Aleutian Islands
CDQ - community development quota
C-P - catcher-processor
EEZ - U.S. Exclusive Economic Zone
EFH - essential fish habitat
EO - executive order
FMP - fishery management plan
GOA - Gulf of Alaska
HAPC - habitat areas of particular concern
IFQ - individual fishing quota
IR/IU - improved retention and improved utilization
LLP - license limitation program
MPA - marine protected area
MSST - minimum stock size threshold
MSY - maximum sustainable yield
MT - metric tons
OFL - overfishing level
OY - optimum yield
P. cod - Pacific Cod
PSC - prohibited species catch
SSL - Steller sea lion
TAC - total allowable catch
VIP - vessel incentive program
VMS - vessel monitoring system

Table 4.2-2. Comparison of FMP Frameworks: the preliminary preferred alternative.

		Preliminary Preferred Alternative	
		FMP PPA.1	**FMP PPA.2**
TAC-setting Process	ABC & OFL	- Set ABC < OFL *(same as FMP 1, 2.2, 3.1, 3.2, 4.1, 4.2)*	- Set ABC < OFL *(same as FMP 1, 2.2, 3.1, 3.2, 4.1, 4.2)*
	TAC	- Sum of TACs has to be within OY range *(same as FMP 1, 2.1, 2.2, 4.1)*	- Set TAC =< ABC for all targets and "other spp." category *(same as FMP 3.1, 3.2)*
	OY	- OY specified as range for BSAI: 1.4-2.0 mill MT and OY specified as range for GOA: 116,000 - 800,000 MT; BSAI OY cap: if the sum of TAC > 2 mill MT then TAC will be adjusted down *(same as FMP 1, 3.1)*	- No change from PPA.1
	B 20 rule	- B_{20} rule for prey species (pollock, P.cod, Atka mackerel) *(same as FMP 1, 2.1, 2.2, 3.1)*	- No change from PPA.1
	Forage Fish	- No directed fishery for forage fish (forage fish ban, Amendment 36/39;) *(same as FMP 1, 2.2, 3.1, 3.2, 4.1, 4.2)*	- No change from PPA.1
	MSST	- Specify MSSTs for Tiers 1-3 *(same as FMP 1, 2.1, 2.2, with inclusion of possible revisions to the National Standard 1 Guidelines)* - Continue to use and improve current harvest control rules to maintain a spawning stock biomass with the potential to produce sustained yields on a continuing basis *(new)*	- Initiate analysis of MSSTs for priority stocks based on the timeframe determined by additional availability of required resources taking into account SSC comments and concerns *(modified FMP 3.2 with inclusion of possible revisions to National Standard 1 Guidelines)* - Improve collection of biological information necessary to determine spawning stock biomass estimates, particularly for species in Tier 4-5 *(new)*
	"Other species", Species Complexes, Non-specified species	- Set group TAC for "other species" *(same as FMP 1, 2.1, 2.2)* - Maintain species categories (target, "other species", PSC and non-specified species) *(new)*	- Develop criteria for 'splitting and lumping' of species in order to have a consistent approach over as wide a range as possible ('other species', rockfish, non-specified, etc.) (*modified FMP 3.1 and 3.2)* - Consider breaking sharks and skates and additional groups out of "other species" group for TAC setting *(modified FMP 3.2)* - Develop criteria to bring a non-specified species into a managed category *(same as FMP 3.2)*

Table 4.2-2 (cont). Comparison of FMP Frameworks: the preliminary preferred alternative.

		Preliminary Preferred Alternative	
		FMP PPA.1	**FMP PPA.2**
TAC-setting Process (Cont.)	ABC Tier system	- Conduct F_{40} review and adopt appropriate measures as necessary *(modified FMP 3.1)*	- Develop, implement and update as necessary, procedures to account for uncertainty in estimating ABC, species-specific production patterns, and ecosystem considerations *(modified FMP 3.2)*
	Ecosystem Indicators	- Develop ecosystem indicators for future use in TAC-setting *(same as FMP 1)*	- Develop and implement, as appropriate, criteria for using key ecosystem indicators in the TAC-setting process *(modified FMP 3.1 and 3.2)* - Use F_{60} for rockfish as proxy for analysis *(modified FMP 3.2)*
	Target Species closures	- Target species closures when harvest limit is reached *(same as FMP 1, 2.1, 2.2, 3.1, 3.2, 4.1)*	- No change from PPA.1
Spatial/ Temporal Mgmt of TAC		- Species TAC distributed spatially for some BSAI and GOA species *(modified FMP 3.1)*	- No change from PPA.1
MPAs and EFH	MPA Process	- Executive Order 13158: Initiative establishes MPA Advisory Committee, MPA Center, MPA website, agency tasks and list of existing U.S. MPAs *(modified FMP 1)* - Development and adoption of definitions of MPAs, marine reserves, marine fishery reserves, protected marine habitats etc. *(new)* - Develop MPA efficacy methodology including program goals, objectives, and criteria, for establishing MPAs *(modified FMP 3.1)*	- Consider adopting 0-20% of BS, AI, GOA as MPAs and no-take marine reserves (e.g., 5% = no take, 15% = MPA) across a range of habitat types *(modified FMP 3.2)*
	Closures	- Maintain current closed/ restricted areas such as Walrus Island closures, RKC Savings Area, Bogoslof, Pribilof Island closures, nearshore Bristol Bay closures, Kodiak Type I-III areas, EGOA trawl closures, closures for herring and salmon, Sitka Pinnacles, etc. *(modified FMP 1)*	- Review all existing closures to see if these areas qualify for MPAs under established criteria. MPAs could include no-take reserves or have restrictions of specific gear types or specific fisheries or specific time periods. *(modified FMP 3.1)*
	EFH & HAPC	- Identify and designate EFH and HAPC *(same as FMP 1, 2.1, 2.2, 3.1, 3.2)*	- Identify and designate EFH and HAPC *(same as FMP 1, 2.1, 2.2, 3.1, 3.2)* - Determine extent of adverse effects from fishing, if any. Implement mitigation measures, if necessary. *(modified FMP 3.2)* - Establish Aleutian Island management area to protect coral/live bottom habitats *(modified FMP 4.1)*

Table 4.2-2 (cont). Comparison of FMP Frameworks: the preliminary preferred alternative.

		Preliminary Preferred Alternative	
		FMP PPA.1	**FMP PPA.2**
SSL Measures	Steller sea lion closures	- 2002 SSL closures: no fishing in Seguam Pass; 3nm no transit zones around rookeries; trawl and fixed gear closures in nearshore and critical habitat areas (*same as FMP 1, 2.1, 2.2, 3.1)*	- Modify 2002 SSL closures and designation of Critical Habitat as appropriate scientific information becomes available *(modified FMP 3.2)*
	Aleutian Islands	- Review cumulative impacts of opening AI pollock fishery *(new)*	- Modify AI SSL closures and designation of Critical Habitat as appropriate scientific information becomes available *(new)*
Bycatch and Incidental Catch Restrictions	Prohibited species catch limits	- Maintain PSC limits for herring, crab, halibut, and salmon in BSAI; maintain PSC limit for halibut in GOA *(same as FMP 1)* - Review effectiveness of coop managed PSC reduction *(same as FMP 3.1)* - BSAI: Consider reducing PSC limits for herring, crab, halibut, and salmon to the extent practicable (0-10%) (for purposes of analysis will use 10%) (*modified FMP 3.1)* - GOA: Identify salmon savings areas and establish PSC limits to manage *(new)* - GOA: Establish PSC limits on salmon (for example, NTE a 25,000 fish cap for Chinook and a 20,500 fish cap for 'other salmon'); establish PSC limits on crab and herring based on biomass or other fishery data *(modified FMP 3.1)* - For those PSC species where annual population estimates exist, explore a mortality rate based approach to setting limits *(modified FMP 3.1)*	- BSAI: Reduce PSC limits for herring, crab, halibut and salmon to the extent practicable (0-20% for analytical purposes) *(modified FMP 3.2)* - GOA: Establish PSC limits on salmon (for example, NTE a 25,000 fish cap for Chinook and a 20,500 fish cap for 'other salmon'); establish PSC limits on crab and herring based on biomass or other fishery data *(modified FMP 3.1)* - GOA: consider reducing all PSC by 0-10% *(modified FMP 3.2)* - BSAI/GOA: For those PSC species where annual population estimates exist, explore a mortality rate-based approach to setting limits (*modified FMP 3.2)*
	IR/IU	- IR/IU for Pollock and P. cod, BSAI - yellowfin and rocksole, GOA - shallow-water flatfish *(modified FMP 3.1)*	- Extend to other species as appropriate (*modified FMP 4.1)*
	Bycatch restrictions	- Maintain current bycatch and incidental catch restrictions *(modified FMP 1)* - Full retention of DSR in Southeast Outside *(modified FMP 1)* - Maintain coop managed 'hot spot' closures to control bycatch *(modified FMP 3.1)*	- Incentive program for incidental catch and bycatch reduction, e.g.: (a) Individual Bycatch Quota (b) Harvest Priority (10% of TAC reserved to reward clean fishing) (c) bycatch reduction standards established (d) Coop managed Harvest Priority (0-10% TAC or PSC reserved to reward clean fishing) *(modified FMP 3.2)*

Table 4.2-2 (cont). Comparison of FMP Frameworks: the preliminary preferred alternative.

		Preliminary Preferred Alternative	
		FMP PPA.1	**FMP PPA.2**
Bycatch and Incidental Catch Restrictions (Cont.	VIP program	- Maintain VIP program *(modified FMP 1)*	- Repeal VIP program *(same as FMP 3.1)*
	Closures	- Maintain existing inseason bycatch closures *(modified FMP 3.1)*	- Evaluate effectiveness of existing closures *(new)* - Develop appropriate inseason closure areas in GOA to address bycatch of halibut, salmon, and/or crab when PSC cap is reached for that species *(modified FMP 3.2)*
	Inseason bycatch measures	- Maintain MRAs *(new)*	- Repeal or modify MRAs and establish a system of caps and quotas *(modified FMP 3.2)*
Seabird Measures	Incidental take	- Take of more than 4 short-tailed albatross within 2 years triggers consultation in groundfish longline fisheries *(modified FMP 3.1)*	- No change from PPA.1
	Seabird avoidance measures	- Longline: Maintain current seabird avoidance measures. Implement measures approved in 2001 when final rule is published *(modified FMP 1)* - Trawl: Evaluate interactions of endangered seabirds with trawl gear *(new)*	- Longline: Cooperate with USFWS to develop scientifically-based fishing methods that reduce incidental take for all seabird species *(modified FMP 3.2)* - Trawl: Evaluate avoidance measures for endangered seabirds and implement as necessary *(new)*
Gear Restrictions and Allocations	closures	- Retain existing no trawl zones and fixed gear restrictions *(same as FMP 1, 2.2)* - Bottom trawl ban in BSAI for pollock *(same as FMP 1, 2.2, 3.1)*	- BSAI and GOA prohibition on pollock bottom trawl *(modified FMP 3.2)*
	allocations	- Retain existing gear restrictions and allocations *(same as FMP 1, 2.2, 3.1, 3.2)* - No pot fishing in GOA for sablefish *(same as FMP 1, 2.2, 3.1)* - Sablefish and P. cod allocated by gear in BSAI *(same as FMP 1, 2.2, 3.1, 3.2)* - Sablefish allocated by gear in GOA *(same as FMP 1, 2.2, 3.1, 3.2)*	- Evaluate pot fishing in GOA for sablefish *(new)*

Table 4.2-2 (cont). Comparison of FMP Frameworks: the preliminary preferred alternative.

		Preliminary Preferred Alternative	
		FMP PPA.1	**FMP PPA.2**
Overcapacity	Restricted access management	- Maintain existing restricted access programs (LLP and moratorium, AFA, IFQ sablefish, etc.) *(modified FMP 1)* - Continue development of rights-based mgmt, on a fishery by fishery basis as needed including: (a) IFQs (b) Coops (i) community-based (ii) sector-based (c) CDQs (d) Other community-based programs (e.g., halibut community share program as applied to other species) *(modified FMP 3.1)*	- Rationalize all fisheries (all GOA, BSAI non-pollock/sablefish) *(same as FMP 3.2)* - Ensure CDQ program maximizes benefits in rural communities *(same as FMP 3.2)*
Alaska Native Issues	Traditional Knowledge	- Develop and implement procedures to incorporate traditional knowledge into fisheries management *(same as FMP 3.1)*	- Incorporate additional traditional knowledge from research *(same as FMP 3.2)*
	AP/Council representation	- Increase consultation with Alaska Native and encourage increased participation *(same as FMP 3.1)*	- Increase consultation with and representation of Alaska Natives in fishery management *(same as FMP 3.2)*
Observer Program	Coverage and monitoring	- Continue existing Observer coverage or modify based on data and compliance needs *(modified FMP 3.1)* - Modification should be scientifically-based (e.g., random placement, flexibility, variable rate) *(modified FMP 3.1)*	- Extend to 100% > 60'; CDQ & AFA to stay the same as Alt 1 *(same as FMP 3.2)* - Expand/modify observer coverage based on scientific data and compliance needs (applies to all vessels: <60' and >= 60') *(modified FMP 3.1)* - Improve species identification for non-target species *(same as FMP 3.1, 3.2)* - Develop uncertainty estimates for target species data *(same as FMP 3.1)*
	Fee Structure	- Industry pays for observer deployment-related costs *(modified FMP 1)* - Explore: (a) Federal contract funding (annual appropriation); use of contract hires vs. Federal employees (b) Research Plan (e.g., fee-based) (c) TAC set aside *(modified FMP 3.1)*	- Develop and implement alternate funding mechanisms a) Federal funding b) Research Plan *(modified FMP 3.2)*

Table 4.2-2 (cont). Comparison of FMP Frameworks: the preliminary preferred alternative.

		Preliminary Preferred Alternative	
		FMP PPA.1	**FMP PPA.2**
Data and Reporting Requirements	Reporting Requirements	- Maintain current reporting requirements (a) AFA requirement that all CPs and motherships to weigh all pollock catch on NMFS approved scales (b) CDQ requirement that all CDQ groundfish catch is to be weighed on NMFS-approved scales *(modified FMP 1)*	- Explore programs that collect and verify economic data through independent third party (accounting firm/other) *(modified FMP 3.1)* - Collect mandatory economic data reporting by vessels and processors, i.e. earnings, expenditure and employment data *(modified FMP 3.2)* - Collect and verify aggregate economic data through independent third party (e.g. accounting firm) *(modified FMP 3.1)*
	VMS	- Maintain mandatory VMS requirement for Atka mackerel, P. cod, and pollock fleets *(modified FMP 3.1)*	- Modify VMS to incorporate new technology and system providers *(same as FMP 3.1, 3.2)*

Notes: ABC – acceptable biological catch
AFA – American Fisheries Act
AI – Aleutian Islands
AP – Advisory Panel
BS – Bering Sea
BSAI – Bering Sea and Aleutian Islands
CDQ – community development quota
CP – catcher-processor
DSR – demersal shelf rockfish
EFH – essential fish habitat
FMP – fishery management plan
GOA – Gulf of Alaska
HAPC – habitat areas of particular concern
IFQ – individual fishing quota
IR/IU – improved retention and improved utilization
LLP – license limitation program
Mill – million
MT – metric tons
OFL – overfishing level
OY – optimum yield
MPA – marine protected areas
MSST – minimum stock size threshold
PSC – prohibited species catch
PPA – preliminary preferred alternative
P.cod – Pacific cod
SSC – Science and Statistical Committee
SSL
TAC – total allowable catch
USFWS – U.S. Fish and Wildlife Service
VIP – vessel incentive program
VMS – vessel monitoring system

Table 4.2-3. Descriptive statistics for closure areas under Alternative 1, as of January 23, 2002.

Current 2002 Trawling Closures[1,2,3,4,5]			
	Fishable Area	Square Meters of Management	Percent of Fishable Area
Aleutian Islands			
No trawl	105380000000	43357506644	41.1%
No take reserve	105380000000	1662800000	1.6%
Total	105380000000	45020306644	42.7%
Bering Sea			
No trawl and Bogoslof	798870000000	153708738278	19.2%
No take reserve	798870000000	567620000	0.1%
Total	798870000000	154276358278	19.3%
Entire Bering Sea and Aleutian Islands			
No trawl	904250000000	197066244922	21.8%
No take reserve	904250000000	2230420000	0.2%
Total	904250000000	199296664922	22.0%
Central\West Gulf West of 144			
No trawl	265690000000	87906000000	33.1%
No take reserve	265690000000	1266300000	0.5%
Total	265690000000	89172300000	33.6%
Eastern Gulf - East of 144			
No trawl	90509000000	73958000000	81.7%
No take	90509000000	8304042	0%[6]
Total	90509000000	73966304042	81.7%
Entire Gulf of Alaska			
No trawl	356199000000	161864000000	45.4%
No take reserve	356199000000	1274604042	0.5%
Total	356199000000	163138604042	45.8%
Totals			
Total no trawl	1260449000000	358930244922	28.5%
Total no take	1260449000000	3505024042	0.3%
Total FMP Area	1260449000000	362435268964	28.8%

Notes: [1]Closures include SSL protection measures, ADF&G restrictions, and No Transit Zones.
[2]For consistency with other Preliminary Supplemental Environmental Impact Statement analysis, closures are cut at the 1000 meter boundary with the exception of the Bogoslof foraging area and the Aleutian Islands.
[3]Pelagic and non-pelagic trawl closures are included.
[4]The SSL no-transit areas account for the no-take-reserves; also includes Sitka Pinnacles (no take marine reserve for groundfish but salmon trolling is allowed).
[5]With the complexity for the SSL measures in the Aleutian Islands, for this analysis, SSL rookeries and haulouts were buffered at 12.7 nautical miles to effectively close 50 percent of critical habitat.
[6]Sitka Pinnacles; percentage is about 0.01 so this number appears as 0 percent.
FMP - fisheries management plan
SSL - Steller sea lion

Table 4.2-4. Descriptive statistics for closure areas under FMP scenario 2.1.

Current 2002 SSL Protection Measures[1,2,3,4]			
	Fishable Area	Square Meters of Management	Percent of Fishable Area
Aleutian Islands			
No trawl	105380000000	43357200000	41.1%
No take reserve	105380000000	1662800000	1.6%
Total	105380000000	45020000000	42.7%
Bering Sea			
No trawl and Bogoslof	798870000000	59826380000	7.5%
No take reserve	798870000000	567620000	0.1%
Total			7.6%
Entire Bering Sea and Aleutian Islands			
No trawl	904250000000	103183580000	11.4%
No take reserve	105380000000	2230420000	0.2%
Total	904250000000	105414000000	11.7%
Central\West Gulf West of 144			
No trawl	265690000000	77406700000	29.1%
No take reserve	265690000000	1266300000	0.5%
Total	265690000000	78673000000	29.6%
Eastern Gulf East of 144			
No trawl	90509000000	0	0.0%
No take	90509000000	0	0.0%
Total	90509000000	0	0.0%
Entire Gulf of Alaska			
No trawl	356199000000	77406700000	21.7%
No take reserve	356199000000	1266300000	0.5%
Total	356199000000	78673000000	22.1%
Totals			
Total no trawl	1260449000000	180590280000	14.3%
Total no take	461579000000	3496720000	0.3%
Total FMP Area	1260449000000	184087000000	14.6%

Notes: [1]Closures include the trawling SSL protection measures and no transit zones. Most H&L and pot closures overlap the trawl closures.
[2]For consistency with other Preliminary Supplementary Environmental Impact Statement analysis, closures are cut at the 1000 meter boundary with the exception of the Bogoslof and Seguam Pass foraging areas.
[3]With the complexity for the SSL measures in the Aleutian Islands, for this analysis, SSL rookeries and haulouts were buffered at 12.7 nautical miles to effectively close 50 percent of critical habitat.
FMP - fishery management plan
SSL - Steller sea lion

Table 4.2-5. Descriptive statistics for closure areas under FMP Scenario 2.2.

Current 2002 Trawling[1,2,3,4,5]			
	Fishable Area	**Square Meters of Management**	**Percent of Fishable Area**
Aleutian Islands			
No trawl	105380000000	43357506644	41.1%
No take reserve	105380000000	1662800000	1.6%
Total	105380000000	45020306644	42.7%
Bering Sea			
No trawl and Bogoslof	798870000000	153708738278	19.2%
No take reserve	798870000000	567620000	0.1%
Total	798870000000	154276358278	19.3%
Entire Bering Sea and Aleutian Islands			
No trawl	904250000000	197066244922	21.8%
No take reserve	904250000000	2230420000	0.2%
Total	904250000000	199296664922	22.0%
Central\West Gulf West of 144			
No trawl	265690000000	87906000000	33.1%
No take reserve	265690000000	1266300000	0.5%
Total	265690000000	89172300000	33.6%
Eastern Gulf East of 144			
No trawl	90509000000	73958000000	81.7%
No take	90509000000	8304042	0%[6]
Total	90509000000	73966304042	81.7%
Entire Gulf of Alaska			
No trawl	356199000000	161864000000	45.4%
No take reserve	356199000000	1274604042	0.5%
Total	356199000000	163138604042	45.8%
Totals			
Total no trawl	1260449000000	358930244922	28.5%
Total no take	1260449000000	3505024042	0.3%
Total FMP Area	1260449000000	362435268964	28.8%

Notes: [1]Closures include SSL protection measures, ADF&G restrictions, and no transit zones.
[2]For consistency with other Preliminary Supplemental Environmental Impact Statement analysis, closures are cut at the 1000 meter boundary with the exception of the Bogoslof foraging area and the Aleutian Islands.
[3]Pelagic and non-pelagic trawl closures are included.
[4]The Steller no transit areas and Sitka Pinnacles account for the no take reserves.
[5]With the complexity for the SSL measures in the Aleutian Islands, for this analysis, SSL rookeries and haulouts were buffered at 12.7 nautical miles to effectively close 50 percent of critical habitat.
[6]Sitka Pinnacles - percentage is about 0.01 percent so this number appears as 0 percent.

Table 4.2-6. Descriptive statistics for closure areas under FMP scenario 3.1.

Current 2002 Trawling Closures[1,2,3,4,5]			
	Fishable Area	**Square Meters of Management**	**Percent of Fishable Area**
Aleutian Islands			
No trawl	105380000000	43357506644	41.1%
No take reserve	105380000000	1662800000	1.6%
Total	105380000000	45020306644	42.7%
Bering Sea			
No trawl and Bogoslof	798870000000	153708738278	19.2%
No take reserve	798870000000	567620000	0.1%
Total	798870000000	154276358278	19.3%
Entire Bering Sea and Aleutian Islands			
No trawl	904250000000	197066244922	21.8%
No take reserve	904250000000	2230420000	0.2%
Total	904250000000	199296664922	22.0%
Central\West Gulf West of 144			
No trawl	265690000000	87906000000	33.1%
No take reserve	265690000000	1266300000	0.5%
Total	265690000000	89172300000	33.6%
Eastern Gulf East of 144			
No trawl	90509000000	73958000000	81.7%
No take	90509000000	8304042	0%[6]
Total	90509000000	73966304042	81.7%
Entire Gulf of Alaska			
No trawl	356199000000	161864000000	45.4%
No take reserve	356199000000	1274604042	0.5%
Total	356199000000	163138604042	45.8%
Totals			
Total no trawl	1260449000000	358930244922	28.5%
Total no take	1260449000000	3505024042	0.3%
Total FMP Area	1260449000000	362435268964	28.8%

Notes: [1]Closures include SSL protection measures, ADF&G restrictions, and no transit zones.
[2]For consistency with other Preliminary Supplemental Environmental Impact Statement analysis, closures are cut at the 1000 meter boundary with the exception of the Bogoslof foraging area and the Aleutian Islands.
[3]Pelagic and non-pelagic trawl closures are included.
[4]The Steller no transit areas and Sitka Pinnacles account for the no take reserves.
[5]With the complexity for the SSL measures in the Aleutian Islands, for this analysis, SSL rookeries and haulouts were buffered at 12.7 nautical miles to effectively close 50 percent of critical habitat.
[6]Sitka Pinnacles - percentage is about 0.01 percent so this number appears as 0 percent.
FMP - fishery management plan

Table 4.2-7. Descriptive statistics for closure areas under FMP scenario 3.2[1,2,3,4].

	Fishable Area	Square Meters of Management Area	Percent of Fishable Area
Aleutian Islands			
No trawl MPA	105380000000	37021000000	35.1%
No take marine reserves	105380000000	20175000000	19.1%
No SSLHL pot trawl MPA	105380000000	19345000000	18.4%
No SSL trawl MPA	105380000000	7650200000	7.3%
Total	105380000000	84166200000	79.9%
Bering Sea			
No trawl MPA	798870000000	170212365792	21.3%
No take marine reserves	798870000000	34247800000	4.3%
No SSL HL pot trawl MPA	798870000000	41941000000	5.3%
No SSL trawl MPA	798870000000	14231000000	1.8%
Total	798870000000	260632165792	32.6%
Entire Bering Sea and Aleutian Islands			
No trawl MPA	904250000000	207233365792	22.9%
No take marine reserves	904250000000	54422800000	6.0%
No SSL HL pot trawl MPA	904250000000	61286000000	6.8%
No SSL trawl MPA	904250000000	21881200000	2.4%
Total	904250000000	344798365792	38.1%
Central\Western Gulf			
No trawl MPA	265690000000	82306490050	31.0%
No take marine reserves	265690000000	44057000000	16.6%
No SSL HL pot trawl MPA	265690000000	13529000000	5.1%
No SSL trawl MPA	265690000000	34410000000	13.0%
Total	265690000000	174302490050	65.6%
Eastern Gulf			
No trawl MPA	90509000000	15070038000	16.7%
No take marine reserves	90509000000	4811664379	5.3%
No SSL H&I pot trawl	90509000000	63602319644	70.3%
Total	90509000000	83484022023	92.2%
Entire Gulf of Alaska			
No trawl MPA	356199000000	97376528050	27.3%
No take marine reserves	356199000000	48868664379	13.7%
No SSL HL pot trawl MPA	356199000000	77131319644	21.7%
No SSL trawl MPA	356199000000	34410000000	9.7%
Total	356199000000	257786512072	72.4%
Total no take	1260449000000	103291464379	8.2%
Total	1260449000000	602584877865	47.8%

Notes: [1]Some areas extend past the shelf and since the fishable area is based on the shelf, analysis does not represent total fishable area closed.
[2]The management areas are cut at the 1000 meter shelf break but for clarity the Aleutian Islands closures are shown in total.
[3]Bering Sea areas have been cut by the 1000 meter bathymetry but the Bogoslof Foraging and small surrounding areas are included in management areas.
[4]Since the eastern Gulf does not contain Steller sea lion protection measures, combined Gulf of Alaska area calculations must be read carefully.

Table 4.2-8. Descriptive statistics for closure areas under FMP scenario 4.1*.

	Fishable Area	Square Meters of Management Area	Percent of Fishable Area
Aleutian Islands			
No take marine reserve	105380000000	73332000000	69.6%
No trawl MPA	105380000000	15843000000	15.0%
Total	105380000000	89175000000	84.6%
Bering Sea			
No take marine reserve	798870000000	151550000000	19.0%
No trawl MPA	798870000000	115900000000	14.5%
Total	798870000000	267450000000	33.5%
Entire Bering Sea and Aleutian Islands			
No take marine reserve	904250000000	224882000000	24.9%
No trawl MPA	904250000000	131743000000	14.6%
Total	904250000000	356625000000	39.4%
Central\Western Gulf			
No take marine reserve	265690000000	114150504308	43.0%
No trawl MPA	265690000000	93946000000	35.4%
Total	265690000000	208096504308	78.3%
Eastern Gulf			
No take marine reserve	90509000000	19787000000	21.9%
No trawl MPA	90509000000	59268000000	65.5%
Total	90509000000	79055000000	87.3%
Entire Gulf of Alaska			
No take marine reserve	356199000000	133937504308	37.6%
No trawl MPA	356199000000	153214000000	43.0%
Total	356199000000	287151504308	80.6%
Totals FMP			
Totals no take marine reserve	1260449000000	358819504308	28.5%
Total no trawl	1260449000000	284957000000	22.6%
Total area	1260449000000	643776504308	51.1%

Notes: *No trawl areas includes only management areas over the 1000 meter bathy except for Sequam Pass and Bogoslof foraging areas
FMP - fishery management plan
MPA - marine protected area

Table 4.2-9. Descriptive statistics for closure areas under FMP scenario 4-2.

	Fishable Area	No Take Marine Reserve	Percent of Fishable Area
Aleutian Islands			
No take marine reserve	105380000000	1001100000000	100.0%
Bering Sea			
No take marine reserve	798870000000	1178852000000	100.0%
Entire Bering Sea and Aleutian Islands			
No take marine reserve	904250000000	2179952000000	100.0%
Central\Western Gulf West of 144			
No take marine reserve	265690000000	879850000000	100.0%
Eastern Gulf East of 144			
No take marine reserve	90509000000	320160000000	100.0%
Entire Gulf of Alaska			
No take marine reserve	356199000000	1200010000000	100.0%
Total FMP			
Total no take area - fishable	1260449000000	3379962000000	100.0%
Total no take area - EEZ	1260449000000	3379962000000	100.0%

Notes: EEZ - exclusive economic zone
FMP - fishery management plan

Table 4.4-1. Comparative baseline for target groundfish species.

Species	Comparative Baseline
BSAI Walleye Pollock	• EBS pollock is managed under Tier 1a, Aleutian Islands and the Central Bering Sea-Bogoslof Islands region is managed under Tier 5. • The EBS pollock population has shown an increasing trend since 1996. • Exploitable biomass (age-3+) has varied around 10 million mt since 1991 (Ianelli et al. 2002b), with a 2003 biomass value of 11,100,000 mt. • EBS pollock is not overfished, nor approaching an overfished condition. • The Aleutian Islands Island region pollock 2002 bottom trawl survey indicates a 65% increase in estimated biomass from the 2000 survey; no directed pollock fishing occurs in this region. • The Central Bering Sea-Bogoslof Island region 2002 hydroacoustic survey reports a biomass of 227,000 mt (Ianelli et al. 2002b); this stock is increasing and rebuilding. • FMP management takes into account all catch and bycatch in the EEZ and State waters when setting annual harvest levels.
GOA Walleye Pollock	• GOA pollock are managed under Tier 3b. • The western and central GOA 2001 survey estimates indicate a 65% decline in GOA pollock biomass estimates compared to the 1999 survey estimates. • The 2001 Shelikof Strait EIT survey indicated a 38% decline in age-2+ abundance; age-3 estimated abundance was highest on record. • Recent year classes appear weak and spawner biomass is expected to decline through at least 2003. • Management takes into account all catch and bycatch when setting annual harvest levels.
BSAI Pacific Cod	• The BSAI Pacific cod are managed under Tier 3b. • The 2002 EBS shelf trawl survey has indicated a decline in biomass from the 2001 estimate of 830,479 mt to 616,923 mt. • The Aleutian Islands survey also shows a decline from the 2000 biomass estimate. • The stock assessment model shows decline in age-3+ biomass and in the female spawning biomass since 1987. • The BSAI Pacific cod stock is not overfished, nor approaching and overfished condition, but is below the target biomass. • Management takes into account all catch and bycatch when setting annual harvest levels.
GOA Pacific Cod	• GOA Pacific cod is managed under Tier 3b. • The lowest survey biomass recorded for GOA Pacific cod occurred in 2001 (although this survey did not include the eastern GOA which contains approximately 8% of the total GOA biomass). • Modeling indicates a steady decline in age-3+ and spawning biomass since the 1990s. • The GOA Pacific cod stock is not overfished, however the stock is below the target biomass. • Management takes into account all catch and bycatch when setting annual harvest levels.
BSAI and GOA Sablefish	• BSAI and GOA sablefish are managed under Tier 3b. • Following 1988, sablefish abundance has decreased significantly, declining faster in the EBS, Aleutian Islands region and western GOA and slower in the central and eastern GOA. • The BSAI/GOA sablefish stock is not overfished, however it is below target biomass. • Management takes into account all catch and bycatch when setting annual harvest levels.
BSAI Atka Mackerel	• BSAI Atka mackerel are managed under Tier 3a. • The 2002 survey biomass estimate indicates a 51% increase from the 2000 survey estimates. • The BSAI Atka mackerel stock is not overfished and is above target biomass. • Management takes into account all catch and bycatch when setting annual harvest levels.

Table 4.4-1 (cont.). Comparative baseline for target groundfish species.

Species	Comparative Baseline
GOA Atka Mackerel	• GOA Atka mackerel are managed under Tier 6. • Reliable biomass estimates do not exist for GOA Atka mackerel, although the CPUE analyses of Atka mackerel indicate a 81% in abundance from 1992-1994 near Umnak Island and a 58% decline near Shumgain Island (Lowe and Fritz 2001), suggesting there may be localized depletion. • GOA Atka mackerel stock is at low abundance and low exploitation (bycatch only fishery). • Management takes into account all bycatch when setting annual harvest levels.
BSAI Yellowfin Sole	• BSAI yellowfin sole are managed under Tier 3a. • Model projections indicate a slow decline in age-2+ and female spawning biomass since 1985. • Above average recruitment from the 1991 year-class is expected to maintain yellowfin sole population levels in the future. • The BSAI yellowfin sole stock is not overfished and is above the target biomass. • Management takes all catch and bycatch into account when setting annual harvest levels.
GOA Shallow Water Flatfish	• The GOA shallow water flatfish complex is managed under Tier 5. • Reliable biomass estimates do not exist for the shallow water flatfish species, although survey biomass estimates indicate that Alaska plaice, northern rock sole and butter sole have shown a decline in 2001 relative to the 1990s. • Reliable biomass estimates do not exist for the shallow water flatfish species, although survey biomass estimates indicate that Southern rock sole, yellowfin sole and sand sole have shown an increase in 2001 biomass relative to 1999; starry flounder since 1990. • Reliable biomass estimates do not exist for the shallow water flatfish species, although survey biomass estimates indicate that English sole biomass has held stable from 1999-2001. • The shallow water flatfish complex is lightly to moderately harvested. • Management takes into account all catch and bycatch when setting annual harvest rates.
BSAI Rock Sole	• Northern and southern rock sole are managed as a single stock in the BSAI under Tier 3a. • The stock assessment model abundance estimate indicates a 38% decline from the 1995 peak biomass. • Below-average recruitment is projected to cause further decline of BSAI rock sole. • The BSAI stock is neither overfished, nor approaching and overfished condition and is above the target biomass. • Management takes into account all catch and bycatch when setting annual harvest rates.
BSAI Flathead Sole	• BSAI flathead sole and Bering flounder are managed as a single stock under Tier 3a. • Model projections indicate a decline in age-3+ biomass since its peak in 1991. • Model projections also indicate a decline in female spawning biomass since its peak in 1995. • The BSAI flathead sole stock is neither overfished, nor approaching and overfished condition and is above target biomass. • Management takes into account all catch and bycatch when setting annual harvest rates.
GOA Flathead Sole	• GOA flathead sole were separated from the other flatfish complex in 2002 and are managed under Tier 3a. • Flathead sole bycatch is limited by Pacific halibut PSC limits. • Flathead sole biomass has declined since1990. • Management takes into account all catch and bycatch when setting annual harvest rates.
BSAI Arrowtooth Flounder	• BSAI Arrowtooth flounder are managed under Tier 3a. • Stock assessment model estimates indicate biomass is high but has been declining since 1996. • Spawning stock has contributions from a wide range of ages. • BSAI Arrowtooth flounder is lightly harvested, although commercial interest is growing. • The BSAI Arrowtooth flounder stock is neither overfished, nor approaching an overfished condition. • Management takes into account all catch and bycatch when setting annual harvest rates.

Table 4.4-1 (cont.). Comparative baseline for target groundfish species.

Species	Comparative Baseline
GOA Arrowtooth Flounder	• GOA Arrowtooth flounder is managed under Tier 3a. • Arrowtooth flounder is the most abundant groundfish species in the GOA • The AFSC gulfwide triennial survey indicates that the 2002 biomass is at a high and stable level. • GOA Arrowtooth flounder is lightly harvested, although commercial interest is growing. • Management takes into account all catch and bycatch when setting annual harvest rates.
BSAI Greenland Turbot	• BSAI Greenland turbot is managed under Tier 3a. • The Greenland turbot shelf survey biomass has shown a declining trend since 1993. • The Greenland turbot fishery is restricted by PSC limits. • Management takes into account all catch and bycatch when setting annual harvest rates.
GOA Deep Water Flatfish	• Dover sole is managed under Tier 5 and Greenland turbot and deepsea sole are managed under Tier 6. • Reliable biomass estimates do not exist for Dover sole, although survey biomass estimates have shown a decline in 2001. • No reliable biomass estimates exists for Greenland turbot or deepsea sole. • The GOA deep water flatfish fishery is restricted by PSC limits. • Management takes into account all catch and bycatch when setting annual harvest rates.
BSAI Alaska Plaice	• Alaska plaice is evaluated under Tier 3a. • The 2002 trawl survey biomass has exhibited a 27% decline relative to the 2001 biomass estimate. • Alaska plaice is above the target biomass and is restricted by PSC limits. • Management takes into account all catch and bycatch when setting annual harvest rates.
BSAI Other Flatfish	• Fifteen species are managed as part of the BSAI Other Flatfish complex under Tier 5. • Reliable biomass estimates do not exist for BSAI other flatfish, although, EBS survey biomass estimates for other flatfish have exhibited an increase from 1996-2001 with a substantial increase in 2002. • Reliable biomass estimates do not exist for BSAI other flatfish, although the Aleutian Islands survey estimates have shown slight increases since 1991. • The other flatfish is restricted by PSC limits. • Management takes into account all catch and bycatch when setting annual harvest rates.
GOA Rex Sole	• Rex sole is managed under Tier 5. • Reliable biomass estimates are not available for rex sole, although survey biomass estimates have exhibited a decline in 2001 relative to the 1990s biomass estimates. • Rex sole is slightly to moderately harvested and is restricted by PSC limits. • Management takes into account all catch and bycatch when setting annual harvest rates.
BSAI Pacific Ocean Perch	• BSAI POP is managed under Tier 3b. • Model projections indicate that BSAI POP survey and total biomass has increased since 1978. • BSAI POP recruitment appears to be highly variable. • BSAI POP is below target biomass. • Management takes into account all catch and bycatch when setting annual harvest rates.
GOA Pacific Ocean Perch	• GOA POP is managed under Tier 3a. • The GOA POP abundance is considered to be of low abundance, considered rebuilt in 1997. • The POP survey biomass estimates indicate an increasing trend since 1990 and has remained stable in the 1999 and 2001 survey. • GOA POP harvest is restricted by PSC limits. • Management takes into account all catch and bycatch when setting annual harvest rates.
GOA Thornyhead Rockfish	• GOA thornyhead rockfish is managed under Tier 3a. • Shortspine thornyhead rockfish abundance has remained relatively stable since 1970. • GOA thornyhead rockfish are not overfished. • Management takes into account all catch and bycatch when setting annual harvest rates.

Table 4.4-1 (cont.). Comparative baseline for target groundfish species.

Species	Comparative Baseline
BSAI Northern Rockfish	• BSAI Northern rockfish are managed under Tier 5. • No reliable biomass estimates exist for BSAI northern rockfish, although survey estimates indicate that the stocks are stable. • Management takes into account all catch and bycatch when setting annual harvest rates.
BSAI Shortraker/Rougheye Rockfish	• Shortraker/rougheye rockfish are managed under Tier 5. • No reliable biomass estimates exist for BSAI shortraker/rougheye rockfish, although survey estimates indicate that the stocks are stable. • Management takes into account all catch and bycatch when setting annual harvest rates.
BSAI Other Rockfish	• Twenty-nine species are included in the BSAI other rockfish assemblage and are managed under Tier 5. • No reliable biomass estimates exist for BSAI other rockfish, although survey estimates indicate that approximately 90% of the other rockfish biomass consists of shortspine thornyhead rockfish. • The BSAI other rockfish group is a bycatch-only fishery. • Management takes into account all bycatch when setting annual harvest rates.
GOA Northern Rockfish	• GOA northern rockfish is managed under Tier 3a. • Reliable biomass estimates do not exist for GOA northern rockfish, although survey biomass estimates have shown an substantial increase in 1999 and 2001. • Management takes into account all catch and bycatch when setting annual harvest rates.
GOA Shortraker/ Rougheye Rockfish	• GOA shortraker/rougheye rockfish are managed under Tier 5. • Reliable biomass estimates for shortraker/rougheye rockfish are not available, although surveys indicate that shortraker/rougheye are most abundant in the eastern GOA with the highest abundances have been seen between 1997-2001. • Management takes into account all catch and bycatch when setting annual harvest rates.
GOA Slope Rockfish	• GOA slope rockfish are managed under Tier 5, sharpchin rockfish are managed under Tier 4. • Reliable biomass estimates do not exist for GOA other slope rockfish, although surveys indicate an increasing trend in silvergrey rockfish from 1984-1999. • Management takes into account all catch and bycatch when setting annual harvest rates.
GOA Pelagic Shelf Rockfish	• Dusky rockfish are managed under Tier 4 and yellowtail and widow rockfish are managed under Tier 5. • No reliable biomass estimates exist for PSR species, although survey biomass estimates indicate a decline since 1996. • Dusky rockfish make up the largest component of PSR biomass. • Management takes into account all catch and bycatch when setting annual harvest rates.
GOA Demersal Shelf Rockfish	• Seven species are part of the DSR complex and they are managed under Tier 4. • The DSR complex is managed jointly between the State and NOAA Fisheries. • Reliable biomass estimates do not exist for the DSR complex, although survey biomass estimates indicate that yellowtail rockfish makes up the largest component of the DSR biomass. • Management takes into account all catch and bycatch when setting annual harvest rates.

Notes:
AFSC - Alaska Fisheries Science Center
BSAI - Bering Sea and Aleutian Islands
CPUE - catch per unit of effort
DSR - demersal shelf rockfish
EBS - eastern Bering Sea
EEZ - Exclusive Economic Zone
EIT - echo integration trawl
FMP - fishery management plan
GOA - Gulf of Alaska
mt - metric tons
POP - Pacific Ocean perch
PSC - prohibited species catch
PSR - pelagic shelf rockfish

Table 4.4-2. Comparative baseline for prohibited species.

Species	Comparative Baseline
Pacific Halibut	• Pacific halibut is managed by the IPHC. • Assessment of Pacific halibut indicates a decrease in exploitable biomass since 1988. • The Pacific halibut resource is considered healthy and total catch has been near record levels. • Management takes into account all removals (bycatch in the federal and state groundfish fisheries and catch in IPHC regulated fisheries) when issuing halibut allocations.
Pacific Salmon and Steelhead Trout	• ADF&G manages salmon fisheries within state jurisdictional waters, fishing within the EEZ is managed under the NPFMC. • Spawning escapements of chinook and other salmon in Southeast Alaska are stable or increasing in 99% of the management units. • However, the Yukon and Kuskowkwim 2000 chinook and chumsalmon runs were declared federal disasters.
Pacific Herring	• Herring are managed by the ADF&G with annual quotas allocated by the Alaska Board of Fisheries • Pacific herring abundances fluctuates widely due to fishing influences, pollution events, disease, climate variability and interaction effects. • The PWS herring stock appears to be recovering from low abundance. • Overall, the Pacific herring stock appears stable. • The ADF&G quota setting process is responsive to fluctuations in herring biomass.
Crab	• Crab fisheries are managed by the State of Alaska with federal oversight. • Red king crab stocks in the Pribilof Islands show estimated biomass levels above MSST, but these estimates are considered poor with a high degree of uncertainty. No harvest occurs due to bycatch concerns. • The Red king crab stock in Bristol Bay has shown an increase in biomass in the last year. • The Red king crab stocks in Kodiak Islands are in decline. • Blue king crab stocks in the Pribilof Islands are considered to be overfished and a rebuilding plan is in progress. • The Saint Matthew Island blue king crab stock is considered overfished and a rebuilding plan is in effect. • The golden king crab population levels are unknown. • The Bering Sea bairdi tanner crab stock is considered overfished and a rebuilding plan is in effect. • The Bering Sea opilio tanner crab stock was declared overfished in 1999 and a rebuilding plan has been in effects since 2000. • The GOA crab stock status is unknown, however ADF&G survey data generally show depressed stocks overall.

Notes: ADF&G - Alaska Department of Fish and Game
EEZ - Exclusive Economic Zone
GOA - Gulf of Alaska
IPHC - International Pacific Halibut Commission
MSST - minimum stock size threshold
NPFMC - North Pacific Fisheries Management Council
PWS - Prince William Sound

Table 4.4-3. Comparative baseline for other Species, forage fish species, and non-specified species.

Species	Comparative Baseline
Other species category	• In the BSAI FMP, squid, sculpin, shark, skate, and octopi are managed in a combined Squid and Other Species category under Tier 5 and as part of the GOA Other Species category. • No reliable biomass data exists for squid, shark or octopi. • Although no reliable biomass estimates exist for sharks, shark biomass appears to have increased between 1984-1999 according to survey data. • Reliable biomass data are available for sculpin and skate. • Skate biomass appears to have increased between 1984-1999 according to survey data. • Skates represent 30-40% of the other species biomass, the most common species in most surveys.
Forage fish category	• Amendments 36 and 39 of the BSAI and GOA FMPs prohibits the development of commercial forage fish fisheries. • No reliable biomass estimates exist for forage fish species. • Smelt makes up the majority of forage fish bycatch, attributed almost exclusively to the pollock fishery. • Capelin and eulachon abundances are associated with climate and regime shifts.
Grenadier* (as part of the non-specified species category)	• There is no management or monitoring of grenadiers in the BSAI or GOA. • Reliable biomass estimates are not available for grenadier. • Due to the lack of management of these species and the large removals that occur, there is a potential for overfishing.

Notes: *This managementcategory consists of many species. This document only analyzes impacts to grenadiers since grenadiers make up the largest proportion of non-specified species bycatch. Although coral species are included in the non-specified species management category, impacts are analyzed under the EFH section (Section 3.6) of this document.
BSAI - Bering Sea and Aleutian Islands
EFH - essential fish habitat
FMP - fishery management plan
GOA - Gulf of Alaska

Table 4.4-4. Comparative baseline for habitat.

Location	Comparative Baseline
Bering Sea	• Living Habitat Baseline: • Diverse benthic community consisting of infauna and epifauna such as sponges, soft and hard corals, anemones, and bryozoans. • Impacts to biostructure range from 1.8 to 9% of the fishable EEZ and 8.2 to 41.9% of the fished area. • Living Habitat Baseline is considered to be adversely impacted. • Distribution of Fishing Effort Baseline: • Bottom trawl fisheries mainly target shallow and deepwater flatfish, Pacific cod, and rockfish. • Pelagic fisheries mainly target Walleye pollock and Atka mackerel. • Pot gear fisheries mainly target Pacific cod, sablefish, and crab. • Longline fisheries mainly target sablefish and rockfish. • Fishery Management Plans for the Bering Sea/Aleutian Islands distribute effort to specific fishery management units with the plan. Areas are seasonally and permanently closed to a particular gear type and afford protection of habitats. In the Bering Sea, there is a mixture of open fishing areas adjacent to areas closed to fishing. Existing regulations close about 19% of the fishable area to trawling at one time of the year or another. Only about 0.1% of the fishable area is designated as year-round, no-take marine reserve. •Baseline is considered to be adversely impacted.
Aleutian Islands	• Living Habitat Baseline: • Rich, diverse, concentrated benthic bio-structures such as sponges, soft corals, tree corals, and anemones. • Baseline impacts ranged from 1.1 to 6.8% of the fishable EEZ and 5.4 to 32.6% of the fished area. • Living Habitat Baseline is considered to be in an adversely impacted state. • Distribution of Fishing Effort Baseline: • Bottom trawl fisheries mainly target Pacific cod, Atka mackerel, and Pacific Ocean perch. • Pelagic fisheries mainly target Walleye pollock. • Pot gear fisheries mainly target Pacific cod, sablefish, and crab. • Longline fisheries mainly target sablefish and rockfish. • Fishery Management Plans for the Bering Sea and Aleutian Islands distribute effort to specific fishery management units with the plan. Areas are seasonally and permanently closed to a particular gear type and afford protection of habitats. In the Aleutian Islands, closure areas exist for a limited number of fishing types. Existing regulations close about 43% of the fishable area to trawling at one time of the year or another. Only about 2% of the fishable area is designated as year-round, no-take marine reserve. •Baseline is considered to be adversely impacted.
Gulf of Alaska	• Living Habitat Baseline: • Diverse benthic community consisting of infauna and epifauna such as sponges, tree corals, soft corals, anemones, and bryozoans. • baseline effects averaged over the entire fishable EEZ range from 0.9 to 6.9% and 3.8 to 29% of the fished area. • Living habitat baseline is judged to be adversely impacted. • Distribution of Fishing Effort Baseline: • Bottom trawl fisheries mainly target Pacific cod, flatfish, and rockfish. • Pelagic fisheries mainly target Walleye pollock and Atka mackerel. • Pot gear fisheries mainly target Pacific cod, sablefish and crab. • Longline fisheries mainly target sablefish and rockfish • Fishery Management Plans for the Gulf of Alaska distribute effort to specific fishery management units with the plan. Areas are seasonally and permanently closed to a particular gear type and afford protection of habitats. In the Gulf of Alaska, there exists a mixture of seasonal closures. Existing regulations close about 46% of the fishable area to trawling at one time of the year or another. Only about 0.5% of the fishable area is designated as year-round, no-take marine reserve. •Baseline is considered to be adversely impacted.

Notes: EEZ - Exclusive Economic Zone

Table 4.4-5. Comparative baseline for seabirds.

Species	Comparative Baseline
Black-footed Albatross	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Worldwide breeding population about 300,000 but declining. • Listed as "vulnerable" according to international conservation criteria. • Serious threats posed from incidental take in international longline fisheries. • Seabird deterrence measures for BSAi and GOA longline fisheries have reduced incidental take since 1997.
Laysan Albatross	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Worldwide population about 2.4 million but declining in largest nesting colony. • Concern for impacts of international longline fishing on declining population. • Seabird deterrence measures for BSAI and GOA longline fisheries have not reduced incidental take since 1997. • Ongoing efforts to reduced incidental take guided by scientific evaluation of deterrence measures through Observer Program and directed research.
Short-tailed Albatross	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Listed as "endangered" under the ESA. • Worldwide population 1600-1700 but increasing at near-maximum rate • Concern for impacts of longline fishing incidental take on recovery of population. • Seabird deterrence measures for BSAI and GOA longline fisheries instituted in 1997 did not eliminate incidental take. • Ongoing efforts to reduce incidental take guided by scientific evaluation of deterrence measures through Observer Program and directed research.
Northern Fulmar	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Abundant resident and breeder with BSAI and GOA population of about 2 million. • Concern for colony-level impacts of incidental take in longlines and trawls • Seabird deterrence measures for BSAI and GOA longline fisheries (1997 to present) have increased incidental take in BSAI and decreased take in GOA. • Ongoing efforts to reduce incidental take guided by scientific evaluation of deterrence measures through Observer Program and directed research.
Shearwaters	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Worldwide populations estimated to be 23 million short-tailed shearwaters and over 30 million sooty shearwaters. Indications of declining population trends. • Large numbers of shearwaters taken in commercial and subsistence hunts in the southern hemisphere and in several international fisheries. • No population modeling to assess impact of fishery takes versus other sources of mortality on declining population. • Seabird deterrence measures for BSAI and GOA longline fisheries have not reduced incidental take since 1997.
Storm-petrels	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Leach's and fork-tailed storm-petrels are abundant breeders in BSAI and GOA. Population trends are poorly known. • Quantitative impact of fisheries on species is largely unknown.
Cormorants	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Pelagic, red-faced, and double-crested cormorants are widely distributed in the BSAI and GOA but are not abundant anywhere. Population trend information is unreliable. • There is no information on the incidental take of cormorants in any Alaska fisheries, including groundfish. • Large numbers of cormorants were killed in the Exxon Valdez oil spill and they are considered to be "not recovered" in Prince William Sound.

Table 4.4-5 (cont.). Comparative baseline for seabirds.

Species	Comparative Baseline
Spectacled Eider	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Worldwide population estimates for spectacled eider exceed 300,000 birds but their Alaska-nesting populations have declined 95% in the last 30 years. • Spectacled eider was listed as threatened under the ESA in 1993. • Spectacled eiders have not bee recorded as being taken incidentally in the groundfish fisheries. • Concern for chronic contamination from lead shot on breeding grounds and exposure to oil from all sources while in massive wintering flocks. • Concern for impacts of bottom trawling and disturbance on benthic foraging habitats.
Steller's Eider	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Worldwide population estimates for Steller's eider unreliable but their Alaska-nesting populations have declined substantially in the last 100 years. • Steller's eider was listed as threatened under the ESA in 1997. • One recorded incidental take of Steller's eider in the groundfish fisheries since 1993. • Concern for chronic contamination from lead shot on breeding grounds and exposure to oil from all sources while in wintering and staging flocks. • Concern for impacts on bottom trawling and disturbance on benthic foraging habitats.
Jaegers	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Pomarine, parasitic, and long-tailed jaegers migrate through the BSAI and GOA in small numbers. Population information is not available. • There is no information on the incidental take of jaegers in any Alaska fisheries, including groundfish.
Gulls	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Population estimates for all species only roughly known. Population trends measured for glaucous-winged gull in few places. • Seabird deterrence measures for BSAI and GOA longline fisheries have not reduced incidental take since 1997. • Impact of fishery waste consumption may be beneficial to some species but harmful to others through predator/prey relationships.
Kittiwakes	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Black-legged kittiwakes widespread and abundant. Population trends monitored in many places throughout BSAI and GOA. • Red-legged kittiwakes less numerous and restricted in range. Population trends have been decreasing substantially, leading to status as USFWS species of management concern. • Since these species are not distinguished in the Observer Program data, no assessment can be made of incidental take impacts. • Concern for colony-level impacts on prey availability, especially for red-legged kittiwakes on St. George Island. • Concern for introduction of rates to Pribilof Islands.
Terns	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Arctic and Aleutian terns are uncommon breeders in BSAI and GOA. Population trends are not monitored anywhere in the project area. • Since these species are not distinguished in the Observer Program data, no assessment can be made of incidental take impacts.

Table 4.4-5 (cont.). Comparative baseline for seabirds.

Species	Comparative Baseline
Murres	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Common and thick-billed murres widespread and abundant in BSAI and GOA. Population trends monitored in many places throughout the BSAI and GOA. • Population trends vary by species and area with some colonies increasing, others stable, and others in decline. • Since these species are not distinguished in the Observer Program data, no assessment can be made of incidental take impacts. • Concern for chronic and acute contamination with oil from all sources. • Concern for introduction of rats to colonies.
Guillemots	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Population estimates for both guillemot species are uncertain. Population trends only monitored for pigeon guillemots in Prince William Sound. • Guillemots do not appear to interact with the groundfish fisheries on a regular basis. • Since these species are not distinguished in the Observer Program data, no assessment can be made of incidental take impacts. • Concern for chronic and acute contamination with oil from all sources.
Murrelets	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Population estimates for all three murrelets species are uncertain and population trends are poorly known. • Marbled and Kittlitz's murrelets are USFWS species of management concern due to apparent population declines. Kittlitz's has been petitioned fro ESA listing. • Since murrelets are only reported in the alcid group in the Observer Program data, no species-specific assessment can be made of incidental take impacts. • Concern for disturbance from vessel traffic. • Concern for chronic and acute contamination with oil from all sources. • Concern for introduction of rates to ancient murrelets colonies.
Auklets	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Five auklet species are generally widespread and abundant in BSAI and GOA although population estimates are uncertain and population trends are poorly known. • Since these species are not distinguished in the Observer Program data, no species-specific assessment can be made of incidental take impacts. • Concern for chronic and acute contamination with oil from all sources. • Concern for plastic ingestion by parakeet auklets. • Concern for introduction of rats to colonies.
Puffins	• Management responsibility is established in the Migratory Bird Treaty Act under the jurisdiction of USFWS. • Population estimates for horned and tufted puffins and rhinoceros auklets are imprecise and population trends are poorly known but all species are abundant or common in the BSAI and GOA. • Puffins suffered major losses from high-sea drift fisheries. • Since puffins are not distinguished in the Observer Program data, no assessment can be made of incidental take impacts. • Concern for chronic and acute contamination with oil from all sources. • Concern for introduction of rates to ancient murrelets colonies.

Notes: BSAI - Bering Sea and Aleutian Islands
ESA - Endangered Species Act
GOA - Gulf of Alaska
USFWS - U.S. Fish and Wildlife Service

Table 4.4-6. Comparative baseline for marine mammals.

Species	Comparative Baseline
Steller Sea Lion	• Steller sea lions are under the jurisdiction of NOAA Fisheries, Protected Resource Division established under the Marine Mammal Protection Act of 1972. • The western population of the Steller sea lion is currently listed as "endangered" under the ESA due to a population decline of approximately 80% from the late 1970s, although decline has lessened in the 1990s to 5.4%. Take from groundfish fisheries and other fisheries (29 individuals) and subsistence harvest (198 individuals) exceeds the Potential Biological Removal (PBR=208) for this species. These is concern for direct competition between the groundfish fisheries and the Steller sea lion prey, but recent SSL protective measures have potentially lessened this effect. • The eastern population is listed as "threatened" under the ESA, but population levels have been increasing approximates 2% over the last ten years and numbers are currently approximately 10,000 (non-pups).
Northern Fur Seals	• Northern fur seals are under the jurisdiction of NOAA Fisheries, Protected Resource Division established under the Marine Mammal Protection Act of 1972. • Population estimate in 2000 about 940,000 and declining. • Population declined substantially in 1970s to early 1980s, leading to "depleted" status under MMP in 1998. • Majority of population breeds on Pribilof Islands. • Anthropogenic take small relative to PBR. • Concern for localized depletion of prey by groundfish fisheries, especially around Pribilof Islands. Displacement of fishing effort from Steller sea lion Critical Habitats is increasing effort in areas important to fur seals.
Pacific Walrus	• Pacific walrus are under the jurisdiction of USFWS established under the MMPA of 1972. • Walrus population is considered large and stable. • Direct interactions with commercial vessels are rare. • There is no overlap of diet with groundfish harvest.
Harbor Seals	• Harbor seals are under the jurisdiction of NOAA Fisheries and protected by the MMPA of 1972. A 1994 amendment to the MMPA established a cooperative agreement between NOAA Fisheries, USFWS and Alaska Native corporations. • Three recognized stocks but under reassessment; Bering Sea estimate = 13,300 seals, GOA/AI estimate = 29,200 seals, Southeast estimate = 77,900 seals. • Population trends mixed. Increasing in Bristol Bay but decreasing around Pribilofs. Major declines in GOA from 1976-1992 followed by steady increases. Generally increase in Southeast. • Concern for chronic and acute contamination with oil from all sources.
Spotted Seal	• Spotted seals are managed jointly by ADF&G and NOAA Fisheries and protected under the MMPA of 1972. • The spotted seal population is considered large and stable. • Direct interactions with commercial fishing vessels are rare. • There is only a partial overlap of diet with groundfish harvest.
Bearded Seal	• Bearded seals are managed jointly by ADF&G and NOAA Fisheries and are protected under the MMPA of 1972. • The bearded seal population is considered large and stable. • Direct interactions with commercial fishing vessels are rare. • There is only a partial overlap of diet with groundfish harvest.
Ringed Seal	• Ringed seals are managed jointly by ADF&G and NOAA Fisheries and are protected under the MMPA of 1972. • The ringed seal population is considered large and stable. • Direct interactions with commercial fishing vessels are rare. • There is only partial overlap of diet with groundfish harvest.

Table 4.4-6 (cont.). Comparative baseline for marine mammals.

Species	Comparative Baseline
Ribbon Seal	• Ribbon seals are under the jurisdiction of NOAA Fisheries and are protected by the MMPA of 1972. • Ribbon seal population trends and current estimates are unknown although there is no evidence that they are declining. • Incidental take by groundfish trawls has been documented but is a rare occurrence. • There appears to be some overlap of prey species with groundfish catch.
Northern Elephant	• Northern elephant seals are under the jurisdiction of NOAA Fisheries and are protected by the MMPA of 1972. • The elephant seal population is expanding and numbers are over 100,000 in US waters. • Direct interactions with commercial fishing vessels are infrequent. • Incidental take by groundfish fleet approaches zero.
Sea Otter	• Sea otters are under the jurisdiction of the USFWS and are protected under the MMPA of 1972. • Sea otter populations in Alaska is divided into three stocks. The southwest stock has decline precipitously in the past 15 years and is a candidate for ESA listing. The southcentral and southeast stocks have generally increased over the same period. • Direct interactions with commercial fishing vessels are rare. • There is a partial overlap of diet with groundfish harvest although sea otters prefer nearshore habitats.
Blue Whale	• Blue whales are under the jurisdiction of NOAA Fisheries and are protected under the MMPA. • Blue whales are listed as “endangered” under the ESA. • The number of whales that actually live in waters affected by the BSAI/GOA groundfish fisheries is unknown. • Their diet does not overlap with species taken by the fisheries, and they do not appear to interact with the fleet on a regular basis.
Fin whale	• Fin whales are under the jurisdiction of NOAA Fisheries and are protected under the MMPA. • Fin whales are listed as “endangered” under the ESA. • There are no reliable population estimates or trend information for the northeast Pacific stock. They are not hunted for subsistence purposes. • Diets of fin whales overlap to a small extent with species taken by the groundfish fisheries, but they do not appear to interact with the fleet on a regular basis.
Sei Whale	• Sei whales are under the jurisdiction of NOAA Fisheries and are protected under the MMPA. • Sei whales are listed as “endangered” under the ESA. • Population trends and current status are unknown. • Diets of sei whales do not overlap with species taken by the groundfish fisheries, and they do not appear to interact with the fleet on a regular basis. No incidental take from commercial fisheries has been reported.
Minke Whale	• Minke whales fall under the jurisdiction of NOAA Fisheries and are protected by the MMPA. • Population trends and current status are unknown, although the species is relatively common in the action area based on the frequency of sightings. • Diets of minke whales apparently overlap partially with species taken by the groundfish fisheries, but minkes do not appear to interact with the fleet on a regular basis. One minke whale mortality occurred in the Bering Sea groundfish trawl fishery in September 2000 (NMFS, REFM Observer preliminary unpublished data).

Table 4.4-6 (cont.). Comparative baseline for marine mammals.

Species	Comparative Baseline
Humpback Whale	• The humpback whale falls under the jurisdiction of NOAA Fisheries and are protected by the MMPA. • Humpback whales are listed as "endangered" under the ESA. • Recent population estimates for the western and central North Pacific stocks are 394 and 4,005 respectively. Trends for the western stock are unknown. The central stock is thought to be increasing but at an unknown rate. • Diets of humpback whales do not generally overlap with species taken by the groundfish fisheries. • There have been numerous cases of incidental take related to commercial fisheries in the past ten years, including two observed mortalities from BSAI groundfish trawls since 1998.
Gray Whale	• Gray whales fall under the jurisdiction of NOAA Fisheries are protected under the MMPA. • Gray whales were once an endangered species under the ESA due to whaling but their population has been increasing, and they were delisted in 1994. • They are rarely taken for subsistence by Alaska Natives, but are still hunted by Natives in Russian waters. • Diets of gray whales do not overlap with species taken by the groundfish fisheries, and they do not appear to interact with the fleet on a regular basis.
Northern Right Whale	• The northern right whale falls under the jurisdiction of NOAA Fisheries and is protected under the MMPA. • Northern right whales are listed as an "endangered" species under the ESA. • Population trends and current status are unknown although the population is believed to be very small based on the infrequency of sightings. • Diets of right whales do not overlap with species taken by the groundfish fisheries, and they do not appear to interact with the fleet on a regular basis. No incidental take from the groundfish fisheries has been reported.
Bowhead Whale	• Bowhead whales fall under the jurisdiction of NOAA Fisheries and are protected by the MMPA. • Bowhead whales are listed as "endangered" under the ESA. • Bowhead whale population has been increasing in the project area since commercial whaling was stopped. • They are an important subsistence resource for northern Alaska Natives. • Diets of bowheads do not overlap with species taken by the groundfish fisheries, and they do not appear to interact with the fleet on a regular basis.
Sperm Whale	• Sperm whales fall under the jurisdiction of NOAA Fisheries and are protected by the MMPA. • Sperm whales are listed as "endangered" under the ESA. • Sperm whales are divided into several stocks in U.S. waters, including the North Pacific stock that regularly inhabits Alaskan waters, but population estimates are considered unreliable. • No incidental take of sperm whales has been observed or reported in commercial fisheries, including the MSA groundfish fisheries, although there have been reports of fishermen trying to deter sperm whales from their longline catches in the GOA. • NOAA Fisheries has issued a BiOp that concludes the groundfish fisheries do not jeopardize the recovery or survival of endangered sperm whales.

Table 4.4-6 (cont.). Comparative baseline for marine mammals.

Species	Comparative Baseline
Beaked Whales (Baird's, Cuvier's and Stejneger's)	• Beaked whales are under the jurisdiction of NOAA Fisheries and protected under the MMPA. • All three species of beaked whales are very rare and seldom if ever interact with the groundfish fisheries in the BSAI and GOA. No incidental take has been recorded from these fisheries. • From what is known of these whales, there is little if any competitive overlap as far as prey species. • Baird's beaked whales are very rare, and seldom if ever interact with the groundfish fisheries. Take is or approaches zero. Little is known of the size of the stock or its distribution but its not considered a strategic stock under the MMPA and is not listed under the ESA.
Pacific White-sided Dolphin	• Pacific white-sided dolphins fall under the jurisdiction of NOAA Fisheries and are protected under the MMPA. • The Pacific white-sided dolphin is a fairly common seasonal resident of the BSAI and GOA. • There is very little overlap between their prey and species taken in the groundfish fisheries. • Incidental take in the groundfish fisheries or other current fisheries is rare.
Killer Whale	• Killer whales fall under the jurisdiction of NOAA Fisheries and are protected under the MMPA. • Killer whales are divided into two stocks that regularly inhabit Alaskan waters, the Eastern North Pacific Northern Resident stock (745 known residents) and the Eastern North Pacific Northern Transient stock (251 known transients). Population estimates are made by identifying individual whales through photographic analysis but a substantial numbers of provisional identifications are not included in the estimates, so they should be considered minimums. • Resident whales feed on various fish species and are likely the type that interacts directly with the fisheries through depredation of longline catches, incidental take in trawl and longline gear, and other effects. • Transient whales concentrate on marine mammal prey and are being investigated for their potential role in the decline of Steller sea lion populations as well as other marine mammal species.
Beluga Whale	• Beluga whales fall under the jurisdiction of NOAA Fisheries and are protected under the MMPA. A 1994 amendment to the developed a cooperative agreement between the USFWS, NOAA Fisheries and Alaska Native organizations. • Beluga whales are divided into five stocks including four stocks that winter in the Bering Sea and one that resides year round in Cook Inlet. Population estimates are made by aerial surveys corrected for sightability of the whales. The four Bering Sea stocks appear to be stable or increasing. The Cook Inlet stock declined substantially in the last ten years because of excessive subsistence harvests and was recently listed as depleted under the MMPA. The stock is now under a co-management agreement that greatly controls subsistence harvest. • Belugas feed on a variety of fish species but prefer to forage near coastal waters or near the pack ice. • No belugas have been reported to be taken in the groundfish fisheries, but they are infrequently taken in State-managed salmon fisheries.
Harbor Porpoise	• The harbor porpoise falls under the jurisdiction of the NOAA Fisheries and is protected under the MMPA. • There is little competitive overlap between the ground fisheries and harbor porpoise prey. • Annual incidental take in the groundfish fisheries rarely, if every, occurs.

Table 4.4-6 (cont.). Comparative baseline for marine mammals.

Species	Comparative Baseline
Dall's Porpoise	• Dall's porpoises falls under the jurisdiction of NOAA Fisheries and are protected by the MMPA. • Annual incidental take in the groundfish fisheries is relatively low for the large populations size in this region. • There is little overlap between the prey of Dall's porpoise and the fish targeted by the groundfish fisheries.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
ESA - Endangered Species Act
GOA - Gulf of Alaska
MMPA - Marine Mammals Protection Act
PBR - potential biological removal
USFWS - U.S. Fish and Wildlife Service

Table 4.4-7. Comparative baseline for socioeconomics.

Area of Concern	Comparative Baseline
Harvesting and Processing Sector (Section 3.9.2)	
Catcher Vessels	Number and Type of Vessels: •The number of catcher vessels in the groundfish fisheries was 917 in 2001. 100 vessels were AFA-eligible. Vessel type — Number TCV BSP ≥ 125 — 29 TCV BSP 60-124 — 51 TCV Div. AFA — 20 TCV Non-AFA — 42 TCV < 60 — 44 PCV — 89 LCV — 72 FGCV 33-59 — 514 FGCV ≤32 — 56 •Significant excess capacity remained in some Alaska groundfish fisheries Vessel Ownership: •In 2001, 40% of the catcher vessels were owned by residents of the Southcentral Alaska (AKSC) and Southeast Alaska (AKSE) Regions. 26% of vessel owners were from the Washington Inland Waters (WAIW) Region. Groundfish Caught and Retained by Species Group: •In 2001, the quantity of groundfish landed by catcher vessels and retained by processors was 927 thousand mt with an ex-vessel value of $287 million. Species or species group — Percent of total groundfish landed A-R-S-O — 18.2 FLAT — 1.3 PCOD — 12.4 PLCK — 68.2 Groundfish Caught and Retained by FMP Subarea: FMP subarea — Percent of total groundfish landed AI — 2.3 BS — 58.1 WG — 7.1 CG — 19.5 EG — 13.0 Ex-Vessel Value of Groundfish Retained: •In 2001, the ex-vessel value of the groundfish landed by catcher vessels and retained by processors was $287 million. Dependence on Groundfish Fisheries: •In 1999, groundfish accounted for 50% of the ex-vessel value of the landings of catcher vessels participating in groundfish fisheries. Employment: •In 2001, the catcher vessel sector created 1,997 FTE positions.

Table 4.4-7 (cont.). Comparative baseline for socioeconomics.

Area of Concern	Comparative Baseline
Catcher Vessels (Cont.)	Payments to Labor •In 2001, the catcher vessel sector generated $115 million in labor income. Average Costs •Firm-level cost data are unavailable. Safety of human life at sea •An average of 16 persons were lost annually in Alaska fisheries in the 1990s.
Catcher Processors	Number and type of vessels •The number of catcher processors in the groundfish fisheries was 89 in 2001. 16 vessels were AFA-eligible. Vessel type — Number ST-CP — 12 FT-CP — 4 HT-CP — 23 P-CP — 7 L-CP — 43 •Significant excess capacity remained in some Alaska groundfish fisheries Vessel ownership •In 2001, 79% of vessel owners were from the Washington Inland Waters (WAIW) Region Groundfish caught by species group •In 2001, the quantity of groundfish caught by catcher processors was 1,066 thousand mt. Species or species group — Percent of total groundfish caught A-R-S-O — 11.6 FLAT — 10.8 PCOD — 24.7 PLCK — 53.0 Groundfish caught by FMP subarea FMP subarea — Percent of total groundfish caught BSAI — 97.1 GOA — 2.9 Quantity and value of groundfish products •In 2001, catcher processors produced 314 thousand mt of product with a gross product value of $744 million. Product Quality •In 2001, average product value was $2,369/mt. Product utilization rates •In 2001, the average product utilization rate for catcher processors was around 30%.

Table 4.4-7 (cont.). Comparative baseline for socioeconomics.

Area of Concern	Comparative Baseline
Catcher Processor (Cont.)	Dependence on groundfish fisheries •In 2001, groundfish accounted for most of the gross product value of the fish processed by catcher processors (specific data unavailable) Employment •In 2001, the catcher processor sector created 3,877 FTE positions. Payments to labor •In 2001, the catcher processor sector generated $266 million in labor income. Average costs •Firm-level cost data are unavailable. Safety of human life at sea •An average of 16 persons were lost annually in Alaska fisheries in the 1990's.
Inshore Processors and Motherships	Number and type of facilities/vessels •In 2001, there were 53 shore plants, 3 motherships, and 3 floating inshore processors in the groundfish fisheries Vessel/facility type — Number BSP-SP — 6 APA-SP — 8 K-SP — 10 SC-SP — 14 SE-SP — 15 Motherships — 3 Floaters — 3 •Significant excess capacity remained in some Alaska groundfish fisheries Facility/vessel ownership •In 2001, 29% of the facilities/vessels were owned by residents of the Southcentral Alaska (AKSC) and Southeast Alaska (AKSE) Regions. 58 percent of facility/vessel owners were from the Washington Inland Waters (WAIW) Region Groundfish retained by species group In 2001, the quantity of groundfish caught by inshore processors and motherships was 932 thousand mt. Species or species group — Percent of total groundfish catch A-R-S-O — 10.3 FLAT — 1.1 PCOD — 11.8 PLCK — 76.7 Groundfish retained by FMP subarea FMP subarea — Percent of total groundfish catch BSAI — 85.5 GOA — 14.5

Table 4.4-7 (cont.). Comparative baseline for socioeconomics.

Area of Concern	Comparative Baseline
Inshore Processors and Motherships (Cont.)	Quantity and value of groundfish seafood products •In 2001, inshore processors and motherships produced 343 thousand mt of product with a gross product value of $683 million. Product Quality •In 2001, average product value was $1,991/mt Product utilization rates •In 2001, the average product recovery rate for inshore processors and motherships was around 37%. Dependence on groundfish fisheries •In 1999, groundfish accounted for 31% of the gross product value of the fish processed by inshore processors and motherships. Employment •In 2001, the inshore processor and mothership sectors created 4,491 FTE positions. Payments to labor •In 2001, the inshore processor and mothership sectors generated $267 million in labor income. Average costs •Firm-level cost data are unavailable.
Regional Socioeconomic Profiles (Section 3.9.3)	
Population	•Population varies considerably between regions; communities engaged include small rural communities and major metropolitan areas. 2000 populations were: AKAPAI 6,000 Kodiak Island 14,000 AKSC 367,000 AKSE 75,000 WAIW 3.9 million ORCO 105,000
Processing Ownership and Activity	•Inshore/offshore provisions provide designated quota allocation to entities operating in coastal Alaska. •AFA provisions effectively preclude entry of new processors into pollock processing, but no community level impacts are apparent to date.
Catcher Vessel Ownership and Activity	•License limitation has not had a major impact on the distribution of the fleet. •Pollock co-ops under AFA serves to reduce effort, but substantial consolidation forecast has not yet been realized.
Tax Revenue	•Onshore delivery requirements arising out of inshore/offshore amendments and AFA provisions have stabilized (and increased) proportion of landings of pollock subject to local taxation.
Employment and Income	•Pollock rationalization (though co-ops) under AFA conditions has resulted in less peak demand for processing employment; processing operations have responded by adjusting worker schedules to use smaller, more stable workforce. •Employment in support service businesses may have decreased in some communities with the elimination of the race-for-fish in the pollock fishery, but quantitative information is not available.

Table 4.4-7 (cont.). Comparative baseline for socioeconomics.

Area of Concern	Comparative Baseline
CDQ (Section 3.9.4)	
CDQ Allocations	•65 ANCSA communities in 6 CDQ regions participate in program. Program benefits include flow of royalties, employment, and income to areas typically characterized by limited commercial economic opportunities. CDQ investment has resulted in increased participation in both regional and local fisheires.
Subsistence (Section 3.9.5)	
Subsistence use of groundfish	•Groundfish typically makes a relatively modest contribution to total subsistence resource base, but comprises up to 9% of base in some commercial groundfish communities
Subsistence use of Steller sea lions	•At least a portion of long term trend of decline in Steller subsistence use may not be directly related to Steller population decline. Most activity occurs in communities in the Southwest portion of the state, although a significant number of Stellers are harvested in a handful of other communities.
Salmon subsistence fisheries	•Subsistence salmon fishery part of household economic base and sociocultural institutions in dozens of communities across vast areas of the Interior as well as along the coast
Indirect subsistence factors: income and joint production	•Joint production activity largely undocumented. Activity that does occur is primarily associated with the smaller vessel classes within the fleet. Vessels used as a platform or to access a number of subsistence activities in addition to fishing (e.g., hunting and berry picking).
Environmental Justice (Section 3.9.6)	
Environmental Justice	•Establishment of CDQ program in 1992 (and subsequent expansion in later years) provides positive benefit to minority and low-income populations.
Market Channels and Benefits to U.S. Consumers (Section 3.9.7)	
Product quantity	•In 2001, 656 thousand mt of primary product were produced with a wholesale value of $1.4 billion. •By decreasing both the quantity and quality of groundfish products available to consumers, the race for fish, which continues in some groundfish fisheries, prevents some potential consumer benefits from being attained
Product year-round availability	•Groundfish fisheries provide high and relatively stable levels of seafood products to domestic and foreign markets
Product quality	•In 2001, average product value was $2,174/mt •By decreasing both the quantity and quality of groundfish products available to consumers, the race for fish, which continues in some groundfish fisheries, prevents some potential consumer benefits from being attained
Product diversity	•Groundfish fisheries provide a relatively high diversity of seafood products to domestic and foreign markets
Non-Market Goods (Section 3.9.8)	
Benefits (including non-market and non-consumptive benefits) derived from marine ecosystems and associated species	•A contingent valuation study found that the value of an expanded recovery program for Steller sea lions was positive and substantial •Evidence suggests that the benefits (including non-market and non-consumptive benefits) derived from the BSAI and GOA ecosystems as a whole are substantial

Table 4.4-8. Comparative baseline for ecosystem.

Area of Concern	Comparative Baseline
Forage fish availability	1. Pelagic forage availability shows BSAI pollock and Atka mackerel above MSST, GOA pollock at low abundance levels, Bering Sea herring is stable, biomass estimates for forage species are not available but bycatch estimates in groundfish fisheries are above average and relative abundance indices from bottom trawl surveys indicate possible increase in eulachon and capelin in the GOA.
Spatial/temporal concentration of fisheries	2. Spatial and temporal concentration of fisheries on forage - Seasonal and temporal catch allocations of pollock and Atka mackerel and SSL closures have spread out fishing removals in space and time though recent results show BS pollock fisheries increasing catch in fur seal foraging habitat.
Introduction of nonnative species	3. Introduction of nonnative species - Total groundfish fishery catch levels (and thus level of ballast water and hull fouling organisms release by fishing vessels) have been stable. There is some possibility of groundfish fishery related successful introductions of nonnative species.
Removal of top predators	4. Removal of top predators - Historical whaling has resulted in low present day abundance of whale species in the North Pacific. Shark bycatch rates are variable by region and present day groundfish fishery impacts are unknown. There is no evidence that present levels of seabird and mammal bycatch in groundfish fisheries are an important source of mortality for most species.
Energy re-direction	5. Energy re-direction - Target species discards have decreased since IR/IU. Scavenger populations (skates, gulls, etc.) do not show relationship to discard levels. Bottom trawl effort (and thus unobserved benthic organism mortality and increased availability to predators due to trawl disturbance) has decreased over time.
Energy removal	6. Energy removal - Total groundfish catches have been relatively stable. Mass balance models indicate total amount of energy removed is a very small proportion of total biomass and that biomass and energy flow are distributed fairly well throughout the system. Bering Sea is a relatively mature (i.e., undisturbed) system compared to other shelf systems.
Species diversity	7. Species diversity - Species level diversity has not been well-assessed. Indicators of assessed species abundance show most target species are above MSST, number of endangered/threatened marine species is not linked to present fishery removals although historical whaling has been the cause of the listing status of most whales, bycatch levels of many nontarget (nonspecified) species are unknown.
Guild diversity	8. Guild diversity - Trophic guild diversity changes are mostly related to climate induced recruitment changes and not to fishing. Bottom gear effort, which is an indicator of benthic community guild disturbance, has been decreasing. HAPC biota, a group of benthic organisms that might be considered a structural habitat guild, do not show fishing-related declines and some groups (sponge, sea anemone, and sea pens) show increasing or relative high abundance indices in recent bottom trawl surveys of the BSAI and GOA. However, some groups such as corals are not well-assessed and present closed areas do not provide sufficient protection so there is a conditionally significant adverse impact of fishing on this group.
Genetic diversity	9. Genetic diversity - There has been heavy exploitation of certain spawning aggregations historically (Bogoslof pollock) but present day spatial/temporal management of groundfish has tended to reduce fishing pressure on spawning aggregations. There is unknown effects on the genetic diversity of stocks that might have distinct genetic components occurring at finer spatial scales than the present groundfish fishery management regions.

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
HAPC - habitat areas of particular concern
MSST - minimum stock size threshold

Table 4.5-1. Eastern Bering Sea pollock effects - significance of effects pertaining to eastern Bering Sea pollock.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Direct Effects							
1. Fishing mortality	I	I	I	I	I	I	I
2. Change in biomass level	I	S-	I	I	I	I	S+
3. Spatial temporal concentration of catch							
Leads to change in genetic structure of population	I	I	I	I	I	I	I
Change in reproductive success	I	I	I	I	I	I	I
Indirect Effects							
4. Change in prey availability	I	I	I	I	I	I	I
5. Habitat suitability (e.g., spawning, nursery, settlement habitat, etc.) as impacted by fishing	I	I	I	I	I	I	I

Notes: FMP - fishery management plan

Table 4.5-2. Gulf of Alaska pollock effects - significance of effects pertaining to Gulf of Alaska pollock.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Direct Effects							
1. Fishing mortality	I	I	I	I	I	I	I
2. Change in biomass level	I	I	I	I	I	I	I
3. Spatial temporal concentration of catch							
Leads to change in genetic structure of population	I	I	I	I	I	I	I
Change in reproductive success	I	I	I	I	I	I	I
Indirect Effects							
4. Change in prey availability	I	I	I	I	I	I	I
5. Habitat suitability (e.g., spawning, nursery, settlement habitat, etc.) as impacted by fishing	I	I	I	I	I	I	I

Notes: FMP - fishery management plan

Table 4.5-3. Cumulative effects analysis for eastern Bering Sea pollock: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of Alaska Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**No**, large removals of pollock occurred in the foreign, domestic, JV and fisheries, but there does not appear to be a lingering effect on the BSAI pollock populations (see Section 3.5.1.1).	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue and is not accounted for in US harvest quotas.	**Not a contributing factor**: Future catch would be accounted for in annual harvest rate and therefore does not add additional fishing mortality.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of pollock.	**Yes, Insignificant** Pollock are fished at less than the OFL and are above the minimum stock size. The combined removals due to the federal groundfish fishery in combination with potential removals from external events are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.

Table 4.5-3 (cont.). **Cumulative effects analysis for eastern Bering Sea pollock: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of Alaska Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Biomass	**I**	**No**, past large removals of pollock and other past effects (see Section 3.5.1.1) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of pollock.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently reduce the pollock biomass such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-3 (cont.). **Cumulative effects analysis for eastern Bering Sea pollock: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of Alaska Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**I**	**No**, see above.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct localized mortality of pollock such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-3 (cont.). **Cumulative effects analysis for eastern Bering Sea pollock: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of Alaska Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Repro-ductive Success	**I**	**Yes**, past fisheries could have had a lingering beneficial effect on pollock recruitment by reducing the adult pollock biomass. Past commercial whaling and sealing also removed large predators. Also there are lingering past effects due to Climate	**Potential Beneficial Contribution:** Fishery removals could have a beneficial effect on pollock recruitment by reducing the adult pollock biomass.	**Potential Beneficial Contribution:** Fishery removals could have a beneficial effect on pollock recruitment by reducing the adult pollock biomass.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-3 (cont.). **Cumulative effects analysis for eastern Bering Sea pollock: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of Alaska Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.10). **No,** lingering population level effects from fisheries catch and bycatch of pollock prey species are not expected (See Section 3.5.1.1).	**Potential Adverse Contribution:** Bycatch of pollock forage fish is expected to continue.	**Potential Adverse Contribution:** Bycatch of pollock forage fish is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the pollock stock is unable to sustain itself at or above MSST.

Table 4.5-3 (cont.). **Cumulative effects analysis for eastern Bering Sea pollock: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of Alaska Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.1).	**Potential Adverse Contribution:** Habitat disturbance that may cause change in spawning or rearing success is expected to continue.	**Potential Adverse Contribution:** Habitat disturbance that may cause change in spawning or rearing success is expected to continue.	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external habitat disturbance factors is not expected to lead to a detectable change in spawning or rearing success such that the ability of the pollock stock to sustain itself at or above MSST is jeopardized.

Notes: FMP - fishery management plan
I - insignificant
JV - joint venture
MSST - minimum stock size threshold
OFL - overfishing level

Table 4.5-4. Cumulative effects analysis for Gulf of Alaska pollock: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Pollock Fishery	State of Alaska Pink Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**No**, large removals of pollock occurred in the foreign, state, federal domestic, and JV fisheries and in the State of Alaska shrimp and bait fisheries, but there does not appear to be a lingering effect on the GOA pollock populations (see Section 3.5.1.1).	**Not a contributing factor** Future catch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality.	**Potential Adverse Contribution:** Bycatch of pollock in this fishery is expected to continue and is not accounted for in the harvest level.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of pollock.	**Yes, Insignificant** Pollock are fished at less than the OFL and are above the minimum stock size. While an extreme pollution event could cause significant mortality in a localized area, the combined effect of internal removals and removals due to reasonably foreseeable external events is not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass	**I**	**No**, past large removals of pollock and other past effects (see Section 3.5.1.1) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of pollock.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently reduce the pollock biomass such that the ability of the stock to maintain itself at or above MSST is jeopardized.
Change in Genetic Structure of Population	**I**	**No**, see above.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct localized mortality of pollock such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-4 (cont.). Cumulative effects analysis for Gulf of Alaska pollock: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Pollock Fishery	State of Alaska Pink Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Repro-ductive Success	**I**	**Yes,** there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.1). **No,** past foreign fisheries tended to target younger pollock and the amount of pollock bycatch in these fisheries is not well documented. However, there is no evidence that the fisheries have had lingering effects on pollock recruitment.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events, especially if large in scale, could result in localized reduced recruitment.	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-4 (cont.). Cumulative effects analysis for Gulf of Alaska pollock: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Pollock Fishery	State of Alaska Pink Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.10). **No,** lingering population level effects from fisheries catch and bycatch of pollock prey species, and the effects of EVOS on these species, are not expected (see Section 3.5.1.1).	**Potential Adverse Contribution:** Bycatch of forage species in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of forage species in this fishery is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the pollock stock is unable to sustain itself at or above MSST.
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries, EVOS, and Climate Changes and Regime Shifts (refer to Section 3.5.1.1).	**Potential Adverse Contribution:** Habitat disturbance may cause changes in spawning or rearing success.	**Potential Adverse Contribution:** Habitat disturbance may cause changes in spawning or rearing success.	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external habitat disturbance factors is not expected to lead to a detectable change in spawning or rearing success such that the ability of the pollock stock to sustain itself at or above MSST is jeopardized.

Notes: EVOS - *Exxon Valdez* oil spill
FMPs - Fishery Management Plan
GOA - Gulf of Alaska
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level

Table 4.5-5. Significance of effects pertaining to Bering Sea and Aleutian Islands Pacific cod.

	Alternative (FMP) 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Direct Effects							
1. Fishing mortality	I	I	I	I	I	I	I
2. Change in biomass level	I	S-	I	I	I	S+	S+
3. Spatial temporal concentration of catch Leads to change in genetic structure of population	I	U	I	I	I	I	I
Change in reproductive success	I	U	I	I	I	I	I
Indirect Effects							
4. Change in prey availability	I	I	I	I	I	I	I
5. Habitat suitability (e.g., spawning, nursery, settlement habitat, etc.) as impacted by fishing	I	U	I	I	I	I	I

Notes: FMP - fishery management plan
I - insignificant
S- - significant adverse
U - unknown

Table 4.5-6. Significance of effects pertaining to Gulf of Alaska Pacific cod.

	Alternative (FMP) 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Direct Effects							
1. Fishing mortality	I	I	I	I	I	I	I
2. Change in biomass level	I	S-	I	I	I	I	S+
3. Spatial temporal concentration of catch							
Leads to change in genetic structure of population	I	U	I	I	I	I	I
Change in reproductive success	I	U	I	I	I	I	I
Indirect Effects							
4. Change in prey availability	I	I	I	I	I	I	I
5. Habitat suitability (e.g., spawning, nursery, settlement habitat, etc.) as impacted by fishing	I	U	I	I	I	I	I

Notes: FMP - fishery management plan
I - insignificant
S- - significant adverse
U - unknown

Table 4.5-7. Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMPs 1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**Yes**, large removals of Pacific cod occurred in the past foreign, domestic, and JV fisheries, and in the State of Alaska bait fisheries. The Pacific cod biomass is below $B_{40\%}$ and there are likely lingering effects from this past fishing pressure. (See Section 3.5.1.2).	**Not a contributing factor**: Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing factor** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small number of discards may not be included.	**Not a contribu-ting factor**: Most future catch and bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, Insignificant** Pacific cod are fished at less than the OFL and stock size is projected to be above $B_{40\%}$from 2003-2007. While an extreme pollution event could cause significant mortality in a localized area, the combined effect of internal removals and removals due to reasonably foreseeable external events is not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass	**I**	**No,** past large removals of Pacific cod and other past effects (see Section 3.5.1.1) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently reduce the Pacific cod biomass such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-7 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMPs 1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**I**	**No**, see above.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of Pacific cod such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.
Change in Repro-ductive Success	**I**	**Yes**, past fisheries could have had a lingering negative effect on Pacific cod recruitment. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.1).	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized. Could be CS- if regime shift was such that it did depress recruitment such that MSST was detrimental.

Table 4.5-7 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMPs 1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.10). **No,** lingering population level effects from fisheries catch and bycatch of Pacific cod prey species are not expected (See Section 3.5.1.1).	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Pacific cod stock is unable to sustain itself at or above MSST.
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.1),	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external impacts on habitat is not expected to impact the Pacific cod stock such that it is unable to sustain itself at or above MSST.

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold
OFL - overfishing level

Table 4.5-8. Cumulative effects analysis for Gulf of Alaska Pacific cod: FMPs 1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	State of Alaska Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**Yes**, large removals of Pacific cod occurred in the past foreign, domestic, and JV fisheries, and in the State of Alaska groundfish, crab and bait fisheries. The Pacific cod biomass is below $B_{40\%}$ and there are likely lingering effects from this past fishing pressure. (See Section 3.5.1.2).	**Not a contributing factor :** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing** factor: Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing factor:** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	Not a contributing factor: Most future catch and bycatch removals would be accounted for in annual harvest rate and therefore do no add additional fishing mortality.	**Potential Adverse contribution** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, Insignificant** Pacific cod are fished at less than the OFL and stock size is projected to be above $B_{40\%}$ from 2003-2007. While an extreme pollution event could cause significant mortality in a localized area, the combined effect of internal removals and removals due to reasonably foreseeable external events is not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass	**I**	**No,** past large removals of Pacific cod and other past effects (see Section 3.5.1.1) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Pacific cod.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently reduce the Pacific cod biomass such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-8 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMPs 1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	State of Alaska Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**I**	**No**, see above.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to direct localized mortality of Pacific cod such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.
Change in Reproductive Success	**I**	**Yes**, past fisheries could have had a lingering negative effect on Pacific cod recruitment, particularly in the GOA where the State groundfish fishery is very localized. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.2).	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-8 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMPs 1, 2.2, 3.1, 3.2, 4.1, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	State of Alaska Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.2). **No,** lingering population level effects from fisheries catch and bycatch of Pacific cod prey species are not expected (See Section 3.5.1.2).	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Pacific cod stock is unable to sustain itself at or above MSST.
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.2).	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external effects on habitat are not expected to impact the ability of the Pacific cod stock is to sustain itself at or above MSST.

Notes: FMP - fishery management plan
GOA - Gulf of Alaska
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level

Table 4.5-9. Significance of effects pertaining to sablefish in the Bering Sea and Aleutian Islands and Gulf of Alaska.

	Alternative (FMP) 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Direct Effects							
1. Fishing mortality	I	I	I	I	I	I	I
2. Change in biomass level	I	S-	I	I	I	I	I
3. Spatial temporal concentration of catch							
Leads to change in genetic structure of population	I	I	I	I	I	I	I
Change in reproductive success	I	I	I	I	I	I	I
Indirect Effects							
4. Change in prey availability	I	I	I	I	I	I	I
5. Habitat suitability (e.g., spawning, nursery, settlement habitat, etc.) as impacted by fishing	I	I	I	I	I	I	I

Notes: FMP - fishery management plan
I - insignificant
S- - significant adverse

Table 4.5-10. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMPs 1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**Yes**, large removals of Sablefish occurred, particularly in the JV and domestic fisheries. Catches that were under reported during the late 1980s may have contributed to abundance declines in the 1990s (see Section 3.5.1.3).	**Not a contributing factor:** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, discards are not accounted for.	**Potential Adverse Contribution:** Future bycatch removals are not accounted for in the three major state fisheries.	**Potential Adverse Contribution:** Catch and bycatch of highly migratory Sablefish are expected to continue.	**Potential Adverse contribution** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, Insignificant** Sablefish are fished at well below the OFL. While an extreme pollution event could cause significant mortality in a localized area, the combined effect of internal removals and removals due to reasonably foreseeable external events is not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.

Table 4.5-10 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMPs 1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Change in Biomass	**I**	**No,** while past large removals of Sablefish and other past effects on biomass have been identified (See Section 3.5.1.3), these do not appear to have had a lingering effect on the ability of the stock to sustain itself above the MSST.	**Potential Adverse Contribution:** Bycatch of Sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of Sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of sablefish.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently reduce the Sablefish biomass such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-10 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMPs 1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**I**	**No**, while spatial/temporal concentration of catch occurred in the State directed sablefish fisheries, there are no lingering effects due to the migratory nature of the fish (refer to Section 3.5.1.3).	**Potential Adverse Contribution:** Bycatch of Sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of Sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to direct localized mortality of Sablefish such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-10 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMPs 1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Change in Repro-ductive Success	**I**	**No**, see above	**Potential Adverse Contribution:** Bycatch of Sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and catch of Sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-10 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMPs 1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.2). **No,** lingering population level effects from fisheries catch and bycatch of Sablefish prey species are not expected (ee Section 3.5.1.3).	**Potential Adverse Contribution:** Bycatch of Sablefish forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Sablefish forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch and catch of Sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Sablefish stock is unable to sustain itself at or above MSST.

Table 4.5-10 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMPs 1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.3).	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Sablefish stock is unable to sustain itself at or above MSST.

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-11. Significance of effects pertaining to Bering Sea and Aleutian Islands Atka mackerel.

	Alternative (FMP) 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Direct Effects							
1. Fishing mortality	I	I	I	I	I	I	I
2. Change in biomass level	I	S-	I	I	I	S+	S+
3. Spatial temporal concentration of catch							
Leads to change in genetic structure of population	I	U	I	I	I	I	I
Change in reproductive success	I	U	I	I	I	S+	S+
Indirect Effects							
4. Change in prey availability	I	I	I	I	I	I	I
5. Habitat suitability (e.g., spawning, nursery, settlement habitat, etc.) as impacted by fishing	I	U	I	I	I	I	I

Notes: FMP - fishery management plan

Table 4.5-12. Significance of effects pertaining to Gulf of Alaska Atka mackerel.

	Alternative (FMP) 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Direct Effects							
1. Fishing mortality	U	U	U	U	U	U	U
2. Change in biomass level	U	U	U	U	U	U	U
3. Spatial temporal concentration of catch							
Leads to change in genetic structure of population	U	U	U	U	U	U	U
Change in reproductive success	U	U	U	U	U	U	U
Indirect Effects							
4. Change in prey availability	I	I	I	I	I	I	I
5. Habitat suitability (e.g., spawning, nursery, settlement habitat, etc.) as impacted by fishing	U	U	U	U	U	U	U

Notes: FMP - fishery management plan
I - insignificant
U - unknown

Table 4.5-13. Cumulative effects analysis for Bering Sea and Aleutian Islands Atka mackerel: FMPs 1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**No**, large removals of Atka mackerel occurred in the foreign, domestic, JV and fisheries, but there does not appear to be a lingering effect on the BSAI Atka mackerel populations (see Section 3.5.1.4).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Atka mackerel.	**Yes, Insignificant** Atka mackerel are fished at less than the OFL and are above the minimum stock size. Any potential removals due to marine pollution are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass	**I**	**No**, past large removals of Atka mackerel and other past effects (see Section 3.5.1.1) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Atka mackerel.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently reduce the Atka mackerel biomass such that the ability of the stock to maintain itself at or above MSST is jeopardized.
Change in Genetic Structure of Population	**I**	**Unknown.** Since the Atka mackerel fishery was highly localized past foreign, JV, and domestic fisheries are found to have had lingering effects on the spatial/temporal distribution of the fish. However, the effect of this change in distribution on genetic structure is unknown.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct localized mortality of Atka mackerel such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.5-13 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Atka mackerel: FMPs 1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Repro-ductive Success	**I**	**Yes**, Past fisheries, and commercial whaling removed large predators and could have had a beneficial effect. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.1).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.
Change in Prey Availability	**I**	**Yes,** see above.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST.	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Atka mackerel stock is unable to sustain itself at or above MSST.
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.1).	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success.	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes, Insignificant** The combination of internal and external habitat disturbance factors is not expected to lead to a detectable change in spawning or rearing success such that the ability of the Atka mackerel stock to sustain itself at or above MSST is jeopardized.

Notes: BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level

Table 4.5-14. Cumulative effects analysis for Gulf of Alaska Atka mackerel: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**U**	**Yes**, large, concentrated removals of Atka mackerel occurred in the foreign, domestic, JV and fisheries, have had a lingering effect on the GOA Atka mackerel population that has not yet recovered (see Section 3.5.1.4).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Atka mackerel.	**Yes,** but the significance is **Unknown** Atka mackerel is managed under tier 6. The fishing mortality rate and the MSST for GOA Atka mackerel is unknown, thus the effect of fishing mortality is Unknown under Alternative 1. Therefore the significance of any cumulative effects is also unknown.
Change in Biomass	**U**	**Yes,** see above.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Atka mackerel.	**Yes,** but the significance is **Unknown** see above.
Change in Genetic Structure of Population	**U**	**Unknown.** Since the Atka mackerel fishery was highly localized past foreign, JV, and domestic fisheries are found to have had lingering effects on the spatial/temporal distribution of the fish. However, the effect of this change in distribution on genetic structure is unknown.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct localized mortality of Atka mackerel such that stock genetics are threatened.	**Yes,** but the significance is **Unknown** see above.

Table 4.5-14 (cont.). Cumulative effects analysis for Gulf of Alaska Atka mackerel: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Repro-ductive Success	**U**	**Yes**, the past highly localized fisheries are found to have had lingering effects on the spatial/temporal distribution of the fish. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.1).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes,** but the significance is **Unknown** see above.
Change in Prey Availability	**I**	**No,** the major prey item for Atka mackerel is invertebrates. Climate changes and regime shifts have likely affected these organisms in the past, but the effects are not expected to be lingering.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST.	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes,** but the significance is **Unknown** since the direction of the external impacts is unknown.
Change in Habitat Suitability	**U**	**Yes,** Past Foreign, JV and Domestic Fisheries, EVOS, and Climate Changes and Regime Shifts (refer to Section 3.5.1.1).	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success.	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes,** but the significance is **Unknown**.

Notes: EVOS - *Exxon Valdez* oil spill
FMP - fishery management plan
GOA - Gulf of Alaska
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-15. Cumulative effects analysis for Bering Sea and Aleutian Islands yellowfin sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of yellowfin sole.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass Level	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality and thus change the biomass level.	**Not a Contributing Factor:** Changes in yellowfin sole recruitment are not correlated with changes in water temperature (refer to Section 3.5.1.5 for more information).	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass level.

Table 4.5-15 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands yellowfin sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality in a directed manner and thus alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of yellowfin sole.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Reproductive Success	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Not a Contributing Factor:** Changes in yellowfin sole recruitment are not correlated with changes in water temperature (refer to Section 3.5.1.5 for more information).	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-15 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands yellowfin sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.5).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation could effect prey availability, however studies on benthic invertebrates have not been conducted.	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Habitat Suitability	I	Yes, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.5).	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation appear to influence yellowfin sole habitat suitability; yellowfin sole appear to prefer warmer temperatures (refer to Section 3.5.1.5 for more information).	**Yes, Insignificant** Levels of habitat disturbance are not expected to lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself above the MSST.

Table 4.5-15 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands yellowfin sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Notes: FMP - fishery management plan
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-16. Cumulative effects analysis for Gulf of Alaska shallow water flatfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past JV and Domestic Fisheries (refer to Section 3.5.1.5).	**Not a Contributing Factor:** Bycatch of shallow water flatfish in this fishery is not expected .	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to shallow water flatfish mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of shallow water flatfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	Yes, Past JV and Domestic Fisheries (refer to Section 3.5.1.5).	**Not a Contributing Factor:** Bycatch of shallow water flatfish in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to shallow water flatfish mortality and thus change the biomass level of the stock.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will jeopardize the capacity of the stock to maintain current population levels.
Change in Genetic Structure of Population	U	No	**Not a Contributing Factor:** Bycatch of shallow water flatfish in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of shallow water flatfish such that stock genetics are threatened.	**Yes, Unknown** It is unknown whether the cumulative effects with significantly alter the genetic subpopulation structure.

Table 4.5-16 (cont.). Cumulative effects analysis for Gulf of Alaska shallow water flatfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.5).	**Not a Contributing Factor:** Bycatch of shallow water flatfish in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the reproductive success of the stock.
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.5).	**Potential Adverse Contribution:** Reduced prey availability and prey quality induced by habitat disturbance by fishing gear is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the prey availability.
Change in Habitat Suitability	U	Yes, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.5).	**Potential Adverse Contribution:** Habitat disturbance from fishery gear is expected to continue.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the habitat suitability in a way that leads to a change in spawning or rearing success.

Notes: FMPs - fishery management plan
JV - joint venture

Table 4.5-17. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands yellowfin sole.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	I	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insignificant

Table 4.5-18. Significance of direct/indirect effects pertaining to the Gulf of Alaska shallow water flatfish complex.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Reproductive Success	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Notes: I - insignificant
U - unknown

Table 4.5-19. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Island rock sole.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	I	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insignificant

Table 4.5-20. Cumulative effects analysis for Bering Sea and Aleutian Islands rock sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of rock sole.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass Level	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass level.

Table 4.5-20 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands rock sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality in a directed manner and thus alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of rock sole.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Reproductive Success	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.6).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation could effect prey availability and habitat suitability, which in combination could effect the reproductive success of the rock sole stock.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-20 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands rock sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.6).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation do effect the availability of some forage species (i.e., capelin), however studies on benthic invertebrates have not been conducted.	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-20 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands rock sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	I	Yes, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.6).	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation appear to influence rock sole habitat suitability; when the temperature is warm, catches are dominated by flatfish, when water temperatures are cooler, catches are dominated by other species.	**Yes, Insignificant** Levels of habitat disturbance are not expected to lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself above the MSST.

Notes: FMP - fishery management plan
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-21. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands flathead sole.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	I	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insignificant

Table 4.5-22. Significance of direct/indirect effects pertaining to Gulf of Alaska flathead sole.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Prey Availability	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Notes: I - insignificant
U - unknown

Table 4.5-23. Cumulative effects analysis for Bering Sea and Aleutian Islands flathead sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of flathead sole.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass Level	I	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass level.

Table 4.5-23 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands flathead sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	I	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality in a directed manner and thus alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of flathead sole such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Reproductive Success	I	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-23 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands flathead sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-23 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands flathead sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Ratin g	Persistent Past Effects	Reasonably Foreseeable Future External Effects		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	I	**Yes**, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.7).	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Levels of habitat disturbance are not expected to lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself above the MSST.

Notes: FMP - fishery management plan
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-24. Cumulative effects analysis for Gulf of Alaska flathead sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past JV and Domestic Fisheries (refer to section 3.5.1.7).	**Not a Contributing Factor:** Bycatch of flathead sole in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of flathead sole.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	Yes, Past JV and Domestic Fisheries (refer to section 3.5.1.7).	**Not a Contributing Factor:** Bycatch of flathead sole in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality and thus change the biomass level of the stock.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will jeopardize the capacity of the stock to maintain current population levels.
Change in Genetic Structure of Population	U	No	**Not a Contributing Factor:** Bycatch of flathead sole in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of flathead sole such that stock genetics are threatened.	**Yes, Unknown** It is unknown whether the cumulative effects with significantly alter the genetic subpopulation structure.

Table 4.5-24 (cont.). Cumulative effects analysis for Gulf of Alaska flathead sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	U	Yes, Climate Changes and Regime Shifts (refer to section 3.5.1.7).	**Not a Contributing Factor:** Bycatch of flathead sole in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the reproductive success of the stock.
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to section 3.5.1.7).	**Potential Adverse Contribution:** Reduced prey availability and prey quality induced by habitat disturbance by fishing gear is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the prey availability.
Change in Habitat Suitability	U	Yes, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to section 3.5.1.7).	**Potential Adverse Contribution:** Habitat disturbance from fishery gear is expected to continue.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the habitat suitability in a way that leads to a change in spawning or rearing success

Notes: FMPs - fishery management plan
JV - joint venture

Table 4.5-25. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands arrowtooth flounder.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	I	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insignificant

Table 4.5-26. Significance of direct/indirect effects pertaining to Gulf of Alaska arrowtooth flounder.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	I	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insignificant

Table 4.5-27. Cumulative effects analysis for Bering Sea and Aleutian Islands arrowtooth flounder: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Events			Natural Events	
			IPHC Longline Fishery	State of Alaska Herring Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	No	**Potential Adverse Contribution:** Arrowtooth flounder are taken in the IPHC longline fishery.	**Not a Contributing Factor:** Arrowtooth flounder bycatch is not expected to occur in these fisheries .	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of arrowtooth flounder.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass Level	I	No	**Potential Adverse Contribution:** Arrowtooth flounder are taken in the IPHC longline fishery.	**Not a Contributing Factor:** Arrowtooth flounder bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass toward levels that jeopardize the ability of the stock to sustain itself above MSST.

Table 4.5-27 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands arrowtooth flounder: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Events			Natural Events	
			IPHC Longline Fishery	State of Alaska Herring Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	I	No	**Not a Contributing Factor:** The small amount of arrowtooth flounder taken in this fishery is not expected to impact the genetic structure of the population.	**Not a Contributing Factor:** Arrowtooth flounder bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality in a directed manner and thus alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of arrowtooth flounder.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Repro-ductive Success	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.8).	**Not a Contributing Factor:** The small amount of arrowtooth flounder taken is not expected to impact the reproductive success of the population.	**Not a Contributing Factor:** Arrowtooth flounder bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation could effect prey availability and habitat suitability, which in combination could effect the reproductive success of the arrowtooth flounder stock.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-27 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands arrowtooth flounder: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Events			Natural Events	
			IPHC Longline Fishery	State of Alaska Herring Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	Yes, Past Foreign, JV, and Domestic Groundfish Fisheries, State of Alaska Groundfish Fisheries, and State of Alaska Herring Fisheries, and Climate Changes and Regime Shifts (refer to Section 3.5.1.8).	**Not a Contributing Factor: The fishery** is not expected to take arrowtooth flounder prey.	**Potential Adverse Contribution:** Removals of the arrowtooth flounder prey species herring is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation do effect the availability of some forage species (i.e., capelin, herring), and shrimp and pollock.	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-27 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands arrowtooth flounder: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Events			Natural Events	
			IPHC Longline Fishery	State of Alaska Herring Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	I	Yes, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.8).	**Not a Contributing Factor:** Habitat degradation by longline gear is not expected to occur.	**Not a Contributing Factor:** Habitat degradation by herring fishery gear is not expected.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation appear to influence arrowtooth flounder habitat suitability; when the temperature is warm, catches are dominated by flatfish, when water temperatures are cooler, catches are dominated by other species.	**Yes, Insignificant** Levels of habitat disturbance are not expected to lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself above the MSST.

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold

Table 4.5-28. Cumulative effects analysis for Gulf of Alaska arrowtooth flounder: FMPs1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Events			Natural Events	
			IPHC Longline Fisheries	State of Alaska Herring Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	No	**Potential Adverse Effect:** Arrowtooth flounder are taken as bycatch in this fishery and the take is not accounted for when setting harvest levels.	**Not a Contributing Factor:** Arrowtooth flounder bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of arrowtooth flounder.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass Level	I	No	**Potential Adverse Effect:** Arrowtooth flounder are taken as bycatch in this fishery and the take is not accounted for when setting harvest levels.	**Not a Contributing Factor:** Arrowtooth flounder bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass toward levels that jeopardize the ability of the stock to sustain itself above MSST.
Change in Genetic Structure of Population	I	No	**Not a Contributing Factor:** Bycatch of arrowtooth flounder is not expected to contribute to changes in genetic diversity.	**Not a Contributing Factor:** Arrowtooth flounder bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality in a directed manner and thus alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of arrowtooth flounder.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-28 (cont.). Cumulative effects analysis for Gulf of Alaska arrowtooth flounder: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Events			Natural Events	
			IPHC Longline Fisheries	State of Alaska Herring Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.8).	**Not a Contributing Factor:** Bycatch of arrowtooth flounder is not expected to contribute to changes in reproductive success.	**Not a Contributing Factor:** Arrowtooth flounder bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation could effect prey availability and habitat suitability, which in combination could effect the reproductive success of the arrowtooth flounder stock.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Prey Availability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.8).	**Not a Contributing Factor:** Bycatch of arrowtooth flounder prey is not expected to occur.	**Potential Adverse Contribution:** Removals of the arrowtooth flounder prey species herring is expected to continue .	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation do effect the availability of some forage species (i.e., capelin, herring), and shrimp and pollock.	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-28 (cont.). Cumulative effects analysis for Gulf of Alaska arrowtooth flounder: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Events			Natural Events	
			IPHC Longline Fisheries	State of Alaska Herring Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	I	Yes, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.8).	**Not a Contributing Factor:** Habitat degradation by the IPHC longline fishery gear is not expected.	**Not a Contributing Factor:** Habitat degradation by herring fishery gear is not expected.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation appear to influence arrowtooth flounder habitat suitability; when the temperature is warm, catches are dominated by flatfish, when water temperatures are cooler, catches are dominated by other species.	**Yes, Insignificant** Levels of habitat disturbance are not expected to lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself above the MSST.

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-29. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands Greenland turbot.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	S-	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insignificant
S- - significant adverse

Table 4.5-30. Significance of direct/indirect effects pertaining to the Gulf of Alaska deep water flatfish complex.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Reproductive Success	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Notes: I - insignificant
U - unknown

Table 4.5-31. Cumulative effects analysis for Bering Sea and Aleutian Islands Greenland turbot: FMPs 1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
Mortality	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Greenland turbot mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Greenland turbot.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass Level	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Greenland turbot mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass toward levels that jeopardize the ability of the stock to sustain itself above MSST.

Table 4.5-31 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Greenland turbot: FMPs 1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
Change in Genetic Structure of Population	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events result in Greenland turbot mortality in a directed manner that could then alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of Greenland turbot such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Reproductive Success	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.9)	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-31 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands Greenland turbot: FMPs 1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
Change in Prey Availability	I	Yes, Past Foreign, JV, and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.9).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-31 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands Greenland turbot: FMPs 1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
Change in Habitat Suitability	I	Yes, Past Foreign, JV, and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.9).	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Levels of habitat disturbance are not expected to lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself above the MSST.

Notes: FMP - fishery management plan
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-32. Cumulative effects analysis for Gulf of Alaska deep water flatfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	No	**Not a Contributing Factor:** Bycatch of deep water flatfish in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to deep water flatfish mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of deep water flatfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	No	**Not a Contributing Factor:** Bycatch of deep water flatfish in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to deep water flatfish mortality and thus change the biomass level of the stock.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will jeopardize the capacity of the stock to maintain current population levels.
Change in Genetic Structure of Population	U	No	**Not a Contributing Factor:** Bycatch of deep water flatfish in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of deep water flatfish such that stock genetics are threatened.	**Yes, Unknown** It is unknown whether the cumulative effects with significantly alter the genetic subpopulation structure.
Change in Reproductive Success	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.9).	**Not a Contributing Factor:** Bycatch of deep water flatfish in this fishery is not expected.	**Potential adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the reproductive success of the stock.

Table 4.5-32 (cont.). Cumulative effects analysis for Gulf of Alaska deep water flatfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.9).	**Potential Adverse Contribution:** Reduced prey availability and prey quality induced by habitat disturbance by fishing gear is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the prey availability.
Change in Habitat Suitability	U	Yes, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.9).	**Potential Adverse Contribution:** Habitat disturbance from fishery gear is expected to continue.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the habitat suitability in a way that leads to a change in spawning or rearing success.

Notes: FMP - fishery management plan
I - insignificant
JV - joint venture
U - unknown

Table 4.5-33. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands Alaska plaice.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	I	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insignificant

Table 4.5-34. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands other flatfish.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Reproductive Success	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Notes: I - insignificant
U - unknown

Table 4.5-35. Significance of direct/indirect effects pertaining to Gulf of Alaska rex sole.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Reproductive Success	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Notes: I - insignificant
U - unknown

Table 4.5-36. Cumulative effects analysis for Bering Sea and Aleutian Islands Alaska plaice: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Natural Events		
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to other flatfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of other flatfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass Level	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to other flatfish mortality and thus effect the biomass level.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass toward levels that jeopardize the ability of the stock to sustain itself above MSST.
Change in Genetic Structure of Population	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of other flatfish such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Reproductive Success	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.10).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Prey Availability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.10).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-36 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Alaska plaice: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Natural Events		
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	I	Yes, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.10).	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Levels of habitat disturbance are not expected to lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself above the MSST.

Notes: FMP - fishery management plan
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-37. Cumulative effects analysis for Bering Sea and Aleutian Islands other flatfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to other flatfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of other flatfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to other flatfish mortality and thus effect the biomass level.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the biomass level such that the stock is unable to maintain current population levels.
Change in Genetic Structure of Population	U	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of other flatfish such that stock genetics are threatened.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly alter the genetic sub-population structure such that the stock is unable to maintain current population levels.
Change in Reproductive Success	U	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.10).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the reproductive success such that the stock is unable to maintain current population levels.
Change in Prey Availability	U	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.10).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the prey availability such that the stock is unable to maintain current population levels.

Table 4.5-37 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands other flatfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	U	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.10).	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the habitat suitability in a way that leads to a change in spawning or rearing success such that the stock is unable to maintain current population levels.

Notes: BSAI - Bering Sea and Aleutian Islands
FMPs - fishery management plan
JV - joint venture
MSST - minimum stock size threshold
U - Unknown

Table 4.5-38. Cumulative effects analysis for Gulf of Alaska rex sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past JV and Domestic Fisheries (refer to Section 3.5.1.10)	**Not a Contributing Factor:** Bycatch of rex sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to rex sole mortality	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of rex sole	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	U	Yes, Past JV and Domestic Fisheries (refer to Section 3.5.1.10)	**Not a Contributing Factor:** Bycatch of rex sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to rex sole mortality and thus change the biomass level of the stock	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Unknown** It is unknown whether the cumulative effects will jeopardize the capacity of the stock to maintain current population levels
Change in Genetic Structure of Population	U	No	**Not a Contributing Factor:** Bycatch of rex sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of rex sole such that stock genetics are threatened.	**Yes, Unknown** It is unknown whether the cumulative effects with significantly alter the genetic subpopulation structure
Change in Reproductive Success	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.10)	**Not a Contributing Factor:** Bycatch of rex sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the reproductive success of the stock

Table 4.5-38 (cont.). Cumulative effects analysis for Gulf of Alaska rex sole: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.10)	**Potential Adverse Contribution:** Reduced prey availability and prey quality induced by habitat disturbance by fishing gear is expected to continue	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the prey availability
Change in Habitat Suitability	U	Yes, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.10)	**Potential Adverse Contribution:** Habitat disturbance from fishery gear is expected to continue	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Unknown** It is unknown whether the cumulative effects will significantly change the habitat suitability in a way that leads to a change in spawning or rearing success

Notes: FMPs - fishery management plan
JV - joint venture

Table 4.5-39. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands Pacific ocean perch.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	I	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	S+	S+
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insiginificant
S+ - significant beneficial

Table 4.5-40. Significance of direct/indirect effects pertaining to Gulf of Alaska Pacific ocean perch (as part of the Gulf of Alaska slope rockfish complex).

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	I	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insignificant

Table 4.5-41. Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific ocean perch: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign, JV and Domestic Groundfish Fisheries (refer to Section 3.5.1.11).	**Not a Contributing Factor**: Bycatch of Pacific ocean perch prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Pacific ocean perch mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific ocean perch.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.

Table 4.5-41 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific ocean perch: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Biomass Level	I	Yes, Past Foreign, JV and Domestic Groundfish Fisheries (refer to Section 3.5.1.11).	**Not a Contributing Factor**: Bycatch of Pacific ocean perch prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Pacific ocean perch mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution:** Recent climate changes and regime shifts have lead to increased advection of the Alaska current and is thought to have increased euphausiid productivity and thus Pacific ocean perch recruitment .	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass level.

Table 4.5-41 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific ocean perch: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	I	No	**Not a Contributing Factor**: Bycatch of Pacific ocean perch prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Pacific ocean perch mortality in a directed manner and thus alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of Pacific ocean perch.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-41 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific ocean perch: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.11).	**Not a Contributing Factor**: Bycatch of Pacific ocean perch prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Recent climate changes and regime shifts have lead to increased advection of the Alaska current and is thought to have increased euphausiid productivity and thus Pacific ocean perch recruitment .	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-41 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific ocean perch: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.11).	**Not a Contributing Factor**: Bycatch of Pacific ocean perch prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Recent climate changes and regime shifts have lead to increased advection of the Alaska current and is thought to have increased euphausiid productivity and thus Pacific ocean perch recruitment.	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-41 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific ocean perch: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	I	Yes, Past Foreign, JV and Domestic Fisheries, IPHC Longline Fisheries, and Climate Changes and Regime Shifts (refer to Section 3.5.1.11).	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of Pacific ocean perch spawning and/or rearing habitats.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation appear to influence Pacific ocean perch habitat suitability.	**Yes, Insignificant:** Trends in stock status do not indicate changes in spawning biomass. The stock is rebuilding. Therefore, cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-42. Cumulative effects analysis for Gulf of Alaska Pacific ocean perch: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign, JV and Domestic Groundfish Fisheries (refer to Section 3.5.1.11).	**Not a Contributing Factor**: Bycatch of Pacific ocean perch is not expected in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Pacific ocean perch mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific ocean perch.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis
Change in Biomass Level	I	Yes, Past Foreign, JV and Domestic Groundfish Fisheries (refer to Section 3.5.1.11).	**Not a Contributing Factor**: Bycatch of Pacific ocean perch is not expected in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Pacific ocean perch mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution:** Recent climate changes and regime shifts have lead to increased advection of the Alaska current and is thought to have increased euphausiid productivity and thus Pacific ocean perch recruitment.	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass level
Change in Genetic Structure of Population	I	No	**Not a Contributing Factor**: Bycatch of Pacific ocean perch is not expected in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Pacific ocean perch mortality in a directed manner and thus alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of Pacific ocean perch.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST

Table 4.5-42 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific ocean perch: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.11).	**Not a Contributing Factor**: Bycatch of Pacific ocean perch is not expected in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Recent climate changes and regime shifts have lead to increased advection of the Alaska current and is thought to have increased euphausiid productivity and thus Pacific ocean perch recruitment.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST
Change in Prey Availability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.11)	**Not a Contributing Factor**: Bycatch of Pacific ocean perch prey is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution:** Recent climate changes and regime shifts have lead to increased advection of the Alaska current and is thought to have increased euphausiid productivity and thus Pacific ocean perch recruitment	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST
Change in Habitat Suitability	I	Yes, Past Foreign, JV and Domestic Fisheries, IPHC Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.11)	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of Pacific ocean perch spawning and/or rearing habitats	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation appear to influence Pacific ocean perch habitat suitability	**Yes, Insignificant** Trends in stock status do not indicate changes in spawning biomass. The stock is rebuilding. Therefore, cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST

Table 4.5-42 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific ocean perch: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Notes: FMPs - fishery management plan
GOA - Gulf of Alaska
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-43. Significance of direct/indirect effects pertaining to Gulf of Alaska thornyhead rockfish.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	I	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insignificant

Table 4.5-44. Cumulative effects analysis for Gulf of Alaska thornyhead rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			IPHC Longline Fishery	State of Alaska Shrimp Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign, JV and Domestic Groundfish Fisheries (refer to Section 3.5.1.12).	**Potential Adverse Effect:** Thornyhead rockfish are caught as bycatch in the IPHC longline fishery.	**Not a Contributing Factor:** Thornyhead rockfish bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of thornyhead rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass Level	I	Yes, Past Foreign, JV and Domestic Groundfish Fisheries (refer to Section 3.5.1.12).	**Potential Adverse Effect:** Thornyhead rockfish are caught as bycatch in the IPHC longline fishery.	**Not a Contributing Factor:** Thornyhead rockfish bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass toward levels that jeopardize the ability of the stock to sustain itself above MSST.
Change in Genetic Structure of Population	I	No	**Potential Adverse Effect:** Thornyhead rockfish are caught as bycatch in the IPHC longline fishery.	**Not a Contributing Factor:** Thornyhead rockfish bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality in a directed manner and thus alter the genetic structure of the population .	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of thornyhead rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-44 (cont.). Cumulative effects analysis for Gulf of Alaska thornyhead rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			IPHC Longline Fishery	State of Alaska Shrimp Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.12).	**Potential Adverse Effect:** Thornyhead rockfish are caught as bycatch in the IPHC longline fishery.	**Not a Contributing Factor:** Thornyhead rockfish bycatch is not expected to occur in these fisheries.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation could effect prey availability and habitat suitability, which in combination could effect the reproductive success of the thornyhead rockfish stock.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Prey Availability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.12).	**Not a Contributing Factor:** Bycatch of thornyhead rockfish prey is not expected in this fishery.	**Potential Adverse Contribution:** Removals of thornyhead rockfish prey species is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown; however shrimp recruitment appears to be favored during the weak Aleutian Low (cooler water temperatures).	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.5-44 (cont.). Cumulative effects analysis for Gulf of Alaska thornyhead rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			IPHC Longline Fishery	State of Alaska Shrimp Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.12).	**Potential Adverse Contribution:** Habitat degradation by the IPHC longline fishery gear is expected to continue.	**Not a Contributing Factor:** Habitat degradation by shrimp fishery gear is not expected.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Insignificant** Levels of habitat disturbance are not expected to lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself above the MSST.

Notes: FMPs - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.5-45. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands northern rockfish (as part of the Bering Sea and Aleutian Islands other red rockfish complex).

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Reproductive Success	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Notes: I - insignificant
U - unknown

Table 4.5-46. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands shortraker and rougheye rockfish (as part of the Bering Sea and Aleutian Islands other red rockfish complex).

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Reproductive Success	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Notes: I - insignificant
U - unknown

Table 4.5-47 Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands other rockfish.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Reproductive Success	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Notes: I - insignificant
U - unknown

Table 4.5-48. Significance of direct/indirect effects pertaining to Gulf of Alaska northern rockfish (as part of the Gulf of Alaska slope rockfish complex).

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	I	I	I	I	I	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Indirect Effects							
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat Suitability	I	I	I	I	I	I	I

Notes: I - insignificant

Table 4.5-49. Significance of direct/indirect effects pertaining to Gulf of Alaska shortraker and rougheye rockfish (as part of the Gulf of Alaska slope rockfish complex).

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Reproductive Success	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Note: I - insignificant
U - unknown

Table 4.5-50. Significance of direct/indirect effects pertaining to Gulf of Alaska slope rockfish (Pacific ocean perch, northern rockfish and shortraker/rougheye rockfish are not included).

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Reproductive Success	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Notes: I - insignificant
U - unknown

Table 4.5-51. Significance of direct/indirect effects pertaining to Gulf of Alaska pelagic shelf rockfish.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	I	I
Change in Reproductive Success	U	U	U	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	U	U	U	U	I	I

Notes: I - insignificant
U - unknown

Table 4.5-52. Significance of direct/indirect effects pertaining to Gulf of Alaska demersal shelf rockfish.

Effects	Rating						
	Alternative 1	Alternative 2.1	Alternative 2.2	Alternative 3.1	Alternative 3.2	Alternative 4.1	Alternative 4.2
Direct Effects							
Mortality	I	S-	S-	I	I	I	I
Change in Biomass Level	U	S-	CS-	U	U	I	I
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	CS-	CS-	U	U	I	I
Change in Reproductive Success	U	CS-	CS-	U	U	I	I
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	I	I
Change in Habitat Suitability	U	CS-	CS-	U	U	I	I

Notes: CS- - conditionally significant adverse
I - insignificant
S- - significant adverse
U - unknown

Table 4.5-53. Cumulative effects analysis for Bering Sea and Aleutian Islands northern rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**Yes,** Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of northern rockfish is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to northern rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of northern rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	**Yes,** Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of northern rockfish is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to northern rockfish mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance **is Unknown**.

Table 4.5-53 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands northern rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	U	**No**	**Not a Contributing Factor**: Bycatch of northern rockfish is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of northern rockfish such that stock genetics are threatened.	**Yes,** but the significance **is Unknown**.
Change in Reproductive Success	U	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of northern rockfish is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance **is Unknown**.

Table 4.5-53 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands northern rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	U	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of northern rockfish prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance **is Unknown**.

Table 4.5-53 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands northern rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	U	**Yes,** Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Halibut Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of northern rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance **is Unknown**.

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture

Table 4.5-54. Cumulative effects analysis for Bering Sea and Aleutian Islands shortraker/rougheye rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to shortraker and rougheye rockfish mortality	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of shortraker and rougheye rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	U	Yes, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to shortraker and rougheye rockfish mortality and thus change the biomass level	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Unknown** The cumulative effects are unknown
Change in Genetic Structure of Population	U	No	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of shortraker and rougheye rockfish such that stock genetics are threatened.	**Yes, Unknown** The cumulative effects are unknown

Table 4.5-54 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands shortraker/rougheye rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	U	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Unknown** The cumulative effects are unknown
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Potential Adverse Contribution:** The shrimp fishery is expected to continue and thus could influence the availability of prey to rougheye rockfish	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish prey is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Unknown** The cumulative effects are unknown
Change in Habitat Suitability	U	Yes, Foreign, JV and Domestic Groundfish Fisheries, IPHC Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Habitat degradation by the State of Alaska shrimp fishery is not expected to occur	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of shortraker and rougheye rockfish spawning and/or rearing habitats	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Unknown** The cumulative effects are unknown

Notes: FMP - fishery management plan
I - insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture
U - unknown

Table 4.5-55. Cumulative effects analysis for Bering Sea and Aleutian Islands other rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to other rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of other rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	Yes, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to other rockfish mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.
Change in Genetic Structure of Population	U	No	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of other rockfish such that stock genetics are threatened.	**Yes, Unknown** The cumulative effects are unknown.

Table 4.5-55 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islandsother rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	U	No	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Potential Adverse Contribution:** The shrimp fishery is expected to continue and thus could influence the availability of prey to many other rockfish species.	**Not a Contributing Factor**: Bycatch of other rockfish species prey is not expected to occur.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.

Table 4.5-55 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islandsother rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	U	Yes, Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Longline Fishery and Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Potential Adverse Contribution:** Habitat disruption by the State of Alaska shrimp fishery gear is expected to continue and could cause disruption of other rockfish species spawning and/or rearing habitats.	**Potential Adverse Contribution:** Habitat disruption by the IPHC longline fishery gear is expected to continue and could cause disruption of other rockfish species spawning and/or rearing habitats.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture

Table 4.5-56. Cumulative effects analysis for Gulf of Alaska northern rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor:** Bycatch of northern rockfish is already accounted for by domestic groundfish fisheries.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to northern rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of northern rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass Level	I	Yes, Past Foreign Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor:** Bycatch of northern rockfish is already accounted for by domestic groundfish fisheries.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to northern rockfish mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Insignificant** The cumulative effects are not expected to alter the biomass towards levels that jeopardize the stocks ability to sustain itself above MSST.
Change in Genetic Structure of Population	I	No	**Not a Contributing Factor:** Bycatch of northern rockfish is already accounted for by domestic groundfish fisheries.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of northern rockfish such that stock genetics are threatened.	**Yes, Insignificant** The cumulative effects are not expected to alter the genetic sub-population structure such that it jeopardizes the ability of the stock to maintain MSST.
Change in Reproductive Success	I	Yes, Past Foreign Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor:** Bycatch of northern rockfish is already accounted for by domestic groundfish fisheries.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Insignificant** The cumulative effects are not expected to change the reproductive success such that it jeopardizes the ability of the stock to maintain itself above MSST.

4.5-56 (cont.). Cumulative effects analysis for Gulf of Alaska northern rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor:** Bycatch of northern rockfish prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Insignificant** The cumulative effects are not expected to change prey availability such that it jeopardizes the ability of the stock to sustain itself above the MSST.
Change in Habitat Suitability	I	Yes, Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Longline Fishery and Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Potential Adverse Contribution:** Habitat disruption by the IPHC longline fishery gear is expected to continue and could cause disruption of northern rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Insignificant:** Trends in stock status do not indicate changes in spawning biomass. Therefore, cumulative effects on habitat have not been and are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold

Table 4.5-57. Cumulative effects analysis for Gulf of Alaska shortraker/rougheye rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign, JV, and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to shortraker and rougheye rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of shortraker and rougheye rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	Yes, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to shortraker and rougheye rockfish mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**
Change in Genetic Structure of Population	U	No	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of shortraker and rougheye rockfish such that stock genetics are threatened.	**Yes,** but the significance is **unknown.**

Table 4.5-57 (cont.). Cumulative effects analysis for Gulf of Alaska shortraker/rougheye rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Potential Adverse Contribution:** Catch of shrimp, the main rougheye rockfish prey species is expected to continue.	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**

Table 4.5-57 (cont.). Cumulative effects analysis for Gulf of Alaska shortraker/rougheye rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	U	Yes, Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Halibut Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Shortraker and rougheye rockfish habitat degradation is not expected to occur in this fishery.	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of shortraker and rougheye rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture

Table 4.5-58. Cumulative effects analysis for Gulf of Alaska slope rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign, JV, and Domestic Fisheries and State of Alaska Groundfish Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Catch of slope rockfish is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch of slope rockfish is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to slope rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of slope rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	Yes, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Catch of slope rockfish is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch of slope rockfish is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to slope rockfish mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.
Change in Genetic Structure of Population	U	No	**Not a Contributing Factor**: Catch of slope rockfish is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch of slope rockfish is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of slope rockfish such that stock genetics are threatened.	**Yes,** but the significance is **unknown.**

Table 4.5-58 (cont.). Cumulative effects analysis for Gulf of Alaska slope rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Catch of slope rockfish is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch of slope rockfish is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of slope rockfish prey is not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of slope rockfish prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**

Table 4.5-58 (cont.). Cumulative effects analysis for Gulf of Alaska slope rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	U	Yes, Past Foreign, JV and Domestic Groundfish Fisheries, State of Alaska Groundfish Fisheries, IPHC Halibut Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Potential Adverse Contribution:** Habitat disruption by State of Alaska groundfish fishery gear is expected to continue and could cause disruption of slope rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of slope rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture
U - unknown

Table 4.5-59. Cumulative effects analysis for Gulf of Alaska pelagic shelf rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign, JV, and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of pelagic shelf rockfish are not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to pelagic shelf rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of pelagic shelf rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	Yes, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of pelagic shelf rockfish are not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to pelagic shelf rockfish mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**
Change in Genetic Structure of Population	U	No	**Not a Contributing Factor**: Bycatch of pelagic shelf rockfish are not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of pelagic shelf rockfish such that stock genetics are threatened.	**Yes,** but the significance is **unknown.**

Table 4.5-59 (cont.). Cumulative effects analysis for Gulf of Alaska pelagic shelf rockfish: FMPs 1, 2.1, 2.2, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of pelagic shelf rockfish are not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Potential Adverse Contribution:** Catch of shrimp, a prey item of dusky rockfish is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**
Change in Habitat Suitability	U	Yes, Past Foreign, JV and Domestic Groundfish Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Pelagic shelf rockfish habitat degradation is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes,** but the significance is **unknown.**

Notes: FMPs - fishery management plan
JV - joint venture

Table 4.5-60. Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMPs 1, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign, JV, and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to demersal shelf rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of demersal shelf rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	Yes, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to demersal shelf rockfish mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.

Table 4.5-60 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMPs 1, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	U	No	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of demersal shelf rockfish such that stock genetics are threatened.	**Yes, Unknown** The cumulative effects are unknown.
Change in Reproductive Success	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.

Table 4.5-60 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMPs 1, 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Potential Adverse Contribution:** Catch of herring, a prey item of demersal shelf rockfish is expected to continue.	**Potential Adverse Contribution:** Catch of shrimp, a prey item of demersal shelf rockfish is expected to continue.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish prey is not expected in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.
Change in Habitat Suitability	U	Yes, Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Halibut Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Demersal shelf rockfish habitat degradation is not expected to occur in this fishery.	**Not a Contributing Factor**: Demersal shelf rockfish habitat degradation is not expected to occur in this fishery.	**Potential Adverse Contribution:** Habitat disruption by State of Alaska fishery gear is expected to continue and could cause disruption of demersal shelf rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of demersal shelf rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture

Table 4.5-61. Direct/indirect effects summary for Pacific halibut in the Bering Sea and Aleutian Islands and Gulf of Alaska: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Change in Prey Availability	I	I	I	I	I	I	I

Notes: FMP - fishery management plan
I - insignificant

Table 4.5-62. Cumulative effects analysis for Pacific halibut in Gulf of Alaska and Bering Sea and Aleutian Islands: FMP 1-4.2, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Halibut Fishery	State Managed Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**I**	**No**	**Not a contributing factor-** IPHC accounts for all removals when setting quotas for directed fisheries.	**Not a contributing factor-** IPHC accounts for all removals when setting quotas for directed fisheries.	**Not a contributing factor-**not expected to result in direct mortality.	**Insignificant-** IPHC sets quotas for directed fisheries accounting for all removals including bycatch in other fisheries.
Change in Reproductive Success	**I**	**No**	**Not a contributing factor-** spawning occurs during midwinter in deep waters where fishing does not occur.	**Not a contributing factor-** spawning occurs during midwinter in deep waters where fishing does not occur.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment.	**Insignificant-** management of halibut stock by the IPHC accounts for positive and negative changes to baseline condition.
Change in prey availability	**I**	**No**	**Not a contributing factor-** halibut are opportunistic predators with diverse diets.	**Not a contributing factor-** halibut are opportunistic predators with diverse diets.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment.	**Insignificant-** management of halibut stock by the IPHC accounts for positive and negative changes to baseline condition.

Notes: FMP - fishery management plan
I - insignificant
IPHC - International Pacific Halibut Commission

Standard Language to Describe Effects:
Not a contributing factor
Potential adverse contribution
Potential beneficial contribution
Unknown

Table 4.5-63. Direct/indirect effects summary for Chinook and other salmon in Bering Sea and Aleutian Islands: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	I	CS-	CS-	I	I	CS+	CS+
Change in Spawning Habitat	I	I	I	I	I	I	I
Change in Prey Availability	U	U	U	U	U	U	U
Change in Genetic Structure of Population	U	U	U	U	U	U	U
Change in Reproductive Success	U	CS-	CS-	U	U	CS+	CS+

Notes: CS- - Conditionally Significant Adverse
CS+ - Conditionally Significant Beneficial
I - Insignificant
U - Unknown

Table 4.5-64. Direct/indirect effects summary for Chinook and other salmon in Gulf of Alaska: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	I	CS-	I	I	I	CS+	CS+
Change in Spawning Habitat	I	I	I	I	I	I	I
Change in Prey Availability	U	U	U	U	U	U	U
Change in Genetic Structure of Population	U	U	U	U	U	U	U
Change in Reproductive Success	U	U	U	U	U	U	U

Notes: CS- - Conditionally Significant Adverse
CS+ - Conditionally Significant Beneficial
FMP - fishery management plan
I - Insignificant
U - Unknown

Table 4.5-65. Cumulative effects analysis for Chinook and other salmon in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	Land management practices	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts of bycatch and state fisheries could hinder recovery.	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impact of bycatch and subsistence fisheries could hinder recovery.	**Not a contributing factor-** significant impacts causing direct mortality is not expected.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally Significant Adverse-** given the poor stock status of salmon runs in western Alaska* and the combined bycatch potential of BSAI and GOA, sustainability of depressed salmon stocks could be impacted.
Change in Spawning Habitat	**I**	**Yes**	**Not a Contributing Factor**: no direct interaction between groundfish fisheries and salmon spawning habitat occurs because Pacific salmon species spawn in freshwater.	**Unknown**: potential interactions and effects have not been determined.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Not a contributing factor**- not expected to significantly change physical habitat	**Unknown-**watersheds used by spawning salmon are managed by various agencies and groups and are influenced by land management practices as well.
Change in prey availability	**U**	**Not Determined**	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Not a contributing factor-** significant impacts causing change in prey structure and/or availability are not expected.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** potential changes to prey availability for salmon have not been determined and effects are unknown.

Table 4.5-65 (cont.). Cumulative effects analysis for Chinook and other salmon in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	Land management practices	Long-term Climate Change and Regime Shift	
Change in genetic structure of population	**U**	**Not Determined**	**Unknown**: composition of bycatch has not been determined	**Unknown**: composition of bycatch has not been determined	**Not a contributing factor-** significant impacts causing change in genetic structure of stock are not expected.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** bycatch composition has not been determined and current stock composition for all species of salmon is unknown.
Change in reproductive success	**U**	**Yes**	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts of bycatch and state fisheries could hinder recovery.	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impact of bycatch and subsistence fisheries could hinder recovery.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** given the poor stock status of salmon runs in western Alaska* and the combined bycatch potential of BSAI and GOA, sustainability of depressed salmon stocks could be impacted. Salmon reproductive success depends on spawning adults reaching destined spawning habitat.

Notes: * Western Alaska incorporates Kuskokwim, Nushagak, and Yukon Rivers also referred to as the AYK region (Arctic-Yukon-Kuskokwim-region).
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
U - unknown

Standard Language to Describe Effects:
Not a contributing factor
Potential adverse contribution
Potential beneficial contribution
Unknown

Table 4.5-66. Cumulative effects analysis for Chinook and other salmon Gulf of Alaska: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land management practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor-** significant impacts causing direct mortality is not expected.	**Potential Beneficial Contribution:** may help to maintain GOA stock status.	**Not a contributing factor**- not expected to result in direct mortality.	**Insignificant-** current stock status of salmon in this region is considered stable. Although bycatch of Chinook salmon originating in the Pacific Northwest occurs in Alaska, ADF&G intensely manages fisheries to ensure bycatch does not exceed limits set forth by the ESA (Section 7).
Change in Spawning Habitat	**I**	**Yes**	**Not a Contributing Factor**: no direct interaction occurs between groundfish fisheries and salmon spawning habitat because Pacific salmon species spawn in freshwater.	**Unknown**: potential interactions and effects have not been determined.	**Unknown**: potential interactions and effects have not been determined.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Not a Contributing Factor**: program does not include natural spawning habitat of salmon	**Not a contributing factor**- not expected to significantly change physical habitat	**Unknown-**watersheds used by spawning salmon are managed by various agencies and groups and are influenced by land management practices as well.

Table 4.5-66 (cont.). Cumulative effects analysis for Chinook and other salmon Gulf of Alaska: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land management practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in prey availability	**U**	**Not determined**	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Not a contributing factor-** significant impacts causing change in prey structure and/or availability are not expected.	**Not a Contributing Factor**: program does not include prey species	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** potential changes to prey availability for salmon have not been determined and effects are unknown.
Change in genetic structure of population	**U**	**Not determined**	**Unknown**: composition of bycatch has not been determined	**Unknown**: composition of bycatch has not been determined	**Unknown**: composition of bycatch has not been determined	**Not a contributing factor-** significant impacts causing change in genetic structure of stock are not expected.	**Unknown:** current stock composition for all species of salmon is unknown.	**Not a contributing factor**- not expected to impact genetic structure.	**Unknown-** bycatch composition has not been determined and current stock composition for all species of salmon is unknown.

Table 4.5-66 (cont.). Cumulative effects analysis for Chinook and other salmon Gulf of Alaska: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land management practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in reproductive success	**U**	**No**	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Potential Beneficial Contribution:** may help to maintain GOA stock status.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** current stock status of salmon in this region is considered stable. Although bycatch of Chinook salmon originating in the Pacific Northwest occurs in Alaska, ADF&G intensely manages fisheries to ensure bycatch does not exceed limits set forth by the ESA (Section 7). Salmon reproductive success depends on spawning adults reaching destined spawning habitat.

Notes:
ADF&G - Alaska Department of Fish and Game
ESA - Endangered Species Act
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
U - unknown

Standard Language to Describe Effects:
Not a contributing factor
Potential adverse contribution
Potential beneficial contribution
Unknown

Table 4.5-67. Direct/indirect effects summary for Pacific herring in the Bering Sea and Aleutian Islands and Gulf of Alaska: Alternatives 1-4.

Direct/Indirect Effect of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	I	I	I	I	I	I	I
Change in Reproductive Success	I	I	I	I	I	I	I
Change in Prey Availability	I	I	I	I	I	I	I
Change in Habitat	I	I	I	I	I	I	I

Notes: FMP - fishery management plan
I - Insignificant

Table 4.5-68. Cumulative Effects Analysis for Pacific Herring in Gulf of Alaska and Bering Sea and Aleutian Islands: FMP 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events		Natural Events		
			State Subsistence Fisheries	State Herring Fisheries	Acute and Chronic Marine Pollution	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Not a contributing factor**-subsistence harvest levels are negligible on a population level for herring.	**Not a contributing factor**-fishing quotas are based on variable exploitation rates that account for declines in stock.	**Potential Adverse Contribution-** subsets of herring populations are still recovering from EVOS and additional pollution could impede on recovery.	**Not a contributing factor-** not expected to result in direct mortality	**Insignificant-** annual quota setting processes are responsive to fluctuations in herring biomass
Change in Reproductive Success	**I**	**Yes**- subsets of herring populations in GOA are still recovering from EVOS	**Not a contributing factor**- subsistence harvest levels are negligible on a population level for herring.	**Not a contributing factor**-annual quota setting processes are responsive to fluctuations in herring biomass	**Potential Adverse Contribution-** subsets of herring populations in GOA are still recovering from EVOS and additional pollution could impede on recovery.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Insignificant-** annual quota setting processes are responsive to fluctuations in herring biomass and the herring stock in GOA affected by EVOS is considered recovering.
Change in Prey Availability	**I**	**No**	**Not a contributing factor**- herring prey primarily on zooplankton which is not affected by subsistence fisheries	**Not a contributing factor**-herring prey primarily on zooplankton which is not a component of bycatch from fisheries.	**Unknown-** potential pollution effects on prey availability are not known.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** potential effects of external events on prey are difficult to predict

Table 4.5-68 (cont.). **Cumulative Effects Analysis for Pacific Herring in Gulf of Alaska and Bering Sea and Aleutian Islands: FMP 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events		Natural Events		
			State Subsistence Fisheries	State Herring Fisheries	Acute and Chronic Marine Pollution	Long-term Climate Change and Regime Shift	
Change in Habitat	**I**	**Yes**- certain GOA habitat is still recovering from EVOS	**Not a contributing factor**- no evidence of fishery impact on habitat of herring.	**Not a contributing factor**- no evidence of fishery impact on habitat of herring.	**Potential Adverse Contribution-**some areas of GOA herring habitat are still recovering from EVOS and additional pollution could impede on recovery.	**Not a contributing factor**-not expected to significantly change physical habitat	**Unknown-** lingering contamination from EVOS on certain habitat of herring in GOA exist but effects are not known.

Notes: EVOS - *Exxon Valdez* Oil Spill
FMP - fishery management plan
GOA - Gulf of Alaska

Table 4.5-69. Direct/indirect effects summary for Bairdi tanner crab in Bering Sea and Aleutian Islands: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	I	S-	CS-	I	I	CS+	CS+
Change in Biomass	I	S-	CS-	I	I	CS+	CS+
Change in Reproductive Success	U	CS-	U	U	U	U	U
Change in Prey Availability	U	U	U	U	U	U	U
Change in Habitat	I	S-	I	I	I	CS+	CS+

Notes: CS+ - conditionally significant beneficial
CS- - conditionally significant adverse
I - insignificant
S- - significantly adverse
U - unknown

Table 4.5-70. Direct/indirect effects summary for Bairdi tanner crab in Gulf of Alaska: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	U	CS-	U	U	U	U	U
Change in Biomass	U	CS-	U	U	U	U	U
Change in Reproductive Success	U	CS-	U	U	U	U	U
Change in Prey Availability	U	U	U	U	U	U	U
Change in Habitat	I	CS-	I	U	U	U	U

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
U - unknown

Table 4.5-71. Direct/indirect effects summary for Opilio tanner crab in the Bering Sea and Aleutian Islands: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	I	S-	CS-	I	I	CS+	CS+
Change in Biomass	I	S-	CS-	I	I	CS+	CS+
Change in Reproductive Success	U	CS-	U	U	U	U	U
Change in Prey Availability	U	U	U	U	U	U	U
Change in Habitat	I	S-	I	I	I	CS+	CS+

Notes: CS+ - conditionally significant beneficial
CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant), U (Unknown)
S- - significantly adverse

Table 4.5-72. Direct/indirect effects summary for red king crab in the Bering Sea and Aleutian Islands: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	I	S-	CS-	I	I	CS+	CS+
Change in Biomass	I	S-	CS-	I	I	CS+	CS+
Change in Reproductive Success	U	CS-	U	U	U	U	U
Change in Prey Availability	U	U	U	U	U	U	U
Change in Habitat	I	S-	I	I	I	CS+	CS+

Notes: CS+ - conditionally significant beneficial
CS- - conditionally significant adverse
I - insignificant
S- - significantly adverse
U - unknown

Table 4.5-73. Direct/indirect effects summary for red king crab in the Gulf of Alaska: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	I	S-	CS-	I	I	CS+	CS+
Change in Biomass	I	S-	CS-	I	I	CS+	CS+
Change in Reproductive Success	U	CS-	U	U	U	U	U
Change in Prey Availability	U	U	U	U	U	U	U
Change in Habitat	I	S-	I	U	U	CS+	CS+

Notes: CS+ - conditionally significant beneficial
CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
S- - significantly adverse
U - unknown

Table 4.5-74. Direct/indirect effects summary for blue king crab in the Bering Sea and Aleutian Islands: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	I	S-	CS-	I	I	CS+	CS+
Change in Biomass	I	S-	CS-	I	I	CS+	CS+
Change in Reproductive Success	U	CS-	U	U	U	U	U
Change in Prey Availability	U	U	U	U	U	U	U
Change in Habitat	I	S-	I	I	I	CS+	CS+

Notes: CS+ - conditionally significant beneficial
CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
S- - significantly adverse
U - unknown

Table 4.5-75. Direct/indirect effects summary for blue king crab in the Gulf of Alaska: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	U	U	U	U	U	U	U
Change in Biomass	U	U	U	U	U	U	U
Change in Reproductive Success	U	U	U	U	U	U	U
Change in Prey Availability	U	U	U	U	U	U	U
Change in Habitat	I	U	I	U	U	U	U

Notes: FMP - fishery management plan
I - insignificant
U - unknown

Table 4.5-76. Direct/Indirect effects summary for golden king crab in Bering Sea and Aleutian Islands and Gulf of Alaska: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	U	U	U	U	U	U	U
Change in Biomass	U	U	U	U	U	U	U
Change in Reproductive Success	U	U	U	U	U	U	U
Change in Prey Availability	I	U	U	U	U	U	U
Change in Habitat	I	CS-	U	I	I	U	U

Notes: CS- - Conditionally Significant Adverse
I - Insignificant
U - Unknown

Table 4.5-77. Cumulative effects analysis for bairdi Tanner crab in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for these stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor-** not expected to result in direct mortality.	**Conditionally significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and recovery has not occurred.
Change in Biomass	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Conditionally significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, stocks are still considered overfished and recovery has not occurred.

Table 4.5-77 (cont.). Cumulative effects analysis for Bairdi Tanner Crab in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor-** not expected to directly affect physical habitat.	**Unknown-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Table 4.5-77 (cont.). Cumulative effects analysis for Bairdi Tanner Crab in Bering Sea and Aleutian Islands: FMP 1.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
I - Insignificant
NOAA - National Oceanic and Atmospheric Administration
U - Unknown

Table 4.5-78. Cumulative effects analysis for bairdi Tanner crab in Gulf of Alaska: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.
Change in Biomass	**U**	**Yes**	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.

Table 4.5-78 (cont.). Cumulative effects analysis for bairdi Tanner crab in Gulf of Alaska: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined and potential changes to prey structure are unknown.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Some stocks in GOA show signs of possible recovery while others are still considered depressed.

Notes: FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
U - unknown

Table 4.5-79. Cumulative effects analysis for opilio Tanner crab in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Conditionally significant adverse-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor-** not expected to result in direct mortality.	**Conditionally significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still in decline and recovery has not occurred.
Change in Biomass	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Conditionally significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are in decline and recovery has not occurred.

Table 4.5-79 (cont.). Cumulative effects analysis for opilio Tanner crab in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.5-79 (cont.). Cumulative effects analysis for opilio Tanner crab in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution** - although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
I - Insignificant
NOAA - National Oceanic and Atmospheric Administration
U - Unknown

Table 4.5-80. Cumulative effects analysis for red king crab in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, some of these stocks are still in decline and recovery has not occurred.
Change in Biomass	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, some of these stocks are in decline and recovery has not occurred.
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.

Table 4.5-80 (cont.). Cumulative effects analysis for red king crab in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
I - Insignificant
U - Unknown

Table 4.5-81. Cumulative effects analysis for red king crab in Gulf of Alaska: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are considered severely depressed and no immediate signs of recovery exist.
Change in Biomass	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are considered severely depressed and no immediate signs of recovery exist.
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.

Table 4.5-81 (cont.). Cumulative effects analysis for red king crab in Gulf of Alaska: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined and potential changes to prey structure are not known.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: FMP - fishery management plan
I - Insignificant
U - Unknown

Table 4.5-82. Cumulative effects analysis for blue king crab in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for these stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and recovery has not occurred.
Change in Biomass	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution**- state crab fisheries are managed by ADF&G in cooperation with NOAA Fisheries. Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, stocks are still considered overfished and recovery has not occurred.

Table 4.5-82 (cont.). Cumulative effects analysis for blue king crab in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.5-82 (cont.). Cumulative effects analysis for blue king crab in Bering Sea and Aleutian Islands: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Habitat	**I**	**Yes**	**Potential adverse contribution** - although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
I - Insignificant
NOAA - National Oceanic and Atmospheric Administration
U - Unknown

Table 4.5-83. Cumulative effects analysis for blue king crab in Gulf of Alaska: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Biomass	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, but current stock status is unknown.
Change in Prey Availability	**U**	**No**	**Unknown**- diet composition of crab has not been determined.	**Unknown**- diet composition of crab has not been determined.	**Unknown**- diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Current stock status is unknown.

Table 4.5-83 (cont.). Cumulative effects analysis for blue king crab in Gulf of Alaska: FMP 1.

Notes: FMP - fishery management plan
I - Insignificant
U - Unknown

Table 4.5-84. Cumulative effects analysis for golden king crab in Bering Sea and Aleutian Islands and Gulf of Alaska: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Biomass	**U**	**Not determined**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Reproductive Success	**U**	**Not determined**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, but current stock status is unknown.
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of crab has not been determined, however prey catch is not expected.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined.

Table 4.5-84 (cont.). Cumulative effects analysis for golden king crab in Bering Sea and Aleutian Islands and Gulf of Alaska: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Habitat	**U**	**Not determined**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Current stock status is unknown.

Notes: FMP - fishery management plan
U - Unknown

Table 4.5-85. Direct/indirect effects summary for other species* in the Bering Sea and Aleutian Islands and Gulf of Alaska: Alternatives 1-4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	U	U	U	U	U	U	U
Change in Reproductive Success	U	U	U	U	U	U	U
Change in Genetic Structure of Population	U	U	U	U	U	U	U
Change in Habitat	U	U	U	U	U	U	U
Change in Biomass	U	U	U	U	U	U	U

Notes: *Includes squid, octopi, sculpin, skate, and shark
FMP - fishery management plan
U - unknown

Table 4.5-86. Cumulative Effects Analysis for Other Species* in the Bering Sea and Aleutian Islands and Gulf of Alaska: FMP 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Ratings	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Managed Commercial Fisheries	IPHC Halibut Longline Fishery	State Sport Halibut Fishery	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** current baseline condition has not been determined	**Unknown-** current baseline condition has not been determined	**Unknown-** current baseline condition has not been determined	**Not a contributing factor-** not expected to result in direct mortality	**Unknown-** cumulative effects cannot be determined due to lack of comparative baseline.
Change in Reproductive Success	**U**	**Not Determined**	**Unknown-** current baseline condition has not been determined	**Unknown-** current baseline condition has not been determined	**Unknown-** current baseline condition has not been determined	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment.	**Unknown-** cumulative effects cannot be determined due to lack of comparative baseline.
Change in Genetic Structure of Population	**U**	**Not Determined**	**Unknown-** current baseline condition has not been determined	**Unknown-** current baseline condition has not been determined	**Unknown-** current baseline condition has not been determined	**Not a contributing factor-** not expected to result in species-specific mortality	**Unknown-** cumulative effects cannot be determined due to lack of comparative baseline.
Change in Biomass	**U**	**Not Determined**	**Unknown-** biomass estimates have not been determined	**Unknown-** biomass estimates have not been determined	**Unknown-**biomass estimates have not been determined	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment.	**Unknown-** cumulative effects cannot be determined due to lack of comparative baseline.
Change in Habitat	**U**	**Not Determined**	**Unknown-** current baseline condition has not been determined	**Unknown-** current baseline condition has not been determined	**Unknown-** current baseline condition has not been determined	**Not a contributing factor-** not expected to significantly change physical habitat.	**Unknown-** cumulative effects cannot be determined due to lack of comparative baseline.

Notes: *Includes squid, octopi, sculpin, skate, and shark.
FMP - fishery management plan
IPHC - International Pacific Halibut Commission
U - unknown

Standard Language to Describe Effects:
Not a contributing factor
Potential adverse contribution
Potential beneficial contribution
Unknown

Table 4.5-87. Significance of direct/indirect effects pertaining to Bering Sea and Aleutian Islands forage fish.

Effects	Rating						
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	U	U
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	U	U
Change in Reproductive Success	U	U	U	U	U	U	U
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	U	U
Change in Habitat Suitability	U	U	U	U	U	U	U

Notes: I - insignificant
U - unknown

4.5-88. Significance of direct/indirect effects pertaining to Gulf of Alaska forage fish.

Effects	Rating						
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Direct Effects							
Mortality	I	I	I	I	I	I	I
Change in Biomass Level	U	U	U	U	U	U	U
Spatial/temporal concentration of the catch							
Change in Genetic Structure of Population	U	U	U	U	U	U	U
Change in Reproductive Success	U	U	U	U	U	U	U
Indirect Effects							
Change in Prey Availability	U	U	U	U	U	U	U
Change in Habitat Suitability	U	U	U	U	U	U	U

Notes: I - insignificant
U - unknown

Table 4.5-89. Cumulative Effects Analysis for Bering Sea and Aleutian Islands Forage Fish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			Alaska Subsistence and Personal Use Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	No	**Potential Adverse Contribution:** The Subsistence and Personal Use Fisheries for forage species (esp. smelts) are expected to continue.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to northern rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of forage fish species.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	No	**Potential Adverse Contribution:** The Subsistence and Personal Use Fisheries for forage species (esp. smelts) are expected to continue.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to northern rockfish mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution**: Climate changes and regime shifts may either increase or decrease forage species recruitment. Osmeridae abundance have shown a decline since the late 1970s coinciding with increased water temperature (refer to Section 3.5.4.1).	**Yes, Unknown** The cumulative effects are unknown.
Change in Genetic Structure of Population	U	No	**Potential Adverse Contribution:** The Subsistence and Personal Use Fisheries for forage species (esp. smelts) are expected to continue.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of forage fish species such that stock genetics are threatened.	**Yes, Unknown** The cumulative effects are unknown.

Table 4.5-89 (cont.). Cumulative Effects Analysis for Bering Sea and Aleutian Islands Forage Fish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			Alaska Subsistence and Personal Use Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.4).	**Potential Adverse Contribution:** The Subsistence and Personal Use Fisheries for forage species (esp. smelts) are expected to continue.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution**: Climate changes and regime shifts may either increase or decrease forage species recruitment through a combination of prey availability and habitat suitability effects. Osmeridae have shown a decline in recruitment since the late 1970s coinciding with increased water temperature (refer to Section 3.5.4.1).	**Yes, Unknown** The cumulative effects are unknown.
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.4).	**Potential Adverse Contribution:** Bycatch of some forage fish prey species is possible, although bycatch is expected to be minimal.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution**: Climate changes and regime shifts may either increase or decrease forage species recruitment through a combination of prey availability and habitat suitability effects. Osmeridae have shown a decline in recruitment since the late 1970s coinciding with increased water temperature (refer to Section 3.5.4.1).	**Yes, Unknown** The cumulative effects are unknown.

Table 4.5-89 (cont.). Cumulative Effects Analysis for Bering Sea and Aleutian Islands Forage Fish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			Alaska Subsistence and Personal Use Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.4).	**Potential Adverse Contribution:** Habitat disruption by Subsistence and Personal Use gear is expected to continue, although disruption is likely to be minimal.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution**: Climate changes and regime shifts may either increase or decrease forage species recruitment through a combination of prey availability and habitat suitability effects. Osmeridae have shown a decline in recruitment since the late 1970s coinciding with increased water temperature (refer to Section 3.5.4.1).	**Yes, Unknown** The cumulative effects are unknown.

Notes: FMP - fishery management plan
U - unknown

Standard Language to Describe Effects:
Not a contributing factor
Potential adverse contribution
Potential beneficial contribution
Unknown

Table 4.5-90. Cumulative effects analysis for Gulf of Alaska forage fish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			Alaska Subsistence and Personal Use Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	No	**Potential Adverse Contribution:** The Subsistence and Personal Use Fisheries for forage species (esp. smelts) are expected to continue.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to northern rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of forage fish species.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	U	No	**Potential Adverse Contribution:** The Subsistence and Personal Use Fisheries for forage species (esp. smelts) are expected to continue.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to northern rockfish mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution**: Climate changes and regime shifts may either increase or decrease forage species recruitment. Osmeridae abundance have shown a decline since the late 1970s coinciding with increased water temperature (refer to Section 3.5.4.1).	**Yes, Unknown** The cumulative effects are unknown.
Change in Genetic Structure of Population	U	No	**Potential Adverse Contribution:** The Subsistence and Personal Use Fisheries for forage species (esp. smelts) are expected to continue.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of forage fish species such that stock genetics are threatened.	**Yes, Unknown** The cumulative effects are unknown.

Table 4.5-90 (cont.). Cumulative effects analysis for Gulf of Alaska forage fish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			Alaska Subsistence and Personal Use Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.4).	**Potential Adverse Contribution:** The Subsistence and Personal Use Fisheries for forage species (esp. smelts) are expected to continue.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution**: Climate changes and regime shifts may either increase or decrease forage species recruitment through a combination of prey availability and habitat suitability effects. Osmeridae have shown a decline in recruitment since the late 1970s coinciding with increased water temperature (refer to Section 3.5.4.1).	**Yes, Unknown** The cumulative effects are unknown.
Change in Prey Availability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.4).	**Potential Adverse Contribution:** Bycatch of some forage fish prey species is possible, although bycatch is expected to be minimal.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution**: Climate changes and regime shifts may either increase or decrease forage species recruitment through a combination of prey availability and habitat suitability effects. Osmeridae have shown a decline in recruitment since the late 1970s coinciding with increased water temperature (refer to Section 3.5.4.1).	**Yes, Unknown** The cumulative effects are unknown.

Table 4.5-90 (cont.). Cumulative effects analysis for Gulf of Alaska forage fish: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			Alaska Subsistence and Personal Use Fisheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	U	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.4).	**Potential Adverse Contribution:** Habitat disruption by Subsistence and Personal Use gear is expected to continue, although disruption is likely to be minimal.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution**: Climate changes and regime shifts may either increase or decrease forage species recruitment through a combination of prey availability and habitat suitability effects. Osmeridae have shown a decline in recruitment since the late 1970s coinciding with increased water temperature (refer to Section 3.5.4.1).	**Yes, Unknown** The cumulative effects are unknown.

Notes: FMP - fishery management plan
U - unknown

Table 4.5-91. Direct/indirect effects summary for grenadier* (and non-specified species) in the Bering Sea and Aleutian Islands and Gulf of Alaska: Alternatives 1 through 4.

Direct/Indirect Effects of FMPs	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Mortality	U	U	U	U	U	U	U
Change in Reproductive Success	U	U	U	U	U	U	U
Change in Genetic Structure of Population	U	U	U	U	U	U	U
Change in Biomass	U	U	U	U	U	U	U

Notes: *Although grenadier are part of a larger Non-specified species FMP category, they are the only species considered for this analysis due to lack of information on other species within the category.
FMP - fishery management plan
U - unknown

Table 4.5-92. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska grenadier*: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Ratings	Persistent Past Effects?	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State Commercial Groundfish Fisheries	IPHC Fishery	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** current baseline condition has not been determined.	**Unknown-** current baseline condition has not been determined.	**Not a contributing factor-**not expected to result in direct mortality.	**Unknown-** cumulative effects cannot be determined due to lack of comparative baseline.
Change in Reproductive Success	**U**	**Not Determined**	**Unknown-** current baseline condition has not been determined.	**Unknown-** current baseline condition has not been determined.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment.	**Unknown-** cumulative effects cannot be determined due to lack of comparative baseline.
Change in Genetic Structure of Population	**U**	**Not Determined**	**Unknown-** current baseline condition has not been determined.	**Unknown-** current baseline condition has not been determined.	**Not a contributing factor-**not expected to result in species-specific mortality.	**Unknown-** cumulative effects cannot be determined due to lack of comparative baseline.
Change in Biomass	**U**	**Not Determined**	**Unknown-** biomass estimates have not been determined.	**Unknown-** biomass estimates have not been determined.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment.	**Unknown-** cumulative effects cannot be determined due to lack of comparative baseline.

Notes: * Although Grenadier are part of a larger Non-Specified Species Category, they are the only species considered for this analysis due to lack of information on other species within category.
FMP - fishery management plan
IPHC - International Pacific Halibut Commission
U - unknown

Standard Language to Describe Effects:
Not a contributing factor
Potential adverse contribution
Potential beneficial contribution
Unknown

Table 4.5-93. Direct/indirect effects of the alternatives on essential fish habitat.

Changes to Living Habitat	**Alternative 1**	**Alternative 2.1**	**Alternative 2.2**	**Alternative 3.1**	**Alternative 3.2**	**Alternative 4.1**	**Alternative 4.2**
Direct Mortality of Benthic Organisms							
Impact of Biostructure Habitat Feature							
Bering Sea	I	S-	I	I	I	S+	S+
Aleutian Islands	I	S-	I	I	S+	S+	S+
Gulf of Alaska	I	S-	I	I	CS-	S+	S+
Changes to Benthic Community Structure	**Alternative 1**	**Alternative 2.1**	**Alternative 1**	**Alternative 1**	**Alternative 3.2**	**Alternative 4.1**	**Alternative 4.2**
Benthic Community Diversity							
Bering Sea	I	S-	I	I	CS+*	S+	S+
Aleutian Islands	I	S-	I	I	S+	S+	S+
Gulf of Alaska	I	S-	I	I	I**	S+	S+
Geographic Diversity of Impacts and Protection							
Bering Sea	I	CS-	I	I	S+	S+	na
Aleutian Islands	I	I	I	I	S+	S+	na
Gulf of Alaska	I	CS-	I	I	I	I	na

Notes: *Closes only a small portion of heavily fished habitat in the Bering Sea.
**Closes mostly all heavily fished habitat
CS- - Conditionally Significant Adverse
CS+ - Conditionally Significant Beneficial
I - Insignificant
na - not applicable
S- - Significantly Adverse
S+ -Significantly Beneficial
U - Unknown

Table 4.5-94. Annotated table of significance ratings of changes to living habitat.

I. Living Habitat

Region	Baseline	Alt. 1	Alt. 2.1	Alt. 2.2	Alt. 3.1	Alt. 3.2	Alt. 4.1	Alt. 4.2
Bering Sea	Large areas of intense fishing being fished at rate to potentially reduce bioshelter habitat to low percent of unfished level.	I	S- : opens up currently unfished habitat and increases effort as necessary to take increased TACs.	I	I	CS+: closed areas are lightly fished, not much effort diverted, one would expect only slight decrease in impact from this closure distribution. Reduction in ABCs may benefit. Could be significantly improved w/strategically placed smaller closure a	S+ closure of an entire major fishing area, requiring e displacement of effort to take C from low density, lightly impacted area. Reduction in TAC and restrictions to trawling likely to compensate.	S+
Aleutian Islands	Perhaps high proportion of longlived benthic organisms susceptible to low intensities of fishing.	CS- : tree coral type habitat may still be decreasing to low equil level.	S-: increases effort necessary to take increased TACs.	CS-	CS-	S+: closures often bisect fishing concentrations which is good strategy. Reduction in ABCs from F60%(?) and uncertainty correction implementation should benefit.	S+ : high proportion, most, of the region is closed,	S+
Gulf of Alaska	Concentrations of intense fishing.	I	S- : opens up currently unfished habitat and increases effort as necessary to take increased TACs.	I	I	CS-: many closures encompass high f concentrations, requiring much higher effort/catch in lightly fished and impacted areas. Reduction in ABC may not compensate for probable increase in effort/catch. Could be significantly improved w/strategically place	S+ most of the region closed, however, all heavily fished areas are closed and effort transferred to lightly fished areas. Reduction in TAC and restrictions to trawling likely to compensate.	S+

Table 4.5-94 (cont.). Annotated table of significance ratings of changes to living habitat.

II. Benthic Community Structure

Region	Baseline	Alt. 1	Alt. 2.1	Alt. 2.2	Alt. 3.1	Alt. 3.2	Alt. 4.1	Alt. 4.2
Bering Sea		I	S- : lack of closure areas and increased effort would reduce diversity	I	I	CS+*: may be some gain in diversity by closing lightly fished areas and effort reduction due to any reduction in catch	S+	S+
Aleutian Islands		I	S- : increased impact from increased effort would decrease diversity,	I	I	S+	S+	S+
Gulf of Alaska		I	S- : lack of closure areas and increased effort would reduce diversity	I	I	I** : transferring impact from already heavily impacted area to lightly impacted may not provide gain in overall diversity	S+	S+

Table 4.5-94 (cont.). Annotated table of significance ratings of changes to living habitat.

III. Geographic Diversity of Impacts and Protection

Region	Baseline	Alt. 1	Alt. 2.1	Alt. 2.2	Alt. 3.1	Alt. 3.2	Alt. 4.1	Alt. 4.2
Bering Sea	some intermediate levels of contrast along existing closure areas	I	CS-or S- :baseline had a closed area w/ boundary that abuts an area of intermediate fishing intensity which provide some diversity of impact which is eliminated in 2.1.	I	I	S+ : one closure boundary bisects a high f concentration providing diversity. Could be significantly improved w/smaller closure areas strategically located.	S+ : one closure area bisects an area of intense fishing providing diversity of impact in that habitat. Very little impact diversity w/in habitats elsewhere.	na
Aleutian Islands	very little closure area, restricted to small radius around SSL habitat haulouts.	I	I: baseline had no closed area boundaries to eliminate	I	I	S+ : some closure areas bisect high f clusters. Closures placed somewhat randomly along the AI	S+? CS+ : all areas of intense fishing are encompassed by closures, providing little impact diversity. Some contrast in impact may occur when effort is confined to the few remaining open areas.	na

Table 4.5-94 (cont.). Annotated table of significance ratings of changes to living habitat.

Region	Baseline	Alt. 1	Alt. 2.1	Alt. 2.2	Alt. 3.1	Alt. 3.2	Alt. 4.1	Alt. 4.2
Gulf of Alaska	some intermediate levels of contrast along existing closure areas	I	CS-or S- :baseline had a closed area w/ boundary that abuts an area of intermediate fishing intensity which provide some diversity of impact which is eliminated in 2.1.	I	I	I :closures encompass habitat units and high f clusters, leaving little contrast or diversity in impact levels within habitat. Could be significantly improved w/smaller closure areas strategically located	I : closure areas encompass all areas of intense fishing. Reallocated effort to open areas may not provide strong contrast in fishing impacts.	na

Notes: ABC - acceptable biological catch
AI - Aleutian Islands
Alt. - alternative
CS- - Conditionally significant
CS+ - Conditionally Significant Beneficial
I - insignificant
na - not applicable
S+ - significantly beneficial
S- - significantly adverse
SSL - Steller sea lions
TAC - total allowable catch

Table 4.5-95. Proportion of fishable (<1,000 meters) area closed year-round to bottom trawling for all species, by geographic area and habitat type.

Geographic area	FMP(s) 1, 2.2, 3.1, PPA.1			FMP 3.2 PPA.2			Alternative 4.1		
	Habitat Type			Habitat Type			Habitat Type		
	Sand	Sand/Mud	Mud	Sand	Sand/Mud	Mud	Sand	Sand/Mud	Mud
Bering Sea Reporting Area									
508	1.00	na	na	1.00	na	na	1.00	na	na
509	0.17	0.16	na	0.18	0.32	na	0.82	0.53	na
512	1.00	na	na	1.00	na	na	1.00	na	na
513	0.74	0.11	na	0.53	0.19	na	0.91	0.41	na
514	0.14	0.00	na	0.20	0.09	na	0.23	0.27	na
516	0.40	na	na	0.40	na	na	1.00	na	na
517	0.00	0.00	na	0.00	0.04	na	1.00	0.52	na
518	0.03	0.01	na	0.56	0.81	na	0.94	1.00	na
519	0.08	0.00	na	0.25	0.01	na	1.00	1.00	na
521	0.99	0.04	0.00	0.57	0.32	0.03	1.00	0.26	0.00
523	na	0.00	na	na	0.24	na	na	0.79	na
524	na	0.00	0.00	na	0.16	0.01	na	0.12	0.12
Aleutian Islands Reporting area									
	Shallow	Deep		Shallow	Deep		Shallow	Deep	
541	0.02	0.00		0.46	0.20		0.88	0.97	
542	0.07	0.01		0.58	0.53		0.93	0.87	
543	0.03	0.00		0.52	0.20		0.86	0.79	
Gulf of Alaska Reporting Area									
	Shallow	Shelf deeps	Slope	Shallow	Shelf deeps	Slope	Shallow	Shelf deeps	Slope
610	0.32	0.03	0.00	0.52	0.26	0.39	0.85	0.72	0.68
620	0.41	0.04	0.00	0.55	0.35	0.38	0.83	0.83	0.43
630	0.53	0.05	0.00	0.62	0.12	0.31	0.81	0.67	0.45
640	0.16	0.01	0.00	0.38	0.31	0.22	0.68	0.36	0.35
650	1.00	1.00	1.00	1.00	1.00	na	1.00	1.00	na

Table 4.5-96. Baseline levels (average of 1997-2001) of bycatch (metric tons) and average projected bycatch of living habitat based on the multispecies projection model.

Area	Baseline	Alt 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	Alt 4.1	Alt 4.2
Bering Sea and Aleutian Islands								
anemone	206	222	178	234	210	167	63	0
coral	69	69	61	92	64	50	50	0
sponge	353	400	469	499	350	247	238	0
tunicate	1,095	823	1,339	1,078	769	860	923	0
seapen/whip	5	6	3	6	6	5	1	0
Total	1,728	1,521	2,050	1,910	1,398	1,330	1,275	0
	Percent change from baseline							
anemone		7.8	-13.7	13.6	1.8	-18.7	-69.2	-100.0
coral		0.5	-11.8	33.8	-7.7	-27.6	-27.0	-100.0
sponge		13.4	33.0	41.6	-0.8	-29.8	-32.4	-100.0
tunicate		-24.9	22.3	-1.6	-29.8	-21.5	-15.7	-100.0
seapen/whip		20.6	-34.2	19.7	21.0	-2.9	-89.1	-100.0
Total		-12.0	18.6	10.5	-19.1	-23.0	-26.2	-100.0
Gulf of Alaska								
anemone	17	14	19	20	17	13	9	9
coral	6	2	2	2	2	1	0	0
sponge	6	3	7	5	5	3	1	0
tunicate	2	2	2	2	1	1	1	0
seapen/whip	1	1	2	1	1	1	0	0
Total	31	22	31	30	26	19	13	9
	Percent change from baseline							
anemone		-15.9	12.3	20.1	1.3	-20.8	-42.9	
coral		-56.4	-66.1	-62.8	-67.2	-77.8	-95.5	
sponge		-55.4	18.6	-6.0	-7.9	-51.5	-73.7	
tunicate		1.8	2.4	-3.7	-26.3	-45.4	-38.7	
seapen/whip		1.0	29.6	-10.5	-13.0	-31.8	-70.2	
Total		-28.7	-0.6	-2.7	-15.2	-38.8	-59.2	

Table 4.5-97. Percent of fishable area closed under Alternative 1 and FMP scenarios.

	Alternative 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Aleutian Islands							
No Trawl MPA	41.1%	41.1%	41.1%	41.1%	35.1%	15.0%	100%
No Take Marine Res	1.6%	1.6%	1.6%	1.6%	19.1%	69.6%	100%
No SSL H&L Pot Trawl MPA	n/a	n/a	n/a	n/a	18.4%	n/a	100%
No SSL Trawl MPA	n/a	n/a	n/a	n/a	7.3%	n/a	100%
Total	42.7%	42.7%	42.7%	42.7%	79.9%	84.6%	100%
Bering Sea							
No Trawl MPA	19.2%	7.5%	19.2%	19.2%	21.3%	14.5%	100%
No Take Marine Res	0.1%	0.1%	0.1%	0.1%	4.3%	24.9%	100%
No SSL H&L Pot Trawl MPA	n/a	n/a	n/a	n/a	5.3%	n/a	100%
No SSL Trawl MPA	n/a	n/a	n/a	n/a	1.8%	n/a	100%
Total	19.3%	7.6%	19.3%	19.3%	32.6%	33.5%	100%
Entire Bering Sea and Aleutian Islands							
No Trawl MPA	21.8%	11.4%	21.8%	21.8%	22.9%	14.6%	100%
No Take Marine Res	0.2%	0.2%	0.2%	0.2%	6.0%	24.9%	100%
No SSL H&L Pot Trawl MPA	n/a	n/a	n/a	n/a	7.0%	n/a	100%
No SSL Trawl MPA	n/a	n/a	n/a	n/a	6.8%	n/a	100%
Total	22.0%	11.7%	22.0%	22.0%	38.1%	39.4%	100%
Central\Western Gulf							
No Trawl MPA	33.1%	29.1%	33.1%	33.1%	31.0%	35.4%	100%
No Take Marine Res	0.5%	0.5%	0.5%	0.5%	16.6%	43.0%	100%
No SSL H&L Pot Trawl MPA	n/a	n/a	n/a	n/a	5.1%	n/a	100%
No SSL Trawl MPA	n/a	n/a	n/a	n/a	13.0%	n/a	100%
Total	33.6%	29.6%	33.6%	33.6%	65.6%	78.3%	100%
Eastern Gulf							
No Trawl MPA	81.7%	0.0%	81.7%	81.7%	16.7%	65.5%	100%
No Take Marine Res	0.0%	0.0%	0.0%	0.0%	5.3%	21.9%	100%
No SSL H&L Pot Trawl	n/a	0.0%	n/a	n/a	70.3%	n/a	100%

Table 4.5-97 (cont.). Percent of fishable area closed under Alternative 1 and FMP scenarios.

	Alternative 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Total	90.1%	0.0%	90.1%	90.1%	92.2%	87.3%	100%
Entire Gulf of Alaska							
No Trawl MPA	45.4%	21.7%	45.4%	45.4%	27.3%	43.0%	100%
No Take Marine Res	0.5%	0.5%	0.5%	0.5%	13.7%	37.6%	100%
No SSL H&L Pot Trawl MPA	n/a	n/a	n/a	n/a	21.7%	n/a	100%
No SSL Trawl MPA	n/a	n/a	n/a	n/a	9.7%	n/a	100%
Total	45.8%	22.1%	45.8%	45.8%	72.4%	80.6%	100%
Total No Take Marine Reserves	**0.3%**	**0.3%**	**0.3%**	**0.3%**	**8.2%**	**28.5%**	**100%**
Total All Closures	**28.8%**	**14.6%**	**28.8%**	**28.8%**	**47.8%**	**51.1%**	**100%**

Notes: FMP - fishery management plan
H&L - hook and line
MPA - marine protected area
n/a - not applicable
SSL - Steller sea lion

Table 4.5-98. Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMPs 1, 2.2, 3.1, and PPA.1

Bering Sea Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **Direct Mortality of Benthic Organisms**	I	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** From offshore catcher/ processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Port Moller, Port Heiden, Dillingham, St. Paul and St. George.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential Adverse Contribution:** could cause direct mortality through physical alteration (burial).	**Not a contributing factor:** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes, CS-**. The additional external impacts will add to the lingering past mortality impacts. Thus, even though the FMP is rated as Insignificant, continued bycatch and damage to living habitat in the Bering Sea will add to the long term and potentially irreversible negative consequences of fishing on the mortality of benthic organisms.
Changes to Benthic Community Structure	I	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Port Moller, Port Heiden, Dillingham, St. Paul and St. George.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause changes in the benthic community especially in nearshore/port areas.	**Potential Adverse Contribution:** If long term, could cause changes in the benthic community through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution**: Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes, CS-** The additional external impacts will add to the lingering past impacts. Thus, even though the FMP is rated as Insignificant, continued bycatch and damage to living habitat in the Bering Sea will add to the long term and potentially irreversible negative effects of fishing on the benthic community
Geographic Diversity of Impacts and Protection	I	**Yes**, fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, less sensitive areas could be impacted by marine pollution.	**Not a Contributing Factor**	**Not a Contributing Factor**	**Yes, CS-** FMP 1 would protect more benthic habitat from trawl gear in 2002 (19%) than was protected in 1980 (8.6%). However, the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types.

Table 4.5-98 (cont.). Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMP 1, 2.2, 3.1 and PPA.1.

Aleutian Islands Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **a) Direct Mortality of Benthic Organisms**	I	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. Prevalence of long lived species of coral makes impacts a particular concern in the Aleutians.	**Potential Adverse Contribution**: Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution**: Impacts of long line fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution**: Impacts of pot fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution**: From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution**: Likely to continue at Atkutan, Adak, Unalaska, Cold Bay Dutch Harbor and King Cove. Other sites possible for development.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential Adverse Contribution**: Could cause direct mortality through physical alteration (burial).	**Not a contributing factor**: Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes, CS-** Long lived species such as tree coral are more prevalent in the Aleutian Islands. The additional external impacts will add to the lingering past mortality impacts on these species. Thus, even though the FMP is rated as Insignificant, continued bycatch and damage to living habitat will add to the long term and potentially irreversible negative consequences of fishing on the mortality of benthic organisms.
Changes to Benthic Community Structure	I	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution**: Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution**: Impacts of long line fisheries on benthic community structure are expected to continue.	**Potential Adverse Contribution**: Impacts of pot fisheries on benthic community structure are expected to continue.	**Potential Adverse Contribution**: From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution**: Likely to continue at Atkutan, Adak, Unalaska, Cold Bay Dutch Harbor and King Cove. Other suites possible for development	**Potential Adverse Contribution**: Acute and/or chronic pollution events could cause changes in the benthic community especially in nearshore/ port areas.	**Potential Adverse Contribution**: Could cause direct mortality through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution**: Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes, CS-** The additional external impacts will add to the lingering past impacts, particularly in the case of long-lived coral species. Thus, even though the FMP is rated as Insignificant, continued bycatch and damage to living habitat will add to the long term and potentially irreversible negative effects of fishing on the benthic community.
Geographic Diversity of Impacts and Protection	I	**Yes,** fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Not a contributing factor.**	**Potential Beneficial/ Averse Contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Beneficial/ Averse Contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by marine pollution.	**Not a contributing factor.**	**Not a contributing factor.**	**Yes, CS-** FMP 1 would protect more benthic habitat from trawl gear in 2002 (43%) than was protected in 1980 (31%). However, the spatial distribution of the closed areas may not protect the full range of habitat types.

Table 4.5-98 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska Habitat: FMP 1, 2.2, 3.1 and PPA.1.

Gulf of Alaska

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **a) Direct Mortality of Benthic Organisms**	I	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution:** Impacts of long line fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution:** Impacts of pot fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Kodiak, Sand Point, Chignik, Port Lions, Ouzinkie and Seward. Other sites possible for development.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential Adverse Contribution:** Could cause direct mortality through physical alteration (burial).	**Not a contributing factor:** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes, CS-** The additional external impacts will add to the lingering past mortality impacts. Thus, even though the FMP is rated as Insignificant, continued bycatch and damage to living habitat in the Gulf of Alaska will add to the long term and potentially irreversible negative consequences of fishing on the mortality of benthic organisms.
Changes to Benthic Community Structure	I	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution:** Impacts of long line fisheries on the benthic community are expected to continue	**Potential Adverse Contribution:** Impacts of pot fisheries on the benthic community are expected to continue.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Kodiak, Sand Point, Chignik, Port Lions, Ouzinkie and Seward. Other sites possible for development.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause changes in the benthic community, especially in nearshore/ port areas.	**Potential Adverse Contribution:** Could cause direct mortality through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution**: Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes, CS-** The additional external impacts will add to the lingering past impacts. Thus, even though the FMP is rated as Insignificant, continued bycatch and damage to living habitat in the Gulf of Alaska will add to the long term and potentially irreversible negative effects of fishing on the benthic community.
Geographic Diversity of Impacts and Protection	I	**Yes,** fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Not a contributing factor.**	**Potential Beneficial/ Averse Contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Beneficial/ Averse Contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by marine pollution.	**Not a contributing factor.**	**Not a contributing factor.**	**Yes, CS-** FMP 1 would protect much more benthic habitat from trawl gear in 2002 (46%) than was protected in 1980 (16%). However, the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. Also, in 1980 more benthic habitat was protected from fixed gear (over 60% of the fishable area) than today (<1% of the fishable area in the Gulf of Alaska). Fixed gear can have adverse effects on long-lived coral species.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant

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Table 4.5-99. Circa 1980: area analysis.**

	Fishable Area	Square Meter of Management Area	Percent of Fishable Area	EEZ	Percent of EEZ
Aleutian Islands					
No trawl	105380000000	27011000000	25.6%	1001100000000	2.7%
No fishing	105380000000	5952300000	5.6%	1001100000000	0.6%
No groundfish longine	105380000000	0	0.0%	1001100000000	0.0%
Total	105380000000	32963300000	31.3%	1001100000000	3.3%
Bering Sea					
No Trawl	798870000000	51160000000	6.4%	1178852000000	4.3%
No Fishing	798870000000	17481000000	2.2%	1178852000000	1.5%
No Longline	798870000000	0	0.0%	1178852000000	0.0%
Total	**798870000000**	**68641000000**	**8.6%**	**1178852000000**	**5.8%**
Entire Bering Sea and Aleutian Islands					
No trawl	904250000000	78171000000	8.6%	2179952000000	3.6%
No fishing	904250000000	23433300000	2.6%	2179952000000	1.1%
No longline*	904250000000	0	0.0%	2179952000000	0.0%
Total without longline	**904250000000**	**101604300000**	**11.2%**	**2179952000000**	**4.7%**
Total with longline	**Null**	**Null**	**Null**	**Null**	**Null**
Central\Western Gulf					
No trawl	265690000000	12412000000	4.7%	879850000000	1.4%
No fishing	265690000000	20836000000	7.8%	879850000000	2.4%
No longline*	265690000000	149210000000	56.2%	879850000000	17.0%
Total with longline	**265690000000**	**182458000000**	**68.7%**	**879850000000**	**20.7%**
Total without longline	**265690000000**	**33248000000**	**12.5%**	**879850000000**	**3.8%**
Eastern Gulf					
No trawl	90509000000	5686400000	6.3%	320160000000	1.8%
No fishing	90509000000	3946500000	4.4%	320160000000	1.2%
No longline*	90509000000	67008000000	74.0%	320160000000	20.9%
Total with longline	**90509000000**	**76640900000**	**84.7%**	**320160000000**	**23.9%**
Total without longline	**265690000000**	**9632900000**	**3.6%**	**879850000000**	**1.1%**
Entire Gulf of Alaska					
No Trawl	356199000000	18098400000	5.1%	1200010000000	1.5%
No fishing	356199000000	24782500000	7.0%	1200010000000	2.1%
No longline*	356199000000	216218000000	60.7%	1200010000000	18.0%
Total with longline	**356199000000**	**259098900000**	**72.7%**	**1200010000000**	**21.6%**
Total without longline	**265690000000**	**42880900000**	**16.1%**	**879850000000**	**4.9%**

Table 4.5-99 (cont.). Circa 1980: area analysis.**

	Fishable Area	Square Meter of Management Area	Percent of Fishable Area	EEZ	Percent of EEZ
Entire Gulf of Alaska					
Total trawling and longline fishing	**1260449000000**	**48215800000**	**3.8%**	**3379962000000**	**1.4%**
Total of above	**1260449000000**	**144485200000**	**11.5%**	**3379962000000**	**4.3%**
Total with longline	**1260449000000**	**360703200000**	**28.6%**	**3379962000000**	**10.7%**

Notes: *Includes only areas that are closed to trawling or trawling and longline fishing for the entire year. Partial Year closures not included in descriptive stats.
**The definition for longlining Circa 1980 included hook-and-line and pot.
BSAI - Bering Sea and Aleutian Islands
EEZ - Exclusive Economic Zone
Closures apply to foreign groundfish fishing fleets only. Domestic fishery was too small to warrant closure measures

Table 4.5-100. Seabirds comparison of direct, indirect, and cumulative effects ratings of alternatives.

Short-tailed albatross

Effect		Rating			
		Alt 1 FMP 1.0	Alt 2 FMP 2.1 FMP 2.2	Alt 3 FMP 3.1 FMP 3.2	Alt 4 FMP 4.1 FMP 4.2
Mortality/ incidental take	D/I	I	CS- I	I I	I I
	CE	CS-	CS- CS-	CS- CS-	CS- none
Change in food availability	D/I	I	I I	I I	I I
	CE	I	I I	I I	I none
Benthic habitat	D/I	I	I I	I I	I I
	CE	none	none	none	none

Laysan albatross, black-footed albatross, and shearwaters

Effect		Rating			
		Alt 1 FMP 1.0	Alt 2 FMP 2.1 FMP 2.2	Alt 3 FMP 3.1 FMP 3.2	Alt 4 FMP 4.1 FMP 4.2
Mortality/ incidental take	D/I	I	CS- I	I I	I I
	CE	S- (albatross) CS- (shearwaters)	S-/CS- S-/CS-	S-/CS- S-/CS-	S-/CS- none
Change in food availability	D/I	I	I I	I I	I I
	CE	I	I I	I I	I none
Benthic habitat	D/I	I	I I	I I	I I
	CE	none	none	none	none

Northern fulmars

Effect		Rating			
		Alt 1 FMP 1.0	Alt 2 FMP 2.1 FMP 2.2	Alt 3 FMP 3.1 FMP 3.2	Alt 4 FMP 4.1 FMP 4.2
Mortality/ incidental take	D/I	I	CS- I	I I	I I
	CE	I	CS- I	I I	I none
Change in food availability	D/I	I	I I	I I	I I
	CE	I	I I	I I	I none
Benthic habitat	D/I	I	I I	I I	I I
	CE	none	none	none	none

Species of management concern

Effect		Rating			
		Alt 1 FMP 1.0	Alt 2 FMP 2.1 FMP 2.2	Alt 3 FMP 3.1 FMP 3.2	Alt 4 FMP 4.1 FMP 4.2
Mortality/ incidental take	D/I	I	I I	I I	I I
	CE	CS- (kittiwakes) S- (murrelets)	CS-/S- CS-/S-	CS-/S- CS-/S-	CS-/S- none
Change in food availability	D/I	I	CS- I	I I	I I
	CE	I	CS- I	I I	I none
Benthic habitat	D/I	I	I I	I I	I I
	CE	none	none	none	none

Table 4.5-100 (cont.). Seabirds comparison of direct, indirect, and cumulative effects ratings of alternatives.

Other piscivorous species

Effect		Rating			
		Alt 1 FMP 1.0	Alt 2 FMP 2.1 FMP 2.2	Alt 3 FMP 3.1 FMP 3.2	Alt 4 FMP 4.1 FMP 4.2
Mortality/ incidental take	D/I	I	I I	I I	I I
	CE	I	I I	I I	I none
Change in food availability	D/I	I	CS- I	I I	I I
	CE	I	CS- I	I I	I none
Benthic habitat	D/I	I	I I	I I	I I
	CE	none	none	none	none

Other planktivorous species

Effect		Rating			
		Alt 1 FMP 1.0	Alt 2 FMP 2.1 FMP 2.2	Alt 3 FMP 3.1 FMP 3.2	Alt 4 FMP 4.1 FMP 4.2
Mortality/ incidental take	D/I	I	I I	I I	I I
	CE	I	I I	I I	I none
Change in food availability	D/I	I	CS- I	I I	I I
	CE	I	CS- I	I I	I none
Benthic habitat	D/I	I	CS- I	I I	I I
	CE	I	CS- I	I I	I none

Spectacled and Steller's eiders

Effect		Rating			
		Alt 1 FMP 1.0	Alt 2 FMP 2.1 FMP 2.2	Alt 3 FMP 3.1 FMP 3.2	Alt 4 FMP 4.1 FMP 4.2
Mortality/ incidental take	D/I	I	I I	I I	I I
	CE	I	I I	I I	I none
Change in food availability	D/I	I	I I	I I	I I
	CE	none	none	none	none
Benthic habitat	D/I	I	I I	I U	U I
	CE	U	U U	U U	U none

Notes: CE - cumulative effects
CS$^-$ - conditionally significant adverse
D/I - direct/indirect effects of the groundfish fishery
FMP - fishery management plan
S$^-$ - significant adverse
I -insignificant
U - unknown

Table 4.5-101. Cumulative effects for short-tailed albatross: FMPs 1, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Section 3.7.4)	Reasonably Foreseeable Future External Effects					Cumulative Effect Significance Rating
			Human Controlled Events			Natural Events		
			Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Geologic Disruption of Nest Sites	Climate Change and Regime Shift	
Mortality - Incidental Take	**I** (for all FMPs except 2.1)	Population recovering from near extinction, most nesting on one Japanese volcanic island Commercial hunts Geologic instability of nest sites Probable incidental take in Japan, foreign, and U.S. fisheries Conservation efforts in Japan and U.S. fisheries	**Potential adverse contribution** Incidental take on longlines, trawl/net gear, and vessel strikes	**Potential adverse contributions** Acute and/or chronic pollution events, especially involving oil and plastic	**Potential beneficial contributions** National and International Seabird Bycatch Reduction Plans Japanese efforts to repair and protect nest sites Reintroduction to previous nesting islands	**Potential adverse contribution** Great majority of nesting occurs on Torishima Island, which is an active volcano	Not a contributing factor	**CS-** Species appears to be increasing at near maximum rate but situation could change substantially if natural or human mortality rates increase by small amounts or if catastrophe occurs on Torishima Island

Table 4.5-101 (cont.). Cumulative effects for short-tailed albatross: FMPs 1, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Section 3.7.4)	Reasonably Foreseeable Future External Effects					Cumulative Effect Significance Rating
			Human Controlled Events			Natural Events		
			Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Geologic Disruption of Nest Sites	Climate Change and Regime Shift	
Change in Food Availability	**I**	Squid and forage fish fisheries	**Potential adverse contribution** Squid and forage fish fisheries	**Potential adverse contribution** Acute and/or chronic pollution events could alter prey abundance and distribution	**Potential beneficial contribution** General efforts to reduce marine pollution	Not a contributing factor	**Potential beneficial/ adverse contribution** on squid and forage fish abundance and distribution	**I** Since habitat once supported millions of this species and population decline not due to habitat change, food supplies should not limit population growth
Benthic Habitat	**I**	None	Not a contributing factor	Not a contributing factor	Not a contributing factor	Not a contributing factor	Not a contributing factor	**No**ne

Notes: FMP - fishery management plan
CS- - conditionally significant adverse
I - insignificant
S- - significant adverse
U - unknown

Table 4.5-102. Cumulative effects for Laysan albatross, black-footed albatross, and shearwaters: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Sections 3.7.2, 3.7.3, and 3.7.6)	Reasonably Foreseeable Future External Effects					Cumulative Effect Significance Rating
			Human Controlled Events				Natural Events	
			Subsistence and Commercial Hunting	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality - Incidental Take	I	Both albatross species declining with more concern for less numerous black-footed, some evidence of shearwater declines Subsistence and commercial hunts Incidental take in foreign and U.S. fisheries Marine and nest site pollution Destruction of nest sites (albatross)	**Potential adverse contribution** Harvest on southern hemisphere nesting grounds (shearwaters)	**Potential adverse contribution** Incidental take on longlines, trawl/net gear, and vessel strikes	**Potential adverse contribution**s Acute and/or chronic pollution events, especially involving oil and plastic Accidental release of nest predators on breeding colony islands	**Potential beneficial contribution**s National and International Seabird Bycatch Reduction Plans Oil spill and pollution prevention laws USFWS protection of colonies in Hawaii (albatross)	**Potential adverse contribution** Periodic die-offs and fluctuations in reproductive success due to food availability	**S- for Laysan and black-footed albatross** Combined mortality from foreign and U.S. fisheries appears to be contributing to population declines **CS- for shearwaters** Combined mortality from fisheries plus harvest on nesting grounds may be having population level effects
Change in Food Availability	I	Supplementary food from fishery wastes Regime shifts	Not a contributing factor	**Potential adverse contribution** Squid and forage fish fisheries Fishery wastes	**Potential adverse contribution** Acute and/or chronic pollution events could alter prey abundance and distribution	Not a contributing factor	**Potential beneficial/ adverse contribution** on squid and forage fish abundance and distribution	**I** Contributions of human events to prey availability appears to be insignificant compared to natural fluctuations

Table 4.5-102 (cont.). **Cumulative effects for Laysan albatross, black-footed albatross, and shearwaters: FMPs 1, 2.1, 2.2, 3.1, 3.2, 4.1, and 4.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Sections 3.7.2, 3.7.3, and 3.7.6)	Reasonably Foreseeable Future External Effects					Cumulative Effect Significance Rating
			Human Controlled Events				Natural Events	
			Subsistence and Commercial Hunting	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Benthic Habitat	**I**	None	Not a contributing factor	Not a contributing factor	Not a contributing factor	Not a contributing factor	Not a contributing factor	None

Notes:
FMP - fishery management plan
CS- - conditionally significant adverse
I - insignificant
S- - significant adverse
U - unknown
USFWS - United States Fish and Wildlife Service

Table 4.5-103. Cumulative effects for northern fulmar: FMPs 1, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Section 3.7.5)	Reasonably Foreseeable Future External Effects				Cumulative Effect Significance Rating
			Human Controlled Events			Natural Events	
			Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality - Incidental Take	**I** (for all FMPs except 2.1)	Fulmar population abundant and apparently stable except perhaps on Pribilof Islands Incidental take in foreign and U.S. fisheries Marine pollution Regime shifts	**Potential adverse contribution** Incidental take on longlines, trawl/net gear, and vessel strikes	**Potential adverse contribution**s Acute and/or chronic pollution events, especially involving oil and plastic Accidental release of nest predators on breeding colony islands	**Potential beneficial contribution**s National and International Seabird Bycatch Reduction Plans Oil spill and pollution prevention laws USFWS protection of colonies	**Potential adverse contribution** Periodic die-offs and fluctuations in reproductive success due to food availability	**I** Mortality from fisheries and other sources is not expected to cause detectable population declines
Change in Food Availability	**I**	Supplementary food from fishery wastes Regime shifts	**Potential adverse contribution** Squid and forage fish fisheries **Potential beneficial/ adverse contribution** Fishery wastes	**Potential adverse contribution** Acute and/or chronic pollution events could alter prey abundance and distribution	Not a contributing factor	**Potential beneficial/ adverse contribution** on squid and forage fish abundance and distribution	**I** Contributions of human events to prey availability appears to be insignificant compared to natural fluctuations
Benthic Habitat	**I**	None	Not a contributing factor	Not a contributing factor	Not a contributing factor	Not a contributing factor	None

Notes:
CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
S- - significant adverse
U - unknown
USFWS - United States Fish and Wildlife Service

Table 4.5-104. Cumulative effects for species of management concern (red-legged kittiwake, marbled murrelet, Kittlitz's murrelet): FMPs 1, 2.2, 3.1, 4.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Sections 3.7.13 and 3.7.17)	Reasonably Foreseeable Future External Effects					Cumulative Effect Significance Rating
			Human Controlled Events				Natural Events	
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality - Incidental Take	**I** **(for all FMPs except 2.1)**	Kittiwakes nest mostly on Pribilofs and population has been declining, both murrelet populations have decreased substantially in core range Subsistence hunts and egging Incidental take in foreign and U.S. fisheries Oil spills , logging, disturbance from vessels (murrelets)	**Potential adverse contribution** Harvest on Pribilofs (kittiwakes)	**Potential adverse contribution** Incidental take on longlines (kittiwakes), trawl/net gear (murrelets), and vessel strikes	**Potential adverse contributions** Acute and/or chronic pollution events, especially involving oil and plastic Accidental release of nest predators on kittiwake colonies Disturbance from all marine vessels (murrelets)	**Potential beneficial contributions** Logging regulations to protect marbled murrelet nests Oil spill and pollution prevention laws Efforts to list Kittlitz's murrelets under Endangered Species Act	**Potential adverse contribution** Periodic die-offs and fluctuations in reproductive success due to food availability	**CS- for red-legged kittiwakes** Population decline may have reversed, contribution of non-natural mortality factors to earlier decline unknown **S- for both murrelets** Mortality in nearshore gillnet fisheries likely contributing, among other factors, to widespread and consistent population declines

Table 4.5-104 (cont.). Cumulative effects for species of management concern (red-legged kittiwake, marbled murrelet, Kittlitz's murrelet): FMPs 1, 2.2, 3.1, 4.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Sections 3.7.13 and 3.7.17)	Reasonably Foreseeable Future External Effects					Cumulative Effect Significance Rating
			Human Controlled Events				Natural Events	
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Change in Food Availability	**I**	Supplementary food from fishery wastes (kittiwakes) Regime shifts	Not a contributing factor	**Potential adverse contribution** Squid and forage fish fisheries Fishery wastes	**Potential adverse contribution** Acute and/or chronic pollution events could alter prey abundance and distribution	Not a contributing factor	**Potential beneficial/ adverse contribution** on forage fish and invertebrate prey abundance and distribution	**U** Contributions of natural and human events to availability of prey on the scale important to all species foraging success is unknown
Benthic Habitat	**I**	Other human and natural bottom disturbance	Not a contributing factor	**Potential adverse contribution** Nearshore trawling and other bottom contact fishing disturbance (murrelets)	**Potential adverse contribution** Acute and/or chronic pollution affecting ocean bottom	**Potential beneficial contribution** Nearshore trawl and bottom contact fishing closures	**Potential beneficial/ adverse contribution** on benthic and demersal prey	**No**ne No contribution of groundfish fishery to this effect

Notes:
CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
S- - significant adverse
U - unknown

Table 4.5-105. Cumulative effects for other piscivorous species[1]: FMPs 1, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to species accounts in Section 3.7)	Reasonably Foreseeable Future External Effects					Cumulative Effect Significance Rating
			Human Controlled Events				Natural Events	
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality - Incidental Take	**I**	Most species common or abundant and widespread. Population trends known best for murres and black-legged kittiwakes, which are variable at different colonies Subsistence hunts and egging, oil spills , fox farming Incidental take in foreign and U.S. fisheries Regime shifts	**Potential adverse contribution** Harvest by Alaskan and Russian Natives concentrated on accessible colonies	**Potential adverse contribution** Incidental take on longlines, trawl/net gear, and vessel strikes	**Potential adverse contributions** Acute and/or chronic pollution events, especially involving oil Accidental release of nest predators on breeding colony islands	**Potential beneficial contributions** National and International Seabird Bycatch Reduction Plans Oil spill and pollution prevention laws USFWS protection of colonies	**Potential adverse contribution** Periodic die-offs and fluctuations in reproductive success due to food availability	**I** Natural and human-caused sources of mortality contribute to population fluctuations at different times but no species in this group appears to be in danger of a consistent area-wide population decline
Change in Food Availability	**I** (for all FMPs except 2.1)	Supplementary food from fishery wastes Regime shifts	Not a contributing factor	**Potential adverse contribution** Forage fish fisheries Fishery wastes (gulls)	**Potential adverse contribution** Acute and/or chronic pollution events could alter prey abundance and distribution	Not a contributing factor	**Potential beneficial/ adverse contribution** on forage fish abundance and distribution	**I** Contributions of natural and human events to availability of prey on the scale important to seabird foraging success is poorly known but there does not appear to be consistent population level effects on these species

Table 4.5-105 (cont.). Cumulative effects for other piscivorous species[1]: FMPs 1, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to species accounts in Section 3.7)	Reasonably Foreseeable Future External Effects					Cumulative Effect Significance Rating
			Human Controlled Events				Natural Events	
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Benthic Habitat	**I** (for all FMPs except 2.1)	Domestic and foreign trawling Other human and natural bottom disturbance	Not a contributing factor	**Potential adverse contribution** Trawling and other bottom contact fishing disturbance within range of species	**Potential adverse contribution** Acute and/or chronic pollution affecting ocean bottom	Not a contributing factor	**Potential beneficial/ adverse contribution** on benthic and demersal prey	**I** Contributions of natural events and human disturbance to food web dynamics of benthic and demersal prey is poorly known but there does not appear to be consistent population level effects on these species

Notes: [1]Species include all gulls except red-legged kittiwake, terns, jaegers, murres, puffins, rhinoceros auklet, ancient murrelet, guillemots, and cormorants.
CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
S- - significant adverse
U - unknown

Table 4.5-106. Cumulative effects for other planktivorous species[1]: 1, 2.1, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Sections 3.7.7 and 3.7.18)	Reasonably Foreseeable Future External Effects					Cumulative Effect Significance Rating
			Human Controlled Events				Natural Events	
			Subsistence Harvest	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality - Incidental Take	**I**	Most species abundant and widespread, population trends not well known but at-sea estimates appear stable Subsistence harvest (auklets) Incidental take in foreign and U.S. fisheries Marine pollution, fox farming Regime shifts	**Potential adverse contribution** Traditional harvest, especially crested auklets	**Potential adverse contribution** Incidental take on longlines, trawl/net gear, and vessel strikes	**Potential adverse contribution**s Acute and/or chronic pollution events, especially involving oil and plastic Accidental release of nest predators on breeding colony islands	**Potential beneficial contribution**s National and International Seabird Bycatch Reduction Plans Oil spill and pollution prevention laws USFWS protection of colonies	**Potential adverse contribution** Periodic die-offs and fluctuations in reproductive success due to food availability	**I** Mortality from fisheries and other sources does not appear to be causing detectable population declines in any species
Change in Food Availability	**I**	Squid and forage fish fisheries Regime shifts Commercial whaling (planktivorous species)	Not a contributing factor	**Potential adverse contribution** Squid and forage fish fisheries	**Potential adverse contribution** Acute and/or chronic pollution events could alter prey abundance and distribution	Not a contributing factor	**Potential beneficial/ adverse contribution** on planktonic prey abundance and distribution	**I** Contributions of human events to prey availability appears to be insignificant compared to natural fluctuations

Table 4.5-106 (cont.). Cumulative effects for other planktivorous species[1]: 1, 2.1, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Sections 3.7.7 and 3.7.18)	Reasonably Foreseeable Future External Effects					Cumulative Effect Significance Rating
			Human Controlled Events				Natural Events	
			Subsistence Harvest	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Benthic Habitat	**I**	None	Not a contributing factor	Not a contributing factor	Not a contributing factor	Not a contributing factor	Not a contributing factor	**No**ne

Notes: [1]Species include Leach's and fork-tailed storm-petrels and all auklets except rhinoceros
CS- - Conditionally significant adverse
FMP - fishery management plan
I - insignificant
S- - Significant adverse
U - Unknown
USFWS - United States Fish and Wildlife Service

Table 4.5-107. Cumulative effects for spectacled and Steller's eiders: FMPs 1, 2.1, 2.2, 3.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Sections 3.7.9 and 3.7.10)	Reasonably Foreseeable Future External Effects						Cumulative Effect Significance Rating
			Human Controlled Events				Natural Events		
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazards	Conservation Efforts	Disturbance by Ice, Whales, and Walrus	Climate Change and Regime Shift	
Mortality - Incidental Take	**I**	Reason(s) for population declines of both species in Alaska unknown Both species listed as threatened under ESA with designated Critical Habitat Subsistence hunts and egging Incidental take in coastal fisheries Lead shot pollution	**Potential adverse contribution** Harvest in northwestern Alaska and Russia	**Potential adverse contribution** Incidental take trawl/net gear and vessel strikes in coastal fisheries	**Potential adverse contributions** Acute and/or chronic pollution events, especially involving oil Disturbance from all marine vessels	**Potential beneficial contributions** Oil spill and pollution prevention laws	Not a contributing factor	Not a contributing factor	**I for Steller's eider** Population decline may have stabilized, subsistence hunts dominate human-caused mortality but do not appear large enough to cause population decline **No contribution to spectacled eider** mortality from groundfish fishery

Table 4.5-107 (cont.). Cumulative effects for spectacled and Steller's eiders: FMPs 1, 2.1, 2.2, 3.1, and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Sections 3.7.9 and 3.7.10)	Reasonably Foreseeable Future External Effects						Cumulative Effect Significance Rating
			Human Controlled Events				Natural Events		
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazards	Conservation Efforts	Disturbance by Ice, Whales, and Walrus	Climate Change and Regime Shift	
Change in Food Availability	**I**	Regime shifts	Not a contributing factor	Not a contributing factor	**Potential adverse contribution** Acute and/or chronic pollution events	Not a contributing factor	**Potential adverse contribution** Disturbance may cause local prey depletions	Unknown effect	None Potential effects of groundfish fisheries through benthic habitat discussed below
Benthic Habitat	**I**	Disturbance of benthic habitat by gray whales and walrus. Trawling and other bottom contact fishing in Critical Habitat	Not a contributing factor	**Potential adverse contribution** Trawling and other bottom contact fishing in Critical Habitat	**Potential adverse contribution** Acute and/or chronic pollution affecting benthic habitat	**Potential beneficial contribution** Nearshore trawl and bottom contact fishing closures	**Potential adverse contribution** Disturbance of bottom may cause changes in productivity and complexity of benthic habitat	Unknown effect	**U** Contributions of natural events and human disturbance to food web dynamics of benthic habitat unknown

Notes:
CS- - conditionally significant adverse
ESA - Endangered Species Act
FMP - fishery management plan
I - insignificant
S- - significant adverse
U - unknown

Table 4.5-108. Total annual mean estimated incidental takes of each marine mammal species group incidental to groundfish fisheries from 1995-1999.

	BSAI		GOA		Estimated Total
	Trawl	Longline	Trawl	Longline	
Steller sea lions - Western Stock	7		0.6	0.8	8.4
Steller sea lions - Eastern Stock					0
Northern Fur Seals	0.6				0.6
Harbor Seals	2.2	0.6	0.4	4	7.2
Other Pinnipeds	18.8				18.8
Transient Killer Whales	0.6	0.8			1.4
Other Toothed Whales	29.9	1.4	1	4.8	36.4
Other Baleen Whales	1.4				1.4
Sea Otters					No. Observer Program
Total	59.8	2.8	2	9.6	74.2

Notes: BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
No. - Number

Source: Angliss et al. 2001.

Table 4.5-109. Estimated fishing mortality rates (*F*) and changes to the fishing mortality rate of Eastern Bering Sea and Gulf of Alaska pollock, Bering Sea and Aleutian Islands and Gulf of Alaska Pacific cod, and Aleutian Islands Atka mackerel projected to occur under each FMP relative to the comparative baseline. The comparative baseline is based on data from the 2002 fishing year. Estimated fishing mortality rates for each alternative are the average *F* expected to occur over the next five years according to the specifications of each management strategy. These data are based outputs from the target species model.

FMP	EBS Pollock		GOA Pollock		BSAI Pacific Cod		GOA Pacific Cod		Aleutian Islands Atka mackerel	
	Est. *F*	% Difference	Est. *F*	% Difference	Est. *F*	% Difference	Est. *F*	% Difference	Est. *F*	% Difference
Baseline	0.187	-	0.174	-	0.228	-	0.255	-	0.251	-
1	0.228	22%	0.176	1%	0.275	20%	0.211	-17%	0.403	60%
2.1	0.448	140%	0.350	100%	0.409	79%	0.419	64%	0.564	124%
2.2	0.315	69%	0.151	-13%	0.293	28%	0.304	19%	0.412	64%
3.1	0.243	30%	0.152	-13%	0.272	19%	0.304	19%	0.403	60%
3.2	0.249	34%	0.124	-29%	0.259	14%	0.271	6%	0.287	14%
4.1	0.045	-76%	0.038	-78%	0.666	-71%	0.068	-73%	0.047	-81%
4.2	-	-100%	-	-100%	-	-100%	-	-100%	-	-100%
PPA.1	0.230	23%	0.134	-23%	0.272	-19%	0.304	19%	0.403	61%
PPA.2	0.239	28%	0.123	-29%	0.254	-11%	0.271	6%	0.288	15%

Notes: BSAI - Bering Sea and Aleutian Islands
EBS - eastern Bering Sea
Est. - estimated
F - fishing mortality rates
GOA - Gulf of Alaska

Table 4.5-110. Summary of the significance determinations for each of the effects on marine mammals under FMP 1.

	Incidental take/ entanglement in marine debris	Harvest of prey species	Spatial/temporal concentration	Disturbance
Steller sea lions - Western Stock	I	I	I	I
Steller sea lions - Eastern Stock	I	I	I	I
Northern Fur Seals	I	I	I	I
Harbor Seals	I	I	I	I
Other Pinnipeds	I	I	I	I
Transient Killer Whales	I	I	I	I
Other Toothed Whales	I	I	I	I
Other Baleen Whales	I	I	I	I
Sea Otters	I	I	I	I

Table 4.5-111. Cumulative effects analysis for the western stocks of Steller sea lions: FMP 1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events					
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Other Intentional Take	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries State-Managed drift and set gillnet fisheries Commercial harvest of pups Subsistence harvest Intentional shootings Steep population declines from 1970s- to 1990, less steep decline from 1990s to present	**Potential adverse contribution** Incidental take in State managed drift gill net fisheries	**Potential adverse contribution** Subsistence harvest throughout range of the western stock Intentional shootings	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil	**Potential beneficial contribution** Endangered Species Act - listed as endangered Marine Mammal Protection Act Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor.** Direct mortality would not be a primary effect of climate change/regime shift.	**Significant adverse** Mortality is considered a cumulative effect. Since the combined take for subsistence, other fisheries and in the groundfish fisheries is at or near the PBR, the continuing endangered status, long-term decline in abundance, cumulative effect is likely having population-level effects. Contribution of the groundfish fisheries is small.

Table 4.5-111 (cont.). Cumulative effects analysis for the western stocks of Steller sea lions: FMP 1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events					
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Other Intentional Take	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries Past harvest by State-managed salmon and herring fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Adverse** Effects prey availability is found to be cumulative from internal effects of the groundfish fisheries and external effects. Conditional on prey being a factor in decline of this stock.
Spatial/temporal concentration of fisheries	**I**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Adverse** Spatial and temporal effects of the fisheries identified for other fisheries. Cumulative effects are conditional on harvest of prey being a factor in recent decline.

Table 4.5-111 (cont.). Cumulative effects analysis for the western stocks of Steller sea lions: FMP 1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events					
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Other Intentional Take	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest Vessel traffic near rookeries and haulouts	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Since disturbance is identified for other fisheries, effect of disturbance are considered cumulative but insignificant at the population level.

Notes: FMP - fishery management plant
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.5-112. Cumulative effects analysis for the eastern stock of Steller sea lions: FMPs 1, 2.2, 3.1, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries. State Managed drift and set gillnet fisheries Commercial harvest of pups Subsistence harvest Predator control Intentional shootings Abundance of the eastern stock has increased over the last 20 years.	**Potential adverse contribution** Incidental take in State-managed drift gillnet fisheries	**Potential adverse contribution** Subsistence harvest in Southeast Alaska Predator control at fish farms in British Columbia	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil spills	**Potential beneficial contribution** Endangered Species Act - listed as threatened in 1990. Restricts disturbance at rookeries and haulouts. Marine Mammal Protection Act (1972) - classified as strategic stock Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor.** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Since the combined take for subsistence, other fisheries and in the groundfish fisheries is below 10% of the PBR, cumulative effect of mortality is considered insignificant at the population level.

Table 4.5-112 (cont.). Cumulative effects analysis for the eastern stock of Steller sea lions: FMPs 1, 2.2, and 3.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries. Past harvest by State-managed salmon and herring fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey but magnitude of potential effects are unknown.	**Insignificant** Effect is cumulative based on internal effect of the groundfish fisheries on prey abundance and external effect of State-managed fisheries. Population-level effects are unlikely due to increasing trends.
Spatial/temporal concentration of fisheries	**I**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Effects are cumulative based on internal and external factors such as State-managed fisheries. Similar to baseline conditions, Population- level effects unlikely due to increasing trend.

Table 4.5-112 (cont.). Cumulative effects analysis for the eastern stock of Steller sea lions: FMPs 1, 2.2, and 3.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest Vessel traffic near rookeries	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Effects of disturbance is cumulative based on internal and external sources. The cumulative effect is unlikely to result in population-level effect.

Notes: FMP - fishery management plan
I - insignificant
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.5-113. Cumulative effects analysis for northern fur seal: FMPs 1.0, 3.1, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries (high seas dirift net) and federal and and State-managed fisheries Commercial harvest on the Pribilof Islands Subsistence harvest Population declined substantially in 1970s to early 1980s, leading to "depleted" status under MMPA in 1988. Population still declining in 2000.	**Potentially adverse contribution** Incidental take in State managed drift gill net fisheries, Incidental take in fisheries outside the EEZ	**Potentially adverse contribution** Subsistence harvest on the Pribilof Islands	**Potentially adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil spills	**Potentially beneficial contribution** Marine Mammal Protection Act (1972). UN Resolution 46/215 banning high seas driftnet fisheries. Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor.** Direct mortality would not be a primary effect of climate change	**Insignificant** Effect is cumulative based on internal effect of fisheries and external effect of subsistence and other fisheries. Since the combined take for subsistence, other fisheries and in the groundfish fisheries is below the PBR, cumulative effect of mortality is considered insignificant at the population level.

Table 4.5-113 (cont.). Cumulative effects analysis for northern fur seal: FMPs 1.0 and 3.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries	**Potentially adverse contribution** Little overlap in prey species with State-managed and foreign fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Adverse** Effects are cumulative based on internal effect fo fisheries and external effects of other fisheries and possibly long-term climate change. Cumulative effect are conditional on availability of prey being factor in recent decline.
Spatial/temporal concentration of fisheries	**I**	Displacement of fisheries offshore increases interaction with fur seal	**Potential adverse contribution** Foreign fisheries outside EEZ and State salmon gillnet fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Adverse** Effects are cumulative based on Spatial and temporal effects of the fisheries identified for other fisheries Cumulative effects are conditional on harvest of prey being factor in recent decline.

Table 4.5-113 (cont.). Cumulative effects analysis for northern fur seal: FMPs 1.0 and 3.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest	**Potentially adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potentially adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Disturbance is cumulative based on internal effects and external factors. Population-levels effect are unlikely and therefore, insignificant.

Notes:
EEZ - exclusive economic zone
FMP - fishery management plan
I - insignificant
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.5-114. Cumulative effects analysis for harbor seal: FMPs 1.0, 3.1, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and Federal and State-managed fisheries State predator control programs Commercial harvest Subsistence harvest Increasing in Bristol Bay but decreasing around Pribilof Islands. Major declines in GOA from 1976 to1992 followed by steady increases. Generally increasing in Southeast Alaska	**Potential adverse contribution** Incidental take in State managed drift gillnet fisheries	**Potential adverse contribution** Subsistence harvest throughout region	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil	**Potential beneficial contribution** Marine Mammal Protection Act (1972)· Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative with internal effects of groundfish fisheries and external effect of take from subsistence and other fisheries. Total is below the PBR, and is considered insignificant.

4.5-114 (cont.). Cumulative effects analysis for harbor seal: FMP 1.0 and 3.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Adverse** Effects cumulative base on internal effect of fisheries and external effects of other fisheries. Cumulative effect are conditional on availability of prey being factor in recent decline.
Spatial/temporal concentration of fisheries	**I**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Adverse** Spatial and temporal effects are cumulative based on internal and external effect of fisheries. Cumulative effect are conditional on harvest of prey being factor in recent decline.
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Disturbance is cumulative based of internal and external sources. Population-level effect are unlikely.

4.5-114 (cont.). Cumulative effects analysis for harbor seal: FMP 1.0 and 3.1.

Notes: FMP - fishery management plant
GOA - Gulf of Alaska
JV - joint venture
MPPRCA -Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.5-115. Cumulative effects analysis for other pinnipeds: FMPs 1.0, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and Federal and State-managed fisheries State predator control programs (spotted seal) Subsistence harvest	**Potential adverse contribution** Incidental take in State managed drift gill net fisheries and herring fisheries	**Potential adverse contribution** Subsistence harvest is a major mortality factor form most species	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil	**Potential beneficial contribution** Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative for all species from internal effecfs of the groundfish fisheries and external factors such as subsistence. For spotted, ringed, bearded and ribbon seal, PBRs are not known. Walrus take is below the PBR and population level effects are unlikely. Elephant seal populations are expanding and human-caused mortality is considered insignificant. Contribution is of groundfish fishery is small for all species.

Table 4.5-115 (cont.). Cumulative effects analysis for other pinnipeds: FMPs 1.0, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Insignificant** Effect are considered cumulative based on internal and external factors. Overlap in prey with fisheries very limited.
Spatial/temporal concentration of fisheries	**I**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Insignificant** Effects are cumulative based on internal and external factors. Very little seasonal overlap with commercial fisheries on the prey of the other pinniped specie.

Table 4.5-115 (cont.). Cumulative effects analysis for other pinnipeds: FMPs 1.0, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Disturbance is found to be cumulative from internal and external sources. Effects are insignificant due to very limited overlap with fisheries.

Notes: FMP - fishery management plan
JV - joint venture
PBR - potential biological removal
MPPRCA - Marine Plastic Pollution Research and Control Act

Table 4.5-116. Cumulative effects analysis for transient killer whales: FMP 1.0, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Intentional shootings	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take and entanglement in JV, foreign and federal domestic groundfish fisheries, State-managed fisheries. Illegal shooting of killer whales in various fisheries	**Potential adverse contributing** Small Incidental take and entanglement in State-managed fisheries	**Potential adverse contribution** Illegal shooting in various fisheries	**Potential adverse contribution** Bioaccumulation of pollutants such as PCBs and DDT Vessel strikes Acute and/or chronic pollution events, especially involving oil spills	**Potential beneficial contribution** Marine Mammal Protection Act (1972) Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative based on internal effects of the groundfish fisheries and external sources. Mortality is combined with resident killer whales but is below 10% of the PBR, cumulative effect of take is considered insignificant at the population level.
Prey Availability	**I**	Decline of marine mammal populations likely affected prey of transients killer whales	**Not a contributing factor** No overlap in prey specie harvested since they prey on marine mammal	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Prey availability is considered cumulative due to internal and external factors. Since transient killer whales eat marine mammals, fisheries contribution is very limited and insignificant at the population level.

4.5-116 (cont.). Cumulative effects analysis for transient killer whales: FMP 1.0, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Intentional shootings	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Spatial/temporal concentration of fisheries	**I**	Spatial and temporal concentration of harvest has likely not be a factor with transient killer whales	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Spatial and temporal harvest of prey is considered cumulative due to internal and external factors. Since transient killer whales eat marine mammals, fisheries contribution is very limited and insignificant at the population level.
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries, and State-managed salmon and herring fisheries fisheries General vessel traffic	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potentially adverse contribution** Disturbance from general harassment	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Disturbance is cumulative based on internal effect of the groundfish fisheries and external effect from other sources. Population-level effect are unlikely and considered insignificant. Contribution of the fisheries is very small.

Notes: DDT - *para*-dichlorodithenyltrichloroethane
FMP - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal
PCB - polychlorinated biphenyls

Table 4.5-117. Cumulative effects analysis for other toothed whales: FMPs 1.0, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take and entanglement in foreign, JV, federal domestic groundfish fisheries and State-managed fisheries. Commercial whaling for sperm whales. Subsistence whaling for beluga whales.	**Potential adverse contribution** Incidental take in State managed drift and set gill net fisheries.	**Potential adverse contribution** Subsistence harvest for beluga whales.	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Bioaccumulation of pollutants such as PCBs and DDT. Acute and/or chronic pollution events, especially involving oil spills.	**Potential beneficial contribution** Endangered Species Act - Sperm Whales. Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (MPPRCA) (1987).	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative due to internal and external sources. Cumulative effects is considered insignificant at the population level for all species this group. Contribution from the groundfish fisheries is very small.

Table 4.5-117 (cont.). Cumulative effects analysis for other toothed whales: FMPs 1.0, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries, and State managed salmon and herring fisheries.	**Potential adverse contribution** Some overlap between fisheries and prey species for most toothed whales and fish targeted in State managed salmon and herring fisheries.	**Not a contributing factor.**	**Not a contributing factor.**	**Not a contributing factor.**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant** Prey availability is cumulative based on internal and external factors. Overlap of prey with species taken in fisheries is limited, prey abundance influenced more by environmental factors.
Spatial/temporal concentration of fisheries	**I**	Harvest of prey species by JV, foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries.	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries.	**Not a contributing factor.**	**Not a contributing factor.**	**Not a contributing factor.**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant** Spatial and temporal effects are considered cumulative but insignificant due to limited overlap with fisheries and prey.

Table 4.5-117 (cont.). Cumulative effects analysis for other toothed whales: FMPs 1.0, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries, and commercial harvest . Subsistence harvest for beluga whales.	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potential adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor.**	**Not a contributing factor.**	**Not a contributing factor.**	**Insignificant** Disturbance is considered cumulative but insignificant at the population level for all species.

Notes:
DDT - *para*-dichlorodiphenyltrichloroethane
FMP - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal
PCBs - polychlorinated biphenyls

Table 4.5-118. Cumulative effects analysis for baleen whales: FMPs 1.0, 2.2, 3.1, 4.1, 4.2, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Commercial whaling of most baleen species devastated most whale population except minke whales. Subsistence whaling for bowhead and gray whales. Entanglement in fishing gear.	**Potential adverse contribution** Incidental take in State managed drift and set gillnet fisheries. Entanglement in fishing gear. Incidental take in Russian driftnet fishery - northern right whales.	**Potential adverse contribution** Subsistence harvest for bowhead and gray whales.	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil. Vessel collisions.	**Potential beneficial contribution** Endangered Species Act- bowhead, fin, right, humpback, and blue whales. International Whaling Commission management of subsistence take. Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (MPPRCA) (1987).	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Conditionally significant adverse** Mortality is cumulative based on internal effects of the groundfish fishery, past persistent effect and external factors. Effect is based on interaction with fisheries and endangered status for fin, humpback and sei whales Rating is conditional on human-caused mortality affecting recovery. **Insignificant** Cumulative effect for bowhead, northern right whale, and blue whale minke whales and gray. Population-level effects are not anticipated.

Table 4.5-118 (cont.). Cumulative effects analysis for baleen whales: FMPs 1.0, 2.2, 3.1, 4.1, and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries, and State managed salmon and herring fisheries.	**Potential adverse contribution** Some overlap between fisheries and prey species for humpback whales.	**Not a contributing factor.**	**Not a contributing factor.**	**Not a contributing factor.**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant** Prey availability is considered cumulative based on internal and external factors. This effect is not likely to have population-level effects. The contribution of the groundfish fisheries is very slight.
Spatial/temporal concentration of fisheries	**I**	Harvest of prey species of humpback by foreign and domestic groundfish fisheries.	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries.	**Not a contributing factor.**	**Not a contributing factor.**	**Not a contributing factor.**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant** Spatial and temporal effects of the fisheries identified as cumulation but not expect to affect any species at the population level.

Table 4.5-118 (cont.). Cumulative effects analysis for baleen whales: FMPs 1.0, 2.2, 3.1, 4.1, and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries, and commercial harvest. Subsistence harvest for bowheads.	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potential adverse contribution** Disturbance from subsistence harvest of bowhead and gray whales.	**Not a contributing factor.**	**Not a contributing factor.**	**Not a contributing factor.**	**Insignificant** Disturbance is cumulative based on both internal effect of the fisheries and external sources. Disturbance in not expected to affect any species at the population-level and is therefore insignificant.

Notes: FMP - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.5-119. Cumulative effects analysis for sea otters: FMP 1.0, 2.1, 2.2, 3.1, 3.2, 4.1, 4.2, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Nature Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Commercial harvests for pelts. Subsistence harvest. Recent population decline of southwest Alaska stock, candidate status for ESA. Exxon Valdez oil spill.	**Potential adverse contribution** Incidental take in State-managed drift gillnet fisheries.	**Potential adverse contribution** Subsistence harvest by Alaska Natives.	**Potential adverse contribution** Acute and/or chronic pollution events, especially involving oil.	**Potential beneficial contribution** Marine Mammal Protection Act. Potential ESA listing for southwest Alaska stock.	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Conditionally Significant Adverse** Southwest Alaska stock. Mortality is cumulative due to internal effect, past effect and other external factors. Dramatic decline of southwest stock of sea otters potentially due to increased mortality from transient killer whales that have switched from declining prey population of Steller sea lions. **Insignificant** Southcentral and southeast stocks. Cumulative effect a is not expected to effect stocks at the population level.

Table 4.5-119 (cont.). Cumulative effects analysis for sea otters: FMP 1.0, 2.1, 2.2, 3.1, 3.2, 4.1, and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Nature Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Minor overlap in prey and species taken by commercial crab fisheries.	**Potential adverse contribution** Limited overlap in prey species and fish targeted in State managed fisheries.	**Not a contributing factor.**	**Not a contributing factor.**	**Not a contributing factor.**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant** Overlap of prey with species taken in fisheries is very limited, prey abundance influenced more by environmental factors.
Spatial/temporal concentration of fisheries	**I**	Overlap of coastal fisheries with sea otter foraging areas.	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries.	**Not a contributing factor.**	**Not a contributing factor.**	**Not a contributing factor.**	**Not a contributing factor.** Invertebrates in sea otter diet are not likely to fluctuate with climate/regime shifts.	**Insignificant** Spatial and temporal effects are considered cumulative but insignificant due to limited overlap with fisheries and prey.
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries. Subsistence harvest.	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potential adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor.**	**Not a contributing factor.**	**Not a contributing factor.**	**Insignificant** Disturbance is considered cumulative but insignificant at the population level.

Table 4.5-119 (cont.). Cumulative effects analysis for sea otters: FMP 1.0, 2.1, 2.2, 3.1, 3.2, 4.1, and 4.2.

Notes: ESA - Endangered Species Act
FMP - fishery management plan
JV - joint venture

Table 4.5-120. Summary of FMP bookend 1 on harvesting and processing sectors.

Sector	Volume (Thousands of Metric Tons)				Output Value ($ Millions)				Groundfish Output Value ($Millions)	Groundfish Payments to Labor ($Millions)	Groundfish Employment (FTE Positions)
	Pollock	Pacific Cod	Flatfish	A-R-S-O	Pollock	Pacific Cod	Flatfish	A-R-S-O			
Outcome Under FMP											
All Catcher-Processors	639.4	188.9	172.9	119.8	392.0	228.5	80.2	79.4	780.2	279.4	4,105.7
All Inshore Processors and Motherships	854.0	96.2	23.5	30.6	539.9	116.1	6.5	79.8	742.4	290.2	4,876.0
All Catcher Vessels	843.1	96.3	12.0	20.8	203.4	52.6	3.7	57.5	317.2	126.9	2,300.3
All Sectors	1,493.4	285.1	196.4	150.4	931.9	344.6	86.7	159.3	1,522.5	696.5	11,282.0
Change from Comparative Baseline											
All Catcher-Processors	2.6	36.9	22.2	-1.1	-2.5	45.1	0.2	-6.6	36.2	13.5	229.0
All Inshore Processors and Motherships	36.7	29.9	2.2	3.4	15.9	35.2	-1.1	9.4	59.4	23.3	385.5
All Catcher Vessels	28.5	31.8	0.2	0.0	7.4	17.0	0.1	4.2	28.7	11.5	284.6
All Sectors	34.1	66.8	24.5	2.3	13.4	80.3	-0.9	2.8	95.7	48.3	899.0
Percentage Change from Comparative Baseline											
All Catcher-Processors	0.4	24.3	14.7	-0.9	-0.6	24.6	0.3	-7.7	4.9	5.1	5.9
All Inshore Processors and Motherships	4.5	45.0	10.5	12.5	3.0	43.6	-14.2	13.3	8.7	8.7	8.6
All Catcher Vessels	3.5	49.4	1.9	-0.2	3.8	47.8	3.0	7.8	9.9	9.9	14.1
All Sectors[1]	2.3	30.6	14.2	1.5	1.5	30.4	-1.0	1.8	6.7	7.4	8.7

Notes: [1]The volume and values for "All Sectors" equal the sums of the volume and value for catcher-processors and inshore processors and motherships. Adding the volume and value for catcher vessels would result in double counting. However, the payments to labor and employment for "All Sectors" equals the sum over all three sectors.
A-R-S-O - Atka mackerel, rockfish, sablefish, and other groundfish
FMP - fishery management plan
FTE - full time equivalent

Table 4.5-121. Significance ratings of the effects of the policy alternatives and FMP bookends on catcher vessels.

Indicator	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Groundfish landings by species group	I (except S+ for Pacific cod)	S+ (except I for flatfish)	S+ (except I for flatfish and A-R-S-O)	I (except S+ for Pacific cod)	I (except S+ for Pacific cod and S- for sablefish and rockfish)	S-	S-
Groundfish ex-vessel value	I	S+	S+	I	I	S-	S-
Employment	I	S+	S+	I	I	S-	S-
Payments to labor	I	S+	S+	I	I	S-	S-
Excess capacity	I	S-	I	CS+	S+	S-	S-
Average costs	I	S-	I	CS+	S-/S+	S-	S-
Fishing vessel safety	I	S-/S+	I	CS+	S-/S+	S-	S+

Notes: CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
FMP - fishery management plan
I - insignificant
S- - significant adverse
S+ - significant beneficial

Table 4.5-122. Cumulative effects analysis for catcher vessels: FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see Section 3.9) .	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group.	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed.	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed.	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment.	**I** although there have been recent declines in salmon and crab, insignificant cumulative effects are expected to affect groundfish landings by species group under this FMP with the exception of an increase in Pacific cod TAC projected to increase catch in the BSAI and GOA.

Table 4.5-122 (cont.). Cumulative effects analysis for catcher vessels: FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Ex-Vessel Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9).	**Not a contributing factor** - though marginal increases are expected these changes in value would not be significant.	**Not a contributing factor** - not expected to affect ex-vessel value.	Potential adverse contribution - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Not a contributing factor** - changes in climate are note expected to affect ex-vessel value directly.	**I** insignificant cumulative effects are expected for ex-vessel value under this FMP as the slight increase projected will likely offset some of the effects of reductions in other fisheries.

Table 4.5-122 (cont.). Cumulative effects analysis for catcher vessels: FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see Section 3.9) .	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish employment.	**Potential beneficial/adverse contribution** - an increase or decrease in other sources of revenue may result in greater or lesser competition for groundfish employment.	**Not a contributing factor** - not expected to affect employment.	**I** **insignificant** cumulative effects on employment are expected under FMP 1. Slight increases projected may offset reductions in other fisheries such as salmon.

Table 4.5-122 (cont.). Cumulative effects analysis for catcher vessels: FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9).	**Potential beneficial/adverse contribution** - payments received in other fisheries may set precedence for groundfish payments.	**Not a contributing factor** - not expected to affect payments to labor.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor.	**I** insignificant cumulative effects on payments to labor are expected. Although an increase is projected, it is not expected to be significant given the current reductions in other fisheries.
Excess Capacity	I	Yes, history of excess capacity (refer to Section 3.9).	**Potential beneficial/adverse contribution** - an increase or decrease in the number of vessels in other fisheries may result in subsequent increases or decreases in the number of vessels participating in the groundfish fishery, particularly pot CVs and FGCVs in State waters.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in an increase or decrease in capacity in the fishery.	**Potential beneficial/adverse contribution** - an increase or decrease in other sources of revenue may result in an increase or decrease in groundfish capacity.	**Not a contributing factor** - not expected to affect excess capacity.	**I** cumulative effects are not expected to be significant due to measures such as the License Limitation Program and the end fo the race for fish. These programs are also used in some other fisheries to control excess capacity.

Table 4.5-122 (cont.). Cumulative effects analysis for catcher vessels: FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	I	Yes, historical race for fish increased costs (see Section 3.9).	**Potential beneficial/adverse contribution** - associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor** - the effects of other economic development opportunities on average costs are minimal.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - the effects of climate change on average costs are minimal.	**I** insignificant cumulative effects are expected as catches per unit of effort associated with the TACs are not expected to change significantly and no additional closures are proposed.

Table 4.5-122 (cont.). Cumulative effects analysis for catcher vessels: FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Fishing Vessel Safety	I	Yes, historical race for fish (see Section3.9)	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - the effects of other economic development opportunities on fishing vessel safety are minimal.	**Not a contributing factor** - the effects of other revenue sources on fishing vessel safety are minimal.	**Not a contributing factor** - the effects of climate change on fishing vessel safety are minimal.	**I** insignificant cumulative effects with regard to vessel safety are likely. Safety remains a serious concern for all fisheries.

Notes: BSAI - Bering Sea and Aleutian Islands
CV - catcher vessel
FGCV - fixed gear catcher vessel
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificnat
TAC - total allowable catch

Table 4.5-123. Significance ratings of the effects of the policy alternatives and FMP bookends on catcher-processors.

Indicator	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Groundfish catch by species group	I (except S+ for Pacific cod)	S+	S+ (except I for flatfish and A-R-S-O)	I (except S+ for Pacific cod)	I (except S+ for Pacific cod and S- for sablefish and rockfish)	S- (except I for flatfish)	S-
Groundfish gross product value	I	S+	S+	I	I	S-	S-
Employment	I	S+	S+	I	I	S-	S-
Payments to labor	I	S+	S+	I	I	S-	S-
Product quality	I	I (except CS- for sablefish)	I	CS+	S-/S+	CS-	S-
Product utilization rate	I	I	I	CS+	S-/S+	CS+	S-
Excess capacity	I	S-	I	CS+	S+	S-	S-
Average costs	I	S-	I	CS+	S-/S+	S-	S-
Fishing vessel safety	I	S-/S+	I	CS+	S-/S+	S-	S+

Notes: CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
FMP - fishery management plan
I - insignificant
S- - significant adverse
S+ - significant beneficial

Table 4.5-124. Cumulative effects analysis for catcher-processors: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Develop-ment of surimi in 1985 increased demand (see Section 3.9).	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group.	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed.	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed.	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment.	I - insignificant cumulative effects are expected to result under this FMP with the exception of an increase in Pacific cod TAC projected to increase catch in the BSAI and GOA. This increase in Pacific cod is likely to offset the reductions in other fisheries.

Table 4.5-124 (cont.). Cumulative effects analysis for catcher-processors: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9).	**Not a contributing factor** - though marginal increases are expected these changes in value would not be significant.	**Not a contributing factor** - not expected to affect gross product value.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Not a contributing factor** - changes in climate are note expected to affect gross product value directly.	I - insignificant cumulative effects are expected under this FMP as the increase in gross product value projected is likely to offset some of the reductions in other fisheries.

Table 4.5-124 (cont.). Cumulative effects analysis for catcher-processors: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see Section 3.9).	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries, as is occurring in the salmon fishery, may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish employment.	**Potential beneficial/adverse contribution** - an increase or decrease in other sources of revenue may result in greater or lesser competition for groundfish employment.	**Not a contributing factor** - not expected to affect employment.	I - insignificant cumulative effects are expected for employment. The slight increases projected are likely to offset recent reductions in other fisheries.

Table 4.5-124 (cont.). Cumulative effects analysis for catcher-processors: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Product Quality and Product Utilization	I	Yes, historical race for fish and increased demand for seafood (see Section 3.9).	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	I - cumulative effects on product quality and utilization are not expected. AFA cooperatives and the end of the race for fish will maintain product quality and utilization at the baseline level.
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9).	**Potential beneficial/adverse contribution** - payments received in other fisheries may influence groundfish payments. Recent reductions in other fisheries may also influence payments to labor.	**Not a contributing factor** - not expected to affect payments to labor.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor.	I - insignificant cumulative effects on payments to labor are likely. Although reductions in other fisheries such as salmon are occurring, some minimal increases in groundfish may offset this effect.

Table 4.5-124 (cont.). Cumulative effects analysis for catcher-processors: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	I	Yes, history of excess capacity (refer to Section 3.9).	**Potential beneficial/adverse contribution** - an increase or decrease in the number of vessels in other fisheries may result in subsequent increases or decreases in the number of vessels participating in the groundfish fishery.	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity.	**I -**cumulative effects are not expected to be significant due to measures such as the License Limitation Program and the end fo the race for fish. These programs are also used in other fisheries to help reduce capacity.
Average Costs	I	Yes, historical race for fish increased costs (see Section 3.9).	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor** - the effects of other economic development opportunities on average costs are minimal.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - the effects of climate change on average costs are minimal.	**I** - cumulative effects are not expected as catches per unit of effort associated with the TACs are not expected to change significantly and no additional closures are proposed under FMP 1.

Table 4.5-124 (cont.). Cumulative effects analysis for catcher-processors: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Fishing Vessel Safety	I	Yes, historical race for fish (see Section 3.9).	**Potential adverse contribution -** Closures in other fisheries may increase risks to vessels.	**Not a contributing factor** - the effects of other economic development opportunities on fishing vessel safety are minimal.	**Not a contributing factor** - the effects of other revenue sources on fishing vessel safety are minimal.	**Not a contributing factor** - the effects of climate change on fishing vessel safety are minimal,	**I** - insignificant cumulative effects are expected to result under FMP 1. Safety is a serious concern for all fisheries.

Notes: AFA - American Fisheries Act
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
GOA- Gulf of Alaska
I - insignificant
S+ - significant beneficial
TAC - total allowable catch

Table 4.5-125. Significance ratings of the effects of the policy alternatives and FMP bookends on inshore processors and motherships.

Indicator	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Groundfish catch by species group	I (except S+ for Pacific cod)	S+ (except I for flatfish)	S+ (except I for flatfish and A-R-S-O)	I (except S+ for Pacific cod)	I (except S+ for Pacific cod and S- for sablefish and rockfish)	S-	S-
Groundfish gross product value	I	S+	S+	I	I	S-	S-
Employment	I	S+	S+	I	I	S-	S-
Payments to labor	I	S+	S+	I	I	S-	S-
Product quality	I	I (except CS- for sablefish)	I	CS+	S-/S+	S-	S-
Product utilization rate	I	I	I	CS+	S-/S+	CS+	S-
Excess capacity	I	S+	S+	CS+	S+	S- (except I for plants that are marginally dependent on groundfish)	S-
Average costs	I	S+	S+	CS+	S-/S+	S-	S-

Notes: CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
FMP - fishery management plan
I - insignificant
S- - significant adverse
S+ - significant beneficial

Table 4.5-126. Cumulative effects analysis for inshore processors and motherships: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see Section 3.9).	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group.	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed.	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed.	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment.	**I** -insignificant cumulative effects are expected under FMP 1 with the exception of significant beneficial changes to Pacific cod landings which are projected to increase.

Table 4.5-126 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value .	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9).	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal.	**Not a contributing factor** - not expected to affect gross product value.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Not a contributing factor** - changes in climate are note expected to affect gross product value directly.	**I -** insignificant cumulative effects are expected under FMP 1. The increase in gross product value projected is expected to offset reductions in the salmon and crab fisheries.

Table 4.5-126 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9).	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential beneficial/adverse contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery.	**Not a contributing factor** - climate change is not expected to affect opportunities in employment.	**I** - an increase in employment is projected under FMP 1, and is likely to offset reductions in other fisheries.

Table 4.5-126 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9).	**Potential beneficial/adverse contribution** - payments received in other fisheries may influence payments to labor in the groundfish fishery.	**Not a contributing factor** - not expected to affect payment to labor.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor.	**I** - insignificant cumulative effects are expected under FMP 1. Although an increase in payments to labor is projected, it is not significant and is likely to offset reductions in other fisheries.
Product Quality and Product Utilization	I	Yes, historical race for fish and increased demand for seafood (see Section 3.9).	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality.	**I** - insignificant cumulative effects on product quality and utilization are expected. AFA cooperatives and the end of the race for fish will maintain product quality and utilization at the baseline level.

Table 4.5-126 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	I	Yes, history of excess capacity (see Section 3.9)	**Potential beneficial/adverse contribution**- an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery.	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity.	**I -** cumulative effects are not expected to be significant due to measures such as the License Limitation Program and the end fo the race for fish.
Average Costs	I	Yes, historical race for fish increased costs (see Section 3.9).	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs.	**I** - cumulative effects are not expected as catches per unit of effort associated with the TACs are not expected to change significantly.

Table 4.5-126 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 1.

Notes: AFA - American Fisheries Act
FMP - fishery management plan
I - insignificant
S+ - significant beneficial
TAC - total allowable catch

Table 4.5-127. Direct and indirect effects summary for Alaska Peninsula and Aleutian Islands region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
In Region Processing	I	S+	S+	I	I	S-	S-
Regionally Owned At-Sea Processors	I	I	I	I	I	I	S-
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	I	S+	I	I	I	S-	S-
In-Region Deliveries of Regionally Owned Catcher Vessels	I	I	I	I	S-	S-	S-
Total Direct, Indirect, and Induced Labor Income and FTEs	I	S+	S+	I	I	S-	S-
Environmental Justice Impacts	I	I	I	I	CS-	S-	S-

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
FTE - full time equivalent
I - insignificant
S- significant adverse
S+ - significant beneficial

Table 4.5-128. Direct and indirect effects summary for Kodiak Island region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
In Region Processing	S+	S+	I	I	I	S-	S-
Regionally Owned At-Sea Processors	I	I	S+	I	I	S-	S-
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	I	S+	S+	I	I	S-	S-
In-Region Deliveries of Regionally Owned Catcher Vessels	S+	S+	I	I	I	S-	S-
Total Direct, Indirect, and Induced Labor Income and FTEs	S+	S+	I	I	I	S-	S-
Environmental Justice Impacts	I	I	I	I	I	S-	S-

Notes: FMP - fishery management
FTE - full time equivalent
I - insignificant
S- - significant adverse
S+ - significant positive

Table 4.5-129. Direct and indirect effects summary for Southcentral Alaska region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
In Region Processing	S+	S+	S+	S+	I	S-	S-
Regionally Owned At-Sea Processors	I	S+	S+	S+	I	S-	S-
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	S+	S+	I	S+	I	S-	S-
In-Region Deliveries of Regionally Owned Catcher Vessels	S+	S+	S+	S+	I	S-	S-
Total Direct, Indirect, and Induced Labor Income and FTEs	S+	S+	S+	S+	I	S-	S-
Environmental Justice Impacts	I	I	I	I	I	I	I

Notes: FMP - fishery management plan
FTE - full time equivalent
I - insignificant
S- - significant adverse
S+ - significant beneficial

Table 4.5-130. Direct and indirect effects summary for Southeast Alaska region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
In Region Processing	I	S+	I	I	S-	S-	S-
Regionally Owned At-Sea Processors	I	S-	S+	S+	I	S-	S-
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	I	S+	S+	I	S-	S-	S-
In-Region Deliveries of Regionally Owned Catcher Vessels	I	S+	I	I	S-	S-	S-
Total Direct, Indirect, and Induced Labor Income and FTEs	I	I	I	I	S-	S-	S-
Environmental Justice Impacts	I	I	I	I	I	I	I

Notes: FMP - fishery management plan
FTE - full time equivalent
I - insignificant
S- - significant adverse
S+ - significant beneficial

Table 4.5-131. Direct and indirect effects summary for Washington Inland Waters region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
In Region Processing	I	I	I	I	I	I	S-
Regionally Owned At-Sea Processors	I	S+	S+	I	I	S-	S-
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	I	S+	S+	I	I	S-	S-
In-Region Deliveries of Regionally Owned Catcher Vessels	I	S+	S+	I	I	S-	S-
Total Direct, Indirect, and Induced Labor Income and FTEs	I	S+	S+	I	I	S-	S-
Environmental Justice Impacts	I	I	I	I	I	S-	S-

Notes: FMP - fishery management plan
FTE - full time equivalent
I - insignificant
S+ - significant beneficial
S- - significant adverse

Table 4.5-132. Direct and indirect effects summary for Oregon coast region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
In Region Processing	I	I	I	I	I	I	I
Regionally Owned At-Sea Processors	I	I	I	I	I	I	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	I	S+	S+	I	I	S-	S-
In-Region Deliveries of Regionally Owned Catcher Vessels	I	I	I	I	I	I	I
Total Direct, Indirect, and Induced Labor Income and FTEs	I	S+	S+	I	I	S-	S-
Environmental Justice Impacts	I	I	I	I	I	I	I

Notes: FMP - fishery management plan
FTE - full time equivalent
I - insignificant
S- - significant adverse
S+ - significant beneficial

Table 4.5-133. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Processing **(indicator of processing sales, municipal revenue, and secondary economic activity)**	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA, municipal reliance on revenue from fish tax	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - cumulative effects are insignificant due to the influence of external factors, which offset increases in in-region processing. The exception is portions of the Alaska Peninsula, where trends in multi-species fisheries and other sources of municipal and state revenue, primarily due to the downturn in salmon and status of crab closures, result in significant adverse effects on in-region processing and municipal revenue.
Regionally Owned At-sea Processors **(Indicator of processing sales, municipal revenue, secondary economic activity)**	**I**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - external factors have little predictable effect on regionally owned at-sea processors; the status of crab closures adversely effect at sea processors participating in the crab fisheries, but this effect is insignificant.

Table 4.5-133 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Extra-Regional Deliveries of Regionally Owned Catcher Vessels **(indicator of secondary employment multipliers, and economic activity)**	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - extra-regional deliveries of regionally owned catcher vessels decrease but are considered insignificant; vessels that participate in multi-species fisheries such as crab and salmon, may experience significant adverse effects, and are primarily based out of the Alaska Peninsula and Kodiak.
In-Region Deliveries of Regionally Owned Catcher Vessels **(indicator of secondary employment multipliers and economic activity)**	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse**- in-region deliveries of regionally owned catcher vessels decrease but are considered insignificant; vessels that participate in multi-species fisheries such as crab and salmon, may experience significant adverse effects, and are primarily based out of the Alaska Peninsula and Kodiak.

Table 4.5-133 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Total Direct, Indirect, and Induced Labor Income and FTEs **(Indicator of employment, income, and indirectly, population)**	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Potential Adverse/ Beneficial Contribution**- Trends in other economic development activities, particularly state and municipal capital projects	**Potential Adverse Contribution-** decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - direct/indirect/induced labor income and employment increase, significantly for Kodiak and Southcentral Alaska. Trends in other fisheries (particularly salmon) and reductions on municipal revenue, decrease labor income and employment, particularly in the Alaska Peninsula, Kodiak, and Southeast Alaska. Cumulative effects are beneficial but insignificant in most regions, except in Alaska Peninsula, where they are significant adverse.

Notes: AFA - American Fisheries Act
FMP - fishery management plan
FTE - full-time equivalent
I - insignificant
S+ - significant positive
TAC - total allowable catch

Table 4.5-134. Direct and indirect effects summary for community development quota program and subsistence issues.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
CDQ Program	I	U	U	I	I	S-	S-
Subsistence Use of Groundfish	I	I	I	I	I	U	U
Subsistence Use of Steller Sea Lions	I	U	I	I	I	U	I
Salmon Subsistence Fisheries	I	U	I	U	U	U	U
Indirect Subsistence Impacts: Income and Joint Production	I	I	I	I	I	S-	S-

Notes: CDQ - community development quota
FMP - fishery management plan
I - insignificant
S- - significant adverse
U - unknown

Table 4.5-135. Cumulative effects analysis for community development quota groups: FMP 1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Allocations	I	Yes - The trend of increases in species and percent for which shares have been allocated to CDQs has increased their involvement in multi-species fisheries.	**Potential adverse or beneficial contribution -** many CDQs participate in multiple fisheries, including salmon, crab, federal groundfish, and halibut. The relative reliance of harvesters and processors on these fisheries varies on a regional basis and on the status of the individual stocks	**Potential adverse or beneficial contribution -** village infrastructure projects create employment and income opportunities for CDQ communities	**Potential adverse or beneficial contribution** - less revenue sharing from state and federal government public funding of infrastructure, changes in fiscal policies are likely to affect CDQ communities	**Not a contributing factor** - fluctuations in groundfish stocks drive fishery opening and closures	**Insignificant** - adverse cumulative effects on CDQ groups could occur due to external factors, but are not enough to be significant

Notes: CDQ - community development quota
FMP - fishery management plan

Table 4.5-136. Cumulative effects analysis for subsistence: FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Subsistence use of groundfish	I	Yes - foreign JV, domestic, and State managed fisheries have decreased populations of some species	**Potential adverse contribution** - state managed groundfish fishery activity could impact subsistence groundfish fishing	**Not a contributing factor** - infrastructure development unlikely to affect groundfish stocks	**Not a contributing factor -**sport and personal use unlikely to adversely affect groundfish stocks	**Potential adverse or beneficial contribution -** fluctuations in groundfish stocks affect availability for subsistence	**Insignificant** - adverse cumulative effects are not enough to have significant impacts on subsistence
Subsistence use of salmon	I	Yes - reduced runs in western Alaska based on past natural events, domestic and foreign commercial fisheries and subsistence harvests	**Potential adverse contribution** - salmon intercept potentially has contributed to poor returns in western Alaska	**Potential adverse contribution** - infrastructure development could effect salmon spawning and rearing habitat	**Not a contributing factor** - sport and personal use is not expected to adversely affect the salmon population	**Potential adverse contribution** - long-term climate change could potentially effect at-sea salmon survival and reduce salmon runs	**Insignificant** - adverse cumulative effects are not enough to have significant impacts on subsistence
Subsistence use of Steller sea lions	I	Yes - long term decline in population from a combination of effect of commercial fisheries and natural factors	**Potential adverse contribution -** other commercial fisheries have contributed to competition for Steller sea lion prey	**Potential adverse contribution -** marine port and harbor development could potentially impact habitat and increase disturbance	**Not a contributing factor** - sport hunting of Steller sea lions is not permitted	**Potential adverse contribution** - long-term climate change could potentially effect recovery Steller populations	**Insignificant** - adverse cumulative effects are not enough to have significant impacts on subsistence

Table 4.5-136 (cont.). Cumulative effects analysis for subsistence: FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Indirect subsistence impacts: income and joint production	I	Yes - commercial fishing provides platform for joint production and income to support subsistence.	**Potential adverse or beneficial contribution -** income and joint production from other fisheries could affect indirect subsistence impacts.	**Potential adverse or beneficial contribution -** income from other economic development activities could affect indirect subsistence impacts	**Not a contributing factor** - impacts to subsistence through sport and personal use is minimal.	**Potential adverse or beneficial contribution -** affects on groundfish stocks and opportunity for joint production and income.	**Insignificant** - adverse cumulative effects not enough to have significant impacts on subsistence.

Notes: FMP - fishery management plan
I - insignificant
JV - joint venture

Table 4.5-137. Cumulative effects analysis for environmental justice: FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime	
Environmental Justice	I	Yes - Fisheries Resource Landing tax increased revenues to communities, MSA amendments and CDQ program established, commercial fishing source of employment and income in Native Alaskan communities.	**Potential adverse or beneficial contribution**- changes in other fisheries could impact Environmental Justice issues	**Potential adverse or beneficial contribution**- infrastructure development trends, effects of other economic activities	**Potential Adverse contribution**- decrease in other state and municipal revenue sources	**Potential adverse or beneficial contribution -** fluctuations in fish stocks affect availability for Alaska Native subsistence use	**I/CS-** -*Direct/indirect effects* include increased availability for income through subsistence pursuits, and participation and employment opportunities for Alaska Natives in the fishery; reductions in revenues to local communities, but not of a magnitude to be significant; insignificant effects from by-catch of salmon and Steller sea lion subsistence activities. -*External effects* from the crab closures and downturn in the salmon industry and reductions in employment funded by public revenue, and reductions in revenue to Alaskan Native communities are adverse, primarily in the Alaska Peninsula/Aleutian Islands -*Cumulative effects* are insignificant, except for the Alaska Peninsula/Aleutian Islands, which are conditionally significant adverse.

Notes: CDQ - community development quota
FMP - fishery management plan
MSA - Magnuson-Stevens Fishery Conservation Management Act

Table 4.5-138. Significance ratings of the effects of the policy alternatives and FMP bookends on market channels and benefits to U.S. consumers.

Indicator	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Benefits to U.S. consumers	I	I	I	I	I	I	CS-

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant

Table 4.5-139. Cumulative effects analysis for market channels: FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects		Cumulative Effect
			Human Controlled	Natural Events	
			Other Fisheries	Long-term Climate Changes and Regime Shift	
Benefits to U.S. consumers	I	Alaska Seafood Marketing Institute product promotion activities. Research and public awareness of health benefits of seafood consumption. Aquaculture development increased overall demand for seafood products. Changes in processing technology increased seafood quality.	**Potential adverse/beneficial contribution** - other fisheries are providing relatively stable levels of seafood products to domestic and foreign markets; supply of fish products that could be influenced by competition in markets, over- fishing in foreign fisheries, and increased domestic consumption.	**Potential adverse/beneficial contribution** - fluctuations in groundfish stocks could potentially affect availability for market channels.	**Insignificant** - wholesale groundfish product value in conjunction with products from other fisheries is not expected to change benefits to U.S. consumers.

Notes: FMP - fishery management plan
I - insignificant

Table 4.5-140. Significance ratings of the effects of the policy alternatives and FMP bookends on the value of the Bering Sea and Gulf of Alaska marine ecosystems.

Indicator	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Benefits derived from marine ecosystems and associated species (including non-consumptive and non-use benefits)	CS-	CS-	CS-	CS-	CS-	CS-	S+

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
S+ - significant adverse

Table 4.5-141. Cumulative effects analysis for non-consumptive and non-use benefits (the value of the Bering Sea and Aleutian Islands and Gulf of Alaska ecosystems): FMP 1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects		Cumulative Effect
			Human Controlled	Natural Events	
			Other Fisheries	Long-term Climate Changes and Regime Shift	
Benefits derived from marine ecosystems and associated species (Including non-consumptive and non-use benefits)	I	Increased public awareness of marine ecosystems (e.g., BSAI and GOA marine ecosystems) and associated endangered species (e.g., Steller sea lions). Increased participation in recreational fishing and eco-tourism activities. Lawsuits challenging NOAA Fisheries for failing to meet the requirements of the Endangered Species Act in its management of Alaska groundfish fisheries.	**Potential adverse contribution** - fishing levels in other domestic and foreign fisheries may be affecting the productivity of the marine ecosystem.	**Potential adverse/beneficial contribution** - fluctuations in groundfish stocks may potentially affect ecosystems and associated species.	**CS-** - some cumulative adverse impacts on the level of benefits derived from these ecosystems (recreational fishing, wildlife viewing, subsistence and non-consumptive activities) and associated species could affect species diversity, primarily due to external factors such long-term climatic change and regime shift and other fisheries - current management measures could continue: the introduction of non-native species, effect a change in pelagic forage availability, spacial and temporal concentration of fishery impact on forage, removal of top predators (potential for seabird bycatch and subsistence harvests of marine mammals), an increased risk of changes in species, functional, and structural habitat diversity for the ecosystem.

Notes: BSAI - Bering Sea and Aleutian Islands
CS - conditionally significant adverse
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant

Table 4.5-142. Contribution of aggregate annual total catch of the State of Alaska Pacific herring and crab fisheries and the International Pacific Halibut Commission Pacific halibut Alaskan fishery to cumulative biomass[1] removal estimates for the alternatives, Bering Sea and Aleutian Islands and Gulf of Alaska combined.

	Baseline	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
A. Estimated annual total catch of groundfish fisheries target and nontarget fish, BSAI and GOA combined, 2003-2008 (Table 4.1-17) and percent change from baseline.	2132.4	2151.1 + 0.9%	3081.3 + 44.5%	2481.6 + 16.4%	2193.8 + 2.9%	2141.3 + 0.4%	766.0 - 64.1%	0.0 - 100.0 %
B. Average annual total catch of Pacific herring, 1997-2001[2], BSAI and GOA combined		37.0	37.0	37.0	37.0	37.0	37.0	37.0
C. Average annual total catch of crab[3], 1997-2001, BSAI		61.2	61.2	61.2	61.2	61.2	61.2	61.2
D. Average annual total catch of Pacific halibut, 1997-2001, BSAI and GOA combined		33.9	33.9	33.9	33.9	33.9	33.9	33.9
E. Combined average annual total catch of herring, crab, and halibut (B+C+D)		132.1	132.1	132.1	132.1	132.1	132.1	132.1
F. Aggregate of average annual total catch: groundfish fisheries target and nontarget fish, herring, crab, and halibut (A+E)		2283.2	3213.4	2613.7	2325.9	2273.4	891.8	132.1
G. Additional increment contributed by herring, crab, and halibut average annual total catch as percentage of groundfish average annual total catch (E/A X 100)		6.1%	4.3%	5.3%	6.0%	6.2%	17.3%	N/A
H. Contribution of herring, crab, and halibut average annual total catch[4] as percentage of total biomass removed annually (E/F X 100)		5.8%	4.1%	5.1%	5.7%	5.8%	14.8%	100.0

Notes: [1]Biomass values are in metric tons (t) X 1000, i.e., 1000 t.
[2]GOA Pacific herring data were averaged over four years, 1998-2001, due to unavailability of 1997 data (Livingston 2002).
[3]Data include five species: *Chionoecetes bairdi, C. opilio,* red king crab, blue king crab, and Korean hair crab (Livingston 2002).
[4]State of Alaska groundfish and subsistence fisheries would remove an additional small increment (ADF&G 2003b, 2001).
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
GOA - Gulf of Alaska
N/A - not applicable

Table 4.5-143. Assessment of the impacts of the various alternatives on the environment with respect to the ecosystem issues of predator-prey relationships, energy flow and balance, and diversity.

Potential Direct and Indirect Effects of Future Groundfish Management Policy	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
Change in pelagic forage availability	I	S-/CS-/I	S-/CS-/I	I	I	S+/CS+/I	S+/CS+/I
Spatial and temporal concentration of fishery impact on forage	I	CS-	I	I	CS+/I	S+/CS+/I	S+/CS+/I
Removal of top predators	I/U	I/CS-/U	I/U	I/U	I/U	S+	S+
Introduction of non-native species	I	CS-	I	I	I	CS+	CS+
Energy removal	I	CS-	I	I	I	CS+	CS+
Energy redirection	I	CS-	I	I	I	CS+	CS+
Change in species diversity	I/U	CS-/I/S-	I/U	I/U	I/U	S+	S+
Change in functional (trophic) diversity	I	CS-	I	I	I	S+	S+
Change in functional (structural habitat) diversity	I	S-	I	I	S+	S+	S+
Change in genetic diversity	I/U	I/U	I/U	I/U	I/U	I/U	I/U

Notes: CS- - Conditionally Significant Adverse
CS+ - Conditionally Significant Beneficial
FMP - fishery management plan
I - Insignificant
S- - Significantly Adverse
S+ - Significantly Beneficial
U - Unknown

Table 4.5-144. Cumulative effects analysis of the ecosystem: FMP 1.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.5.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in pelagic forage availability	**I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries) and pollock and Atka mackerel catch • State of Alaska directed capelin and herring fishery • Subsistence removals • Climatic effects on recruitment and distribution	**Not a contributing factor** The halibut fishery will not remove pelagic forage species.	**Not a contributing factor** These fisheries affect distinct sub-populations and are not expected to reduce pelagic forage biomass in the BSAI.	**Potential negative contribution** The herring fishery will remove an annual increment of pelagic forage biomass.	**Not a contributing factor** Salmon farming will not affect pelagic forage species.	**Potential negative contribution** Subsistence harvests will annually remove a small increment of pelagic forage biomass.	**Not a contributing factor** Regulated marine mammal removals will not measurably affect pelagic forage biomass.	**Potential negative contribution** Oil and fuel spills during herring or capelin spawning could depress populations of pelagic forage species.	**Potential positive or negative contribution** Climate change could alter productivity and affect the total pelagic forage biomass.	**CS-** Rating is driven by commercial shipping: A large oil spill in the GOA involving key spawning times and/or areas could substantially reduce herring and capelin populations. This impact could be intensified, by a climatic regime shift. ADF&G will annually review and set herring exploitation rates. Annual subsistence removals will not measurably affect pelagic forage biomass.
Spatial and temporal concentration of fishery impact on forage	**I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries), herring bycatch and pollock and Atka mackerel catch by area and season • State of Alaska directed capelin and herring fishery by area and season • Subsistence removals by area and season • Climatic effects on recruitment and distribution	**Not a contributing factor:** The halibut fishery will not remove pelagic forage species.	**Not a contributing factor:** These fisheries affect distinct sub-populations and are not expected to interact synergistically with spatial and temporal patterns of fishing effort in the BSAI.	**Potential negative contribution:** The herring fishery could affect local concentrations of herring and other forage fish. Because the herring fishery is mainly inshore, overlaps with the groundfish fishery would be more likely temporal than spatial.	**Not a contributing factor:** Salmon farming will not affect pelagic forage species.	**Potential negative contribution:** Subsistence fishing will most likely not be annually adjusted to offset FMP effects and will sometimes overlap with the spatial and temporal pattern of the groundfish fishery.	**Not a contributing factor:** Regulated marine mammal removals will not add to the spatial and temporal impacts of the groundfish fishery.	**Potential negative contribution:** Persistent effects of oil and fuel spills could sporadically intensify spatial and temporal impacts of the groundfish fishery on forage species.	**Potential positive or negative contribution:** Climate change could alter the spatial and temporal distributions of pelagic forage species in ways that might be synergistic with spatial and temporal concentrations of groundfish fishery impacts.	**CS-** Rating reflects the potential for incremental contributions from the herring fishery, subsistence fishing, sporadic fuel and oil spills, and climate change to converge and affect pelagic forage species in ways that could add to, or interact with, spatial and temporal patterns of groundfish fishery impacts on forage species.

Table 4.5-144 (cont.). Cumulative effects analysis of the ecosystem: FMP 1.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.5.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Removal of top predators	**I, U**	• Domestic groundfish fishery shark, seabird, and pinniped bycatch • Commercial whaling and fur seal harvests • State of Alaska directed fisheries removals • Shark, pinniped, and seabird bycatch in State of Alaska fisheries • Shark, pinniped, and seabird bycatch in foreign groundfish fishery • Subsistence mammal harvests • Climate variability effects on top predator species recruitment and distribution	**Potential negative contribution:** The IPHC longline fishery annually removes an increment of halibut, a top predator.	**Potential negative contribution:** Seabird bycatch in NPO longline fisheries and removals of targeted top predators such as Greenland turbot will result in annual removals.	**Potential negative contribution:** State of Alaska directed fisheries will annually remove an increment of top predators as targeted species and bycatch.	**Not a contributing factor:** Salmon farming will not affect top predators.	**Not a contributing factor:** Subsistence fishing will not affect top predators.	**Potential negative contribution:** Subsistence harvests will annually remove a small increment of marine mammals.	**Potential negative contribution:** Oil and fuel spills could sporadically remove portions of top predator populations through direct mortality.	**Potential positive or negative contribution:** A regime shift could affect the recruitment and distribution of top predator populations. A regime shift would not remove top predators through direct mortality but could alter total numbers of top predators in the system by affecting recruitment.	**CS-** Rating is driven by the condition that bycatch from NPO longline fisheries operating outside the EEZ continues to remove seabirds, but also reflects the potential for incremental contributions from the IPHC longline fishery, State of Alaska groundfish fisheries, subsistence harvests of marine mammals, sporadic fuel and oil spills, and future climatic regime shifts to add to the removal of top predators by the BSAI and GOA groundfish fisheries.
Introduction of non-native species	**I**	• Domestic groundfish fishery ballast • Salmon farming • Commercial shipping • Climate variability effects on probability of successful introduction	**Potential negative contribution:** Ballast water release and hull-fouling organisms may introduce exotic marine species on a recurring basis.	**Not a contributing factor:** Predominant westward currents would tend to prevent exotics introduced to the Western Bering Sea from being carried eastward to the Alaskan shelf.	**Potential negative contribution:** Ballast water release and hull-fouling organisms associated with fishing vessels from outside Alaska may introduce exotic marine species on a recurring basis.	**Potential negative contribution:** Farmed Atlantic salmon is an exotic species. Escapes may reproduce and establish runs, competing with native species. Introduced pathogens and parasites could infect wild stocks.	**Not a contributing factor:** Subsistence fish harvests provide no evident mechanism or pathway for the introduction of exotic species.	**Not a contributing factor:** Subsistence marine mammal harvests provide no evident mechanism or pathway for the introduction of exotic species.	**Potential negative contribution:** Ballast water and hull-fouling organisms may introduce non-native species on a recurring basis. Many other pathways for the introduction of exotic marine species to Alaska have been identified (ADF&G 2002a,b).	**Potential negative contribution:** A warming trend may allow exotic populations that are currently limited by low seawater temperatures to become viable. Potential positive contribution: Low seawater temperatures may continue to limit the viability of introduced marine species.	**CS-** Rating reflects the potential for FMP 1, in combination with the IPHC and State of Alaska commercial fisheries and commercial shipping, to introduce one or more exotic species that establish viable BSAI or GOA populations. Atlantic salmon escapes from farms could also establish viable populations, and many other pathways for introductions have been identified. If a future regime shift produces warmer conditions, exotics currently limited by low ambient seawater temperatures could establish viable populations.

Table 4.5-144 (cont.). Cumulative effects analysis of the ecosystem: FMP 1.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.5.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Energy removal	**I**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Halibut fishery removals • Subsistence removals • Climate variability effects on system production	**Potential negative contribution:** The halibut fishery will annually remove energy from the system.	**Unknown:** Fishing effort outside the EEZ will annually remove energy from the Bering Sea ecosystem, but external components interactive with the BSAI ecosystem have not been characterized with respect to energy removal.	**Potential negative contribution:** State of Alaska directed fisheries will annually remove energy from the system.	**Not a contributing factor:** Salmon farming will not remove energy from the ecosystem.	**Potential negative contribution:** Subsistence fish harvests will annually remove an increment of energy from the ecosystem.	**Potential negative contribution:** Subsistence marine mammal harvests will annually remove an increment of energy from the ecosystem.	**Not a contributing factor:** There is no evident pathway or mechanism by which commercial shipping will remove energy from the system.	**Not a contributing factor:** Climate variations will affect ecosystem productivity, and energy removals will follow climate-driven trends. Under these conditions, there would be (approximately) no net change in energy balance.	**I** Total groundfish catch is estimated to remove less than 1% of the total system energy. Energy removals from external sources are not likely to increase this level to the point where long-term changes in system biomass, production, or energy cycling occur outside the range of natural variability.
Energy redirection	**I**	• Domestic groundfish fishery discards, offal, and bottom gear effort • State of Alaska directed fisheries discards, offal, and bottom gear effort • Subsistence discards and offal • Halibut fishery discards and offal • Climate variability effects on energy cycling	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Not a contributing factor:** Discards and offal production in the Western Bering Sea will not measurably alter BSAI and GOA energy pathways.	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Not a contributing factor:** Salmon farms in B.C. and Washington State will not affect energy pathways in the GOA or BSAI.	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Potential negative contribution**: Offal from subsistence marine mammal harvests will produce incremental changes to energy distribution in the BSAI and GOA.	**Potential negative contribution:** Releases of graywater and refuse from cruise ships and other vessels will produce incremental changes to energy distribution, primarily in the GOA.	**Potential positive or negative contribution:** Climate variations will affect energy cycling in the ecosystem, but information is insufficient to allow a reliable prediction of the consequences.	**I** Discards, offal, or gear-related mortality from external sources are not likely to supplement effects of the groundfish fisheries sufficiently to produce long-term changes in system biomass, respiration, production, or energy cycling outside the range of natural variability. Local water quality degradation in the immediate vicinity of fish processing facilities will occur if local conditions allow contaminants to concentrate in limited areas. Fish processing waste discharge is regulated through USEPA and Alaska Department of Environmental Conservation permitting programs.

Table 4.5-144 (cont.). Cumulative effects analysis of the ecosystem: FMP 1.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.5.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in species diversity	**I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on species level diversity	**Potential negative contribution:** Seabird bycatch levels associated with the IPHC longline fishery are unknown and could be high enough to affect species diversity.	**Potential negative contribution:** Seabird bycatch by Western Bering Sea fisheries could be high enough to affect BSAI species diversity.	**Potential negative contribution:** State of Alaska directed fisheries are managed to avoid depletions near or below minimum biologically acceptable limits. However, bycatch will annually remove an increment of seabirds.	**Potential negative contribution:** Escapes could establish viable populations. These could add to species diversity or, alternatively, reduce native stock through successful competition for spawning and rearing habitat.	**Not a contributing factor:** Subsistence fish harvests will not selectively remove enough individuals to affect species diversity.	**Potential negative contribution:** Subsistence marine mammal harvests have the potential to deplete some species to levels below minimum biologically acceptable limits.	**Potential negative contribution:** Introduced exotic species from hulls and ballast water may establish viable populations and thus alter species diversity.	**Potential positive or negative contribution:** Future climate variations may alter the productivity and distribution of individual species.	**CS-** Rating reflects the potential for seabird bycatch and subsistence harvests of marine mammals, in combination with potential effects of FMP 1, to remove sufficient numbers of individuals to influence species diversity within trophic guilds. The introduction of exotic species, currently limited by unknown factors, could increase the potential for changes in species diversity. Future climatic conditions, in combination with fisheries-related pressures, could also affect species diversity.
Change in functional (trophic) diversity	**I**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on trophic diversity	**Not a contributing factor:** The IPHC fishery will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	**Not a contributing factor:** These fisheries will not affect species or size diversity within BSAI or GOA trophic guilds.	**Not a contributing factor:** State of Alaska directed fisheries will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	**Potential negative contribution:** Diversity within a trophic guild would increase if Atlantic salmon established a viable population at the trophic level occupied by Pacific salmon.	**Not a contributing factor:** Subsistence fish harvests will not selectively remove enough individuals to affect trophic diversity.	**Potential negative contribution:** Subsistence marine mammal harvests have the potential to affect species diversity within piscivore guilds.	**Potential negative contribution:** Introduced exotic species from hulls and ballast water may establish viable populations and thus alter trophic diversity.	**Potential positive or negative contribution:** A future regime shift could affect trophic diversity by forcing trends that expand some trophic levels and contract others. A warming trend could allow exotic species to establish viable populations, thus altering trophic diversity.	**CS-** Rating reflects the potential for a climatic regime shift to decrease species diversity with one or more trophic guilds, making the affected guilds more vulnerable to fishing pressure where slow-growing species with relatively low productivity (e.g., rockfish) are involved.

Table 4.5-144 (cont.). Cumulative effects analysis of the ecosystem: FMP 1.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.5.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in functional (structural habitat) diversity	**I**	• Foreign groundfish fishery pre-MSA (1960s–1976) bottom gear effort • JV groundfish fishery bottom gear effort • Domestic groundfish bottom gear effort • Climate variability effects on structural habitat diversity	**Not a contributing factor:** This fishery does not employ bottom gear.	**Not a contributing factor:** These fisheries will not affect structural habitat in the BSAI and GOA.	**Potential negative contribution:** The scallop fishery will employ bottom dredges that will damage structural habitat and contribute a small increment in combination with the larger cumulative area affected by the BSAI and GOA groundfish fisheries.	**Not a contributing factor:** Salmon farming will not affect marine structural habitat.	**Not a contributing factor:** Subsistence fish harvests will not affect marine structural habitat.	**Not a contributing factor:** Subsistence marine mammal harvests will not affect marine structural habitat.	**Potential negative contribution:** A large oil or fuel spills could damage sensitive bottom-dwelling organisms that provide structural habitat.	**Potential positive or negative contribution:** A regime shift could change the mean annual seawater temperature sufficiently to increase or retard the growth of bottom-dwelling organisms, thus altering structural habitat diversity.	**CS-** Alternative 1 could contribute to a significant negative cumulative effect on structural habitat diversity under at least three conditions: (1) the additive effect of bottom dredging by the scallop fishery, (2) a large petroleum spill affecting a broad geographic area of bottom habitat, and/or (3) a climatic regime shift that reduces the population size and distribution of bottom-dwelling organisms that provide structural habitat.
Change in genetic diversity	**I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on genetic diversity	**Not a contributing factor:** The IPHC longline fishery is managed to avoid the concentrated targeting of fish with a narrow range of attributes.	**Not a contributing factor:** Catch removals potentially altering the genetic diversity of Western Bering Sea stocks are not expected to affect BSAI stocks, because distinct subpopulations are involved.	**Not a contributing factor:** MSST, TAC, and other catch regulation of future directed fisheries will be managed by ADF&G to sustain genetic diversity, including stocks associated with individual salmon streams.	**Potential negative contribution:** Escaped Atlantic salmon may establish viable populations that affect the genetic diversity of the GOA and BSAI ecosystems. Populations established by escaped Pacific salmon species could produce similar effects.	**Potential negative contribution:** Subsistence fish harvests may focus on particular spawning aggregations or larger fish, thus adding an annual increment to removals with the potential to decrease genetic diversity.	**Potential negative contribution:** Subsistence marine mammal harvests may concentrate on particular resident subpopulations defined by location, e.g., Cook Inlet belugas.	**Potential negative contribution:** Hull-fouling invertebrates and exotics introduced through ballast water discharge may establish viable populations in the future, potentially out-competing and displacing native species.	**Potential positive or negative contribution:** A climatic regime shift could increase the mean annual temperature of seawater sufficiently to allow exotic species to establish viable populations.	**I** Although the identified external factors could cumulatively influence genetic diversity within the BSAI and GOA ecosystems, the rating reflects the low potential for these factors to significantly affect the genetic diversity of species targeted or taken incidentally by the BSAI and GOA groundfish fisheries.

Table 4.5-144 (cont.). Cumulative effects analysis of the ecosystem: FMP 1.

Notes:
ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Island
CS- - conditionally significant negative
EEZ - Exclusive Economic Zone
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture
MSA - Magnuson-Stevens Fishery Conservation Management Act
MSST - minimum stock size threshold
NPO - North Pacific Ocean
TAC - total allowable catch
U - unknown
USEPA - United States Environmental Protection Agency

Table 4.5-145 Target species direct/indirect and cumulative effects significance ratings under FMP 1.

Direct/ Indirect Effects	Effect	Pollock, Pacific Cod and Sablefish	AI Atka Mackerel	GOA Atka Mackerel	BSAI Flatfish*	GOA Flatfish*	GOA Arrowtooth Flounder	BSAI Other Flatfish	BSAI and GOA POP	GOA Thornyhead Rockfish	BSAI Rockfish*	GOA Rockfish*	GOA Northern Rockfish
Mortality	DI	I	I	U	I	I	I	I	I	I	I	I	I
	CE	I	I	U	I	I	I	I	I	I	I	I	I
Change in Biomass	DI	I	I	U	I	U	I	U	I	I	U	U	I
	CE	I	I	U	I	U	I	U	I	I	U	U	I
Spatial/ Temporal Concentration of Catch - change in genetic structure	DI	I	I	U	I	U	I	U	I	I	U	U	I
	CE	I	I	U	I	U	I	U	I	I	U	U	I
Spatial/ Temporal Concentration of Catch - change in reproductive success	DI	I	I	U	I	U	I	U	I	I	U	U	I
	CE	I	I	U	I	U	I	U	I	I	U	U	I
Change in prey availability	DI	I	I	I	I	U	I	U	I	I	U	U	I
	CE	I	I	U	I	U	I	U	I	I	U	U	I
Change in Habitat	DI	I	I	U	I	U	I	U	I	I	U	U	I
	CE	I	I	U	I	U	I	U	I	I	U	U	I

Notes: *BSAI Flatfish - BSAI yellowfin sole, BSAI flathead sole, BSAI rock sole, BSAI arrowtooth flounder, BSAI Alaska plaice and BSAI Greenland turbot
*GOA Flatfish - GOA shallow water flatfish, GOA flathead sole, GOA deep water flatfish and GOA rex sole
*BSAI Rockfish - BSAI northern rockfish, BSAI shortraker/rougheye rockfish and BSAI other rockfish
*GOA Rockfish - GOA shortraker/rougheye rockfish, GOA slope rockfish, GOA pelagic shelf rockfish, GOA demersal shelf rockfish
AI - Aleutian Islands
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
DI - direct/indirect effect
EBS - Eastern Bering Sea
GOA - Gulf of Alaska
I - insignificant
POP - Pacific ocean perch
U - unknown
Please refer to Table 4.1-1 for the significance criteria for target species.

Table 4.5-146 Prohibited, other, forage and non-specified species direct/indirect and cumulative effects significance ratings under FMP 1.

Direct/ Indirect Effects	Effect	Prohibited Species								Other Species	Forage Fish	Non-specified Species
		Pacific Halibut	BSAI Chinook and other salmon	GOA Chinook and other salmon	Pacific Herring	BSAI and GOA Crab						Grenadier
						BSAI Crab*	GOA Red King	GOA Crab*	BSAI and GOA Golden King			
Mortality	DI	I	I	I	I	I	I	U	U	U	I	U
	CE	I	CS-	I	I	CS-	CS-	U	U	U	I	U
Change in biomass level	DI	NA	NA	NA	NA	I	I	U	U	U	U	U
	CE	NA	NA	NA	NA	CS-	CS-	U	U	U	U	U
Change in reproductive success	DI	I	U	U	I	U	U	U	U	U	U	U
	CE	I	U	U	I	U	U	U	U	U	U	U
Change in prey availability	DI	I	U	U	I	U	U	U	U	NA	U	NA
	CE	I	U	U	U	U	U	U	U	NA	U	NA
Change in Habitat	DI	I	I	I	I	I	I	I	I	U	U	NA
	CE	I	U	U	U	U	U	U	U	U	U	NA
Change in genetic structure	DI	NA	U	U	NA	NA	NA	NA	NA	U	U	U
	CE	NA	U	U	NA	NA	NA	NA	NA	U	U	U

Notes: *BSAI Crab - BSAI bairdi Tanner, BSAI opilio Tanner, BSAI red king and BSAI blue king
*GOA Crab - GOA bairdi Tanner and GOA blue king
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
CS- - conditionally significant negative/adverse
DI - direct/indirect effect
GOA - Gulf of Alaska
I - insignificant
NA - not applicable
U - unknown
Please refer to Table 4.1-1 for the significance criteria for Pacific halibut, Pacific herring, other species, forage fish species and non-specified species.
Please refer to Table 4.1-2 for the significance criteria for crab.
Please refer to Table 4.1-3 for the significance criteria for salmon.

Table 4.5-147 Habitat direct/indirect and cumulative effects significance ratings under FMP 1.

Direct/Indirect Effects	Effect	Bering Sea	Aleutian Islands	Gulf of Alaska
Changes to Living Habitat Direct mortality of benthic organisms	**DI**	I	I	I
	CE	CS--	CS-	CS-
Changes to Benthic Community Structure	**DI**	I	I	I
	CE	CS-	CS-	CS-
Changes in Distribution of Fishing Effort Geographic diversity of management measures	**DI**	I	I	I
	CE	CS-	CS-	CS-

Notes: CE - cumulative effect
CS- -conditionally significant adverse
DI - direct/indirect effect
I - insignificant
Refer to Table 4.1-4 for habitat significance criteria

Table 4.5-148 Seabirds direct/indirect and cumulative effects significance ratings under FMP 1.

Direct/ Indirect Effects	Effect	Short-tailed Albatross	Other Albatross and Shearwaters*	Northern Fulmar	Species of Management Concern*	Other Piscivorous Species*	Other Planktivorous Species*	Spectacled and Steller's Eiders
Mortality (Incidental Take)	**DI**	I	I	I	I	I	I	I
	CE	CS-	S- Albatross CS- Shearwaters	I	CS- Kittiwakes S- Murrelets	I	I	I
Availability of Food	**DI**	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I
Benthic Habitat	**DI**	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	U

Notes: *Other Albatross and Shearwaters - Laysan and Black-footed Albatross,Sooty and Short-tailed Shearwaters
*Other Piscivorous Species - Alcids (except auklets), gulls, jaegers, terns, and cormorants
*Other Planktivorous Species - Auklets and storm-petrels
*Species of Management Concern - Red-legged Kittiwake, Marbled Murrelet, and Kittlitz's Murrelet
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
S- significant adverse
U - unknown
Please refer to Table 4.1-5 for the significance criteria for seabirds.

Table 4.5-149 Marine mammals direct/indirect and cumulative effects significance ratings under FMP 1.

Direct/ Indirect Effects	Effect	W Steller Sea Lion	E Steller Sea Lion	Northern Fur Seal	Harbor Seal	Killer Whale (Transients)	Other Pinnipeds*	Other Toothed Whales*	Baleen Whales*	Sea Otters
Mortality (Incidental Take and Entanglement)	**DI**	I	I	I	I	I	I	I	I	I
	CE	S-	I	I	I	I	CS-[1] I[2]	I	CS-[3] I[4]	CS-
Prey Availability	**DI**	I	I	I	I	I	I	I	I	I
	CE	CS-	I	CS-	CS-	I	I	I	I	I
Spatial/ Temporal Concentration of Fisheries	**DI**	I	I	I	I	I	I	I	I	I
	CE	CS-	I	CS-	CS-	I	I	I	I	I
Disturbance	**DI**	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I

Notes: [1] - Spotted, ringed, bearded and ribbon seals
[2] - Walrus and elephant seal
[3] - Fin, humpback and sei whales
[4] - Minke, gray, bowhead, northern right and blue whales
*Baleen Whales - Blue Whale, Fin Whale, Sei Whale, Minke Whale, Humpback Whale, Gray Whale, Northern Right Whale, Bowhead Whale.
*Other Pinnipeds - Pacific Walrus, Spotted Seal, Bearded Seal, Ringed Seal, Ribbon Seal, Elephant Seal
*Other Toothed Whales - Sperm Whales, Beaked Whales, White Sided Dolphin, Beluga Whale, Harbor Porpoise, Dall's Porpoise.
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
E - eastern stock
I - insignificant
W - western stock
Please refer to Table 4.1-6 for the significant criteria for marine mammals.

Table 4.5-150 Socioeconomics direct/indirect and cumulative effects significance ratings under FMP 1.

Direct/Indirect Effects	Effect	Catcher Vessels	Catcher Processors	Inshore Processors/ Motherships
Groundfish Landings by Species Group	DI	I	I	I
	CE	I	I	I
Groundfish Gross Product Value	DI	I	I	I
	CE	I	I	I
Employment	DI	I	I	I
	CE	I	I	I
Payments to Labor	DI	I	I	I
	CE	I	I	I
Product Quality and Product Utilization Rate	DI	NA	I	I
	CE	NA	I	I
Excess Capacity	DI	I	I	I
	CE	I	I	I
Average Costs	DI	I	I	I
	CE	I	I	I
Fishing Vessel Safety	DI	I	I	NA
	CE	I	I	NA

Direct/Indirect Effects	Effect	Regions and Communities
In-Region Processing	DI	I/S+
	CE	I/S+
Regionally Owned At-Sea Processors	DI	I
	CE	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	DI	I/S+
	CE	I/S-
In-Regional Deliveries of Regionally Owned Catcher Vessels	DI	I/S+
	CE	I/S-
Total Direct, Indirect, and Induced Labor Income and FTEs	DI	I/S+
	CE	I/S-

Direct/Indirect Effects	Effect	CDQ	EJ	Market Channels	Non-Consumptive and Non-Use
CDQ	DI	I	NA	NA	NA
	CE	I	NA	NA	NA
EJ	DI	NA	I	NA	NA
	CE	NA	I/CS-	NA	NA
Benefits to U.S. Consumers	DI	NA	NA	I	NA
	CE	NA	NA	I	NA
Benefits Derived from Marine Ecoystems	DI	NA	NA	NA	I
	CE	NA	NA	NA	CS-

Direct/Indirect Effects	Effect	Subsistence
Subsistence use of groundfish	DI	I
	CE	I
Subsistence Use of Salmon	DI	I
	CE	I
Subsistence Use of Steller sea lions	DI	I
	CE	I
Indirect subsistence use: income and joint	DI	I
	CE	I

Notes: In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. The same threshold is roughly used to assess changes in qualitative indicators (e.g. fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgement of the socioeconomic analysts.

CDQ - community development quota
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
EJ - environmental justice
FTE - full-time equivalent
NA - not applicable
S+ - significant beneficial
S- - significant negative

Table 4.5-151 Ecosystem direct/indirect and cumulative effects significance ratings under FMP 1.

Direct/Indirect Effects	Effect	Ecosystem
Change in Pelagic Forage Availability	**DI**	I
	CE	CS-
Spatial and Temporal Concentration of Fishery Impact on Forage	**DI**	I
	CE	CS-
Removal of Top Predators	**DI**	I, U
	CE	CS-
Introduction of Non-native Species	**DI**	I
	CE	CS-
Energy Removal	**DI**	I
	CE	I
Energy Redirection	**DI**	I
	CE	I
Change in Species Diversity	**DI**	I, U
	CE	CS-
Change in Functional (trophic) Diversity	**DI**	I
	CE	CS-
Change in Functional (structural habitat) Diversity	**DI**	I
	CE	CS-
Change in Genetic Diversity	**DI**	I,U
	CE	I

Notes: CE - cumulative effect
CS- conditionally significant adverse
DI - direct/indirect effect
I - insignificant
U - unknown
Please refer to Table 4.1-7 for the ecosystem significance criteria.

Table 4.6-1. Cumulative effects analysis for eastern Bering Sea pollock: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of AK Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**No**, large removals of pollock occurred in the foreign, domestic, JV and fisheries, but there does not appear to be a lingering effect on the BSAI pollock populations (see Section 3.5.1.1)	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue and is not accounted for in US harvest quotas.	**Not a contributing factor** Future catch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of pollock.	**Yes, Insignificant** Pollock are fished at less than the OFL and are above the minimum stock size. The combined removals due to the federal groundfish fishery in combination with potential removals from external events are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass	**S-**	**No**, past large removals of pollock and other past effects (see Section 3.5.1.1) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of pollock.	**Yes, Significant Negative** Although the OFL is not exceeded under this FMP, model projections show the EBS pollock stock above the MSST during the years 2003-2005, but below MSST for 2006 and 2007.

4.6-1 (cont). Cumulative effects analysis for eastern Bering Sea pollock: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of AK Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**I**	**No**, see above.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct localized mortality of pollock such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.
Change in Reproductive Success	**I**	**Yes**, past fisheries could have had a lingering beneficial effect on pollock recruitment by reducing the adult pollock biomass. Past commercial whaling and sealing also removed large predators. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.1)	**Potential Beneficial Contribution:** Fishery removals could have a beneficial effect on pollock recruitment by reducing the adult pollock biomass.	**Potential Beneficial Contribution:** Fishery removals could have a beneficial effect on pollock recruitment by reducing the adult pollock biomass.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

4.6-1 (cont). Cumulative effects analysis for eastern Bering Sea pollock: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of AK Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.1). **No,** lingering population level effects from fisheries catch and bycatch of pollock prey species are not expected (see Section 3.5.1.1).	**Potential Adverse Contribution:** Bycatch of pollock forage fish is expected to continue.	**Potential Adverse Contribution:** Bycatch of pollock forage fish is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the pollock stock is unable to sustain itself at or above MSST
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.1)	**Potential Adverse Contribution:** Habitat disturbance that may cause change in spawning or rearing success is expected to continue.	**Potential Adverse Contribution:** Habitat disturbance that may cause change in spawning or rearing success is expected to continue.	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external habitat disturbance factors is not expected to lead to a detectable change in spawning or rearing success such that the ability of the pollock stock to sustain itself at or above MSST is jeopardized.

Notes: BSAI - Bering Sea and Aleutian Islands
EBS - Eastern Bering Sea
FMP - Fishery Management Plan
I - insignificant
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level
S- - significant adverse

Table 4.6-2. Cumulative effects analysis for Gulf of Alaska Pollock: FMPs 2.1 and 2.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Pollock Fishery	State of Alaska Pink Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**No**, large removals of pollock occurred in the foreign, state, federal domestic, and JV fisheries and in the State of Alaska shrimp and bait fisheries, but there does not appear to be a lingering effect on the GOA pollock populations (see Section 3.5.1.1).	**Not a contributing factor** Future catch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality.	**Potential Adverse Contribution:** Bycatch of pollock in this fishery is expected to continue and is not accounted for in the harvest level.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of pollock.	**Yes, Insignificant** Pollock are fished at less than the OFL and are above the minimum stock size. While an extreme pollution event could cause significant mortality in a localized area, the combined effect of internal removals and removals due to reasonably foreseeable external events is not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass	**I**	**No**, past large removals of pollock and other past effects (see Section 3.5.1.1) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of pollock.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently reduce the pollock biomass such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.6-2 (cont.). Cumulative effects analysis for Gulf of Alaska Pollock: FMPs 2.1 and 2.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Pollock Fishery	State of Alaska Pink Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**I**	**No**, see above.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct localized mortality of pollock such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.6-2 (cont.). Cumulative effects analysis for Gulf of Alaska Pollock: FMPs 2.1 and 2.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Pollock Fishery	State of Alaska Pink Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Repro-ductive Success	**I**	**Yes,** there are lingering past effects due to Climate Changes and Regime Shifts (refer to section 3.5.1.1). **No,** past foreign fisheries tended to target younger pollock and the amount of pollock bycaught in these fisheries is not well documented. However, there is no evidence that the fisheries have had lingering effects on pollock recruitment.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events, especially if large in scale, could result in localized reduced recruitment.	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.6-2 (cont.). Cumulative effects analysis for Gulf of Alaska Pollock: FMPs 2.1 and 2.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Pollock Fishery	State of Alaska Pink Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to section 3.5.1.10). **No,** lingering population level effects from fisheries catch and bycatch of pollock prey species, and the effects of EVOS on these species, are not expected (See section 3.5.1.1).	**Potential Adverse Contribution:** Bycatch of forage species in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of forage species in this fishery is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the pollock stock is unable to sustain itself at or above MSST
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries, EVOS, and Climate Changes and Regime Shifts (refer to Section 3.5.1.1)	**Potential Adverse Contribution:** Habitat disturbance may cause changes in spawning or rearing success	**Potential Adverse Contribution:** Habitat disturbance may cause changes in spawning or rearing success	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external habitat disturbance factors is not expected to lead to a detectable change in spawning or rearing success such that the ability of the pollock stock to sustain itself at or above MSST is jeopardized.

Table 4.6-2 (cont.). Cumulative effects analysis for Gulf of Alaska Pollock: FMPs 2.1 and 2.2.

Notes: EVOS - *Exxon Valdez* oil spill
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
MSST - minimum stock size threshold
MSY - maximum size yield
OFL - overfishing level

Table 4.6-3. Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**Yes**, large removals of Pacific cod occurred in the past foreign, domestic, and JV fisheries, and in the State of Alaska bait fisheries. The Pacific cod biomass is below $B_{40\%}$ and there are likely lingering effects from this past fishing pressure. (see Section 3.5.1.2)	**Not a contributing factor**: Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing factor** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contribu-ting factor**: Most future catch and bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, Insignificant** Model projections indicate catch will be equal to, but not exceed the OFL for all years. External fisheries will not contribute to fishing mortality. While an extreme pollution event could cause significant mortality in a localized area, the combined effect of internal removals and removals due to reasonably foreseeable external events is not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.

Table 4.6-3 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Biomass	**S-**	**Yes,** Large removals of Pacific cod did occur in the past and could have a lingering effect on the present-day stock, the biomass of which is below $B_{40\%}$	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, Significantly adverse.** Due to the internal effects of the FMP, biomass of BSAI stock is projected to fall below the MSST in 2007. The additional mortality from eternal human controlled events will likely cause additional reduction in biomass.
Change in Genetic Structure of Population	**U**	**No**, see above.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of Pacific cod such that stock genetics are threatened.	**Yes,** but the significance is **Unknown**. Evidence is insufficient to conclude whether the combined effects of the internal and external actions/events would impact the stock's ability to maintain itself at or above MSST.

Table 4.6-3 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	**U**	**Yes**, past fisheries could have had a lingering negative effect on Pacific cod recruitment. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.2)	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes,** but the significance is **Unknown** Evidence is insufficient to conclude whether the combined effects of the internal and external actions/events would impact the stock's ability to maintain itself at or above MSST.

Table 4.6-3 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.2). **No,** lingering population level effects from fisheries catch and bycatch of Pacific cod prey species are not expected (see Section 3.5.1.2).	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST	**Potential Beneficial/ Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Pacific cod stock is unable to sustain itself at or above MSST

Table 4.6-3 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	**U**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.2)	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success	**Potential Beneficial/ Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes,** but the significance is **Unknown** Evidence is insufficient to conclude whether the combined effects of the internal and external actions/events would impact the stick's ability to maintain itself at or above MSST.

Notes: $B_{40\%}$ - the long-term average biomass that would be expected under average recruitment when the stock is harvested at a fishing mortality rate equal to $F_{40\%}$ (see Appendix F).
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
I - insignificant
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level]
S- - significant adverse
U - unknown

Table 4.6-4. Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	State of Alaska Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**Yes**, large removals of Pacific cod occurred in the past foreign, domestic, and JV fisheries, and in the State of AK groundfish, crab and bait fisheries. The Pacific cod biomass is below $B_{40\%}$ and there are likely lingering effects from this past fishing pressure (See Section 3.5.1.2).	**Not a contributing factor :** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing factor:** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing factor:** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing factor:** Future catch and bycatch removals would be accounted for in annual harvest rate and therefore do no add additional fishing mortality.	**Potential Adverse contribution** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, Insignificant** Pacific cod are fished at less than the OFL and stock size is projected to be above $B_{40\%}$ from 2003-2007.

Table 4.6-4 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	State of Alaska Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Biomass	**S-**	**Yes,** Large removals of Pacific cod did occur in the past and could have a lingering effect on the present-day stock, the biomass of which is below $B_{40\%}$	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Pacific cod.	**Yes, Significantly adverse.** Due to the internal effects of the FMP, biomass of the GOA stock is projected to fall below the MSST in 2004.

Table 4.6-4 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	State of Alaska Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**U**	**No**, see above.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to direct localized mortality of Pacific cod such that stock genetics are threatened.	**Yes,** but the significance is **Unknown**. Evidence is insufficient to conclude whether the combined effects would impact the stock's ability to maintain itself at or above MSST.

Table 4.6-4 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	State of Alaska Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	**U**	**Yes**, past fisheries could have had a lingering negative effect on Pacific cod recruitment, particularly in the GOA where the State groundfish fishery is very localized. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.2)	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes,** but the significance is **Unknown**. Evidence is insufficient to conclude whether the combined effects would impact the stock's ability to maintain itself at or above MSST.

Table 4.6-4 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	State of Alaska Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.2). **No,** lingering population level effects from fisheries catch and bycatch of Pacific cod prey species are not expected (see Section 3.5.1.2).	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Pacific cod stock is unable to sustain itself at or above MSST

Table 4.6-4 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of Alaska Crab Fishery	State of Alaska Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	**U**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.2)	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes,** but the significance is **Unknown**

Notes: $B_{40\%}$ - the long-term average biomass that would be expected under average recruitment when the stock is harvested at a fishing mortality rate equal to $F_{40\%}$ (see Appendix F).
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture
MSY - maximum sustainable yield
MSST - minimum stock size threshold
OFL - overfishing level
S- - significant adverse
U - unknown

Table 4.6-5. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**Yes**, large removals of Sablefish occurred, particularly in the JV and domestic fisheries. Catches that were under reported during the late 1980s may have contributed to abundance declines in the 1990s (see Section 3.5.1.3)	**Not a contributing factor :** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, discards are not accounted for.	**Potential Adverse Contribution:** Future bycatch removals are not accounted for in the three major state fisheries.	**Potential Adverse Contribution:** Catch and bycatch of highly migratory Sablefish are expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, Insignificant** Sablefish are fished at well below the OFL. While an extreme pollution event could cause significant mortality in a localized area, the combined effect of internal removals and removals due to reasonably foreseeable external events is not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.

4.6-5 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Change in Biomass	**S-**	**No,** while past large removals of sablefish and other past effects on biomass have been identified (see Section 3.5.1.3), these do not appear to have had a lingering effect on the ability of the stock to sustain itself above the MSST.	**Potential Adverse Contribution:** Bycatch of sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of sablefish.	**Yes, Significant Negative** Spawning biomass is projected to decrease and remain below MSST under the direct effects of FMP 2.1. The combined potential adverse effects of the external factors could add to the adverse effect. Therefore, cumulative effects are also considered significantly adverse.
Change in Genetic Structure of Population	**I**	**No**, while spatial/temporal concentration of catch occurred in the State directed sablefish fisheries, there are no lingering effects due to the migratory nature of the fish (refer to Section 3.5.1.3).	**Potential Adverse Contribution:** Bycatch of sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and bycatch of sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to direct localized mortality of sablefish such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

4.6-5 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	**I**	**No**, see above	**Potential Adverse Contribution:** Bycatch of sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch and catch of sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

4.6-5 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.3). **No,** lingering population level effects from fisheries catch and bycatch of sablefish prey species are not expected (see Section 3.5.1.3).	**Potential Adverse Contribution:** Bycatch of sablefish forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of sablefish forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch and catch of sablefish in this fishery is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST.	**Potential Beneficial/ Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the sablefish stock is unable to sustain itself at or above MSST.

4.6-5 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska sablefish: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of Alaska Groundfish Fishery	Canadian Fisheries in Canada	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.3).	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success.	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success.	**Potential Beneficial/ Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the sablefish stock is unable to sustain itself at or above MSST

Notes: FMP - fishery management plan
I - insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level
S- - significant adverse

Table 4.6-6. Cumulative effects analysis for Bering Sea and Aleutian Islands Atka mackerel: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**No**, large removals of Atka mackerel occurred in the foreign, domestic, JV and fisheries, but there does not appear to be a lingering effect on the BSAI Atka mackerel populations (see Section 3.5.1.4).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Atka mackerel.	**Yes, Insignificant** Atka mackerel are fished at less than the OFL and are above the minimum stock size. Any potential removals due to marine pollution are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass	**S-**	**No**, past large removals of Atka mackerel and other past effects (see Section 3.5.1.4) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Atka mackerel.	**Yes, Significant Negative** The combination of internal and external factors could sufficiently reduce the Atka mackerel biomass such that the ability of the stock to maintain itself at or above MSST is jeopardized.
Change in Genetic Structure of Population	**U**	**Unknown.** Since the Atka mackerel fishery was highly localized past foreign, JV, and domestic fisheries are found to have had lingering effects on the spatial/temporal distribution of the fish. However, the effect of this change in distribution on genetic structure is unknown.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct localized mortality of Atka mackerel such that stock genetics are threatened.	**Yes,** but the significance is **Unknown.**

Table 4.6-6 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Atka mackerel: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	**U**	**Yes**, Past commercial whaling and removed large predators and could have had a beneficial effect. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.4).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes,** but the significance is **Unknown.**
Change in Prey Availability	**I**	**Yes,** see above.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST.	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Atka mackerel stock is unable to sustain itself at or above MSST.
Change in Habitat Suitability	**U**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.4).	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success.	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes,** but the significance is **Unknown.**

Notes: BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
I - insignificant
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level
S- - significant adverse
U - unknown

Table 4.6-7. Cumulative effects analysis for Bering Sea and Aleutian Islands Greenland turbot: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Greenland turbot mortality.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Greenland turbot.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass Level	S-	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Greenland turbot mortality and thus change the biomass level.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Significant Negative** The combined effect of the FMP and reasonably foreseeable future external effects provide evidence that biomass will tend toward levels that jeopardize the ability of the stock to sustain itself at or above the MSST.
Change in Genetic Structure of Population	I	No	**Potential Adverse Contribution:** Acute and/or chronic pollution events result in Greenland turbot mortality in a directed manner that could then alter the genetic structure of the population.	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of Greenland turbot such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.

Table 4.6-7 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Greenland turbot: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.9).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Prey Availability	I	Yes, Past Foreign, JV, and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.9).	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST.
Change in Habitat Suitability	I	Yes, Past Foreign, JV, and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.9).	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment.	**Yes, Insignificant** Levels of habitat disturbance are not expected to lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself above the MSST.

Notes: FMP - fishery management plan
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level

Table 4.6-8. Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**S-**	**Yes,** Past Foreign, JV, and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to demersal shelf rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of demersal shelf rockfish.	**Yes, Significant Adverse** Cumulative effects are expected to jeopardize the capacity of the stock to maintain current population levels.

Table 4.6-8 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Biomass Level	**S-**	**Yes,** Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to demersal shelf rockfish mortality and thus change the biomass level.	**Potential Beneficial/ Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Significant Adverse** Cumulative effects are expected to jeopardize the capacity of the stock to maintain current population levels.

Table 4.6-8 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**CS-**	**No**	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of demersal shelf rockfish such that stock genetics are threatened.	**Yes, Conditionally Significant Adverse** There is evidence that the combined effect of the direct effects associated with the FMP and the reasonably foreseeable future effects could lead to a detectable reduction in genetic diversity such that it jeopardizes the stocks ability to maintain current population levels.

Table 4.6-8 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	**CS-**	**Yes**, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/ Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Conditionally Significant Adverse** There is evidence that the combined effect of the direct effects associated with the FMP, past persistent effects and the reasonably foreseeable future effects could lead to a detectable decrease in reproductive success such that it jeopardizes the stocks ability to maintain current population levels.

Table 4.6-8 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**U**	**Yes**, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Potential Adverse Effect:** Catch of herring, a prey item of demersal shelf rockfish is expected to continue.	**Potential Adverse Effect:** Catch of shrimp, a prey item of demersal shelf rockfish is expected to continue.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish prey is not expected in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish prey is not expected to occur in this fishery.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/ Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.

Table 4.6-8 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	**CS-**	**Yes**, Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Halibut Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Demersal shelf rockfish habitat degradation is not expected to occur in this fishery.	**Not a Contributing Factor**: Demersal shelf rockfish habitat degradation is not expected to occur in this fishery.	**Potential Adverse Effect:** Habitat disruption by State of Alaska fishery gear is expected to continue and could cause disruption of demersal shelf rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of demersal shelf rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/ Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Conditionally Significant Adverse:** The combined effect of indirect effects of the FMP, persistent past effects and reasonably foreseeable future effects could lead to levels of habitat disturbance that decrease the spawning and/or rearing success of demersal shelf rockfish.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture
S- - significant adverse
U - unknown

Table 4.6-9. Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**S-**	**Yes**, Past Foreign, JV, and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to demersal shelf rockfish mortality.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of demersal shelf rockfish.	**Yes, Significant Adverse** Cumulative effects are expected to jeopardize the capacity of the stock to maintain current population levels.
Change in Biomass Level	**CS-**	**Yes**, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to demersal shelf rockfish mortality and thus change the biomass level.	**Potential Beneficial/ Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Conditionally Significant Adverse** Cumulative effects could jeopardize the capacity of the stock to maintain current population levels.

Table 4.6-9 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**CS-**	**No**	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population.	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of demersal shelf rockfish such that stock genetics are threatened.	**Yes, Conditionally Significant Adverse** There is evidence that the combined effect of the direct effects associated with the FMP and the reasonably foreseeable future effects could lead to a detectable reduction in genetic diversity such that it jeopardizes the stocks ability to maintain current population levels.

Table 4.6-9 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	**CS-**	**Yes**, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery.	**Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery.	**Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment.	**Potential Beneficial/ Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Conditionally Significant Adverse** There is evidence that the combined effect of the direct effects associated with the FMP, past persistent effects and the reasonably foreseeable future effects could lead to a detectable decrease in reproductive success such that it jeopardizes the stocks ability to maintain current population levels.

Table 4.6-9 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**U**	**Yes**, Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Potential Adverse Effect**: Catch of herring, a prey item of demersal shelf rockfish is expected to continue.	**Potential Adverse Effect**: Catch of shrimp, a prey item of demersal shelf rockfish is expected to continue.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish prey is not expected in this fishery.	**Not a Contributing Factor**: Bycatch of demersal shelf rockfish prey is not expected to occur in this fishery.	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality.	**Potential Beneficial/ Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Unknown** The cumulative effects are unknown.

Table 4.6-9 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	**CS-**	**Yes**, Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Halibut Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13).	**Not a Contributing Factor**: Demersal shelf rockfish habitat degradation is not expected to occur in this fishery.	**Not a Contributing Factor**: Demersal shelf rockfish habitat degradation is not expected to occur in this fishery.	**Potential Adverse Effect**: Habitat disruption by State of Alaska fishery gear is expected to continue and could cause disruption of demersal shelf rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution**: Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of demersal shelf rockfish spawning and/or rearing habitats.	**Potential Adverse Contribution**: Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success.	**Potential Beneficial/ Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown.	**Yes, Conditionally Significant Adverse**: Although the indirect effects associated with the FMP is unknown, the combined effect of the proposed fishing levels, persistent past effects and reasonably foreseeable future effects could lead to levels of habitat disturbance that decrease the spawning and/or rearing success of demersal shelf rockfish.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
IPHC - International Pacific Halibut Commission
JV - joint venture
S- - significant adverse
U - unknown

Table 4.6-10. Cumulative effects analysis for chinook and other salmon in the Bering Sea and Aleutian Islands: FMPs 2.1 and 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	Land Management Practices	Long-term Climate Change and Regime Shift	
Mortality	**CS-**	**Yes**	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts from increases in bycatch in GOA and BSAI, when combined with state commercial fisheries, could hinder recovery of depressed salmon stocks.	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts from increases in bycatch in GOA and BSAI, when combined with state subsistence fisheries, could hinder recovery of depressed salmon stocks.	**Not a contributing factor-** significant impacts causing direct mortality is not expected.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally Significant Adverse-** given the poor stock status of salmon runs in western Alaska* and the combined effects of groundfish and state fisheries bycatch potential in BSAI and GOA, sustainability of depressed salmon stocks could be impacted.
Change in Spawning Habitat	**I**	**Yes**	**Not a Contributing Factor**: no direct interaction between groundfish fisheries and salmon spawning habitat occurs because Pacific salmon species spawn in freshwater.	**Unknown**: potential interactions and effects have not been determined.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Not a contributing factor**- not expected to significantly change physical habitat	**Unknown-**watersheds used by spawning salmon are managed by various agencies and groups and are influenced by land management practices as well.

Table 4.6-10 (cont.). Cumulative Effects Analysis for Chinook and Other Salmon in the Bering Sea and Aleutian Islands: FMPs 2.1 and 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	Land Management Practices	Long-term Climate Change and Regime Shift	
Change in prey availability	**U**	**Not Determined**	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Not a contributing factor-** significant impacts causing change in prey structure and/or availability are not expected.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** potential changes to prey availability for salmon have not been determined and effects are unknown.
Change in genetic structure of population	**U**	**Not Determined**	**Unknown**: composition of bycatch has not been determined	**Unknown**: composition of bycatch has not been determined	**Not a contributing factor-** significant impacts causing change in genetic structure of stock are not expected.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** bycatch composition has not been determined and current stock composition for all species of salmon is unknown.
Change in reproductive success	**CS-**	**Yes**	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts from increases in bycatch in GOA and BSAI, when combined with state commercial fisheries, could hinder recovery of depressed salmon stocks.	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts from increases in bycatch in GOA and BSAI, when combined with state subsistence fisheries, could hinder recovery of depressed salmon stocks.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Conditionally Signifcant Adverse-** given the poor stock status of salmon runs in western Alaska* and the combined bycatch potential of BSAI and GOA, sustainability of depressed salmon stocks could be impacted. Salmon reproductive success depends on spawning adults reaching destined spawning habitat. Thus, increased catch of these adults could hinder successful migration.

Table 4.6-10 (cont.). Cumulative Effects Analysis for Chinook and Other Salmon in the Bering Sea and Aleutian Islands: FMPs 2.1 and 2.2.

Notes: * Western Alaska incorporates Kuskokwim, Nushagak, and Yukon rivers, also referred to as the AYK region (Arctic-Yukon-Kuskokwim-region).
BSAI - Bering Sea and Aleutian Islands
CS - - conditionally significantly adverse
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
U - unknown

Table 4.6-11. Cumulative effects analysis for chinook and other salmon in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Management Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Mortality	**CS-**	**Yes**	**Potential Adverse Contribution:** current stock status of salmon in this region is considered stable. However, combined increases in bycatch in BSAI and GOA, when combined with state commercial fisheries, could impact sustainability of stock.	**Potential Adverse Contribution:** current stock status of salmon in this region is considered stable. However, combined increases in bycatch in BSAI and GOA, when combined with state subsistence fisheries, could impact sustainability of stock.	**Insignificant:** current stock status of salmon in this region is considered stable and sport fisheries are not viewed as having significant impact to salmon stock.	**Not a contributing factor-** significant impacts causing direct mortality is not expected.	**Potential Beneficial Contribution:** may help to maintain GOA stock status.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally Significant Adverse-** although current stock status of salmon in this region is considered stable, the combined effects of groundfish and state fisheries bycatch potential in BSAI and GOA, could impact sustainability of some stocks.

Table 4.6-11 (cont.). Cumulative effects analysis for chinook and other salmon in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Management Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in Spawning Habitat	**I**	**Yes**	**Not a Contributing Factor**: no direct interaction between groundfish fisheries and salmon spawning habitat occurs because Pacific salmon species spawn in freshwater.	**Unknown**: potential interactions and effects have not been determined.	**Unknown**: potential interactions and effects have not been determined.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Not a Contributing Factor**: program does not include natural spawning habitat of salmon.	**Not a contributing factor**- not expected to significantly change physical habitat.	**Unknown-** watersheds used by spawning salmon are managed by various agencies and groups and are influenced by land management practices as well.
Change in prey availability	**U**	**Not determined**	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Not a contributing factor-** significant impacts causing change in prey structure and/or availability are not expected.	**Not a Contributing Factor**: program does not include prey species.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment.	**Unknown-** potential changes to prey availability for salmon have not been determined and effects are unknown.

Table 4.6-11 (cont.). Cumulative effects analysis for chinook and other salmon in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Management Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in genetic structure of population	**U**	**Not determined**	**Unknown**: composition of bycatch has not been determined.	**Unknown**: composition of bycatch has not been determined.	**Unknown**: composition of bycatch has not been determined.	**Not a contributing factor-** significant impacts causing change in genetic structure of stock are not expected.	**Unknown:** effects of salmon bycatch on diversity are unknown.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** bycatch composition has not been determined and accurate stock composition for all species of salmon is unknown.

Table 4.6-11 (cont.). Cumulative effects analysis for chinook and other salmon in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Management Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in reproductive success	**U**	**No**	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Potential Beneficial Contribution:** may help to maintain GOA stock status.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** although stock status of salmon in this region is considered stable, the combined bycatch potential of BSAI and GOA could impact sustainability of certain stocks. Salmon reproductive success depends on spawning adults reaching destined spawning habitat. Thus, increased catch of these adults could hinder successful migration.

Notes:
BSAI - Bering Sea and Aleutian Islands
CS - conditionally significant adverse
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
U - unknown

Table 4.6-12. Cumulative effects analysis for chinook and other salmon in the Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Managemen t Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** significant impacts causing direct mortality is not expected.	**Potential Beneficial Contribution:** may help to maintain GOA stock status.	**Not a contributing factor:** not expected to result in direct mortality.	**Insignificant-** current stock status of salmon in this region is considered stable. Although bycatch of Chinook salmon originating in the Pacific Northwest occurs in Alaska, ADF&G intensely manages fisheries to ensure bycatch does not exceed limits set forth by the ESA (Section 7).

Table 4.6-12 (cont.). Cumulative effects analysis for chinook and other salmon in the Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Management Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in Spawning Habitat	**I**	**Yes**	**Not a Contributing Factor**: no direct interaction occurs between groundfish fisheries and salmon spawning habitat because Pacific salmon species spawn in freshwater.	**Unknown**: potential interactions and effects have not been determined.	**Unknown**: potential interactions and effects have not been determined.	**Potential adverse contribution:** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Not a Contributing Factor**: program does not include natural spawning habitat of salmon.	**Not a contributing factor**: not expected to significantly change physical habitat.	**Unknown-**watersheds used by spawning salmon are managed by various agencies and groups and are influenced by land management practices as well.

Table 4.6-12 (cont.). Cumulative effects analysis for chinook and other salmon Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Managemen t Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in prey availability	**U**	**Not determined**	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Not a contributing factor-** significant impacts causing change in prey structure and/or availability are not expected.	**Not a Contributing Factor**: program does not include prey species	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment.	**Unknown-** potential changes to prey availability for salmon have not been determined and effects are unknown.
Change in genetic structure of population	**U**	**Not determined**	**Unknown:** composition of bycatch has not been determined.	**Unknown:** composition of bycatch has not been determined.	**Unknown:** composition of bycatch has not been determined.	**Not a contributing factor:** significant impacts causing change in genetic structure of stock are not expected.	**Unknown:** effects of salmon bycatch on biodiversity are unknown.	**Not a contributing factor:** not expected to result in direct mortality.	**Unknown-** bycatch composition has not been determined and current stock composition for all species of salmon is unknown.

Table 4.6-12 (cont.). Cumulative effects analysis for chinook and other salmon Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Managemen t Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in reproductive success	**U**	**No**	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Potential adverse contribution:** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Potential Beneficial Contribution:** may help to maintain GOA stock status.	**Potential adverse or beneficial contribution:** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** although stock status of salmon in this region is considered stable, the combined bycatch potential of BSAI and GOA could impact sustainability of certain stocks. Salmon reproductive success depends on spawning adults reaching destined spawning habitat. Thus, increased catch of these adults could hinder successful migration.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
ESA - Endangered Species Act
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
U - unknown

Table 4.6-13. Cumulative effects analysis for bairdi Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**S-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for these stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor-** not expected to result in direct mortality.	**Significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and no signs of recovery exist. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability and recovery of these stocks.

Table 4.6-13 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Biomass	**S-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and no signs of recovery exist. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability and recovery of these stocks.

Table 4.6-13 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**CS-**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Conditionally Significant Adverse**: Although crab seasons are set to avoid mating and molting periods, stocks have not shown signs of recovery to date. Increases in mortality resulting from removal of PSC limits, bycatch restrictions, protection areas and trawl closures under this FMP, could significantly impact the reproductive success of these stocks while also hindering recovery.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.6-13 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Habitat	**S-**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution** - although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and no signs of recovery exist. Removal of protection areas and trawl closures proposed in this FMP, could impede on the recovery of these stocks and significantly impact the sustainability of this stock as a whole.

Notes: ADF&G - Alaska Department Fish & Game
BSAI - Bering Sea and Aleutian Islands
CS- - conditionally significant adverse
FMP - fishery management plan
NOAA Fisheries - National Marine Fisheries Service
PSC - prohibited species catch
S- - significant adverse
U - unknown

Table 4.6-14. Cumulative effects analysis for bairdi Tanner crab in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**CS-**	**Yes**	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability of these stocks.
Change in Biomass	**CS-**	**Yes**	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact biomass of these stocks as a whole.

Table 4.6-14 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**CS-**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods. However, some stocks in GOA show signs of possible recovery while others are still considered depressed. Increase in mortality resulting from removal of PSC limits, bycatch restrictions, protection areas and trawl closures under this FMP, could significantly impact the reproductive success and sustainability of these stocks.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined and potential changes to prey structure are unknown.
Change in Habitat	**CS-**	**Yes**	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor-** not expected to directly affect physical habitat.	**Unknown-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Some stocks in GOA show signs of possible recovery while others are still considered depressed. However, removal of protection areas and trawl closures proposed in this FMP, could significantly impact the sustainability of this stock as a whole.

Table 4.6-14 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Gulf of Alaska: FMP 2.1.

Notes: CS- - conditionally significant adverse
GOA - Gulf of Alaska
FMP - fishery management plan
PSC - prohibited species catch
U - unknown

Table 4.6-15. Cumulative effects analysis for opilio Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**S-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor-** not expected to result in direct mortality.	**Significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are currently in decline and no signs of recovery exist. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability and recovery of these stocks.

Table 4.6-15 (cont.). Cumulative effects analysis for opilio Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Biomass	**S-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are currently in decline and no signs of recovery exist. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability and recovery of these stocks.

Table 4.6-15 (cont.). Cumulative effects analysis for opilio Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**CS-**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Conditionally Significant Adverse**: Although crab seasons are set to avoid mating and molting periods, stocks have not shown signs of recovery to date. Increases in mortality resulting from removal of PSC limits, bycatch restrictions, protection areas and trawl closures under this FMP, could significantly impact the reproductive success of these stocks while also hindering recovery.
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.6-15 (cont.). Cumulative effects analysis for opilio Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Habitat	**S-**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution** - although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**- not expected to directly affect physical habitat.	**Significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are currently in decline and no signs of recovery exist. Removal of protection areas and trawl closures proposed in this FMP, could impede on the recovery of these stocks and significantly impact the sustainability of this stock as a whole.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
CS- - conditionally significant adverse
FMP - fishery management plan
NOAA Fisheries - National Marine Fisheries Service
PSC - prohibited species catch
S- - significant adverse
U - unknown

Table 4.6-16. Cumulative effects analysis for red king crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**S-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Not a contributing factor**- not expected to result in direct mortality.	**Significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are currently in decline and no signs of recovery exist. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability and recovery of these stocks.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Biomass	**S-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are currently in decline and no signs of recovery exist. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability and recovery of these stocks.

Table 4.6-16 (cont.). Cumulative effects analysis for red king crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**CS-**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Conditionally Significant Adverse**: Although crab seasons are set to avoid mating and molting periods, stocks have not shown signs of recovery to date. Increases in mortality resulting from removal of PSC limits, bycatch restrictions, protection areas and trawl closures under this FMP, could significantly impact the reproductive success of these stocks while also hindering recovery.
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.6-16 (cont.). Cumulative effects analysis for red king crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Habitat	**S-**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are currently in decline and no signs of recovery exist. Removal of protection areas and trawl closures proposed in this FMP, could impede on the recovery of these stocks and significantly impact the sustainability of this stock as a whole.

Notes: BSAI - Bering Sea and Aleutian Islands
CS- - conditionally significant adverse
FMP - fishery management plan
PSC - prohibited species catch
S- - significant adverse
U - unknown

Table 4.6-17. Cumulative effects analysis for red king crab in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**S-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Not a contributing factor-** not expected to result in direct mortality.	**Significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are currently depressed and no signs of recovery exist. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability and recovery of these stocks.
Change in Biomass	**S-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are currently depressed and no signs of recovery exist. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability and recovery of these stocks.

Table 4.6-17 (cont.). Cumulative effects analysis for red king crab in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**CS-**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Conditionally Significant Adverse**: Although crab seasons are set to avoid mating and molting periods, stocks have not shown signs of recovery to date. Increases in mortality resulting from removal of PSC limits, bycatch restrictions, protection areas and trawl closures under this FMP, could significantly impact the reproductive success of these stocks while also hindering recovery.
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of crab has not been determined, however prey catch is not expected.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined and potential changes to prey structure are not known.

Table 4.6-17 (cont.). Cumulative effects analysis for red king crab in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Habitat	**S-**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are currently depressed and no signs of recovery exist. Removal of protection areas and trawl closures proposed in this FMP, could impede on the recovery of these stocks and significantly impact the sustainability of this stock as a whole.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
PSC - prohibited species catch
S- -significant adverse
U - unknown

Table 4.6-18. Cumulative effects analysis for blue king crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**S-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for these stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor**- not expected to result in direct mortality.	**Significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and no signs of recovery exist. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability and recovery of these stocks.

Table 4.6-18 (cont.). Cumulative effects analysis for blue king crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Biomass	**S-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution**- state crab fisheries are managed by ADF&G in cooperation with NOAA Fisheries. Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and no signs of recovery exist. Increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability and recovery of these stocks.

Table 4.6-18 (cont.). Cumulative effects analysis for blue king crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**CS-**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Conditionally Significant Adverse**: Although crab seasons are set to avoid mating and molting periods, stocks have not shown signs of recovery to date. Increases in mortality resulting from removal of PSC limits, bycatch restrictions, protection areas and trawl closures under this FMP, could significantly impact the reproductive success of these stocks while also hindering recovery.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.6-18 (cont.). Cumulative effects analysis for blue king crab in the Bering Sea and Aleutian Islands: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Habitat	**S-**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**- not expected to directly affect physical habitat.	**Significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and no signs of recovery exist. Removal of protection areas and trawl closures proposed in this FMP, could impede on the recovery of these stocks and significantly impact the sustainability of this stock as a whole.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
CS- - conditionally significant adverse
FMP - fishery management plan
NOAA Fisheries - National Marine Fisheries Service
PSC - prohibited species catch
S- significant adverse
U - unknown

Table 4.6-19. Cumulative effects analysis for blue king crab in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** stock status is currently unknown due to lack of survey information. However, increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability of these stocks.
Change in Biomass	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** stock status is currently unknown due to lack of survey information. However, increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact biomass of these stocks as a whole.
Change in Reproductive Success	**U**	**Not determined**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, but current stock status is unknown. However, increase in mortality resulting from removal of PSC limits, bycatch restrictions, protection areas and trawl closures under this FMP, could significantly impact the reproductive success and sustainability of these stocks.

Table 4.6-19 (cont.). Cumulative effects analysis for blue king crab in the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined.
Change in Habitat	**U**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- Current stock status is unknown. However, removal of protection areas and trawl closures proposed in this FMP, could significantly impact the sustainability of this stock as a whole.

Notes: FMP - fishery management plan
PSC - prohibited species catch
U - unknown

Table 4.6-20. Cumulative effects analysis for golden king crab in the Bering Sea and Aleutian Islands and the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** stock status is currently unknown due to lack of survey information. However, increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact sustainability of these stocks.
Change in Biomass	**U**	**Not determined**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** stock status is currently unknown due to lack of survey information. However, increases in crab catch and bycatch by federal fisheries, in addition to removal of protection areas, trawl closures, and PSC limits proposed in this FMP, could significantly impact biomass of these stocks as a whole.

Table 4.6-20. Cumulative effects analysis for golden king crab in the Bering Sea and Aleutian Islands and the Gulf of Alaska: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Not determined**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, but current stock status is unknown. However, increase in mortality resulting from removal of PSC limits, bycatch restrictions, protection areas and trawl closures under this FMP, could significantly impact the reproductive success and sustainability of these stocks.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined.
Change in Habitat	**CS-**	**Not determined**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- Current stock status is unknown. However, removal of protection areas and trawl closures proposed in this FMP, could significantly impact the sustainability of this stock as a whole.

Table 4.6-20. Cumulative effects analysis for golden king crab in the Bering Sea and Aleutian Islands and the Gulf of Alaska: FMP 2.1.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
PSC prohibited species catch
U - unknown

Table 4.6-21. Cumulative effects analysis for bairdi Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**CS-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for these stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor-** not expected to result in direct mortality.	**Conditionally significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and recovery has not occurred.

Table 4.6-21 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Biomass	**CS-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, stocks are still considered overfished and recovery has not occurred.
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.

Table 4.6-21 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution** - although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
NOAA Fisheries - National Marine Fisheries Service
U - unknown

Table 4.6-22. Cumulative effects analysis for bairdi Tanner crab in the Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.
Change in Biomass	**U**	**Yes**	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.

Table 4.6-22 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined and potential changes to prey structure are unknown.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Some stocks in GOA show signs of possible recovery while others are still considered depressed.

Notes: FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
U - unknown

Table 4.6-23. Cumulative effects analysis for opilio Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**CS-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still in decline and recovery has not occurred.
Change in Biomass	**CS-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Conditionally significant adverse-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are in decline and recovery has not occurred.

Table 4.6-23 (cont.). Cumulative effects analysis for opilio Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.6-23 (cont.). Cumulative effects analysis for opilio Tanner crab in the Bering Sea and Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
NOAA Fisheries - National Marine Fisheries Service

Table 4.6-24. Cumulative effects analysis for red king crab in the Bering Sea and Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**CS-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, some of these stocks are still in decline and recovery has not occurred.
Change in Biomass	**CS-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, some of these stocks are in decline and recovery has not occurred.

Table 4.6-24 (cont.). Cumulative effects analysis for red king crab in the Bering Sea Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: BSAI - Bering Sea and Aleutian Islands
CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
U - unknown

Table 4.6-25. Cumulative effects analysis for red king crab in the Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**CS-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are considered severely depressed and no immediate signs of recovery exist.
Change in Biomass	**CS-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are considered severely depressed and no immediate signs of recovery exist.

Table 4.6-25 (cont.). Cumulative effects analysis for red king crab in the Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined and potential changes to prey structure are not known.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
U - unknown

Table 4.6-26. Cumulative effects analysis for blue king crab in the Bering Sea and Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**CS-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for these stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and recovery has not occurred.
Change in Biomass	**CS-**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution**- state crab fisheries are managed by ADF&G in cooperation with NOAA Fisheries. Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Conditionally significant adverse**- Although bycatch limits and quota setting processes are responsive to changes in abundance, stocks are still considered overfished and recovery has not occurred.

Table 4.6-26 (cont.). Cumulative effects analysis for blue king crab in the Bering Sea and Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.6-26 (cont.). Cumulative effects analysis for blue king crab in the Bering Sea and Aleutian Islands: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Habitat	**I**	**Yes**	**Potential adverse contribution** - although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
NOAA Fisheries - National Marine Fisheries Service
U - unknown

Table 4.6-27. Cumulative effects analysis for blue king crab in the Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Biomass	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, but current stock status is unknown.
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of crab has not been determined, however prey catch is not expected.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined.

Table 4.6-27 (cont.). Cumulative effects analysis for blue king crab in the Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Current stock status is unknown.

Notes: FMP - fishery management plan
I - insignificant
U - unknown

Table 4.6-28. Cumulative effects analysis for golden king crab in the Bering Sea and Aleutian Islands and the Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Biomass	**U**	**Not determined**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Reproductive Success	**U**	**Not determined**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, but current stock status is unknown.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined.

Table 4.6-28 (cont.). Cumulative effects analysis for golden king crab in the Bering Sea and Aleutian Islands and the Gulf of Alaska: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Habitat	**U**	**Not determined**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Current stock status is unknown.

Notes: FMP - fishery management plan
U - unknown

Table 4.6-29. Cumulative effects analysis for the Bering Sea and Aleutian Islands and the Gulf of Alaska habitat: FMP 2.1.

Bering Sea Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **Direct Mortality of Benthic Organisms**	**S-**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution** From offshore catcher/ processors and/or onshore processors.	**Potential Adverse Contribution** Likely to continue at Port Moller, Port Heiden, Dillingham, St. Paul and St. George.	**Potential Adverse Contribution** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential Adverse Contribution** could cause direct mortality through physical alteration (burial).	**Not a contributing factor** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes, S-.** The additional external factors would not improve conditions, and in fact, could add to the mortality of benthic organisms.
Changes to Benthic Community Structure	**S-**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution** From offshore catcher/processors and/or onshore processors.	**Potential Adverse Contribution** Likely to continue at Port Moller, Port Heiden, Dillingham, St. Paul and St. George.	**Potential Adverse Contribution** Acute and/or chronic pollution events could cause changes in the benthic community especially in nearshore/port areas.	**Potential Adverse Contribution** If long term, could cause changes in the benthic community through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution** Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific.	**Yes, S-.** The additional external factors would not improve conditions, and in fact, could add to adverse changes in the benthic community.

Table 4.6-29 (cont.). Cumulative effects analysis for the Bering Sea and Aleutian Islands and Gulf of Alaska habitat: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Geographic diversity of Impacts and Protection	**CS-**	**Yes**, fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Potential Averse Contribution** Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution** New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution** Depending on the distribution of the fishing effort, less sensitive areas could be impacted by marine pollution.	**Not a Contributing Factor**	**Not a Contributing Factor**	**Yes, CS-** FMP 2.1 would protect slightly less benthic habitat from trawl gear in 2002 than was protected in 1980. This FMP opens many areas that are presently closed in order to protect crab and halibut habitat. The additional external effects are not expected to improve the internal FMP rating.

Table 4.6-29 (cont.). Cumulative effects analysis for the Bering Sea and Aleutian Islands and Gulf of Alaska habitat: FMP 2.1.

Aleutian Islands Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **Direct Mortality of Benthic Organisms**	**S-**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. Prevalence of long lived species of coral makes impacts a particular concern in the Aleutians.	**Potential Adverse Contribution** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution** Impacts of long line fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution** Impacts of pot fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution** From offshore catcher/ processors and/or onshore processors.	**Potential Adverse Contribution** Likely to continue at Atkutan, Adak, Unalaska, Cold Bay Dutch Harbor and King Cove. Other sites possible for development.	**Potential Adverse Contribution** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/ port areas.	**Potential Adverse Contribution** Could cause direct mortality through physical alteration (burial).	**Not a contributing factor** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes S-** The additional external factors would not improve conditions, and in fact, could add to the mortality of benthic organisms.

Table 4.6-29 (cont.). Cumulative effects analysis for the Bering Sea and Aleutian Islands and Gulf of Alaska habitat: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Changes to Benthic Community Structure	**S-**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution** Impacts of long line fisheries on benthic community structure are expected to continue.	**Potential Adverse Contribution** Impacts of pot fisheries on benthic community structure are expected to continue.	**Potential Adverse Contribution** From offshore catcher-processors and/or onshore processors.	**Potential Adverse Contribution** Likely to continue at Atkutan, Adak, Unalaska, Cold Bay Dutch Harbor and King Cove. Other suites possible for development.	**Potential Adverse Contribution** Acute and/or chronic pollution events could cause changes in the benthic community especially in nearshore/ port areas.	**Potential Adverse Contribution** Could cause direct mortality through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution** Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific.	**Yes, S-** The additional external factors would not improve conditions, and in fact, could add to adverse changes in the benthic community.

Table 4.6-29 (cont.). Cumulative effects analysis for the Bering Sea and Aleutian Islands and Gulf of Alaska habitat: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Geographic diversity of Impacts and Protection	**I**	**Yes,** fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Not a contributing factor**	**Potential Beneficial/ Averse Contribution** Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Beneficial/ Averse Contribution** Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Averse Contribution** Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution** New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution** Depending on the distribution of the fishing effort, sensitive areas could be impacted by marine pollution.	**Not a contributing factor**	**Not a contributing factor**	**Yes, I** FMP 2.1 would protect more benthic habitat from trawl gear in 2002) than was protected in 1980. However, the spatial distribution of the closed areas under the current FMPs may not protect the full range of habitat types.

Table 4.6-29 (cont.). **Cumulative effects analysis for the Bering Sea and Aleutian Islands and Gulf of Alaska habitat: FMP 2.1.**

Gulf of Alaska Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **Direct Mortality of Benthic Organisms**	**S-**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution** Impacts of long line fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution** Impacts of pot fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution** Likely to continue at Kodiak, Sand Point, Chignik, Port Lions, Ouzinkie and Seward. Other sites possible for development.	**Potential Adverse Contribution** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential Adverse Contribution** Could cause direct mortality through physical alteration (burial).	**Not a contributing factor** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes S-** The additional external factors would not improve conditions, and in fact, could add to the mortality of benthic organisms

Table 4.6-29 (cont.). **Cumulative effects analysis for the Bering Sea and Aleutian Islands and Gulf of Alaska habitat: FMP 2.1.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Benthic Community Structure	**S-**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution** Impacts of long line fisheries on the benthic community are expected to continue	**Potential Adverse Contribution** Impacts of pot fisheries on the benthic community are expected to continue.	**Potential Adverse Contribution** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution** Likely to continue at Kodiak, Sand Point, Chignik, Port Lions, Ouzinkie and Seward. Other sites possible for development.	**Potential Adverse Contribution** Acute and/or chronic pollution events could cause changes in the benthic community, especially in nearshore/port areas.	**Potential Adverse Contribution** Could cause direct mortality through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution** Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes, S-** The additional external factors would not improve conditions, and in fact, could add to adverse changes in the benthic community.

Table 4.6-29 (cont.). **Cumulative effects analysis for the Bering Sea and Aleutian Islands and Gulf of Alaska habitat: FMP 2.1.**

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Geographic diversity of Impacts and Protection	**CS-**	**Yes,** fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Not a contributing factor.**	**Potential Beneficial/ Averse Contribution** Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Beneficial/ Averse Contribution** Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Averse Contribution** Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution** New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution** Depending on the distribution of the fishing effort, sensitive areas could be impacted by marine pollution.	**Not a contributing factor.**	**Not a contributing factor.**	**Yes, CS-** FMP 2.1 would protect more benthic habitat from trawl gear in 2002) than was protected in 1980. However, the spatial distribution of the closed areas under the FMP 2.1 may not protect the full. range of habitat types.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
IPHC - International Pacific Halibut Commission
S- - significant adverse

Table 4.6-30. Cumulative effects analysis for short-tailed albatross: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects (refer to Section 3.7.4)	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Geologic Disruption of Nest Sites	Climate Change and Regime Shift	
Mortality - Incidental Take	**CS-**	Population recovering from near extinction, most nesting on one Japanese volcanic island Commercial hunts Geologic instability of nest sites Probable incidental take in Japan, foreign, and U.S. fisheries Conservation efforts in Japan and U.S. fisheries	**Potential adverse contribution** Incidental take on longlines, trawl/net gear, and vessel strikes	**Potential adverse contribution**s Acute and/or chronic pollution events, especially involving oil and plastic	**Potential beneficial contribution**s National and International Seabird Bycatch Reduction Plans Japanese efforts to repair and protect nest sites Reintroduction to previous nesting islands	**Potential adverse contribution** Great majority of nesting occurs on Torishima Island, which is an active volcano	**Not a contributing factor**	**CS-** Species appears to be increasing at near maximum rate but situation could change substantially if natural or human mortality rates increase by small amounts or if catastrophe occurs on Torishima Island
Change in Food Availability	**I**	Squid and forage fish fisheries	**Potential adverse contribution** Squid and forage fish fisheries	**Potential adverse contribution** Acute and/or chronic pollution events could alter prey abundance and distribution	**Potential beneficial contribution** General efforts to reduce marine pollution	**Not a contributing factor**	**Potential beneficial/ adverse contribution** on squid and forage fish abundance and distribution	**I** - Since habitat once supported millions of this species and population decline not due to habitat change, food supplies should not limit population growth

Table 4.6-30 (cont.). Cumulative effects analysis for short-tailed albatross: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects (refer to Section 3.7.4)	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Geologic Disruption of Nest Sites	Climate Change and Regime Shift	
Benthic Habitat	I	None	Not a contributing factor	Not a contributing factor	Not a contributing factor	Not a contributing factor	Not a contributing factor	None

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant

Table 4.6-31. Cumulative effects analysis for northern fulmar: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects (refer to Section 3.7.5)	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality - Incidental Take	**CS-**	Fulmar population abundant and apparently stable except perhaps on Pribilof Islands Incidental take in foreign and U.S. fisheries Marine pollution Regime shifts	**Potential adverse contribution** Incidental take on longlines, trawl/net gear, and vessel strikes	**Potential adverse contribution**s Acute and/or chronic pollution events, especially involving oil and plastic Accidental release of nest predators on breeding colony islands	**Potential beneficial contribution**s National and International Seabird Bycatch Reduction Plans Oil spill and pollution prevention laws USFWS protection of colonies	**Potential adverse contribution** Periodic die-offs and fluctuations in reproductive success due to food availability	CS- - Mortality from groundfish fisheries may have population level effects on particular colonies
Change in Food Availability	**I**	Supplementary food from fishery wastes Regime shifts	**Potential adverse contribution** Squid and forage fish fisheries **Potential beneficial/ adverse contribution** Fishery wastes	**Potential adverse contribution** Acute and/or chronic pollution events could alter prey abundance and distribution	**Not a contributing factor**	**Potential beneficial/ adverse contribution** on squid and forage fish abundance and distribution	**I** - Contributions of human events to prey availability appears to be insignificant compared to natural fluctuations
Benthic Habitat	**I**	**None**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**None**

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant

Table 4.6-32. Cumulative effects analysis for species of management concern (red-legged kittiwake, marbled murrelet, Kittlitz's murrelet): FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects (refer to Sections 3.7.13 and 3.7.17)	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality - Incidental Take	**I**	Kittiwakes nest mostly on Pribilofs and population has been declining, both murrelet populations have decreased substantially in core range. Subsistence hunts and egging. Incidental take in foreign and U.S. fisheries. Oil spills, logging, disturbance from vessels (murrelets).	**Potential adverse contribution** Harvest on Pribilof Islands (kittiwakes).	**Potential adverse contribution** Incidental take on longlines (kittiwakes), trawl/net gear (murrelets), and vessel strikes.	**Potential adverse contribution**s Acute and/or chronic pollution events, especially involving oil and plastic. Accidental release of nest predators on kittiwake colonies. Disturbance from all marine vessels (murrelets).	**Potential beneficial contribution**s Logging regulations to protect marbled murrelet nests. Oil spill and pollution prevention laws. Efforts to list Kittlitz's murrelets under Endangered Species Act.	**Potential adverse contribution** Periodic die-offs and fluctuations in reproductive success due to food availability.	**CS- for red-legged kittiwakes** Population decline may have reversed, contribution of non-natural mortality factors to earlier decline unknown. S- for both murrelets Mortality in nearshore gillnet fisheries likely contributing, among other factors, to widespread and consistent population declines.
Change in Food Availability	**CS-**	Supplementary food from fishery wastes (kittiwakes). Regime shifts.	**Not a contributing factor**	**Potential adverse contribution** Squid and forage fish fisheries. Fishery wastes.	**Potential adverse contribution** Acute and/or chronic pollution events could alter prey abundance and distribution.	**Not a contributing factor**	**Potential beneficial/ adverse contribution** on forage fish and invertebrate prey abundance and distribution.	**CS-** Development of directed forage fish fishery may lead to localized depletion of prey on the scale important to all species foraging success.

Table 4.6-32 (cont.). **Cumulative effects analysis for species of management concern (red-legged kittiwake, marbled murrelet, Kittlitz's murrelet): FMP 2.1.**

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects (refer to Sections 3.7.13 and 3.7.17)	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Benthic Habitat	**I**	Other human and natural bottom disturbance.	**Not a contributing factor**	**Potential adverse contribution** Nearshore trawling and other bottom contact fishing disturbance (murrelets).	**Potential adverse contribution** Acute and/or chronic pollution affecting ocean bottom.	**Potential beneficial contribution** Nearshore trawl and bottom contact fishing closures	**Potential beneficial/ adverse contribution** on benthic and demersal prey.	**None** No contribution of groundfish fishery to this effect.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant

Table 4.6-33. Cumulative effects analysis for other piscivorous species: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects (refer to species accounts in Section 3.7)	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality - Incidental Take	**I**	Most species common or abundant and widespread. Population trends known best for murres and black-legged kittiwakes, which are variable at different colonies. Subsistence hunts and egging. Incidental take in foreign and U.S. fisheries. Oil spills, fox farming. Regime shifts.	**Potential adverse contribution** Harvest by Alaskan and Russian Natives concentrated on accessible colonies.	**Potential adverse contribution** Incidental take on longlines, trawl/net gear, and vessel strikes.	**Potential adverse contribution**s Acute and/or chronic pollution events, especially involving oil. Accidental release of nest predators on breeding colony islands.	**Potential beneficial contribution**s National and International Seabird Bycatch Reduction Plans Oil spill and pollution prevention laws USFWS protection of colonies	**Potential adverse contribution** Periodic die-offs and fluctuations in reproductive success due to food availability	**I -** Natural and human-caused sources of mortality contribute to population fluctuations at different times but no species in this group appears to be in danger of a consistent area-wide population decline

Table 4.6-33 (cont.) Cumulative effects analysis for other piscivorous species: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects (refer to species accounts in Section 3.7)	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Change in Food Availability	**CS-**	Supplementary food from fishery wastes. Regime shifts.	**Not a contributing factor.**	**Potential adverse contribution** Forage fish fisheries. Fishery wastes (gulls).	**Potential adverse contribution** Acute and/or chronic pollution events could alter prey abundance and distribution.	**Not a contributing factor**	**Potential beneficial/ adverse contribution** on forage fish abundance and distribution	**CS-** Development of directed forage fish fishery may lead to localized depletion of prey on the scale important to all species foraging success
Benthic Habitat	**CS-**	Domestic and foreign trawling Other human and natural bottom disturbance	**Not a contributing factor**	**Potential adverse contribution** Trawling and other bottom contact fishing disturbance within range of species	**Potential adverse contribution** Acute and/or chronic pollution affecting ocean bottom	**Not a contributing factor**	**Potential beneficial/ adverse contribution** on benthic and demersal prey	**CS-** Major increase in trawl effort has potential to affect food web dynamics of benthic and demersal prey over time.

Notes: CS - conditionally significant adverse
FMP - fishery management plan
I - insignificant
USFWS - U.S. Fish and Wildlife Service

Table 4.6-34. Summary of the significance determinations for each of the effects on marine mammals under FMPs 2.1 and 2.2.

	Incidental take/entanglement in marine debris		Harvest of prey species		Spatial/temporal concentration		Disturbance	
FMP	**2.1**	**2.2**	**2.1**	**2.2**	**2.1**	**2.2**	**2.1**	**2.2**
Steller sea lions - western stock	I	I	S-	S-	S-	I	CS-	I
Steller sea lions - eastern stock	I	I	S-	I	CS-	I	CS-	I
Northern Fur Seal	I	I	CS-	CS-	CS-	I	CS-	I
Harbor Seals	I	I	S-	S-	CS-	I	CS-	I
Other Pinnipeds	I	I	I	I	I	I	CS-	I
Transient Killer Whales	I	I	I	I	I	I	CS-	I
Other Toothed Whales	I	I	I	I	I	I	CS-	I
Other Baleen Whales	I	I	I	I	I	I	CS-	I
Sea Otters	I	I	I	I	I	I	I	I

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
S- - significant adverse

Table 4.6-35. Cumulative effects analysis for the western stock of Steller sea lions: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Other Intentional Take	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries. State-Managed drift and set gillnet fisheries. Commercial harvest of pups. Subsistence harvest. Intentional shootings. Steep population declines from 1970s to 1990, less steep decline from 1990s.	**Potential adverse contribution** Incidental take in State managed drift gill net fisheries.	**Potential adverse contribution** Subsistence harvest throughout range of the western stock. Intentional shootings.	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil.	**Potential beneficial contribution** Endangered Species Act - listed as endangered. Marine Mammal Protection Act. Marine Plastic Pollution Research and Control Act (1987).	**Not a contributing factor.** Direct mortality would not be a primary effect of climate change/regime shift.	**Significant adverse.** Mortality is considered a cumulative effect. Since the combined take for subsistence, other fisheries and in the groundfish fisheries is at or near the PBR, the continuing endangered status, long-term decline in abundance, cumulative effect is likely having population-level effects. Contribution of the groundfish fisheries is small.

Table 4.6-35 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Other Intentional Take	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**S-**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries. Past harvest by State-managed salmon and herring fisheries.	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Significant Adverse** Effects prey availability is found to be cumulative from internal effects of the groundfish fisheries and external effects. Effect is significant adverse due to increased harvest of prey.
Spatial/ temporal concentration of fisheries	**S-**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries.	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Significant Adverse** Spatial and temporal effects of the fisheries identified for other fisheries. Based on opening new areas and increased harvest of prey.

Table 4.6-35 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Other Intentional Take	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**CS-**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries. Subsistence harvest. Vessel traffic near rookeries and haulouts.	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potential adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Adverse**. Since disturbance is identified for other fisheries, effect of disturbance are considered cumulative. The effect is conditional on location and timing of disturbance.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
JV - joint venture
PBR - potential biological removal
S- - significant adverse

Table 4.6-36. Cumulative effects analysis for the western stock of Steller sea lions: FMP 2.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Other Intentional Take	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries. State-Managed drift and set gillnet fisheries. Commercial harvest of pup. Subsistence harvest. Intentional shootings. Steep population declines from 1970s to 1990, less steep decline in the 1990s.	**Potential adverse contribution** Incidental take in State managed drift gill net fisheries.	**Potential adverse contribution** Subsistence harvest throughout range of the western stock. Intentional shootings	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil spills.	**Potential beneficial contribution** Endangered Species Act - listed as endangered. Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (1987).	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift..	**Significant adverse.** Mortality is considered a cumulative effect. Since the combined take for subsistence, other fisheries and in the groundfish fisheries is at or near the PBR, the continuing endangered status, long-term decline in abundance, cumulative effect is likely having population-level effects. Contribution of the groundfish fisheries is small.

Table 4.6-36 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 2.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Other Intentional Take	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**S-**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries. Past harvest by State-managed salmon and herring fisheries.	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Significant Adverse** Effects prey availability is found to be cumulative from internal effects of the groundfish fisheries and external effects. Based on increase in harvest of SSL prey species.
Spatial/ temporal concentration of fisheries	**I**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries.	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Adverse** Spatial and temporal effects of the fisheries identified for other fisheries. Cumulative effects are conditional on harvest of prey being factor in recent decline.

Table 4.6-36 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 2.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Other Intentional Take	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries. Subsistence harvest. Vessel traffic near rookeries and haulouts.	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potential adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Since disturbance is identified for other fisheries, effect of disturbance are considered cumulative but insignificant at the population level.

Notes: FMP - fishery management plan
I - insignificant
JV - joint venture
PBR - potential biological removal
S- significant adverse
SSL - Steller sea lion

Table 4.6-37. Cumulative effects analysis for the eastern stock of Steller sea lions: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries. State-managed drift and set gillnet fisheries. Commercial harvest of pups. Subsistence harvest. Predator control. Intentional shootings. Abundance of the eastern stock has increased over the last 20 years.	**Potential adverse contribution** Incidental take in State managed drift gill net fisheries.	**Potential adverse contribution** Subsistence harvest in Southeast Alaska. Predator control at fish farms in British Columbia.	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil.	**Potential beneficial contribution** Endangered Species Act - listed as threatened in 1990. Restricts disturbance at rookeries and haulouts. Marine Mammal Protection Act (1972) - classified as strategic stock. Marine Plastic Pollution Research and Control Act (1987).	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Since the combined take for subsistence, other fisheries and in the groundfish fisheries is below 10% of the PBR, cumulative effect of take is considered insignificant at the population level.

Table 4.6-37 (cont.). Cumulative effects analysis for the eastern stock of Steller sea lions: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**S-**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries. Past harvest by State-managed salmon and herring fisheries.	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Significant Adverse** Effect is cumulative based on internal effect of the groundfish fisheries on prey abundance and external effect of State-managed fisheries and possibly long-term climate change. Increase harvest of prey from internal effect of the groundfish fisheries being a factor that would likely result in a population-level effect on this stock.

Table 4.6-37 (cont.). Cumulative effects analysis for the eastern stock of Steller sea lions: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Spatial/ temporal concentration of fisheries	**CS-**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries.	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Adverse.** Spatial and temporal effects of the fisheries are identified internal effect of the groundfish fishery and for other fisheries. Conditional on location and timing of increased harvest of groundfish resulting in a population- level effect.
Disturbance	**CS-**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries. Subsistence harvest. Vessel traffic near rookeries.	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potential adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Adverse** Effects of disturbance is cumulative based on internal and external sources. The cumulative effect is unlikely to result in population-level effect..

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
JV - joint venture
PBR - potential biological removal
S- - significant adverse

Table 4.6-38. Cumulative effects analysis for northern fur seal: FMP 2.1.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal (high seas dirift net) and State-managed fisheries. Commercial harvest on the Pribilof Islands. Subsistence harvest. Population declined substantially in 1970s to early 1980s, leading to "depleted" status under MMPA in 1988. Population still declining in 2000.	**Potentially adverse contribution** Incidental take in State managed drift gill net fisheries. Incidental take in fisheries outside the EEZ.	**Potentially adverse contribution** Subsistence harvest on the Pribilof Islands.	**Potentially adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil.	**Potentially beneficial contribution** Marine Mammal Protection Act (1972). UN Resolution 46/215 banning high seas driftnet fisheries. Marine Plastic Pollution Research and Control Act (1987).	**Not a contributing factor.** Direct mortality would not be a primary effect of climate change.	**Insignificant** Mortality is cumulative based on internal effect of fishery and external effect of subsistence and other fisheries. Since the combined take for subsistence, other fisheries and in the groundfish fisheries is below the PBR, cumulative effect of take is considered insignificant at the population level.

Table 4.6-38 (cont.). Cumulative effects analysis for northern fur seal: FMP 2.1.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**CS-**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries	**Potentially adverse contribution** Little overlap in prey species with State-managed and foreign fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Adverse** Effects are cumulative based on internal effect fo fisheries and external effects of other fisheries and possibly long-term climate change. Cumulative effect are based on increased harvest of prey and is conditional on availability of prey being factor in recent decline.

Table 4.6-38 (cont.). Cumulative effects analysis for northern fur seal: FMP 2.1.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Spatial/ temporal concentration of fisheries	**CS-**	Displacement of fisheries offshore increases interaction with fur seal.	**Potential adverse contribution** Foreign fisheries outside EEZ and State-managed salmon gillnet fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Conditionally Significant Adverse** Spatial and temporal effects of the fisheries identified for other fisheries and long-term climate change. Cumulative effect rating based on new areas open to fishing and is conditional on harvest of prey being factor in recent decline.
Disturbance	**CS-**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries. Subsistence harvest.	**Potentially adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potentially adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Adverse**. Effects of disturbance is cumulative based on internal and external sources. The cumulative effect is based on increased fishing activity and is conditional on location and timing of additional disturbance.

Table 4.6-38 (cont.). Cumulative effects analysis for northern fur seal: FMP 2.1.

Notes: CS- - conditionally significant adverse
EEZ - exclusive economic zone
FMP - fishery management plan
I - insignificant
JV - joint venture
MMPA - Marine Mammal Protection Act
PBR - potential biological removal
UN - United Nations

Table 4.6-39. Cumulative effects analysis for harbor seal: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and Federal and State-managed fisheries. State predator control programs. Commercial harvest. Subsistence harvest. Increasing in Bristol Bay but decreasing around Pribilof Islands. Major declines in GOA from 1976 to1992 followed by steady increases. Generally increase in Southeast.	**Potential adverse contribution** Incidental take in State-managed drift gill net fisheries.	**Potential adverse contribution** Subsistence harvest throughout region.	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil spills.	**Potential beneficial contribution** Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (1987).	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative with internal effects of fisheries and external effect of take from subsistence and other fisheries. Total is below the PBR, and is considered insignificant.

Table 4.6-39 (cont.). Cumulative effects analysis for harbor seal: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**S-**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries.	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Significant Adverse** Effects are cumulative base on internal effect of groundfish fisheries and external effects of other fisheries. Cumulative effects are adverse due to increased harvest of harbor seal prey and population- level effects are likely.
Spatial/ temporal concentration of fisheries	**CS-**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries.	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Conditionally Significant Adverse** Spatial and temporal effects are cumulative based on internal and external effect of fisheries. Effects are conditional increased harvest affecting availability of prey in time and space and resulting in population-level effects.

Table 4.6-39 (cont.). Cumulative effects analysis for harbor seal: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**CS-**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries. Subsistence harvest.	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potential adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Adverse** Disturbance is cumulative based on internal and external sources. Effects are conditional on location and timing of new disturbance from expanded fisheries.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
JV - joint venture
PBR - potential biological removal
S- significant adverse

Table 4.6-40. Cumulative effects analysis for harbor seal: FMP 2.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal and State-managed fisheries. State predator control programs. Commercial harvest. Subsistence harvest. Increasing trend in Bristol Bay but decreasing around Pribilof Islands. Major declines in GOA from 1976 to1992 followed by steady increases. Generally increase in Southeast.	**Potential adverse contribution** Incidental take in State-managed drift gillnet fisheries.	**Potential adverse contribution** Subsistence harvest throughout region.	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil.	**Potential beneficial contribution** Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (1987).	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative with internal effects of fisheries and external effect of take from subsistence and other fisheries. Total is below the PBR, and is considered insignificant.

Table 4.6-40 (cont.). Cumulative effects analysis for harbor seal: FMP 2.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Change and Regime Shift	
Prey Availability	**S-**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries.	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Significant Adverse** Effects cumulative base on internal effect of fisheries and external effects of other fisheries. Cumulative effect are adverse due to increased harvest of harbor seal prey and population level effects are likely.
Spatial/ temporal concentration of fisheries	**I**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries.	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Conditionally Significant Adverse** Spatial and temporal effects are cumulative based on internal and external effect of fisheries. Cumulative effect are conditional on harvest of prey being factor in recent decline.

Table 4.6-40 (cont.). Cumulative effects analysis for harbor seal: FMP 2.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries. Subsistence harvest.	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potential adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Disturbance is cumulative base of internal and external sources. Level of disturbance is insignificant at the population level.

Notes: FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
JV - joint venture
PBR - potential biological removal
S- - significant adverse

Table 4.6-41. Cumulative effects analysis for other pinnipeds: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal and and State-managed fisheries. State predator control programs (spotted seal). Subsistence harvest.	**Potential adverse contribution** Incidental take in State-managed drift gill net fisheries and herring fisheries.	**Potential adverse contribution** Subsistence harvest is a major mortality factor form most species.	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil.	**Potential beneficial contribution** Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (1987).	**Not a contributing factor.** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative for all species from internal effects of the groundfish fisheries and external factors such as subsistence. For spotted, ringed, bearded and ribbon seal, PBRs are not known. Walrus take is below the PBR and population level effects are unlikely. Elephant seal populations are expanding and human-caused mortality is considered insignificant. Contribution is of groundfish fishery is small for all species.

Table 4.6-41 (cont.). Cumulative effects analysis for other pinnipeds: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries.	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant** Overlap in prey with fisheries very limited.
Spatial/ temporal concentration of fisheries	**I**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries.	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant**. Very little seasonal overlap with commercial fisheries on the prey of the other pinniped species.

Table 4.6-41 (cont.). Cumulative effects analysis for other pinnipeds: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**CS-**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Adverse** Effects of disturbance cumulative based on internal and external sources. Effect is based on repeal of area closures and greatly increased fishing effort and is conditional on location and timing of new disturbance.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
JV - joint venture
I - insignificant
PBR - potential biological removal

Table 4.6-42. Cumulative effects analysis for transient killer whales: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Intentional shootings	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take and entanglement in JV, foreign and federal domestic groundfish fisheries, State-managed fisheries. Illegal shooting of killer whales in various fisheries	**Potential adverse contributing** Small Incidental take and entanglement in State-managed fisheries.	**Potential adverse contribution** Illegal shooting in various fisheries.	**Potential adverse contribution** Bioaccumulation of pollutants such as PCBs and DDT. Vessel strikes. Acute and/or chronic pollution events, especially involving oil spills.	**Potential beneficial contribution** Marine Mammal Protection Act (1972) Marine Plastic Pollution Research and Control Act (1987).	**Not a contributing factor.** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative based on internal effects of the groundfish fisheries and external sources. Mortality is combined with resident but is below 10% of the PBR, cumulative effect of take is considered insignificant at the population level.
Prey Availability	**I**	Decline of marine mammal populations likely affected prey of transients killer whales.	**Not a contributing factor** No overlap in prey specie harvested since they prey on marine mammal.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Prey availability is considered cumulative due to internal and external factors. Since transient killer whales eat marine mammals, fisheries contribution is very limited and insignificant at the population level.

Table 4.6-42 (cont.). Cumulative effects analysis for transient killer whales: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Intentional shootings	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Spatial/ temporal concentration of fisheries	**I**	Spatial and temporal concentration of harvest has likely not be a factor with transient killer whales.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Spatial and temporal harvest of prey is considered cumulative due to internal and external factors. Since transient killer whales eat marine mammals, fisheries contribution is very limited and insignificant at the population level.

Table 4.6-42 (cont.). Cumulative effects analysis for transient killer whales: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Intentional shootings	Marine Pollution and Vessel Hazards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**CS-**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries, and State-managed salmon and herring fisheries fisheries. General vessel traffic.	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potentially adverse contribution** Disturbance from general harassment.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Adverse.** Disturbance is cumulative based on internal effect of the groundfish fisheries and external effect from other sources. Determination is conditional on location and timing of disturbance and could potentially have population-level effects.

Notes: CS- - conditionally significant adverse
DDT - *para*-dichlorodiphenyltrichloroethane
FMP - fishery management plan
I - insignificant
JV - joint venture
PCB - polychlorinated biphenyls
PRB - potential biological removal

Table 4.6-43. Cumulative effects analysis for other toothed whales: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take and entanglement in foreign, JV, federal domestic groundfish fisheries and State-managed fisheries. Commercial whaling for sperm whales. Subsistence whaling for beluga whales.	**Potential adverse contribution** Incidental take in State managed drift and set gill net fisheries.	**Potential adverse contribution** Subsistence harvest for beluga whales.	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Bioaccumulation of pollutants such as PCBs and DDT. Acute and/or chronic pollution events, especially involving oil spills.	**Potential beneficial contribution** Endangered Species Act - Sperm Whales. Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (1987).	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative due to internal and external sources. Cumulative effects is considered insignificant at the population level for all species this group. Contribution from the groundfish fisheries is very small.

Table 4.6-43 (cont.). Cumulative effects analysis for other toothed whales: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries, and State managed salmon and herring fisheries.	**Potential adverse contribution** Some overlap between fisheries and prey species for most toothed whales and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant** Prey availability is cumulative based on internal and external factors. Overlap of prey with species taken in fisheries is limited, prey abundance influenced more by environmental factors.
Spatial/ temporal concentration of fisheries	**I**	Harvest of prey species by JV, foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant** Spatial and temporal effects are considered cumulative but insignificant due to limited overlap with fisheries and prey.

Table 4.6-43 (cont.). Cumulative effects analysis for other toothed whales: FMP 2.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries, and commercial harvest . Subsistence harvest for beluga whales	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally significant adverse** Disturbance is considered cumulative based on contribution from internal and external sources. The effects of increased fishing activity and new fishing areas could have effects at the population level for some species. This is conditional on the locations and timing of new disturbance.

Notes: DDT - *para*-dichlorodiphenyltrichloroethane
FMP - fishery management plan
I - insignificant
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PCBs - polychlorinated biphenyls

Table 4.6-44. Cumulative effects analysis for baleen whales: FMP2.1.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Commercial whaling of most baleen species devastated most whale population except minke whales. Subsistence whaling for bowhead and gray whales. Entanglement in fishing gear.	**Potential adverse contribution** Incidental take in State managed drift and set gill net fisheries. Entanglement in fishing gear. Incidental take in Russian driftnet fishery - right whales.	**Potential adverse contribution** Subsistence harvest for bowhead and gray whales.	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil. Vessel collisions.	**Potential beneficial contribution** Endangered Species Act-bowhead, fin, right, humpback, and blue whales. International Whaling Commission management of subsistence take. Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (1987).	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Conditionally significant adverse** Mortality is cumulative based on internal effects of the groundfish fishery, past persistent efffect and external factors. Effect is based on interaction with fisheries and endangered status for fin, humpback and sei whales Rating is conditional on human-caused mortality affecting recovery. **Insignificant** Cumulative effect for bowhead, northern right whale, and blue whale minke whales and gray. Population-level effects are not anticipated.

Table 4.6-44 (cont.). Cumulative effects analysis for baleen whales: FMP2.1.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries, and State managed salmon and herring fisheries.	**Potential adverse contribution** Some overlap between fisheries and prey species for humpback whales.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant** Prey availability is considered cumulative based on internal and external factors. This effect is not likely to have population-level effects. The contribution of the groundfish fisheries is very slight.
Spatial/ temporal concentration of fisheries	**I**	Harvest of prey species of humpback by foreign and domestic groundfish fisheries.	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey.	**Insignificant** Spatial and temporal effects of the fisheries identified as cumulation but not expect to affect any species at the population level.

Table 4.6-44 (cont.). Cumulative effects analysis for baleen whales: FMP2.1.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**CS-**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries, and commercial harvest. Subsistence harvest for bowheads.	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic.	**Potential adverse contribution** Disturbance from subsistence harvest of bowhead and gray whales.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally significant adverse** Disturbance is cumulative based on both internal effect of the fisheries and external sources. Disturbance from expanded fisheries and could potentially have population level effect.

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
I - insignificant
JV - joint venture
PBR - potential biological removal

Table 4.6-45. Summary of FMP bookend 2.1 on harvesting and processing sectors.

Sector	Volume (Thousands of Metric Tons)				Output Value ($ Millions)				Groundfish Output Value ($ Millions)	Groundfish Payments to Labor ($ Millions)	Groundfish Employment (FTE Positions)
	Pollock	Pacific Cod	Flatfish	A-R-S-O	Pollock	Pacific Cod	Flatfish	A-R-S-O			
Outcome Under FMP											
All Catcher Processors	929.6	197.8	257.7	148.3	572.8	238.5	127.9	121.4	1,060.6	371.2	5,606.2
All Inshore Processors and Motherships	1,209.7	185.2	16.9	39.8	774.9	225.1	4.4	108.3	1,112.8	435.0	7,399.6
All Catcher Vessels	1,208.2	185.3	9.4	24.6	291.9	103.4	2.6	77.4	475.3	190.1	4,245.0
All Sectors	2,139.3	383.0	274.6	188.1	1,347.7	463.6	132.4	229.6	2,173.3	996.3	17,250.9
Change from Comparative Baseline											
All Catcher Processors	287.6	45.8	107.0	27.4	178.3	55.1	48.0	35.3	316.6	105.3	1,729.5
All Inshore Processors and Motherships	392.4	118.8	-4.4	12.7	251.0	144.2	-3.1	37.8	429.8	168.1	2,909.1
All Catcher Vessels	393.5	120.9	-2.3	3.7	95.9	67.8	-1.0	24.1	186.8	74.7	2,229.3
All Sectors	680.0	164.6	102.6	40.1	429.2	199.3	44.8	73.1	746.5	348.1	6,867.9
Percentage Change from Comparative Baseline											
All Catcher Processors	44.8	30.1	71.0	22.7	45.2	30.1	60.0	41.0	42.6	39.6	44.6
All Inshore Processors and Motherships	48.0	179.1	-20.6	46.6	47.9	178.3	-41.4	53.6	62.9	63.0	64.8
All Catcher Vessels	48.3	187.6	-20.0	17.9	48.9	190.5	-27.4	45.2	64.7	64.7	110.6
All Sectors	46.6	75.4	59.7	27.1	46.7	75.4	51.2	46.7	52.3	53.7	66.1

Notes: The volume and values for "All Sectors" equal the sums of the volume and value for catcher processors and inshore processors and motherships. Adding the volume and value for catcher vessels would result in double counting. However, the payments to labor and employment for "All Sectors" equals the sum over all three sectors.
A-R-S-O - Atka mackerel, rockfish, sablefish, and other groundfish
FTE - full-time equivalent

Table 4.6-46. Cumulative effects analysis for catcher vessels: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	Potential adverse contribution - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	Not a contributing factor -effects of other economic activities do not affect the number of groundfish landed	Not a contributing factor -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	Potential beneficial/ adverse contribution - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	S+ the increase in fishing effort will increase groundfish landings by species group with the exception of flatfish which is rated as insignificant. These increases are expected to offset the reductions in other fisheries, particularly salmon.

Table 4.6-46 (cont.). Cumulative effects analysis for catcher vessels: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Ex-Vessel Value .	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	Not a contributing factor - though marginal increases are expected these changes in value would not be significant	Not a contributing factor - not expected to affect ex-vessel value	Potential adverse contribution - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	Not a contributing factor - changes in climate are not expected to affect ex-vessel value directly	S+ the increase in fishing effort will result in an increase in ex-vessel value except for flatfish which is rated as insignificant. These increases are expected to offset the reductions in other fisheries, particularly salmon.

Table 4.6-46 (cont.). Cumulative effects analysis for catcher vessels: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	Potential beneficial/ adverse contribution - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery	Potential beneficial/ adverse contribution - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish fishery employment	Potential beneficial/ adverse contribution - an increase or decrease in other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	Not a contributing factor - climate change is not expected to affect opportunities in employment	S+ the increase in the amount of groundfish fishing will increase opportunities for employment and may mitigate some of the reductions in other fisheries.

Table 4.6-46 (cont.). Cumulative effects analysis for catcher vessels: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	Potential beneficial/adverse contribution - payments received in other fisheries may influence groundfish payments	Not a contributing factor - not expected to affect payment to labor	Potential adverse contribution - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	Not a contributing factor - not expected to affect payments to labor	S+ the increase in the amount of groundfish fishing will increase payments to labor and may mitigate some of the reductions in other fisheries.

Table 4.6-46 (cont.). Cumulative effects analysis for catcher vessels: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S-	Yes, history of excess capacity (see section 3.9)	Potential beneficial/ adverse contribution - an increase or decrease in the number of vessels permitted in other fisheries may result in subsequent increases or decreases in the number of vessels participating in the groundfish fishery, particularly pot CVs and FGCVs in state waters.	Potential beneficial/adverse contribution - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	Potential beneficial/adverse contribution - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	Not a contributing factor - not expected to affect excess capacity	S- under FMP 2.1 the increase in fishing results in a significant increase in excess capacity.

Table 4.6-46 (cont.). Cumulative effects analysis for catcher vessels: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	S-	Yes, historical race for fish increased costs (see section 3.9)	Potential beneficial/adverse contribution- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries	Not a contributing factor - the effects of other economic development opportunities on average costs are negligible	Potential adverse contribution - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	Not a contributing factor - although climate can affect fish populations, it is not expected to affect average costs	S- under FMP 2.1 the increase in fishing will result in increased average costs due to the significant increase in associated capital expenditures and potential for communities to raise fish taxes.

Table 4.6-46 (cont.). Cumulative effects analysis for catcher vessels: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Fishing Vessel Safety	S-/S+	Yes, historical race for fish (see section 3.9)	Potential adverse contribution - closures in other fisheries may increase transit times for vessels harvesting fish thereby increasing safety risks.	Not a contributing factor - not expected to affect safety	Not a contributing factor - not expected to affect safety	Not a contributing factor - not expected to affect safety	S+/S- an increase in fishing could result in a race for fish thereby negatively affecting safety; however, a reduction in area closures could allow vessels to fish closer to shore thereby increasing safety. Safety remains a serious concern for all fisheries.

Notes: CV - catcher vessel
FGCV - fixed gear catcher vessel
FMP - fishery management plan

Table 4.6-47. Summary of FMP bookend 2.2 on harvesting and processing sectors.

Sector	Volume (Thousands of Metric Tons)				Output Value ($ Millions)				Groundfish Output Value ($ Millions)	Groundfish Payments to Labor ($ Millions)	Groundfish Employment (FTE Positions)
	Pollock	Pacific Cod	Flatfish	A-R-S-O	Pollock	Pacific Cod	Flatfish	A-R-S-O			
Outcome Under FMP											
All Catcher Processors	762.9	212.1	216.8	131.7	468.4	255.9	102.3	86.5	913.2	326.3	4,788.2
All Inshore Processors and Motherships	987.6	98.9	23.2	27.6	621.5	118.2	6.2	81.8	827.8	323.7	5,464.8
All Catcher Vessels	979.7	99.4	12.2	17.9	235.3	53.8	3.8	59.0	351.9	140.8	2,402.4
All Sectors	1,750.4	311.1	240.1	159.3	1,089.9	374.1	108.6	168.3	1,740.9	790.7	12,655.5
Change from Comparative Baseline											
All Catcher Processors	120.9	60.1	66.1	10.8	73.9	72.5	22.4	0.5	169.3	60.4	911.5
All Inshore Processors and Motherships	170.3	32.6	2.0	0.4	97.6	37.3	-1.4	11.3	144.8	56.8	974.3
All Catcher Vessels	165.1	34.9	0.5	-2.9	39.3	18.2	0.2	5.7	63.4	25.3	386.7
All Sectors	291.2	92.7	68.1	11.2	171.5	109.8	21.0	11.8	314.1	142.5	2,272.5
Percentage Change from Comparative Baseline											
All Catcher Processors	18.8	39.5	43.9	8.9	18.7	39.5	28.0	0.6	22.8	22.7	23.5
All Inshore Processors and Motherships	20.8	49.1	9.2	1.6	18.6	46.1	-17.9	16.0	21.2	21.3	21.7
All Catcher Vessels	20.3	54.2	3.9	-14.0	20.0	51.1	5.6	10.7	22.0	22.0	19.2
All Sectors	20.0	42.5	39.6	7.6	18.7	41.6	24.0	7.5	22.0	22.0	21.9

Notes: The volume and values for "All Sectors" equal the sums of the volume and value for catcher processors and inshore processors and motherships. Adding the volume and value for catcher vessels would result in double counting. However, the payments to labor and employment for "All Sectors" equals the sum over all three sectors.
A-R-S-O - Atka mackerel, rockfish, sablefish, and other groundfish
FTE - full-time equivalent

Table 4.6-48. Cumulative effects analysis for catcher vessels: FMP 2.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S+** the increase in fishing effort will increase groundfish landings by species group. The increase projected for groundfish will likely mitigate some of the effects of reductions in other fisheries.

Table 4.6-48 (cont.). Cumulative effects analysis for catcher vessels: FMP 2.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Ex-Vessel Value .	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish market value, these effects are minimal	**Not a contributing factor** - not expected to affect ex-vessel value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Potential adverse or beneficial contribution** - changes in the amount of fish landed (see above) may affect ex-vessel value beneficially or negatively depending on whether there are more or less fish available	**S+** the increase in fishing effort will result in an increase in ex-vessel value. The increase projected for groundfish will likely mitigate some of the effects of reductions in other fisheries.

Table 4.6-48 (cont.). Cumulative effects analysis for catcher vessels: FMP 2.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential adverse or beneficial contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential adverse or beneficial contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential adverse or beneficial contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**S+** increase in the amount of groundfish fishing will increase opportunities for employment. The projected increase in employment is expected to mitigate some of the effects of reductions in other fisheries.

Table 4.6-48 (cont.). Cumulative effects analysis for catcher vessels: FMP 2.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential adverse contribution** - payments received in other fisheries may influence groundfish payments. Recent reductions in those fisheries may also have an effect.	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**S+** the increase in the amount of groundfish fishing will increase payments to labor. The projected increase in payments to labor is expected to mitigate some of the effects of reductions in other fisheries.
Excess Capacity	I	Yes, history of excess capacity (see section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**I** under FMP 2.2 fishing capacity remains the same as the comparative baseline

Table 4.6-48 (cont.). Cumulative effects analysis for catcher vessels: FMP 2.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	I	Yes, historical race for fish increased costs (see section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**I** under FMP 2.2 average costs are expected to remain the same as the comparative baseline. Potential community pressure to increase fish taxes could result in higher average costs, though this effect is not expected to be significant.
Fishing Vessel Safety	I	Yes, historical race for fish (see section 3.9)	**Potential adverse contribution** - closures in other fisheries may affect how far vessels must travel to harvest fish.	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**I** cumulative effects are not expected to significantly change vessel safety. Although safety remains a serious concern for all fisheries, the risk is not expected to change significantly under FMP 2.2.

Notes: FMP - fishery management plan

Table 4.6-49. Cumulative effects analysis for catcher processors: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S+** the significant increase in fishing effort will increase groundfish landings by species group. Although model projections of retained harvests may be overestimated, the increases may mitigate some of the reductions in other fisheries such as salmon and crab.

Table 4.6-49 (cont.). Cumulative effects analysis for catcher processors: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Not a contributing factor** - not expected to affect gross product value	**S+** the increase in fishing effort will result in an increase in gross product value. Although model projections of retained harvests may be overestimated, the increases may mitigate some of the reductions in other fisheries such as salmon and crab.

Table 4.6-49 (cont.). Cumulative effects analysis for catcher processors: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential beneficial/ adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/ adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish fishery employment	**Potential beneficial/ adverse contribution** - an increase or decrease in other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**S+** the increase in the amount of groundfish fishing will increase opportunities for employment. Head and gut trawl catcher processors, surimi trawl catcher processors and fillet trawl catcher processors account for most of this increase.

Table 4.6-49 (cont.). Cumulative effects analysis for catcher processors: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/ adverse contribution** - payments to labor in other fisheries may influence payments in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**S+** the increase in the amount of groundfish fishing will increase payments to labor. Head and gut trawl catcher processors, surimi trawl catcher processors and fillet trawl catcher processors account for most of this increase.

Table 4.6-49 (cont.). Cumulative effects analysis for catcher processors: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Product Quality and Product Utilization	CS-/I	Yes, history of the race for fish negatively affected product quality.	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization..	**Not a contributing factor** - not expected to affect product quality or utilization.	**S-** cumulative adverse effects on product quality or utilization are expected to result from the return to the race for fish.
Excess Capacity	S-	Yes, history of excess capacity (see section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S-** repeal of all effort limitation programs will result in a significant increase in excess capacity.

Table 4.6-49 (cont.). Cumulative effects analysis for catcher processors: FMP 2.1.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	S-	Yes, historical race for fish increased costs (see section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**S-** cumulative effects are expected as a result of lower catches per unit of effort associated with higher TACs, an increase in capital expenditures with entry of new vessels and the race for fish. Any increase in community pressure to raise fish taxes may further aggravate this effect.
Fishing Vessel Safety	S-/S+	Yes, historical race for fish (see section 3.9)	**Potential adverse contribution** - closures in other fisheries may increase risks to vessels.	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**S+/S-** an increase in fishing could result in a race for fish thereby negatively affecting safety; however, a reduction in area closures could allow vessels to fish closer to shore thereby increase safety

Notes: FMP - fishery management plan
TAC - total allowable catch

Table 4.6-50. Cumulative effects analysis for catcher processors: FMP 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S+/I	Yes, increased global demand for seafood especially whitefish. Develop-ment of surimi in 1985 increased demand (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S+** the increase in fishing effort will increase groundfish landings by species group. The increase projected for Pacific cod and flatfish harvests are likely to offset the reductions in other fisheries significantly.

Table 4.6-50 (cont.). Cumulative effects analysis for catcher processors: FMP 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish market value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Not a contributing factor** - not expected to affect gross product value	**S+** the increase in fishing effort will result in an increase in gross product. Harvest of Pacific cod accounts for much of this increase and should offset current reductions in other fisheries such as salmon.

Table 4.6-50 (cont.). Cumulative effects analysis for catcher processors: FMP 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential adverse or beneficial contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential adverse or beneficial contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential adverse or beneficial contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**S+** the increase in the amount of groundfish fishing will increase opportunities for employment. Head and gut trawl catcher processors, surimi trawl catcher processors and fillet trawl catcher processors account for most of this increase.

Table 4.6-50 (cont.). Cumulative effects analysis for catcher processors: FMP 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential adverse/beneficial contribution** - payments to labor and recent reductions in other fisheries may influence the payments in the groundfish fishery.	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**S+** the increase in the amount of groundfish fishing will increase opportunities for employment. Head and gut trawl catcher processors, surimi trawl catcher processors and fillet trawl catcher processors account for most of this increase.

Table 4.6-50 (cont.). Cumulative effects analysis for catcher processors: FMP 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Product Quality and Product Utilization	I	Yes, history of the race for fish negatively affected product quality.	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**I** insignificant cumulative effects on product quality and utilization are expected. AFA cooperatives, technological advances and the end of the race for fish will maintain product quality and utilization at the baseline level.
Excess Capacity	I	Yes, history of excess capacity (see section 3.9)	**Potential beneficial/adverse contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Not a contributing factor** - not expected to affect excess capacity	**Not a contributing factor** - not expected to affect excess capacity	**Not a contributing factor** - not expected to affect excess capacity	**I** measures that limit capacity and reduce the race for fish would remain under FMP 2.2.

Table 4.6-50 (cont.). Cumulative effects analysis for catcher processors: FMP 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	I	Yes, historical race for fish increased costs (see section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**I** cumulative effects are not expected. Fixed costs per ton will decrease as catch increases however, variable costs will increase as catch per unit of effort declines. Community pressure to increase fish taxes could result in higher average costs though it is not likely under FMP 2.2.
Fishing Vessel Safety	I	Yes, historical race for fish (see section 3.9)	**Potential adverse contribution** - closures in other fisheries can increase risks to vessels.	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**I** insignificant cumulative effects are expected for vessel safety. Safety remains a concern for all fisheries.

Notes: AFA - American Fisheries Act
FMP - fishery management plan

Table 4.6-51. Cumulative effects analysis for inshore processors and motherships: FMP 2.1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S+/I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S+** the increase in TAC and removal of PSC limits increases landings significantly, particularly for pollock and Pacific cod. This increase is so great, changes in other fisheries are not likely to have a significant effect.

Table 4.6-51 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 2.1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Potential beneficial/adverse contribution** - changes in the amount of fish landed (see above) may affect gross product value beneficially or negatively depending on whether there are more or less fish available	**S+** the increase in TAC and removal of PSC limits increases landings significantly, thereby increasing gross product value.

Table 4.6-51 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 2.1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential beneficial/adverse contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**S+** cumulative effects are expected to result in a significant increase in employment due to the increase in fish processing.

Table 4.6-51 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 2.1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries may influence payments to labor in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**S+** cumulative effects are expected to result in a significant increase in payments to labor due to the increase in TAC
Product Quality and Product Utilization	CS-/I	Yes, history of the race for fish negatively affected product quality..	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization	**Not a contributing factor** - not expected to affect product quality or utilization	**Not a contributing factor** - not expected to affect product quality or utilization	**CS-/I** insignificant cumulative effects on product quality are expected, with the exception of sablefish, which is considered conditionally significant negative should the fishery resume the race for fish under FMP 2.1. Insignificant cumulative effects for product utilization are expected.

Table 4.6-51 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 2.1.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S+	Yes, history of excess capacity (see section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S+** cumulative effects are expected to be significant as throughput is expected to increase due to the increase in fishing thereby reducing any processing excess capacity
Average Costs	S+	Yes, historical race for fish increased costs (see section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**S+** cumulative effects are expected to be beneficial as throughput increases over constant fixed costs. Recent pressure from municipal taxes is not likely to offset this effect.

Table 4.6-51 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 2.1.

Notes: FMP - fishery management plan
PSC - prohibited species catch
TAC - total allowable catch

Table 4.6-52. Cumulative effects analysis of inshore processors and motherships: FMP 2.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S+/I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S+** cumulative effects are expected to result from the significant increase in pollock and Pacific cod. These increases are likely to offset current reductions in other fisheries.

Table 4.6-52 (cont.). Cumulative effects analysis of inshore processors and motherships: FMP 2.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Potential adverse or beneficial contribution** - changes in the amount of fish landed (see above) may affect gross product value beneficially or negatively depending on whether there are more or less fish available	**S+** cumulative effects are expected due to a significant increase in deliveries of pollock and Pacific cod to pollock shore plants in BSAI. This increase is likely to offset any increased pressure from reduced government subsidies.

Table 4.6-52 (cont.). Cumulative effects analysis of inshore processors and motherships: FMP 2.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential adverse or beneficial contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential adverse or beneficial contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential adverse or beneficial contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**S+** cumulative effects are expected to result from the significant increase in pollock and Pacific cod, regardless of current reductions in the salmon and crab fisheries.

Table 4.6-52 (cont.). Cumulative effects analysis of inshore processors and motherships: FMP 2.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	S+	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - the success or failure of other fisheries is not expected to affect payments to labor.	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**S+** cumulative effects are expected to result from the significant increase in pollock and Pacific cod, regardless of current reductions in the salmon and crab fisheries.
Product Quality and Product Utilization	I	Yes, history of the race for fish negatively affected product quality.	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**I** insiginficant cumulative effects on product quality and utilization are expected. AFA cooperatives, the end of the race for fish and technological advancements will maintain product quality and utilization at the baseline level.

Table 4.6-52 (cont.). Cumulative effects analysis of inshore processors and motherships: FMP 2.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S+	Yes, history of excess capacity (see section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S+** cumulative effects are expected due to the increase in the amount of fish being processed thereby significantly reducing processing capacity.
Average Costs	S+	Yes, historical race for fish increased costs (see section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**S+** cumulative effects are expected to result from greater amounts of fish being processed while fixed costs remain unchanged.

Table 4.6-52 (cont.). Cumulative effects analysis of inshore processors and motherships: FMP 2.2.

Notes: AFA - American Fisheries Act
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan

Table 4.6-53. Cumulative effects analysis for Bering Sea and Aleutian Island and Gulf of Alaska regions and communities: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Processing/ municipal revenue	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA, municipal reliance on revenue from fish tax	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - Trends in multi-species fisheries and other sources of municipal and state revenue result in adverse effects on in-region processing and municipal revenue. These adverse external effects are offset by significant increases in Alaska in-region processing, resulting in a finding of insignificant cumulative effect. For the Washington Inland Waters and Oregon Coast regions, direct/indirect effects are insignificant, and there are no reasonably foreseeable events that would have a significant contribution

Table 4.6-53 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Island and Gulf of Alaska regions and communities: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Regionally Owned At-sea Processors	**I/S+/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - Direct/indirect effects are beneficial for Southcentral Alaska and Washington Inland Waters regions, external effects will not contribute much to cumulative effects, particularly given the size and diversity of the regional economies. Direct/indirect effects are insignificant in Kodiak Island; with a more diversified economy and population base, external effects associated with other fisheries and sources of revenue will be adverse, but cumulatively insignificant.
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - significant direct/ indirect beneficial effects for all regions contribute to regional economies. However, given the size and diversity of some regional economies, and the adverse nature of external effects related to other fisheries and revenue sharing in the Alaska regions that offset benefits, cumulative effects are insignificant for all regions.

Table 4.6-53 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Island and Gulf of Alaska regions and communities: FMP 2.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Deliveries of Regionally Owned Catcher Vessels	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - direct/indirect effects range from beneficial to insignificant. However, given the size and diversity of some regional economies, and the adverse nature of external effects related to other fisheries and revenue sharing in the Alaska regions that offset benefits, cumulative effects are insignificant for all regions.
Total Direct, Indirect, and Induced Labor Income and FTEs	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Potential Adverse/ Beneficial Contribution**- Trends in other economic development activities, particularly state and municipal capital projects	**Potential Adverse Contribution -** decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - direct/indirect effects are significantly beneficial for all regions. Within Washington and Oregon, fisheries are a small part of the regional economies and effects are dwarfed by other trends. Trends in other fisheries and reductions on municipal revenue decrease labor income and employment and offset these benefits in the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska regions. Cumulative effects are beneficial but insignificant in all regions.

Table 4.6-53 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Island and Gulf of Alaska regions and communities: FMP 2.1.

Notes: AFA - American Fisheries Act
FMP - fishery management plan
FTE - full-time equivalent
TAC - total allowable catch

Table 4.6-54. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 2.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Processing/ municipal revenue	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA, municipal reliance on revenue from fish tax	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - Trends in multi-species fisheries and other sources of municipal and state revenue result in adverse effects on in-region processing and municipal revenue; adverse external effects are offset by significant increases in Alaska in-region processing, resulting in a finding of insignificant cumulative effect. For the Washington Inland Waters and Oregon Coast regions, direct/indirect effects are insignificant, and there are no reasonably foreseeable events that would have a significant contribution

Table 4.6-54 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 2.2**.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Regionally Owned At-sea Processors	**I/S+/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - Direct/indirect effects are beneficial for Southcentral Alaska and Washington Inland Waters regions, external effects will not contribute much to cumulative effects, particularly given the size and diversity of the regional economies. Direct/indirect effects are insignificant in Kodiak Island; with a more diversified economy and population base, external effects associated with other fisheries and sources of revenue will be adverse, but cumulatively insignificant.
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - cumulative effects are insignificant for all regions, where direct/indirect benefits generally offset adverse external factors in Alaska regions. In Southeast Alaska, direct/indirect are insignificant, and adverse external effects are likely to result in adverse but insignificant cumulative effects.

Table 4.6-54 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 2.2**.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Deliveries of Regionally Owned Catcher Vessels	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - direct/indirect effects of in-region deliveries range from beneficial to insignificant. However, given the size and diversity of some regional economies, and the adverse nature of external effects related to other fisheries and revenue sharing in the Alaska regions that offset benefits, cumulative effects are insignificant for all regions.
Total Direct, Indirect, and Induced Labor Income and FTEs	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Potential Adverse/ Beneficial Contribution**- Trends in other economic development activities, particularly state and municipal capital projects	**Potential Adverse Contribution -** decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - direct/indirect effects are beneficial for all regions. Within Washington and Oregon, fisheries are a small part of the regional economies and effects are dwarfed by other trends. Trends in other fisheries and reductions on municipal revenue decrease labor income and employment and offset these benefits in the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska regions. Cumulative effects are beneficial but insignificant in all regions.

Table 4.6-54 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 2.2.

Notes: AFA - American Fisheries Act
FMP - fishery management plan
FTE - full-time equivalent
TAC - total allowable catch

Table 4.6-55. Cumulative effects analysis for community development quota groups: FMPs 2.1 and 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Allocations	U/I	Yes - The trend of increases in species and percent for which shares have been allocated to CDQs has increased their involvement in multi-species fisheries.	**Potential adverse or beneficial contribution -** many CDQs participate in multiple fisheries, including salmon, crab, federal groundfish, and halibut. The relative reliance of harvesters and processors on these fisheries varies on a regional basis and on the status of the individual stocks	**Potential adverse or beneficial contribution -** village infrastructure projects create employment and income opportunities for CDQ communities	**Potential adverse or beneficial contribution** - less revenue sharing from state and federal government, public funding of infrastructure, changes in fiscal policies are likely to affect CDQ communities	**Not a contributing factor** - fluctuations in groundfish stocks drive fishery opening and closures	**FMP 2.1 Unknown** - some level of adverse cumulative effects but significant is unknown **FMP 2.2 Insignificant** - adverse cumulative effects on CDQ groups could occur due to external factors, but are not be enough to be significant

Notes: CDQ - community development quota
FMP - fishery management plan

Table 4.6-56. Cumulative effects analysis for subsistence: FMPs 2.1 and 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Subsistence use of groundfish	I/I	Yes - foreign JV, domestic, and State managed fisheries have decreased populations of some species	**Potential adverse contribution**- state managed groundfish fishery activity could impact subsistence groundfish fishing	**Not a contributing factor** - infrastructure development unlikely to affect groundfish stocks	**Not a contributing factor -**sport and personal use unlikely to adversely affect groundfish stocks	**Potential adverse or beneficial contribution -** fluctuations in groundfish stocks affect availability for subsistence	**FMP 2.1 and 2.2** **I** - adverse cumulative effects are not enough to have significant impacts on subsistence
Subsistence use of salmon	CS-/I	Yes - reduced runs in western Alaska based on past natural events, domestic and foreign commercial fisheries and subsistence harvests	**Potential adverse contribution** - salmon intercept potentially has contributed to poor returns in western Alaska	**Potential adverse contribution** - infrastructure development could effect salmon spawning and rearing habitat	**Not a contributing factor** - sport and personal use is not expected to adversely affect the salmon population	**Potential adverse contribution** - long-term climate change could potentially effect at-sea salmon survival and reduce salmon runs	**FMP 2.1** **CS-** given the removal of the prohibited species catch caps, poor stock status of salmon runs in western Alaska and the combined effects of groundfish and state fisheries bycatch potential in BSAI and GOA, the availability of depressed salmon stocks for subsistence could be significantly impacted **FMP 2.2** **I -** adverse cumulative effects are not enough to have significant impacts on subsistence

Table 4.6-56 (cont.). Cumulative effects analysis for subsistence: FMPs 2.1 and 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Subsistence use of Steller sea lions	CS-/I	Yes - long term decline in population from a combination of effect of commercial fisheries and natural factors	**Potential adverse contribution -** other commercial fisheries have contributed to competition for Steller sea lion prey	**Potential adverse contribution -** marine port and harbor development could potentially impact habitat and increase disturbance	**Not a contributing factor** - sport hunting of Steller sea lions is not permitted	**Potential adverse contribution** - long-term climate change could potentially effect recovery Steller populations	**FMP 2.1** **CS-** the combined take for subsistence, other fisheries and in the groundfish fisheries, the continuing endangered status, and long-term decline in abundance reduce the availability of Steller sea lions for subsistence are likely to result in conditionally significant adverse cumulative effects **FMP 2.2** **I** - adverse cumulative effects are not enough to have significant impacts on subsistence

Table 4.6-56 (cont.). Cumulative effects analysis for subsistence: FMPs 2.1 and 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Indirect subsistence use: income and joint production	I/I	Yes - commercial fishing provides platform for joint production and income to support subsistence	**Potential adverse or beneficial contribution -** income and joint production from other fisheries could affect indirect subsistence impacts	**Potential adverse or beneficial contribution -** income from other economic development activities could affect indirect subsistence impacts	**Not a contributing factor** - impacts to subsistence through sport and personal use is minimal	**Potential adverse or beneficial contribution -** affects on groundfish stocks and opportunity for joint production and income	**FMP 2.1** **I** - increased opportunities for joint production are beneficial but not significant **FMP 2.2** **I** - adverse cumulative effects are not enough to have significant impacts on subsistence

Notes: FMP - fishery management plan

Table 4.6-57. Cumulative effects analysis for environmental justice: FMPs 2.1 and 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State revenues	Long-term Climate Change and Regime Shift	
Environmental Justice	I	Yes - Fisheries Resource Landing tax increased revenues to communities, MSA amendments and CDQ program established, commercial fishing source of employment and income in Native Alaskan communities.	**Potential adverse or beneficial contribution**- changes in other fisheries could impact environmental justice issues in Native communities	**Potential adverse contribution**- infrastructure development trends, effects of other economic activities	**Potential adverse contribution-** decrease in other state and municipal revenue sources	**Potential adverse or beneficial contribution-** fluctuations in fish stocks affect availability for Alaska Native subsistence use	**FMP 2.1 Insignificant** - -*Direct/indirect* impacts ranges from beneficial to adverse, but are cumulatively insignificant except for salmon subsistence in Western Alaska, which are conditionally significant adverse; increased benefits for non-CDQ communities participating in groundfish fisheries, and municipal revenue in Native communities, but cumulative effects are insignificant. - *External effects* include beneficial effects from increased joint production opportunities for subsistence, but are cumulatively insignificant; elimination of the multi species CDQ program could create some level of adverse cumulative effects, but not enough to be significant; effects from bycatch of salmon could be expected to increase due to the repeal of prohibited species catch restrictions. This could create conditionally significant adverse cumulative effects to subsistence fishery areas. -*Cumulative effects* are insignificant **FMP 2.2 Insignificant** - -*Direct/indirect* impacts ranges from beneficial to adverse, but are cumulatively insignificant; increased benefits for non-CDQ communities participating in groundfish fisheries, and municipal revenue in Native communities, but cumulative effects are insignificant. - *External effects* include beneficial effects from increased joint production opportunities for subsistence, but are cumulatively insignificant; elimination of the multi species CDQ program could create some level of adverse cumulative effects, but not enough to be significant; effects from bycatch of salmon could have adverse cumulative effects but not enough to be significant; significant adverse cumulative effects to Steller sea lion subsistence activities could result but not enough to be significant. -*Cumulative effects* are insignificant

Notes: FMP - fishery management plan

Table 4.6-58. Cumulative effects analysis for market channels: FMP 2.1 and 2.2

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects		Cumulative Effect
			Human Controlled	Natural Events	
			Other Fisheries	Long-term Climate Changes and Regime Shift	
Benefits to U.S. consumers	I	Alaska Seafood Marketing Institute product promotion activities Research and Public awareness of health benefits of seafood consumption Aquaculture development increased overall demand for seafood products Changes in processing technology increased seafood quality	**Potential adverse/beneficial contribution** - other fisheries are providing relatively stable levels of seafood products to domestic and foreign markets; supply of fish products that may be influenced by competition in markets, over fishing foreign fisheries, and increased domestic consumption	**Potential adverse/beneficial contribution** - fluctuations in groundfish stocks may potentially affect availability for market channels	**Insignificant** - wholesale groundfish product value in conjunction with products from other fisheries is not expected to change benefits to U.S. consumers

Notes: FMP - fishery management plan

Table 4.6-59. Cumulative effects analysis for non-consumptive and non-use benefits (the value of the Bering Sea and Aleutian Islands and Gulf of Alaska ecosystems): FMPs 2.1 and 2.2.

Direct/Indirect Effects of FMPs	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects		Cumulative Effect
			Human Controlled	Natural Events	
			Other Fisheries	Long-term Climate Changes and Regime Shift	
Benefits derived from marine ecosystems and associated species (Including non-consumptive and non-use benefits)	CS-	Increased public awareness of marine ecosystems (e.g., BSAI and GOA marine ecosystems) and associated endangered species (e.g., Steller sea lions) Increased participation in recreational fishing and eco-tourism activities Lawsuits challenging NOAA Fisheries for failing to meet the requirements of the Endangered Species Act in its management of Alaska groundfish fisheries	**Potential adverse contribution** - fishing levels in other domestic and foreign fisheries may be affecting the productivity of the marine ecosystem	**Potential adverse/ beneficial contribution** - fluctuations in groundfish stocks may potentially affect ecosystems and associated species	**Conditionally Significant Adverse** - cumulative adverse impacts on the level of benefits derived from these ecosystems (recreational fishing, wildlife viewing, subsistence and non-consumptive activities) and associated species. The greater fishing effort under FMP 2.1 could incrementally contribute to energy removal and energy redirection occurring on the groundfish fisheries, and accelerate the introduction of non-native species, effect a change in pelagic forage availability, spacial and temporal concentration of fishery impact on forage, removal of top predators (potential for seabird bycatch and subsistence harvests of marine mammals), could increase the risk of changes in species, functional, and structural habitat diversity for the ecosystem

Table 4.6-60. Cumulative effects analysis of the ecosystem: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating (see Section 4.6.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Controlled Events							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in pelagic forage availability	**S-, CS-, I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries) and pollock and Atka mackerel catch • State of Alaska directed capelin and herring fishery • Subsistence removals • Climatic effects on recruitment and distribution	**Not a contributing factor:** The halibut fishery will not remove pelagic forage species.	**Not a contributing factor:** These fisheries affect distinct sub-populations and are not expected to reduce pelagic forage biomass in the BSAI.	**Potential negative contribution:** The herring fishery will remove an annual increment of pelagic forage biomass.	**Not a contributing factor:** Salmon farming will not affect pelagic forage species.	**Potential negative contribution:** Subsistence harvests will annually remove a small increment of pelagic forage biomass.	**Not a contributing factor:** Regulated marine mammal removals will not measurably affect pelagic forage biomass.	**Potential negative contribution:** Oil and fuel spills during herring or capelin spawning could depress populations of pelagic forage species.	**Potential positive or negative contribution:** Climate change could alter productivity and affect the total pelagic forage biomass.	**S-** Rating is driven by the predicted significant negative direct effect of FMP 2.1, augmented by the potential for a large oil spill in the GOA involving key spawning times and/or areas to substantially reduce herring and capelin populations. This cumulative effect would not be offset, but could be intensified, by a climatic regime shift. ADF&G will annually review and set herring exploitation rates. Annual subsistence removals will not measurably affect pelagic forage biomass.
Spatial and temporal concentration of fishery impact on forage	**CS-**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries), herring bycatch and pollock and Atka mackerel catch by area and season • State of Alaska directed capelin and herring fishery by area and season • Subsistence removals by area and season • Climatic effects on recruitment and distribution	**Not a contributing factor:** The halibut fishery will not remove pelagic forage species.	**Not a contributing factor:** These fisheries affect distinct sub-populations and are not expected to interact synergistically with spatial and temporal patterns of fishing effort in the BSAI.	**Potential negative contribution:** The herring fishery could affect local concentrations of herring and other forage fish. Because the herring fishery is mainly inshore, overlaps with the groundfish fishery would be more likely temporal than spatial.	**Not a contributing factor:** Salmon farming will not affect pelagic forage species.	**Potential negative contribution:** Subsistence fishing will most likely not be annually adjusted to offset FMP effects and will sometimes overlap with the spatial and temporal pattern of the groundfish fishery.	**Not a contributing factor:** Regulated marine mammal removals will not add to the spatial and temporal impacts of the groundfish fishery.	**Potential negative contribution:** Persistent effects of oil and fuel spills could sporadically intensify spatial and temporal impacts of the groundfish fishery on forage species.	**Potential positive or negative contribution:** Climate change could alter the spatial and temporal distributions of pelagic forage species in ways that might be synergistic with spatial and temporal concentrations of groundfish fishery impacts.	CS- Rating reflects the potential for FMP 2.1 to produce fishing concentration levels on pelagic forage species high enough to impair the long-term viability of seabirds and marine mammals. Incremental contributions from the herring fishery, subsistence fishing, sporadic fuel and oil spills, and climate change could affect pelagic forage species in ways that could add to, or interact with, spatial and temporal patterns of groundfish fishery impacts on forage species.

Table 4.6-60 (cont.). Cumulative effects analysis of the ecosystem: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating (see Section 4.6.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Controlled Events							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Removal of top predators	**CS-, I, U**	• Domestic groundfish fishery shark, seabird, and pinniped bycatch • Commercial whaling and fur seal harvests • State of Alaska directed fisheries removals • Shark, pinniped, and seabird bycatch in State of Alaska fisheries • Shark, pinniped, and seabird bycatch in foreign groundfish fishery • Subsistence mammal harvests • Climate variability effects on top predator species recruitment and distribution	**Potential negative contribution:** The IPHC longline fishery annually removes an increment of halibut, a top predator.	**Potential negative contribution:** Seabird bycatch in NPO longline fisheries and removals of targeted top predators such as Greenland turbot will result in annual removals.	**Potential negative contribution:** State of Alaska directed fisheries will annually remove an increment of top predators as targeted species and bycatch.	**Not a contributing factor:** Salmon farming will not affect top predators.	**Not a contributing factor:** Subsistence fishing will not affect top predators.	**Potential negative contribution:** Subsistence harvests will annually remove a small increment of marine mammals.	**Potential negative contribution:** Oil and fuel spills could sporadically remove portions of top predator populations through direct mortality.	**Potential positive or negative contribution:** A regime shift could affect the recruitment and distribution of top predator populations. A regime shift would not remove top predators through direct mortality but could alter total numbers of top predators in the system by affecting recruitment.	**CS-** Rating reflects the potential of FMP 2.1, in combination with bycatch from NPO longline fisheries operating outside the EEZ and incremental contributions from the IPHC longline fishery, State of Alaska groundfish fisheries, subsistence harvests of marine mammals, sporadic fuel and oil spills, and future climatic regime shifts, to push the biomass of one or more top predator species below minimum biologically acceptable limits.
Introduction of non-native species	**CS-**	• Domestic groundfish fishery ballast • Salmon farming • Commercial shipping • Climate variability effects on probability of successful introduction	**Potential negative contribution:** Ballast water release and hull-fouling organisms may introduce exotic marine species on a recurring basis.	**Not a contributing factor:** Predominant westward currents would tend to prevent exotics introduced to the Western Bering Sea from being carried eastward to the Alaskan shelf.	**Potential negative contribution:** Ballast water release and hull-fouling organisms associated with fishing vessels from outside Alaska may introduce exotic marine species on a recurring basis.	**Potential negative contribution:** Farmed Atlantic salmon is an exotic species. Escapes may reproduce and establish runs, competing with native species. Introduced pathogens and parasites could infect wild stocks.	**Not a contributing factor:** Subsistence fish harvests provide no evident mechanism or pathway for the introduction of exotic species.	**Not a contributing factor:** Subsistence marine mammal harvests provide no evident mechanism or pathway for the introduction of exotic species.	**Potential negative contribution:** Ballast water and hull-fouling organisms may introduce non-native species on a recurring basis. Many other pathways for the introduction of exotic marine species to Alaska have been identified (ADF&G 2002a,b).	**Potential negative contribution:** A warming trend may allow exotic populations that are currently limited by low seawater temperatures to become viable. Potential positive contribution: Low seawater temperatures may continue to limit the viability of introduced marine species.	**CS-** Rating reflects the potential for FMP 2.1, in combination with the IPHC and State of Alaska commercial fisheries and commercial shipping, to introduce one or more exotic species that establish viable BSAI or GOA populations. Atlantic salmon escapes from farms could also establish viable populations, and many other pathways for introductions have been identified. If a future regime shift produces warmer conditions, exotics currently limited by low ambient seawater temperatures could establish viable populations.

Table 4.6-60 (cont.). Cumulative effects analysis of the ecosystem: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating (see Section 4.6.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Controlled Events							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Energy removal	**CS-**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Halibut fishery removals • Subsistence removals • Climate variability effects on system production	**Potential negative contribution:** The halibut fishery will annually remove energy from the system.	**Unknown** Fishing effort outside the EEZ will annually remove energy from the Bering Sea ecosystem, but external components interactive with the BSAI ecosystem have not been characterized with respect to energy removal.	**Potential negative contribution:** State of Alaska directed fisheries will annually remove energy from the system.	**Not a contributing factor:** Salmon farming will not remove energy from the ecosystem.	**Potential negative contribution:** Subsistence fish harvests will annually remove an increment of energy from the ecosystem.	**Potential negative contribution:** Subsistence marine mammal harvests will annually remove an increment of energy from the ecosystem.	**Not a contributing factor:** There is no evident pathway or mechanism by which commercial shipping will remove energy from the system.	**Not a contributing factor:** Climate variations will affect ecosystem productivity, and energy removals will follow climate-driven trends. Under these conditions, there would be (approx.) no net change in energy balance.	**CS-** Incremental contributions of energy (biomass) removal from the IPHC halibut fishery, State of Alaska commercial fisheries, and subsistence harvests of fish and marine mammals will add to the direct/indirect effects of the groundfish fisheries, increasing the cumulative total energy removed from the BSAI and GOA ecosystems.
Energy redirection	**CS-**	• Domestic groundfish fishery discards, offal, and bottom gear effort • State of Alaska directed fisheries discards, offal, and bottom gear effort • Subsistence discards and offal • Halibut fishery discards and offal • Climate variability effects on energy cycling	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Not a contributing factor:** Discards and offal production in the Western Bering Sea will not measurably alter BSAI and GOA energy pathways.	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Not a contributing factor:** Salmon farms in B.C. and Washington State will not affect energy pathways in the GOA or BSAI.	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Potential negative contribution:** Offal from subsistence marine mammal harvests will produce incremental changes to energy distribution in the BSAI and GOA.	**Potential negative contribution:** Releases of graywater and refuse from cruise ships and other vessels will produce incremental changes to energy distribution, primarily in the GOA.	**Potential positive or negative contribution:** Climate variations will affect energy cycling in the ecosystem, but information is insufficient to allow a reliable prediction of the consequences.	**CS-** Discards, offal, or gear-related mortality from the IPHC halibut fishery, State of Alaska commercial fisheries, and subsistence harvests of fish and marine mammals will supplement effects of the groundfish fisheries. Releases of graywater and refuse from commercial shipping will additionally affect energy distribution. Local water quality degradation in the immediate vicinity of fish processing facilities will occur if local conditions allow contaminants to concentrate in limited areas. The greater fishing effort under FMP 2.1 would increase the potential for this to occur.
Change in species diversity	**S-, CS-, I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s-1976) removals • Halibut fishery removals • Climate variability effects on species level diversity	**Potential negative contribution:** Seabird bycatch levels associated with the IPHC longline fishery are unknown and could be high enough to affect species diversity.	**Potential negative contribution:** Seabird bycatch by Western Bering Sea fisheries could be high enough to affect BSAI species diversity.	**Potential negative contribution:** State of Alaska directed fisheries are managed to avoid depletions near or below minimum biologically acceptable limits. However, bycatch will annually remove an increment of seabirds.	**Potential negative contribution:** Escapes could establish viable populations. These could add to species diversity or, alternatively, reduce native stock through successful competition for spawning and rearing habitat.	**Not a contributing factor:** Subsistence fish harvests will not selectively remove enough individuals to affect species diversity.	**Potential negative contribution:** Subsistence marine mammal harvests have the potential to deplete some species to levels below minimum biologically acceptable limits.	**Potential negative contribution:** Introduced exotic species from hulls and ballast water may establish viable populations and thus alter species diversity.	**Potential positive or negative contribution:** Future climate variations may alter the productivity and distribution of individual species.	S- Rating reflects the potential for seabird bycatch and subsistence harvests of marine mammals, in combination with potential significantly adverse direct effects of FMP 2.1, to remove sufficient numbers of individuals to influence species diversity within trophic guilds. The introduction of exotic species, currently limited by unknown factors, could increase the potential for changes in species diversity. Future climatic conditions, in combination with fisheries-related pressures, could also affect species diversity.

Table 4.6-60 (cont.). Cumulative effects analysis of the ecosystem: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating (see Section 4.6.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Controlled Events							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in functional (trophic) diversity	**CS-**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s-1976) removals • Halibut fishery removals • Climate variability effects on trophic diversity	**Not a contributing factor:** The IPHC fishery will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	**Not a contributing factor:** These fisheries will not affect species or size diversity within BSAI or GOA trophic guilds.	**Not a contributing factor:** State of Alaska directed fisheries will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	**Potential negative contribution:** Diversity within a trophic guild would increase if Atlantic salmon established a viable population at the trophic level occupied by Pacific salmon.	**Not a contributing factor:** Subsistence fish harvests will not selectively remove enough individuals to affect trophic diversity.	**Potential negative contribution:** Subsistence marine mammal harvests have the potential to affect species diversity within piscivore guilds.	**Potential negative contribution:** Introduced exotic species from hulls and ballast water may establish viable populations and thus alter trophic diversity.	**Potential positive or negative contribution:** A future regime shift could affect trophic diversity by forcing trends that expand some trophic levels and contract others. A warming trend could allow exotic species to establish viable populations, thus altering trophic diversity.	**CS-** Rating reflects the potential for incremental contributions from salmon farming, subsistence harvests of marine mammals, exotic species introduced through commercial shipping traffic, and a future climatic regime shift, in combination with the potential effects of FMP 2.1, to alter the diversity of species within a trophic guild beyond the range of natural variability.
Change in functional (structural habitat) diversity	**S-**	• Foreign groundfish fishery pre-MSA (1960s-1976) bottom gear effort • JV groundfish fishery bottom gear effort • Domestic groundfish bottom gear effort • Climate variability effects on structural habitat diversity	**Not a contributing factor:** This fishery does not employ bottom gear.	**Not a contributing factor:** These fisheries will not affect structural habitat in the BSAI and GOA.	**Potential negative contribution:** The scallop fishery will employ bottom dredges that will damage structural habitat and contribute a small increment in combination with the larger cumulative area affected by the BSAI and GOA groundfish fisheries.	**Not a contributing factor:** Salmon farming will not affect marine structural habitat.	**Not a contributing factor:** Subsistence fish harvests will not affect marine structural habitat.	**Not a contributing factor:** Subsistence marine mammal harvests will not affect marine structural habitat.	**Potential negative contribution:** A large oil or fuel spills could damage sensitive bottom-dwelling organisms that provide structural habitat.	**Potential positive or negative contribution:** A regime shift could change the mean annual seawater temperature sufficiently to increase or retard the growth of bottom-dwelling organisms, thus altering structural habitat diversity.	**S-** The significant negative effect of bottom fishing associated with FMP 2.1 could be intensified under three future conditions: (1) the additive effect of bottom dredging by the scallop fishery, (2) a large petroleum spill affecting a broad geographic area of bottom habitat, and/or (3) a climatic regime shift that reduces the population size and distribution of bottom-dwelling organisms that provide structural habitat.

Table 4.6-60 (cont.). Cumulative effects analysis of the ecosystem: FMP 2.1.

Direct/ Indirect Effects of FMP	FMP Rating (see Section 4.6.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Controlled Events							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in genetic diversity	**I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s-1976) removals • Halibut fishery removals • Climate variability effects on genetic diversity	**Not a contributing factor:** The IPHC longline fishery is managed to avoid the concentrated targeting of fish with a narrow range of attributes.	**Not a contributing factor:** Catch removals potentially altering the genetic diversity of Western Bering Sea stocks are not expected to affect BSAI stocks, because distinct subpopulations are involved.	**Not a contributing factor:** MSST, TAC, and other catch regulation of future directed fisheries will be managed by ADF&G to sustain genetic diversity, including stocks associated with individual salmon streams.	**Potential negative contribution:** Escaped Atlantic salmon may establish viable populations that affect the genetic diversity of the GOA and BSAI ecosystems. Populations established by escaped Pacific salmon species could produce similar effects.	**Potential negative contribution:** Subsistence fish harvests may focus on particular spawning aggregations or larger fish, thus adding an annual increment to removals with the potential to decrease genetic diversity.	**Potential negative contribution:** Subsistence marine mammal harvests may concentrate on particular resident sub-populations defined by location, e.g., Cook Inlet belugas.	**Potential negative contribution:** Hull-fouling invertebrates and exotics introduced through ballast water discharge may establish viable populations in the future, potentially out-competing and displacing native species.	**Potential positive or negative contribution:** A climatic regime shift could increase the mean annual temperature of seawater sufficiently to allow exotic species to establish viable populations.	**I** Although the identified external factors could cumulatively influence genetic diversity within the BSAI and GOA ecosystems, the rating reflects the low potential for these factors to significantly affect the genetic diversity of species targeted or taken incidentally by the BSAI and GOA groundfish fisheries.

Notes: ADF&G - Alaska Department of Fish and Game
B.C. - British Columbia, Canada
BSAI - Bering Sea and Aleutian Islands
CS- - conditionally significant negative
EEZ - exclusive economic zone
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
IPHC - International Halibut Commission
JV - joint venture
MSA - Magnuson-Stevens Fishery Conservation and Management Act
MSST - minimum stock size threshold
NPO - North Pacific ocean
S- - significant negative
TAC - total allowable catch
U - unknown

Table 4.6-61. Cumulative effects analysis of ecosystem: FMP 2.2.

Direct/ Indirect Effects of FMP	FMP Rating (Section 4.6.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Controlled Events							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in pelagic forage availability	**S-, CS-, I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries) and pollock and Atka mackerel catch • State of Alaska directed capelin and herring fishery • Subsistence removals • Climatic effects on recruitment and distribution	**Not a contributing factor** The halibut fishery will not remove pelagic forage species.	**Not a contributing factor** These fisheries affect distinct sub-populations and are not expected to reduce pelagic forage biomass in the BSAI.	**Potential negative contribution** The herring fishery will remove an annual increment of pelagic forage biomass.	**Not a contributing factor** Salmon farming will not affect pelagic forage species.	**Potential negative contribution** Subsistence harvests will annually remove a small increment of pelagic forage biomass.	**Not a contributing factor** Regulated marine mammal removals will not measurably affect pelagic forage biomass.	**Potential negative contribution** Oil and fuel spills during herring or capelin spawning could depress populations of pelagic forage species.	**Potential positive or negative contribution** Climate change could alter productivity and affect the total pelagic forage biomass.	**S-** Rating is driven by the predicted significant negative direct effect of FMP 2.2, augmented by the potential for a large oil spill in the GOA involving key spawning times and/or areas to substantially reduce herring and capelin populations. This cumulative effect could be intensified, by a climatic regime shift. ADF&G will annually review and set herring exploitation rates.
Spatial and temporal concentration of fishery impact on forage	**I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries), herring bycatch and pollock and Atka mackerel catch by area and season • State of Alaska directed capelin and herring fishery by area and season • Subsistence removals by area and season • Climatic effects on recruitment and distribution	**Not a contributing factor** The halibut fishery will not remove pelagic forage species.	**Not a contributing factor** These fisheries affect distinct sub-populations and are not expected to interact synergistically with spatial and temporal patterns of fishing effort in the BSAI.	**Potential negative contribution** The herring fishery could affect local concentrations of herring and other forage fish. Because the herring fishery is mainly inshore, overlaps with the groundfish fishery would be more likely temporal than spatial.	**Not a contributing factor** Salmon farming will not affect pelagic forage species.	**Potential negative contribution** Subsistence fishing will most likely not be annually adjusted to offset FMP effects and will sometimes overlap with the spatial and temporal pattern of the groundfish fishery.	**Not a contributing factor** Regulated marine mammal removals will not add to the spatial and temporal impacts of the groundfish fishery.	**Potential negative contribution** Persistent effects of oil and fuel spills could sporadically intensify spatial and temporal impacts of the groundfish fishery on forage species.	**Potential positive or negative contribution** Climate change could alter the spatial and temporal distributions of pelagic forage species in ways that might be synergistic with spatial and temporal concentrations of groundfish fishery impacts.	**CS-** Rating reflects the potential for Incremental contributions from the herring fishery, subsistence fishing, sporadic fuel and oil spills, and climate change to converge and affect pelagic forage species in ways that could add to, or interact with, spatial and temporal patterns of groundfish fishery impacts on forage species.

Table 4.6-61(cont.). **Cumulative effects analysis of ecosystem: FMP 2.2.**

Direct/ Indirect Effects of FMP	FMP Rating (Section 4.6.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Controlled Events							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Removal of top predators	**I, U**	• Domestic groundfish fishery shark, seabird, and pinniped bycatch • Commercial whaling and fur seal harvests • State of Alaska directed fisheries removals • Shark, pinniped, and seabird bycatch in State of Alaska fisheries • Shark, pinniped, and seabird bycatch in foreign groundfish fishery • Subsistence mammal harvests • Climate variability effects on top predator species recruitment and distribution	**Potential negative contribution** The IPHC longline fishery annually removes an increment of halibut, a top predator.	**Potential negative contribution** Seabird bycatch in NPO longline fisheries and removals of targeted top predators such as Greenland turbot will result in annual removals.	**Potential negative contribution** State of Alaska directed fisheries will annually remove an increment of top predators as targeted species and bycatch.	**Not a contributing factor** Salmon farming will not affect top predators.	**Not a contributing factor** Subsistence fishing will not affect top predators.	**Potential negative contribution** Subsistence harvests will annually remove a small increment of marine mammals.	**Potential negative contribution** Oil and fuel spills could sporadically remove portions of top predator populations through direct mortality.	**Potential positive or negative contribution** A regime shift could affect the recruitment and distribution of top predator populations. A regime shift would not remove top predators through direct mortality but could alter total numbers of top predators in the system by affecting recruitment.	**CS-** Rating reflects the potential of FMP 2.2, in combination with Western Bering Sea fisheries bycatch and incremental contributions from the IPHC longline fishery, subsistence harvests of marine mammals, sporadic fuel and oil spills, and future climatic regime shifts, to push the biomass of one or more top predator species below minimum biologically acceptable limits.
Introduction of non-native species	**I**	• Domestic groundfish fishery ballast • Commercial shipping • Climate variability effects on probability of successful introduction	**Potential negative contribution** Ballast water release and hull-fouling organisms may introduce exotic marine species on a recurring basis.	**Not a contributing factor** Predominant westward currents would tend to prevent exotics introduced to the Western Bering Sea from being carried eastward to the Alaskan shelf.	**Potential negative contribution** Ballast water release and hull-fouling organisms associated with fishing vessels from outside Alaska may introduce exotic marine species on a recurring basis.	**Potential negative contribution** Farmed Atlantic salmon is an exotic species. Escapes may reproduce and establish runs, competing with native species. Introduced pathogens and parasites could infect wild stocks.	**Not a contributing factor** Subsistence fish harvests provide no evident mechanism or pathway for the introduction of exotic species.	**Not a contributing factor** Subsistence marine mammal harvests provide no evident mechanism or pathway for the introduction of exotic species.	**Potential negative contribution** Ballast water and hull-fouling organisms may introduce non-native species on a recurring basis. Many other pathways for the introduction of exotic marine species to Alaska have been identified (ADF&G 2002a,b).	**Potential negative contribution** A warming trend may allow exotic populations that are currently limited by low seawater temperatures to become viable. Potential positive contribution: Low seawater temperatures may continue to limit the viability of introduced marine species.	**CS-** Rating reflects the potential for FMP 2.2, in combination with the IPHC and State of Alaska commercial fisheries and commercial shipping, to introduce one or more exotic species that establish viable BSAI or GOA populations. Atlantic salmon escapes from farms could also establish viable populations, and many other pathways for introductions have been identified. If a future regime shift produces warmer conditions, exotics currently limited by low ambient seawater temperatures could establish viable populations.

Table 4.6-61(cont.). Cumulative effects analysis of ecosystem: FMP 2.2.

Direct/ Indirect Effects of FMP	FMP Rating (Section 4.6.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Controlled Events							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Energy removal	I	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Halibut fishery removals • Subsistence removals • Climate variability effects on system production	**Potential negative contribution** The halibut fishery will annually remove energy from the system.	**Unknown** Fishing effort outside the EEZ will annually remove energy from the Bering Sea ecosystem, but external components interactive with the BSAI ecosystem have not been characterized with respect to energy removal.	**Potential negative contribution** State of Alaska directed fisheries will annually remove energy from the system.	**Not a contributing factor** Salmon farming will not remove energy from the ecosystem.	**Potential negative contribution** Subsistence fish harvests will annually remove an increment of energy from the ecosystem.	**Potential negative contribution** Subsistence marine mammal harvests will annually remove an increment of energy from the ecosystem.	**Not a contributing factor** There is no evident pathway or mechanism by which commercial shipping will remove energy from the system.	**Not a contributing factor** Climate variations will affect ecosystem productivity, and energy removals will follow climate-driven trends. Under these conditions, there would be (approximately) no net change in energy balance.	**I** Total groundfish catch is estimated to remove less than 1% of the total system energy. Energy removals from external sources are not likely to increase this level to the point where long-term changes in system biomass, production, or energy cycling occur outside the range of natural variability.
Energy redirection	I	• Domestic groundfish fishery discards, offal, and bottom gear effort • State of Alaska directed fisheries discards, offal, and bottom gear effort • Subsistence discards and offal • Halibut fishery discards and offal • Climate variability effects on energy cycling	**Potential negative contribution** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Not a contributing factor** Discards and offal production in the Western Bering Sea will not measurably alter BSAI and GOA energy pathways.	**Potential negative contribution** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Not a contributing factor** Salmon farms in B.C. and Washington State will not affect energy pathways in the GOA or BSAI.	**Potential negative contribution** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Potential negative contribution** Offal from subsistence marine mammal harvests will produce incremental changes to energy distribution in the BSAI and GOA.	**Potential negative contribution** Releases of graywater and refuse from cruise ships and other vessels will produce incremental changes to energy distribution, primarily in the GOA.	**Potential positive or negative contribution** Climate variations will affect energy cycling in the ecosystem, but information is insufficient to allow a reliable prediction of the con-sequences.	**I** Discards, offal, or gear-related mortality from external sources are not likely to supplement effects of the groundfish fisheries sufficiently to produce long-term changes in system biomass, respiration, production, or energy cycling outside the range of natural variability. Local water quality degradation in the immediate vicinity of fish processing facilities will occur if local conditions allow contaminants to concentrate in limited areas. Fish processing waste discharge is regulated through USEPA and Alaska Department of Environmental Conservation permitting programs.

Table 4.6-61(cont.). **Cumulative effects analysis of ecosystem: FMP 2.2.**

Direct/ Indirect Effects of FMP	FMP Rating (Section 4.6.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Controlled Events							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in species diversity	**I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s-1976) removals • Halibut fishery removals • Climate variability effects on species level diversity	**Potential negative contribution** Seabird bycatch levels associated with the IPHC longline fishery are unknown and could be high enough to affect species diversity.	**Potential negative contribution** Seabird bycatch by Western Bering Sea fisheries could be high enough to affect BSAI species diversity.	**Potential negative contribution** State of Alaska directed fisheries are managed to avoid depletions near or below minimum biologically acceptable limits. However, bycatch will annually remove an increment of seabirds.	**Potential negative contribution** Escapes could establish viable populations. These could add to species diversity or, alternatively, reduce native stock through successful competition for spawning and rearing habitat.	**Not a contributing factor** Subsistence fish harvests will not selectively remove enough individuals to affect species diversity.	**Potential negative contribution** Subsistence marine mammal harvests have the potential to deplete some species to levels below minimum biologically acceptable limits.	**Potential negative contribution** Introduced exotic species from hulls and ballast water may establish viable populations and thus alter species diversity.	**Potential positive or negative contribution** Future climate variations may alter the productivity and distribution of individual species.	**CS-** Rating reflects the potential for seabird bycatch and subsistence harvests of marine mammals to remove sufficient numbers of individuals to influence species diversity within trophic guilds. The introduction of exotic species, currently limited by unknown factors, could increase the potential for changes in species diversity. Future climatic conditions, in combination with fisheries-related pressures, could also affect species diversity.
Change in functional (trophic) diversity	**I**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s-1976) removals • Halibut fishery removals • Climate variability effects on trophic diversity	**Not a contributing factor** The IPHC fishery will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	**Not a contributing factor** These fisheries will not affect species or size diversity within BSAI or GOA trophic guilds.	**Not a contributing factor** State of Alaska directed fisheries will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	**Potential negative contribution** Diversity within a trophic guild would increase if Atlantic salmon established a viable population at the trophic level occupied by Pacific salmon.	**Not a contributing factor** Subsistence fish harvests will not selectively remove enough individuals to affect trophic diversity.	**Potential negative contribution** Subsistence marine mammal harvests have the potential to affect species diversity within piscivore guilds.	**Potential negative contribution** Introduced exotic species from hulls and ballast water may establish viable populations and thus alter trophic diversity.	**Potential positive or negative contribution** A future regime shift could affect trophic diversity by forcing trends that expand some trophic levels and contract others. A warming trend could allow exotic species to establish viable populations, thus altering trophic diversity.	**CS-** Rating reflects the potential for incremental contributions from salmon farming, subsistence harvests of marine mammals, exotic species introduced through commercial shipping traffic, and a future climatic regime shift, in combination with the potential effects of FMP 2.2, to alter the diversity of species within a trophic guild beyond the range of natural variability.

Table 4.6-61(cont.). Cumulative effects analysis of ecosystem: FMP 2.2.

Direct/ Indirect Effects of FMP	FMP Rating (Section 4.6.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Controlled Events							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in functional (structural habitat) diversity	**I**	• Foreign groundfish fishery pre-MSA (1960s-1976) bottom gear effort • JV groundfish fishery bottom gear effort • Domestic groundfish bottom gear effort • Climate variability effects on structural habitat diversity	**Not a contributing factor** This fishery does not employ bottom gear.	**Not a contributing factor** These fisheries will not affect structural habitat in the BSAI and GOA.	**Potential negative contribution** The scallop fishery will employ bottom dredges that will damage structural habitat and contribute a small increment in combination with the larger cumulative area affected by the BSAI and GOA groundfish fisheries.	**Not a contributing factor** Salmon farming will not affect marine structural habitat.	**Not a contributing factor** Subsistence fish harvests will not affect marine structural habitat.	**Not a contributing factor** Subsistence marine mammal harvests will not affect marine structural habitat.	**Potential negative contribution** A large oil or fuel spills could damage sensitive bottom-dwelling organisms that provide structural habitat.	**Potential positive or negative contribution** A regime shift could change the mean annual seawater temperature sufficiently to increase or retard the growth of bottom-dwelling organisms, thus altering structural habitat diversity.	**CS -** FMP 2.2 could contribute to a significant negative cumulative effect on structural habitat diversity under at least three conditions: (1) the additive effect of bottom dredging by the scallop fishery, (2) a large petroleum spill affecting a broad geographic area of bottom habitat, and/or (3) a climatic regime shift that reduces the population size and distribution of bottom-dwelling organisms that provide structural habitat.
Change in genetic diversity	**I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s-1976) removals • Halibut fishery removals • Climate variability effects on genetic diversity	**Not a contributing factor** The IPHC longline fishery is managed to avoid the concentrated targeting of fish with a narrow range of attributes.	**Not a contributing factor** Catch removals potentially altering the genetic diversity of Western Bering Sea stocks are not expected to affect BSAI stocks, because distinct subpopulations are involved.	**Not a contributing factor** MSST, TAC, and other catch regulation of future directed fisheries will be managed by ADF&G to sustain genetic diversity, including stocks associated with individual salmon streams.	**Potential negative contribution** Escaped Atlantic salmon may establish viable populations that affect the genetic diversity of the GOA and BSAI ecosystems. Populations established by escaped Pacific salmon species could produce similar effects.	**Potential negative contribution** Subsistence fish harvests may focus on particular spawning aggregations or larger fish, thus adding an annual increment to removals with the potential to decrease genetic diversity.	**Potential negative contribution** Subsistence marine mammal harvests may concentrate on particular resident sub-populations defined by location, e.g., Cook Inlet belugas.	**Potential negative contribution** Hull-fouling invertebrates and exotics introduced through ballast water discharge may establish viable populations in the future, potentially out-competing and displacing native species.	**Potential positive or negative contribution** A climatic regime shift could increase the mean annual temperature of seawater sufficiently to allow exotic species to establish viable populations.	**I** Although the identified external factors could cumulatively influence genetic diversity within the BSAI and GOA ecosystems, the rating reflects the low potential for these factors to significantly affect the genetic diversity of species targeted or taken incidentally by the BSAI and GOA groundfish fisheries.

Notes:
ADF&G - Alaska Department of Fish and Game
B.C. - British Columbia, Canada
BSAI - Bering Sea and Aleutian Islands
CS- - conditionally significant negative
EEZ - exclusive economic zone
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
IPHC - International Halibut Commission
JV - joint venture
MSA - Magnuson-Stevens Fishery Conservation and Management Act
MSST - minimum stock size threshold
NPO - North Pacific ocean
S- - significant negative
TAC - total allowable catch
U - unknown
USEPA - U.S. Environmental Protection Agency

Table 4.6-62. Target species direct/indirect and cumulative effects significance ratings under FMPs 2.1 and 2.2.

Direct/ Indirect Effects	Effect	EBS Pollock		GOA Pollock		BSAI and GOA Pacific Cod		BSAI and GOA Sablefish		AI Atka Mackerel		GOA Atka Mackerel		BSAI Flatfish*		GOA Flatfish*		GOA Arrowtooth Flounder		BSAI Greenland Turbot		BSAI Other Flatfish		BSAI and GOA POP		GOA Thornyhead Rockfish		BSAI Rockfish*		GOA Rockfish*		GOA Northern Rockfish		GOA Demersal Shelf Rockfish	
		2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2
Mortality	DI	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	S-	S-
	CE	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	S-	S-
Change in Biomass	DI	S-	I	I	I	S-	I	S-	I	S-	I	U	U	I	I	U	U	I	I	S-	I	U	U	I	I	I	I	U	U	U	U	I	I	S-	CS-
	CE	S-	I	I	I	S-	I	S-	I	S-	I	U	U	I	I	U	U	I	I	S-	I	U	U	I	I	I	I	U	U	U	U	I	I	S-	CS-
Spatial/ Temporal Concentration of Catch - change in genetic structure	DI	I	I	I	I	U	I	I	I	U	I	U	U	I	I	U	U	I	I	I	I	U	U	I	I	I	I	U	U	U	U	I	I	CS-	CS-
	CE	I	I	I	I	U	I	I	I	U	I	U	U	I	I	U	U	I	I	I	I	U	U	I	I	I	I	U	U	U	U	I	I	CS-	CS-
Spatial/ Temporal Concentration of Catch - change in reproductive success	DI	I	I	I	I	U	I	I	I	U	I	U	U	I	I	U	U	I	I	I	I	U	U	I	I	I	I	U	U	U	U	I	I	CS-	CS-
	CE	I	I	I	I	U	I	I	I	U	I	U	U	I	I	U	U	I	I	I	I	U	U	I	I	I	I	U	U	U	U	I	I	CS-	CS-
Change in prey availability	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	U	U	I	I	I	I	U	U	U	U	I	I	U	U
	CE	I	I	I	I	I	I	I	I	I	I	U	U	I	I	U	U	I	I	I	I	U	U	I	I	I	I	U	U	U	U	I	I	U	U
Change in Habitat	DI	I	I	I	I	U	I	U	I	U	I	U	U	I	I	U	U	I	I	I	I	U	U	I	I	I	I	U	U	U	U	I	I	CS-	CS-
	CE	I	I	I	I	U	I	U	I	U	I	U	U	I	I	U	U	I	I	I	I	U	U	I	I	I	I	U	U	U	U	I	I	CS-	CS-

Notes: *BSAI Flatfish - BSAI yellowfin sole, BSAI flathead sole, BSAI rock sole, BSAI arrowtooth flounder and BSAI Alaska plaice
*GOA Flatfish - GOA shallow water flatfish, GOA flathead sole, GOA deep water flatfish and GOA rex sole
*BSAI Rockfish - BSAI northern rockfish, BSAI shortraker/rougheye rockfish and BSAI other rockfish
*GOA Rockfish - GOA shortraker/rougheye rockfish, GOA slope rockfish and GOA pelagic shelf rockfish
AI - Aleutian Islands
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
CS- conditionally significant negative
DI - direct/indirect effect
EBS - Eastern Bering Sea
GOA - Gulf of Alaska
I - insignificant
POP - Pacific ocean perch
S- - significant negative
U - unknown
Please refer to Table 4.1-1 for the significance criteria for target species.

Table 4.6-62 (cont.). Target species direct/indirect and cumulative effects significance ratings under FMPs 2.1 and 2.2.

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Table 4.6-63 Prohibited, other, forage and non-specified species direct/indirect and cumulative effects significance ratings under FMPs 2.1 and 2.2.

Direct/ Indirect Effects	Effect	Pacific Halibut		BSAI Chinook and other salmon		GOA Chinook and other salmon		Pacific Herring		Crab										Other Species		Forage Species		Non-Specified Species	
										BSAI Crab*		GOA Bairdi Tanner		GOA Red King		GOA Blue King		BSAI and GOA Golden King						Grenadier	
		2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2
Mortality	DI	I	I	CS-	CS-	CS-	I	I	I	S-	CS-	CS-	U	S-	CS-	U	U	U	U	U	U	I	I	U	U
	CE	I	I	CS-	CS-	CS-	I	I	I	S-	CS-	U	U	S-	CS-	U	U	U	U	U	U	I	I	U	U
Change in biomass level	DI	NA	NA	NA	NA	NA	NA	NA	NA	S-	CS-	CS-	U	S-	CS-	U	U	U	U	U	U	U	U	U	U
	CE	NA	NA	NA	NA	NA	NA	NA	NA	S-	CS-	U	U	S-	CS-	U	U	U	U	U	U	U	U	U	U
Change in reproductive success	DI	I	I	CS-	CS-	U	U	I	I	C	U	CS-	U	CS-	U	U	U	U	U	U	U	U	U	U	U
	CE	I	I	CS-	CS-	U	U	I	I	C	U	U	U	CS-	U	U	U	U	U	U	U	U	U	U	U
Change in prey availability	DI	I	I	U	U	U	U	I	I	U	U	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
Change in Habitat	DI	I	I	I	I	I	I	I	I	S-	I	CS-	I	S-	I	U	I	CS-	CS-	U	U	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	S-	U	U	U	S-	U	U	U	U	U	U	U	U	U	NA	NA
Change in genetic structure	DI	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U
	CE	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U

Notes: *BSAI Crab - BSAI bairdi Tanner, BSAI opilio Tanner, BSAI red king and BSAI blue king
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
CS- - conditionally significant negative/adverse
DI - direct/indirect effect
GOA - Gulf of Alaska
I - insignificant
NA - not applicable
S- - significant adverse
U - unknown
Please refer to Table 4.1-1 for the significance criteria for Pacific halibut, Pacific herring, other species, forage fish species and non-specified species.
Please refer to Table 4.1-2 for the significance criteria for crab.
Please refer to Table 4.1-3 for the significance criteria for salmon.

Table 4.6-64 Habitat direct/indirect and cumulative effects significance ratings under FMPs 2.1 and 2.2.

Direct/ Indirect Effects	Effect	Bering Sea	Aleutian Islands	Gulf of Alaska	Bering Sea	Aleutian Islands	Gulf of Alaska
		2.1			2.2		
Changes to Living Habitat	**DI**	S-	S-	S-	I	I	I
Direct mortality of benthic organisms	**CE**	S-	S-	S-	CS-	CS-	CS-
Changes to Benthic Community Structure	**DI**	S-	S-	S-	I	I	I
	CE	CS-	CS-	CS-	CS-	CS-	CS-
Changes in Distribution of Fishing Effort	**DI**	CS-	I	CS-	I	I	I
Geographic diversity of management measures	**CE**	CS-	CS-	CS-	CS-	CS-	CS-

Notes: CE - cumulative effect
CS- -conditionally significant adverse
DI - direct/indirect effect
I - insignificant
S- - significant adverse
Refer to Table 4.1-4 for habitat significance criteria

Table 4.6-65 Seabirds direct/indirect and cumulative effects significance ratings under FMPs 2.1 and 2.2.

Direct/ Indirect Effects	Effect	Short-tailed Albatross		Other Albatross and Shearwaters		Northern Fulmar		Species of Management Concern		Other Piscivorous Species		Other Planktivorous Species		Spectacled and Steller's Eiders	
		2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2
Mortality (Incidental Take)	**DI**	CS-	I	CS-	I	CS-	I	I	I	I	I	I	I	I	I
	CE	CS-	CS-	S- Albatross CS- Shearwaters	S- Albatross CS- Shearwaters	CS-	I	CS- Kittiwakes S- Murrelets	CS- Kittiwakes S- Murrelets	I	I	I	I	I	I
Availability of Food	**DI**	I	I	I	I	I	I	CS-	I	CS-	I	CS-	I	I	I
	CE	I	I	I	I	I	I	CS-	I	CS-	I	CS-	I	I	I
Benthic Habitat	**DI**	I	I	I	I	I	I	I	I	I	I	CS-	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	CS-	I	U	U

Notes: *Other Albatross and Shearwaters - Laysan and Black-footed Albatross,Sooty and Short-tailed Shearwaters
*Other Piscivorous Species - Alcids (except auklets), gulls, jaegers, terns, and cormorants
*Other Planktivorous Species - Auklets and storm-petrels
*Species of Management Concern - Red-legged Kittiwake, Marbled Murrelet, and Kittlitz's Murrelet
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
S- significant adverse
U - unknown
Please refer to Table 4.1-5 for the significance criteria for seabirds.

Table 4.6-66. Marine mammals direct/indirect and cumulative effects significance ratings under FMPs 2.1 and 2.2.

Direct/Indirect Effects	Effect	W Steller Sea Lion		E Steller Sea Lion		Northern Fur Seal		Harbor Seal		Killer Whale (Transients)		Other Pinnipeds *		Other Toothed Whales*		Baleen Whales*		Sea Otters	
		2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2
Mortality (Incidental Take and Entanglement)	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	S-	S-	I	I	I	I	I	I	I	I	CS-[1] I[2]	CS-[1] I[2]	I	I	CS-[3] I[4]	CS-[3] I[4]	CS-	CS-
Prey Availability	**DI**	I	S-	S-	I	CS-	CS-	S-	I	I	I	I	I	I	I	I	I	I	I
	CE	S-	CS-	CS-	I	CS-	CS-	S-	CS-	I	I	I	I	I	I	I	I	I	I
Spatial/Temporal Concentration of Fisheries	**DI**	I	I	CS-	I	CS-	I	CS-	I	I	I	I	I	I	I	I	I	I	I
	CE	CS-	CS-	I	I	CS-	CS-	CS-	CS-	I	I	I	I	I	I	I	I	I	I
Disturbance	**DI**	CS-	I	CS-	I	CS-	I	CS-	I	CS-	I	I	I	CS-	I	CS-	I	I	I
	CE	CS-	I	CS-	I	CS-	I	I	I	CS-	I	I	I	CS-	I	CS-	I	I	I

Notes: [1] - Spotted, ringed, bearded and ribbon seals
[2] - Walrus and elephant seal
[3] - Fin, humpback and sei whales
[4] - Minke, gray, bowhead, northern right and blue whales
*Baleen Whales - Blue Whale, Fin Whale, Sei Whale, Minke Whale, Humpback Whale, Gray Whale, Northern Right Whale, Bowhead Whale.
*Other Pinnipeds - Pacific Walrus, Spotted Seal, Bearded Seal, Ringed Seal, Ribbon Seal, Elephant Seal
*Other Toothed Whales - Sperm Whales, Beaked Whales, White Sided Dolphin, Beluga Whale, Harbor Porpoise, Dall's Porpoise.
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
E - eastern stock
I - insignificant
S- - significant adverse
W - western stock
Please refer to Table 4.1-6 for the significant criteria for marine mammals.

Table 4.6-67. Socioeconomics direct/indirect and cumulative effects significance ratings under FMPs 2.1 and 2.2.

Direct/Indirect Effects	Effect	Catcher Vessels		Catcher Processors		Inshore Processors/ Motherships	
		2.1	2.2	2.1	2.2	2.1	2.2
Groundfish Landings by Species Group	DI	S+	S+	S+	S+/I	S+/I	S+/I
	CE	S+	S+	S+	S+	S+	S+
Groundfish Gross Product Value	DI	S+	S+	S+	S+	S+	S+
	CE	S+	S+	S+	S+	S+	S+
Employment	DI	S+	S+	S+	S+	S+	S+
	CE	S+	S+	S+	S+	S+	S+
Payments to Labor	DI	S+	S+	S+	S+	S+	S+
	CE	S+	S+	S+	S+	S+	S+
Product Quality and Product Utilization Rate	DI	NA	NA	CS-/I	I	CS-/I	I
	CE	NA	NA	S-	I	CS-/I	I
Excess Capacity	DI	S-	I	S-	I	S+	S+
	CE	S-	I	S-	I	S+	S+
Average Costs	DI	S-	I	S-	I	S+	S+
	CE	S-	I	S-	I	S+	S+
Fishing Vessel Safety	DI	S-/S+	I	S-/S+	I	NA	NA
	CE	S-/S+	I	S-/S+	I	NA	NA

Direct/Indirect Effects	Effect	Regions and Communities	
		2.1	2.2
In-Region Processing	DI	I/S+	I/S+
	CE	I	I
Regionally Owned At-Sea Processors	DI	I/S+/S-	I/S+/S-
	CE	I	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	DI	I/S+	S+
	CE	I	I
In-Regional Deliveries of Regionally Owned Catcher Vessels	DI	I/S+	I/S+
	CE	I	I
Total Direct, Indirect, and Induced Labor Income and FTEs	DI	I/S+	I/S+
	CE	I	I

Table 4.6-67 (cont.). Socioeconomics direct/indirect and cumulative effects significance ratings under FMPs 2.1 and 2.2.

Direct/Indirect Effects	Effect	CDQ		EJ		Market Channels		Non-Consumptive and Non-Use	
		2.1	2.2	2.1	2.2	2.1	2.2	2.1	2.2
CDQ	**DI**	U	I	NA	NA	NA	NA	NA	NA
	CE	U	I	NA	NA	NA	NA	NA	NA
EJ	**DI**	NA	NA	I	I	NA	NA	NA	NA
	CE	NA	NA	I	I	NA	NA	NA	NA
Benefits to U.S. Consumers	**DI**	NA	NA	NA	NA	I	I	NA	NA
	CE	NA	NA	NA	NA	I	I	NA	NA
Benefits Derived from Marine Ecoystems	**DI**	NA	NA	NA	NA	NA	NA	CS-	CS-
	CE	NA	NA	NA	NA	NA	NA	CS-	CS-

Direct/Indirect Effects	Effect	Subsistence	
		2.1	2.2
Subsistence use of groundfish	**DI**	I	I
	CE	I	I
Subsistence Use of Salmon	**DI**	CS-	I
	CE	CS-	I
Subsistence Use of Steller sea lions	**DI**	CS-	I
	CE	CS-	I
Indirect subsistence use: income and joint	**DI**	I	I
	CE	I	I

Notes: In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. The same threshold is roughly used to assess changes in qualitative indicators (e.g. fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgement of the socioeconomic analysts.

CDQ - community development quota
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
EJ - environmental justice
FTE - full-time equivalent
I - insignificant
NA - not applicable
S+ - significant beneficial
S- - significant negative

Table 4.6-68. Ecosystem direct/indirect and cumulative effects significance ratings under FMPs 2.1 and 2.2.

Direct/Indirect Effects	Effect	Ecosystem	
		2.1	2.2
Change in Pelagic Forage Availability	DI	S-, CS-, I	S-, CS-, I
	CE	S-	S-, CS-, I
Spatial and Temporal Concentration of Fishery Impact on Forage	DI	CS-	I
	CE	CS-	CS-
Removal of Top Predators	DI	CS-, I, U	I, U
	CE	CS-	CS-
Introduction of Non-native Species	DI	CS-	I
	CE	CS-	CS-
Energy Removal	DI	CS-	I
	CE	CS-	I
Energy Redirection	DI	CS-	I
	CE	CS-	I
Change in Species Diversity	DI	S-, CS-, I, U	I, U
	CE	S-	CS-
Change in Functional (trophic) Diversity	DI	CS-	I
	CE	CS-	CS-
Change in Functional (structural habitat) Diversity	DI	S-	I
	CE	S-	CS-
Change in Genetic Diversity	DI	I, U	I, U
	CE	I, U	I

Notes: CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
S- - significant adverse
U - unknown
Please refer to Table 4.1-7 for the ecosystem significance criteria.

Table 4.7-1. Cumulative Effects Analysis for Chinook and Other Salmon in the Bering Sea and Aleutian Islands: FMPs 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	Land Management Practices	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts of bycatch and state fisheries could hinder recovery.	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts of bycatch and subsistence fisheries could hinder recovery.	**Not a contributing factor**: significant impacts causing direct mortality is not expected.	**Not a contributing factor**: not expected to result in direct mortality.	**Conditionally Significant Adverse-** given the poor stock status of salmon runs in western Alaska* and the combined bycatch potential of BSAI and GOA, sustainability of depressed salmon stocks could be impacted.
Change in Spawning Habitat	**I**	**Yes**	**Not a Contributing Factor**: no direct interaction between groundfish fisheries and salmon spawning habitat occurs because Pacific salmon species spawn in freshwater.	**Unknown**: potential interactions and effects have not been determined.	**Potential adverse contribution:** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Not a contributing factor**: not expected to significantly change physical habitat	**Unknown-** watersheds used by spawning salmon are managed by various agencies and groups and are influenced by land management practices as well.
Change in Prey Availability	**U**	**Not Determined**	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Not a contributing factor**: significant impacts causing change in prey structure and/or availability are not expected.	**Potential adverse or beneficial contribution**: warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** potential changes to prey availability for salmon have not been determined and effects are unknown.

Table 4.7-1 (cont.). Cumulative Effects Analysis for Chinook and Other Salmon in the Bering Sea and Aleutian Islands: FMPs 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	Land Management Practices	Long-term Climate Change and Regime Shift	
Change in Genetic Structure of Population	**U**	**Not Determined**	**Unknown**: composition of bycatch has not been determined	**Unknown**: composition of bycatch has not been determined	**Not a contributing factor**: significant impacts causing change in genetic structure of stock are not expected.	**Not a contributing factor**: not expected to result in direct mortality.	**Unknown-** bycatch composition has not been determined and current stock composition for all species of salmon is unknown.
Change in reproductive success	**U**	**Yes**	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts of bycatch and state fisheries could hinder recovery.	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts of bycatch and subsistence fisheries could hinder recovery.	**Potential adverse contribution**: degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Potential adverse or beneficial contribution**: warm trends favor recruitment whereas cool trends weaken recruitment	**Conditionally Significant Adverse-** given the poor stock status of salmon runs in western Alaska* and the combined bycatch potential of BSAI and GOA, sustainability of certain salmon stocks could be impacted. Salmon reproductive success depends on spawning adults reaching destined spawning habitat. Thus, catch of these adults could hinder successful migration.

Notes: BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
GOA - Gulf of Alaska
* Western Alaska incorporates Kuskokwim, Nushagak, and Yukon Rivers also referred to as the AYK region (Arctic-Yukon-Kuskokwim-region).

Table 4.7-2. Cumulative Effects Analysis for Chinook and Other Salmon in the Gulf of Alaska: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land management practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Not a contributing factor**: current stock status of salmon in this region is considered stable.	**Not a contributing factor**: current stock status of salmon in this region is considered stable.	**Not a contributing factor**: current stock status of salmon in this region is considered stable.	**Not a contributing factor**: significant impacts causing direct mortality is not expected.	**Potential Beneficial Contribution**: may help to maintain GOA stock status	**Not a contributing factor**: not expected to result in direct mortality.	**Insignificant-** current stock status of salmon in this region is considered stable. Although bycatch of Chinook salmon originating in the Pacific Northwest occurs in Alaska, ADF&G intensely manages fisheries to ensure bycatch does not exceed limits set forth by the ESA (section 7).

Table 4.7-2 (cont.). Cumulative Effects Analysis for Chinook and Other Salmon in the Gulf of Alaska: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land management practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in Spawning Habitat	**I**	**Yes**	**Not a Contributing Factor**: no direct interaction occurs between groundfish fisheries and salmon spawning habitat because Pacific salmon species spawn in freshwater.	**Unknown**: potential interactions and effects have not been determined.	**Unknown**: potential interactions and effects have not been determined.	**Potential adverse contribution**: degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Not a Contributing Factor**: program does not include natural spawning habitat of salmon	**Not a contributing factor**: not expected to significantly change physical habitat	**Unknown-** watersheds used by spawning salmon are managed by various agencies and groups and are influenced by land management practices as well.
Change in prey availability	**U**	**Not determined**	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Unknown**: a relationship between prey catch and salmon prey availability is currently unknown.	**Not a contributing factor**: significant impacts causing change in prey structure and/or availability are not expected.	**Not a Contributing Factor**: program does not include prey species	**Potential adverse or beneficial contribution**: warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** potential changes to prey availability for salmon have not been determined and effects are unknown.

Table 4.7-2 (cont.). Cumulative Effects Analysis for Chinook and Other Salmon in the Gulf of Alaska: FMP 3.1, 3.2, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land management practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in genetic structure of population	**U**	**Not determined**	**Unknown**: composition of bycatch has not been determined	**Unknown**: composition of bycatch has not been determined	**Unknown**: composition of bycatch has not been determined	**Not a contributing factor**: significant impacts causing change in genetic structure of stock are not expected.	**Unknown**: potential effects of salmon bycatch on biodiversity are unknown.	**Not a contributing factor**: not expected to result in direct mortality.	**Unknown-** bycatch composition has not been determined and current stock composition for all species of salmon is unknown.

Table 4.7-2 (cont.). Cumulative Effects Analysis for Chinook and Other Salmon in the Gulf of Alaska: FMP 3.1, 3.2, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land management practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in reproductive success	**U**	**Not determined**	**Not a contributing factor**: current stock status of salmon in this region is considered stable.	**Not a contributing factor**: current stock status of salmon in this region is considered stable.	**Not a contributing factor**: current stock status of salmon in this region is considered stable.	**Potential adverse contribution**: degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Potential Beneficial Contribution**: may help to maintain GOA stock status.	**Potential adverse or beneficial contribution**: warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** although stock status of salmon in this region is considered stable, the combined bycatch potential of BSAI and GOA could impact sustainability of certain stocks. Salmon reproductive success depends on spawning adults reaching destined spawning habitat. Thus, increased catch of these adults could hinder successful migration.

Notes: BSAI - Bering Sea and Aleutian Islands
ESA - Endangered Species Act
FMP - fishery management plan
GOA - Gulf of Alaska

Table 4.7-3. Cumulative Effects Analysis for Bairdi Tanner Crab in the Bering Sea and Aleutian Islands: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential adverse contribution:** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution**: Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution**: Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution:** rebuilding plans and protection areas have been established for these stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor**: not expected to result in direct mortality.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and recovery has not occurred.

Table 4.7-3 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Bering Sea and Aleutian Islands: FMP 3.1, 3.2., PPA.1 and PPA.2

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Biomass	**I**	**Yes**	**Potential adverse contribution:** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution**: Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	Potential adverse contribution: Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution:** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown:** potential effects of climate change on biomass levels have not been determined.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, stocks are still considered overfished and recovery has not occurred.
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor:** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor:** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor:** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution:** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown:** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**- Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.

Table 4.7-3 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Bering Sea and Aleutian Islands: FMP 3.1, 3.2., PPA.1 and PPA.2

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Prey Availability	**U**	**No**	**Unknown:** diet composition of BSAI crab has not been determined.	**Unknown:** diet composition of BSAI crab has not been determined.	**Unknown:** diet composition of BSAI crab has not been determined.	**Not a contributing factor:** these plans do not address prey structure of crab.	**Unknown:** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**: although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**: although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**: although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution:** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**: not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
NOAA Fisheries - National Marine Fisheries Service

Table 4.7-4. Cumulative effects analysis for bairdi Tanner crab in the Gulf of Alaska: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.
Change in Biomass	**U**	**Yes**	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.

Table 4.7-4 (cont.). Cumulative effects analysis for bairdi Tanner crab in the Gulf of Alaska: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Not determined**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined and potential changes to prey structure are unknown.
Change in Habitat	**U**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Some stocks in GOA show signs of possible recovery while others are still considered depressed.

Notes: FMP - fishery management plan
GOA - Gulf of Alaska

Table 4.7-5. Cumulative effects analysis for opilio Tanner crab in the Bering Sea and Aleutian Islands: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor-** not expected to result in direct mortality.	**Unknown-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still in decline and recovery has not occurred.
Change in Biomass	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are in decline and recovery has not occurred.

Table 4.7-5 (cont.). Cumulative effects analysis for opilio Tanner crab in the Bering Sea and Aleutian Islands: FMP 3.1. 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.7-5 (cont.). Cumulative effects analysis for opilio Tanner crab in the Bering Sea and Aleutian Islands: FMP 3.1. 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
NOAA Fisheries - National Marine Fisheries Service

Table 4.7-6. Cumulative effects analysis for red king crab in the Bering Sea and Aleutian Islands: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, some of these stocks are still in decline and recovery has not occurred.
Change in Biomass	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, some of these stocks are in decline and recovery has not occurred.

Table 4.7-6 (cont.). Cumulative effects analysis for red king crab in the Bering Sea and Aleutian Islands: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.
Change in Habitat	**I**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan

Table 4.7-7. Cumulative effects analysis for red king crab in Gulf of Alaska: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are considered severely depressed and no immediate signs of recovery exist.
Change in Biomass	**I**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are considered severely depressed and no immediate signs of recovery exist.

Table 4.7-7 (cont.). Cumulative effects analysis for red king crab in Gulf of Alaska: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined and potential changes to prey structure are not known.
Change in Habitat	**U**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: FMP - fishery management plan

Table 4.7-8. Cumulative effects analysis for blue king crab in the Bering Sea and Aleutian Islands: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**I**	**Yes**	**Potential beneficial contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for these stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor-** not expected to result in direct mortality.	**Unknown-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and recovery has not occurred.

Table 4.7-8 (cont.). Cumulative effects analysis for blue king crab in the Bering Sea and Aleutian Islands: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Biomass	**I**	**Yes**	**Potential beneficial contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution**- state crab fisheries are managed by ADF&G in cooperation with NOAA Fisheries. Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, stocks are still considered overfished and recovery has not occurred.
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.

Table 4.7-8 (cont.). Cumulative effects analysis for blue king crab in the Bering Sea and Aleutian Islands: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.
Change in Habitat	**I**	**Yes**	**Potential beneficial contribution** - although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**-Potential beneficial contribution** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor-** not expected to directly affect physical habitat.	**Unknown-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Stock has not shown signs of recovery to date.

Notes: ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
NOAA Fisheries - National Marine Fisheries Service

Table 4.7-9. Cumulative effects analysis for blue king crab in Gulf of Alaska: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Biomass	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Reproductive Success	**U**	**Not determined**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, but current stock status is unknown.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined.

Table 4.7-9 (cont.). Cumulative effects analysis for blue king crab in Gulf of Alaska: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Habitat	**U**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Current stock status is unknown.

Notes: FMP - fishery management plan
U - Unknown

Table 4.7-10. Cumulative effects analysis for golden king crab in the Bering Sea and Aleutian Islands and the Gulf of Alaska: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Biomass	**U**	**Not determined**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** stock status is currently unknown due to lack of survey information.
Change in Reproductive Success	**U**	**Not determined**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, but current stock status is unknown.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined.

Table 4.7-10 (cont.). Cumulative effects analysis for golden king crab in the Bering Sea and Aleutian Islands and the Gulf of Alaska: FMP 3.1, 3.2, PPA.1, and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Habitat	**U**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures. Current stock status is unknown.

Notes: FMP - fishery management plan

Table 4.7-11. Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMP 3.2 and PPA.2.
Bering Sea Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **Direct Mortality of Benthic Organisms**	I	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential adverse contribution** From offshore catcher/ processors and/or onshore processors.	**Potential adverse contribution** Likely to continue at Port Moller, Port Heiden, Dillingham, St. Paul and St. George.	**Potential adverse contribution** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential adverse contribution** could cause direct mortality through physical alteration (burial).	**Not a contributing factor** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes CS+/CS-** Although some benefits accrue within the proposed MPAs, impacts from fishing are not totally eliminated, and TAC/effort is likely to remain high. While there is an incremental expansion of no-take MPAs, the closures analyzed under this FMP are not refined and may not be effective. Therefore, with the addition of the external impacts, the cumulative effect of the FMP on mortality is determined to be conditionally significant adverse. However, if the closures proposed under PPA.2 were to be further defined based on additional information regarding important habitats in need of protection, cumulative effects may a conditionally significant beneficial rating

Table 4.7-11 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMP 3.2 and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Benthic Community Structure	**CS+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential adverse contribution** From offshore catcher /processors and/or onshore processors.	**Potential adverse contribution** Likely to continue at Port Moller, Port Heiden, Dillingham, St. Paul and St. George.	**Potential adverse contribution** Acute and/or chronic pollution events could cause changes in the benthic community especially in nearshore/port areas.	**Potential adverse contribution** If long term, could cause changes in the benthic community through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential beneficial/ adverse contribution** Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes CS+/CS-** Some of the closures for this FMP are located where light levels of fishing occur and may provide some low level of contrast and diversity. While benefits accrue due to the MPAs, the closure areas are not refined and may not be effective in protecting benthic community structure. Therefore, along with the already impacted state of the communities and the external negative impacts, the FMP is rated as conditionally significant adverse in the cumulative case. However, if the closures proposed under FMP PPA.2 were to be further defined based on additional information regarding important habitats in need of protection, cumulative effects may have more of a conditionally significant beneficial rating rather than conditionally significant adverse.

Table 4.7-11 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMP 3.2 and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Geographic Diversity of Impacts and Protection	**S+**	**Yes**, fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Potential adverse contribution** Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential beneficial/ adverse contribution**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential adverse contribution** Depending on the distribution of the fishing effort, less sensitive areas could be impacted by marine pollution.	**Not a Contributing Factor**	**Not a Contributing Factor**	**Yes CS+/CS-** FMP 3.2 would protect more benthic habitat from trawl gear in the future than was protected in 1980. However since TAC is likely to remain high and the locations of the proposed MPAs are not refined, the benefits provided by the closed areas are uncertain since previously unfished areas would likely be fished and impacts would occur in areas not previously impacted. However, better definition and focus of the closures could lead to a conditionally significant beneficial rating.

Table 4.7-11 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMP 3.2 and PPA.2.

Aleutian Islands Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **Direct Mortality of Benthic Organisms**	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. Prevalence of long lived species of coral makes impacts a particular concern in the Aleutians.	**Potential adverse contribution** Impacts of dredging are expected to continue in localized areas.	**Potential adverse contribution** Impacts of long line fisheries on living habitat (coral) are expected to continue.	**Potential adverse contribution** Impacts of pot fisheries on living habitat (coral) are expected to continue.	**Potential adverse contribution** From offshore catcher/ processors and/or onshore processors.	**Potential adverse contribution** Likely to continue at Atkutan, Adak, Unalaska, Cold Bay Dutch Harbor and King Cove. Other sites possible for development.	**Potential adverse contribution** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential adverse contribution** Could cause direct mortality through physical alteration (burial).	**Not a contributing factor** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes CS+/CS-** As described above, the baseline condition is already adversely affected. The proposed no-take MPAs will also some benefits to accrue, but impacts will still occur, especially since TAC remains high. However, further definition and refinement of the closure areas may allow for a conditionally significant beneficial cumulative effects rating.

Table 4.7-11 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMP 3.2 and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Changes to Benthic Community Structure	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential adverse contribution** Impacts of dredging are expected to continue in localized areas.	**Potential adverse contribution** Impacts of long line fisheries on benthic community structure are expected to continue.	**Potential adverse contribution** Impacts of pot fisheries on benthic community structure are expected to continue.	**Potential adverse contribution** From offshore catcher /processors and/or onshore processors.	**Potential adverse contribution** Likely to continue at Atkutan, Adak, Unalaska, Cold Bay Dutch Harbor and King Cove. Other suites possible for development	**Potential adverse contribution** Acute and/or chronic pollution events could cause changes in the benthic community especially in nearshore/port areas.	**Potential adverse contribution** Could cause direct mortality through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential beneficial/ adverse contribution** Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes CS+/CS-** As described above for mortality of benthic organisms, the existing impacted baseline, combined with the uncertain benefits of the proposed MPAs, leads to a conclusion of conditionally significantly adverse . Further definition and refinement of the closure areas may allow for a conditionally significant beneficial cumulative effects rating.

Table 4.7-11 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMP 3.2 and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Geographic Diversity of Impacts and Protection	**S+**	**Yes,** fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Not a contributing factor.**	**Potential beneficial/ adverse contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential beneficial/ adverse contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential adverse contribution** Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential beneficial/ adverse contribution**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential adverse contribution** Depending on the distribution of the fishing effort, sensitive areas could be impacted by marine pollution.	**Not a contributing factor.**	**Not a contributing factor.**	**Yes CS+/CS-** Since TAC is likely to remain high and the locations of the proposed MPAs are not refined, the benefits provided by the closed areas are uncertain. Further definition and refinement of the closure areas may allow for a conditionally significant beneficial cumulative effects. rating.

Table 4.7-11 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMP 3.2 and PPA.2.

Gulf of Alaska Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **Direct Mortality of Benthic Organisms**	**CS-**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential adverse contribution** Impacts of dredging are expected to continue in localized areas.	**Potential adverse contribution** Impacts of long line fisheries on living habitat (coral) are expected to continue.	**Potential adverse contribution** Impacts of pot fisheries on living habitat (coral) are expected to continue.	**Potential adverse contribution** From offshore catcher/ processors and/or onshore processors.	**Potential adverse contribution** Likely to continue at Kodiak, Sand Point, Chignik, Port Lions, Ouzinkie and Seward. Other sites possible for development.	**Potential adverse contribution** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential adverse contribution** Could cause direct mortality through physical alteration (burial).	**Not a contributing factor** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes CS+/CS-** The external effects identified here have the potential to provide additional mortality to benthic organisms. the cumulative effects on mortality could be adverse. Further definition and refinement of the closure areas may allow for a conditionally significant beneficial cumulative effects rating.

Table 4.7-11 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMP 3.2 and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Benthic Community Structure	**I**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential adverse contribution** Impacts of dredging are expected to continue in localized areas.	**Potential adverse contribution** Impacts of long line fisheries on the benthic community are expected to continue	**Potential adverse contribution** Impacts of pot fisheries on the benthic community are expected to continue.	**Potential adverse contribution** From offshore catcher/ processors and/or onshore processors.	**Potential adverse contribution** Likely to continue at Kodiak, Sand Point, Chignik, Port Lions, Ouzinkie and Seward. Other sites possible for development.	**Potential adverse contribution** Acute and/or chronic pollution events could cause changes in the benthic community, especially in nearshore/port areas.	**Potential adverse contribution** Could cause direct mortality through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential beneficial/ adverse contribution** Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes CS+/CS-** As described above, while the FMP provides for additional closure areas and no-take MPAs, impacts are not totally eliminated and the proposed MPAs might not be effective. Further definition and refinement of the closure areas may allow for a conditionally significant beneficial cumulative effects rating.

Table 4.7-11 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska Habitat: FMP 3.2 and PPA.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Geographic Diversity of Impacts and Protection	I	**Yes,** fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Not a contributing factor.**	**Potential beneficial/ adverse contribution** Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential beneficial/ adverse contribution** Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential adverse contribution** Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential beneficial/ adverse contribution** New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential adverse contribution** Depending on the distribution of the fishing effort, sensitive areas could be impacted by marine pollution.	**Not a contributing factor.**	**Not a contributing factor.**	**Yes CS+/CS-** Only slight, if any, improvement in geographic diversity of impact would result and as described above for the Bering Sea and Aleutian Islands, the proposed MPAs might not be effective. Further definition and refinement of the closure areas may allow for a conditionally significant beneficial cumulative effects rating.

Notes: FMP - fishery management plan
IPHC - International Pacific Halibut Commission

Table 4.7-12. Cumulative effects analysis for spectacled and Steller's eiders: FMP 3.2 and FMP 4.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Sections 3.7.9 and 3.7.10)	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events				Natural Events		
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Disturbance by Ice, Whales, and Walrus	Climate Change and Regime Shift	
Mortality - Incidental Take	**I**	Reason(s) for population declines of both species in Alaska unknown Both species listed as threatened under ESA with designated Critical Habitat Subsistence hunts and egging Incidental take in coastal fisheries Lead shot pollution	**Potential adverse contribution** Harvest in northwestern Alaska and Russia	**Potential adverse contribution** Incidental take trawl/net gear and vessel strikes in coastal fisheries	**Potential adverse contributions** Acute and/or chronic pollution events, especially involving oil Disturbance from all marine vessels	**Potential beneficial contributions** Oil spill and pollution prevention laws	Not a contributing factor	Not a contributing factor	**I for Steller's eider** Population decline may have stabilized, subsistence hunts dominate human-caused mortality but do not appear large enough to cause population decline **No contribution to spectacled eider** mortality from groundfish fishery
Change in Food Availability	**I**	Regime shifts	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse contribution** Acute and/or chronic pollution events	**Not a contributing factor**	**Potential adverse contribution** Disturbance may cause local prey depletions	**Unknown effect**	**None** Potential effects of groundfish fisheries through benthic habitat discussed below

Table 4.7-12 (cont.). Cumulative effects analysis for spectacled and Steller's eiders: FMP 3.2 and FMP 4.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects (refer to Sections 3.7.9 and 3.7.10)	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events				Natural Events		
			Subsistence Hunting and Egging	Other U.S., State, and Foreign Fisheries	Marine Pollution and Vessel Hazzards	Conservation Efforts	Disturbance by Ice, Whales, and Walrus	Climate Change and Regime Shift	
Benthic Habitat	**U**	Disturbance of benthic habitat by gray whales and walrus. Trawling and other bottom contact fishing in Critical Habitat	**Not a contributing factor**	**Potential adverse contribution** Trawling and other bottom contact fishing in Critical Habitat	**Potential adverse contribution** Acute and/or chronic pollution affecting benthic habitat	**Potential beneficial contribution** Nearshore trawl and bottom contact fishing closures	**Potential adverse contribution** Disturbance of bottom may cause changes in productivity and complexity of benthic habitat	**Unknown effect**	**U** Contributions of natural events and human disturbance to food web dynamics of benthic habitat unknown

Notes: FMP - fishery management plan

Table 4.7-13. Summary of the significance determinations for each of the effects on marine mammals under FMPs 3.1 and 3.2.

	Incidental take/entanglement in marine debris		Harvest of prey species		Spatial/temporal concentration		Disturbance	
FMP	**3.1**	**3.2**	**3.1**	**3.2**	**3.1**	**3.2**	**3.1**	**3.2**
Steller sea lions - Western Stock	I	I	I	I	I	CS+	I	I
Steller sea lions - Eastern Stock	I	I	I	I	I	CS+	I	I
Northern Fur Seal	I	I	I	I	I	CS+	I	I
Harbor Seals	I	I	I	I	I	CS+	I	I
Other Pinnipeds	I	I	I	I	I	I	I	I
Transient Killer Whales	I	I	I	I	I	I	I	I
Other Toothed Whales	I	I	I	I	I	I	I	I
Other Baleen Whales	I	I	I	I	I	I	I	I
Sea Otters		I	I	I	I	I	I	I

Table 4.7-14. Cumulative effects analysis for the western stock of Steller sea lions: FMP 3.1, PPA.1 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries State-Managed drift and set gillnet fisheries Commercial harvest of pups Subsistence harvest Intentional shootings Steep population declines from 1970s- to 1990, less steep decline from 1990s	**Potential adverse contribution** Incidental take in State managed drift gill net fisheries	**Potential adverse contribution** Subsistence harvest throughout range of the western stock	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oi spill	**Potential beneficial contribution** Endangered Species Act - listed as threatened in 1990 and endangered in 1993 Marine Mammal Protection Act (1972) - classified as depleted stock · Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Significant adverse** Mortality is considered a cumulative effect. Since the combined take for subsistence, other fisheries and in the groundfish fisheries is at or near the PBR, the continuing endangered status, long-term decline in abundance. The cumulative effect is likely having population-level effects. Contribution of the groundfish fisheries is small.

Table 4.7-14 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 3.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries Past harvest by State-managed salmon and herring fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Adverse** Effects prey availability is found to be cumulative from internal effects of the groundfish fisheries and external effects. Cumulative effect are conditional on harvest of prey being factor in recent decline.
Spatial/temporal concentration of fisheries	**I**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Adverse** Spatial and temporal effects of the fisheries identified for other fisheries. Cumulative effect are conditional on harvest of prey being factor in recent decline.

Table 4.7-14 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 3.1.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest Vessel traffic near rookeries and haulouts	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Since disturbance is identified for other fisheries, effect of disturbance are considered cumulative but insignificant at the population level.

Notes: FMP - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.7-15. Cumulative effects analysis for the western stock of Steller sea lions: FMP 3.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries State-Managed drift and set gillnet fisheries Commercial harvest of pups Subsistence harvest Intentional shootings Steep population declines from 1970s- to 1990, less steep decline from 1990s to present	**Potential adverse contribution** Incidental take in State managed drift gill net fisheries	**Potential adverse contribution** Subsistence harvest throughout range of the western stock	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oi spills	**Potential beneficial contribution** Endangered Species Act - listed as threatened in 1990 and endangered in 1993 Marine Mammal Protection Act (1972) - classified as depleted stock Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Significant adverse** Mortality is considered a cumulative effect. Since the combined take for subsistence, other fisheries and in the groundfish fisheries is at or near the PBR, the continuing endangered status, long-term decline in abundance. The cumulative effect is likely having population-level effects. Contribution of the groundfish fisheries is small.

Table 4.7-15 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 3.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries Past harvest by State-managed salmon and herring fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Adverse** Effects prey availability is found to be cumulative from internal effects of the groundfish fisheries and external effects. Cumulative effect are conditional on harvest of prey being factor in recent decline.
Spatial/temporal concentration of fisheries	**CS+**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Beneficial** Spatial and temporal is cumulative based on internal and external contributions. Cumulative effect are conditional on substantial increase in protection for SSL prey with shoreline buffers and MPAs improving the prey field for SSLs

Table 4.7-15 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 3.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest Vessel traffic near rookeries and haulouts	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Since disturbance is identified for other fisheries, effect of disturbance are considered cumulative but insignificant at the population level.

Notes:
FMP - fishery management plan
JV - joint venture
MPA - marine protection areas
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal
SSL - Steller sea lion

Table 4.7-16. Cumulative effects analysis for the eastern stock of Steller sea lions: FMP 3.2

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries State Managed drift and set gillnet fisheries Commercial harvest of pups Subsistence harvest Predator control Intentional shootings Abundance of the eastern stock has increased over the last 20 years	**Potential adverse contribution** Incidental take in State managed drift gill net fisheries	**Potential adverse contribution** Subsistence harvest in Southeast Alaska Predator control at fish farms in British Columbia	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil spills	**Potential beneficial contribution** Endangered Species Act - listed as threatened in 1990. Restricts disturbance at rookeries and haulouts Marine Mammal Protection Act (1972) - classified as strategic stock Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor.** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Since the combined take for subsistence, other fisheries and in the groundfish fisheries is below 10% of the PBR, cumulative effect of take is considered insignificant at the population level.

Table 4.7-16 (cont.). Cumulative effects analysis for the eastern stock of Steller sea lions: FMP 3.2

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries Past harvest by State-managed salmon and herring fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Insignificant** Effect is cumulative based on internal effect of the groundfish fisheries on prey abundance and external effect of State-managed fisheries and possibly long-term climate change. Effects unlikely at the population-level.
Spatial/temporal concentration of fisheries	**CS+**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Conditionally Significant Beneficial** Spatial and temporal effects cumulative form internal effects of the fisheries and external for other fisheries. Population level effect likely based on large increase in area closures.

Table 4.7-16 (cont.). Cumulative effects analysis for the eastern stock of Steller sea lions: FMP 3.2

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest Vessel traffic near rookeries	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Disturbance is cumulative based on internal effects and external effect of other fisheries. Population level effects are not likely.

Notes: FMP - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.7-17. Cumulative effects analysis for northern fur seal: FMP 3.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries (high seas drift net) and federal and and State-managed fisheries Commercial harvest on the Pribilof Islands Subsistence harvest Population declined substantially in 1970s to early 1980s, leading to "depleted" status under MMPA in 1988. Population still declining in 2000.	**Potentially adverse contribution** Incidental take in State managed drift gill net fisheries. Incidental take in fisheries outside the EEZ	**Potentially adverse contribution** Subsistence harvest on the Pribilof Islands	**Potentially adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil spills	**Potentially beneficial contribution** Marine Mammal Protection Act (1972)· UN Resolution 46/215 banning high seas driftnet fisheries. Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor.** Direct mortality would not be a primary effect of climate change	**Insignificant** Effect is cumulative based on internal effect of fisheries and external effect of subsistence and other fisheries. Since the combined take for subsistence, other fisheries and in the groundfish fisheries is below the PBR, cumulative effect of mortality is considered insignificant at the population level.

Table 4.7-17 (cont.). Cumulative effects analysis for northern fur seal: FMP 3.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries	**Potentially adverse contribution** Little overlap in prey species with State-managed and foreign fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Adverse** Effects are cumulative based on internal effect fo fisheries and external effects of other fisheries and possibly long-term climate change. Cumulative effect are conditional on availability of prey being factor in recent decline.
Spatial/temporal concentration of fisheries	**CS+**	Displacement of fisheries offshore increases interaction with fur seal	**Potential adverse contribution** Foreign fisheries outside EEZ and State salmon gillnet fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Beneficial** Effects are cumulative based on spatial and temporal effects of the fisheries identified for other fisheries. Cumulative effect are based on increased protection with MPA and shoreline buffers and conditional on harvest of prey being factor in recent decline.

Table 4.7-17 (cont.). Cumulative effects analysis for northern fur seal: FMP 3.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest	**Potentially adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potentially adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Disturbance is cumulative based on internal effects and external factors. Population-levels effect are unlikely and therefore, insignificant.

Notes:
EEZ - exclusive economic zone
FMP - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal
UN - United Nations

Table 4.7-18. Cumulative effects analysis for harbor seal: FMP 3.2.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and Federal and State-managed fisheries State predator control programs Commercial harvest Subsistence harvest Increasing in Bristol Bay but decreasing around Pribilof Islands. Major declines in GOA from 1976 to1992 followed by steady increases. Generally increasing in Southeast Alaska	**Potential adverse contribution** Incidental take in State managed drift gill net fisheries	**Potential adverse contribution** Subsistence harvest throughout region	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil	**Potential beneficial contribution** Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative with internal effects of groundfish fisheries and external effect of take from subsistence and other fisheries. Total is below the PBR, and is considered insignificant.

Table 4.7-18 (cont.). Cumulative effects analysis for harbor seal: FMP 3.2.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Change and Regime Shift	
Prey Availability	**I**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Adverse** Effects cumulative base on internal effect of fisheries and external effects of other fisheries. Cumulative effect are conditional on availability of prey being factor in recent decline.
Spatial/temporal concentration of fisheries	**CS+**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Beneficial** Spatial and temporal effects are cumulative based on internal and external effect of fisheries. Cumulative effect are conditional increased shoreline buffers providing improvements to harbor seal prey field and harvest of prey being factor in recent decline of harbor seal.

Table 4.7-18 (cont.). Cumulative effects analysis for harbor seal: FMP 3.2.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Disturbance is cumulative base of internal and external sources. Population-level effect are unlikely

Notes: FMP. - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.7-19. Summary of FMP bookend 3.1 and PPA.1 on harvesting and processing sectors.

Sector	Volume (Thousands of Metric Tons)				Output Value ($ Millions)				Groundfish Output Value ($ Millions)	Groundfish Payments to Labor ($ Millions)	Groundfish Employment (FTE Positions)
	Pollock	Pacific Cod	Flatfish	A-R-S-O	Pollock	Pacific Cod	Flatfish	A-R-S-O			
Outcome Under FMP											
All Catcher Processors	662.3	197.4	159.1	123.6	406.8	238.0	72.5	82.8	800.1	287.3	4,192.7
All Inshore Processors and Motherships	873.5	99.4	20.7	26.7	548.1	119.0	4.7	80.2	751.9	294.1	4,942.6
All Catcher Vessels	862.3	99.8	9.3	17.6	207.5	53.4	2.9	57.9	321.7	128.7	2,223.9
All Sectors	1,535.8	296.9	179.8	150.3	954.9	356.9	77.2	163.0	1,552.0	710.1	11,359.2
Change from Comparative Baseline											
All Catcher Processors	20.3	45.4	8.4	2.7	12.3	54.6	-7.4	-3.3	56.2	21.4	316.0
All Inshore Processors and Motherships	56.3	33.1	-0.6	-0.5	24.1	38.1	-2.9	9.7	68.9	27.2	452.1
All Catcher Vessels	47.7	35.4	-2.4	-3.2	11.5	17.9	-0.7	4.6	33.2	13.3	208.2
All Sectors	76.6	78.5	7.8	2.2	36.5	92.6	-10.4	6.4	125.1	61.9	976.3
Percentage Change from Comparative Baseline											
All Catcher Processors	3.2	29.9	5.6	2.2	3.1	29.8	-9.3	-3.8	7.6	8.1	8.2
All Inshore Processors and Motherships	6.9	49.9	-2.7	-1.7	4.6	47.0	-38.6	13.7	10.1	10.2	10.1
All Catcher Vessels	5.8	54.9	-20.5	-15.3	5.8	50.2	-20.0	8.6	11.5	11.5	10.3
All Sectors	5.2	36.0	4.5	1.5	4.0	35.0	-11.8	4.1	8.8	9.5	9.4

Notes: The volume and values for "All Sectors" equal the sums of the volume and value for catcher processors and inshore processors and motherships. Adding the volume and value for catcher vessels would result in double counting. However, the payments to labor and employment for "All Sectors" equals the sum over all three sectors.
A-R-S-O - Atka mackerel, rockfish, sablefish, and other groundfish
FTE - full-time equivalent

Table 4.7-20. Cumulative effects analysis for catcher vessels: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see Section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** overall, insignificant cumulative effects are expected as the projected TAC, especially for Pacific cod, is likely to offset some of the recent reductions in other fisheries, such as salmon

Table 4.7-20 (cont.). Cumulative effects analysis for catcher vessels: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Ex-Vessel Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Not a contributing factor** - though marginal increases are expected these changes in value would not be significant.	**Not a contributing factor** - not expected to affect ex-vessel value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - changes in climate are not expected to affect ex-vessel value directly	**I** insignificant cumulative effects on ex-vessel value are likely as slight increases in TAC may offset reductions in other fisheries

Table 4.7-20 (cont.). Cumulative effects analysis for catcher vessels: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see Section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish employment.	**Potential beneficial/adverse contribution** - an increase or decrease in other sources of revenue may result in greater or lesser competition for groundfish employment.	**Not a contributing factor** - not expected to affect employment	**I** insignificant cumulative effects are expected for employment as the slight increase in projected employment (8 percent) may offset reductions in other fisheries

Table 4.7-20 (cont.). Cumulative effects analysis for catcher vessels: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries may influence payments to labor. Reductions in the salmon fisheries may also influence payments, as many vessels rely on a mix of fisheries as a source of revenue.	**Not a contributing factor** - not expected to affect payments to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**I** cumulative effects on payments to labor are not significant. Although an increase is projected, it is likely this increase will offset the reductions in other fisheries and increased pressure from communities to raise fish taxes.
Excess Capacity	CS+	Yes, history of excess capacity (refer to Section 3.9)	**Potential beneficial/adverse contribution** - an increase or decrease in the number of vessels in other fisheries may result in subsequent increases or decreases in the number of vessels participating in the groundfish fishery, particularly pot CVs and FGCVs in state waters.	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**CS+** reduction in fishing capacity could result from the expanded use of rights-based management. It is uncertain to what extent rights-based management would be extended to other fisheries under FMP 3.1

Table 4.7-20 (cont.). Cumulative effects analysis for catcher vessels: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	CS+	Yes, historical race for fish increased costs (see Section 3.9	**Potential beneficial/adverse contribution-** associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor** - the effects of other economic development opportunities on average costs are minimal	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - the effects of climate change on average costs are minimal	**CS+** under FMP 3.1 average costs could decrease as a result of rights-based management. It is uncertain to what extent rights-based management would be extended to other fisheries under FMP 3.1
Fishing Vessel Safety	CS+	Yes, historical race for fish (see section3.9)	**Potential adverse contribution** - area closures implemented in other fisheries could have an effect on fishing vessel safety	**Not a contributing factor** - the effects of other economic development opportunities on fishing vessel safety are minimal	**Not a contributing factor** - the effects of other revenue sources on fishing vessel safety are minimal	**Not a contributing factor** - the effects of climate change on fishing vessel safety are minimal	**CS+** safety remains a concern for all fisheries. However, cumulative effects are conditionally beneficial because to the extent that a rights-based management regime is extended to other groundfish fisheries, vessel safety would improve.

Notes: CV - catcher vessel
FGCV - fixed gear catcher vessel
FMP - fishery management plan
TAC - total allowable catch

Table 4.7-21. Summary of FMP bookend 3.2 and PPA.2 on harvesting and processing sectors.

Sector	Volume (Thousands of Metric Tons)				Output Value ($ Millions)				Groundfish Output Value ($ Millions)	Groundfish Payments to Labor ($ Millions)	Groundfish Employment (FTE Positions)
	Pollock	Pacific Cod	Flatfish	A-R-S-O	Pollock	Pacific Cod	Flatfish	A-R-S-O			
Outcome Under FMP											
All Catcher Processors	670.9	189.2	174.4	96.2	415.5	228.7	86.5	63.4	794.1	284.4	4,142.5
All Inshore Processors and Motherships	871.5	94.8	17.9	18.3	547.6	114.0	4.4	51.9	717.9	280.7	4,794.9
All Catcher Vessels	863.7	95.6	9.9	12.0	207.4	51.1	2.9	37.8	299.2	119.7	1,849.0
All Sectors	1,542.4	284.0	192.4	114.5	963.1	342.6	90.9	115.3	1,511.9	684.7	10,786.5
Change from Comparative Baseline											
All Catcher Processors	28.9	37.2	23.7	-24.8	21.0	45.3	6.6	-22.6	50.1	18.5	265.8
All Inshore Processors and Motherships	54.2	28.5	-3.3	-8.8	23.6	33.1	-3.2	-18.6	34.9	13.8	304.4
All Catcher Vessels	49.1	31.2	-1.8	-8.8	11.4	15.5	-0.7	-15.5	10.7	4.3	-166.7
All Sectors	83.1	65.7	20.4	-33.6	44.6	78.4	3.4	-41.2	85.1	36.5	403.5
Percentage Change from Comparative Baseline											
All Catcher Processors	4.5	24.5	15.7	-20.5	5.3	24.7	8.2	-26.3	6.7	6.9	6.9
All Inshore Processors and Motherships	6.6	43.0	-15.7	-32.6	4.5	40.9	-42.0	-26.4	5.1	5.2	6.8
All Catcher Vessels	6.0	48.4	-15.6	-42.2	5.8	43.5	-18.4	-29.1	3.7	3.7	-8.3
All Sectors	5.7	30.1	11.9	-22.7	4.9	29.6	3.9	-26.3	6.0	5.6	3.9

Notes: The volume and values for "All Sectors" equal the sums of the volume and value for catcher processors and inshore processors and motherships. Adding the volume and value for catcher vessels would result in double counting. However, the payments to labor and employment for "All Sectors" equals the sum over all three sectors.
A-R-S-O - Atka mackerel, rockfish, sablefish, and other groundfish
FTE - full-time equivalent

Table 4.7-22. Cumulative effects analysis for catcher vessels: FMP 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may also impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** overall, insignificant cumulative effects are expected as the increases projected, particularly for Pacific cod may offset the projected reductions in ARSO and flatfish, and the recent reduction in the salmon and crab fisheries.
Groundfish Ex-Vessel Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though marginal increases are expected these changes in value would not be significant.	**Not a contributing factor** - not expected to affect ex-vessel value.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Not a contributing factor** - changes in climate are note expected to affect ex-vessel value directly.	**I** insignificant cumulative effects are likely because the increase projected for Pacific cod may mitigate the projected decrease in ARSO and recent reductions in salmon and crab.

Table 4.7-22 (cont.). Cumulative effects analysis for catcher vessels: FMP 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish employment.	**Potential beneficial/adverse contribution** - an increase or decrease in other sources of revenue may result in greater or lesser competition for groundfish employment.	**Not a contributing factor** - not expected to affect employment.	**I** insignificant cumulative effects are likely due to the slight increase projected which may mitigate reductions in other fisheries such as salmon and crab.
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries and recent reductions in the salmon and crab fisheries may influence groundfish payments.	**Not a contributing factor** - not expected to affect payments to labor.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor.	**I** insignificant cumulative effects are likely due to the slight increase projected which may mitigate reductions in other fisheries such as salmon and crab.

Table 4.7-22 (cont.). Cumulative effects analysis for catcher vessels: FMP 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S+	Yes, history of excess capacity (refer to section 3.9)	**Potential beneficial/adverse contribution** - an increase or decrease in the number of vessels in other fisheries may result in subsequent increases or decreases in the number of vessels participating in the groundfish fishery, particularly pot CVs and FGCVs in state waters.	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S+** reduction in fishing capacity will result from the use of rights-based management.
Average Costs	S-/S+	Yes, historical race for fish increased costs (see section 3.9	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor** - the effects of other economic development opportunities on average costs are minimal	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - the effects of climate change on average costs are minimal	**S-/S+** the potential for additional closure areas could result in increases in average costs; rights-based management will eliminate the race for fish thereby reducing average costs. Depending on how communities impose fish taxes, these taxes could increase or decrease average costs.

Table 4.7-22 (cont.). Cumulative effects analysis for catcher vessels: FMP 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Fishing Vessel Safety	S-/S+	Yes, historical race for fish (see section3.9)	**Potential adverse contribution** - area closures in other fisheries may increase the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - the effects of other economic development opportunities on fishing vessel safety are minimal	**Not a contributing factor** - the effects of other revenue sources on fishing vessel safety are minimal	**Not a contributing factor** - the effects of climate change on fishing vessel safety are minimal	**S-/S+** the potential for additional closure areas could result in vessels having to fish farther from shore. However, elimination of the race for fish will improve safety. Vessel safety remains a serious concern in all fisheries.

Notes: CV - catcher vessel
FGCV - fixed gear catcher vessel
FMP - fishery management plan
TAC - total allowable catch

Table 4.7-23. Cumulative effects analysis for catcher processors: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** overall, insignificant cumulative effects are expected as the projected TAC, especially for Pacific cod, is likely to offset some of the recent reductions in other fisheries, such as salmon
Groundfish Ex-Vessel Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though marginal increases are expected these changes in value would not be significant.	**Not a contributing factor** - not expected to affect ex-vessel value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - changes in climate are note expected to affect ex-vessel value directly	**I** insignificant cumulative effects on ex-vessel value are likely as slight increases in TAC may offset reductions in other fisheries

Table 4.7-23 (cont.). Cumulative effects analysis for catcher processors: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish employment.	**Potential beneficial/adverse contribution** - an increase or decrease in other sources of revenue may result in greater or lesser competition for groundfish employment.	**Not a contributing factor** - not expected to affect employment	**I** insignificant cumulative effects are expected for employment as the slight increase in projected employment may offset reductions in other fisheries
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries may influence payments to labor. Reductions in the salmon fisheries may also influence payments, as many vessels rely on a mix of fisheries as a source of revenue.	**Not a contributing factor** - not expected to affect payments to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**I** cumulative effects on payments to labor are not significant. Although an increase is projected, it is likely this increase will offset the reductions in other fisheries and increased pressure from communities to raise fish taxes.

Table 4.7-23 (cont.). Cumulative effects analysis for catcher processors: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	CS+	Yes, history of excess capacity (refer to section 3.9)	**Potential beneficial/adverse contribution** - an increase or decrease in the number of vessels in other fisheries may result in subsequent increases or decreases in the number of vessels participating in the groundfish fishery, particularly pot CVs and FGCVs in state waters.	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**CS+** reduction in fishing capacity could result from the expanded use of rights-based management. It is uncertain to what extent rights-based management would be extended to other fisheries under FMP 3.1
Average Costs	CS+	Yes, historical race for fish increased costs (see section 3.9	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor** - the effects of other economic development opportunities on average costs are minimal	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - the effects of climate change on average costs are minimal	**CS+** under FMP 3.1 average costs could decrease as a result of rights-based management. It is uncertain to what extent rights-based management would be extended to other fisheries under FMP 3.1

Table 4.7-23 (cont.). Cumulative effects analysis for catcher processors: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Fishing Vessel Safety	CS+	Yes, historical race for fish (see section3.9)	**Potential adverse contribution** - area closures implemented in other fisheries could have an effect on fishing vessel safety	**Not a contributing factor** - the effects of other economic development opportunities on fishing vessel safety are minimal	**Not a contributing factor** - the effects of other revenue sources on fishing vessel safety are minimal	**Not a contributing factor** - the effects of climate change on fishing vessel safety are minimal	**CS+** safety remains a concern for all fisheries. However, cumulative effects are conditionally beneficial because, to the extent that a rights-based management regime is extended to other groundfish fisheries, vessel safety would improve.

Notes: CV - catcher vessel
FGCV - fixed gear catcher vessel
FMP - fishery management plan
TAC - total allowable catch

Table 4.7-24. Cumulative effects analysis for catcher processors: FMP 3.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group.	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** overall, insignificant cumulative effects are expected. The increase in Pacific cod harvest may mitigate some of the reductions in other fisheries.
Groundfish Gross Product Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Not a contributing factor** - not expected to affect gross product value	**I** insignificant cumulative effects on gross product value are expected. Though product value has recently dropped in other fisheries, particularly salmon, slight increases in groundfish value projected under FMP 3.2 may offset this effect.

Table 4.7-24 (cont.). Cumulative effects analysis for catcher processors: FMP 3.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential beneficial/ adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/ adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish fishery employment	**Potential beneficial/ adverse contribution** - an increase or decrease in other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**I** cumulative effects are not expected to result in significant changes from the baseline as slight increases in employment may offset reductions in other fisheries.
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/ adverse contribution** - payments to labor in other fisheries and recent reductions in those fisheries may influence payments in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**I** cumulative effects on payments to labor expected to increase although not significantly from the baseline

Table 4.7-24 (cont.). Cumulative effects analysis for catcher processors: FMP 3.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Product Quality and Product Utilization	S+/S-	Yes, history of the race for fish negatively affected product quality.	Potential adverse/beneficial contribution - area closures, or lack thereof, in other fisheries can affect groundfish quality by altering access to traditional fishing grounds	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**S-/S+** additional area closures would cause product quality to decline. However, rights-based management would result in higher product quality and utilization.
Excess Capacity	S+	Yes, history of excess capacity (see section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S+** a rights-based management regime extended to other groundfish fisheries would significantly reduce excess capacity

Table 4.7-24 (cont.). Cumulative effects analysis for catcher processors: FMP 3.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	S+/S-	Yes, historical race for fish increased costs (see section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**S-/S+** increased spatial and temporal closures would increase costs. However, rationalization will reduce average costs. Depending on how communities impose fish taxes, average costs could increase or decrease as a result.
Fishing Vessel Safety	S+/S-	Yes, historical race for fish (see section 3.9)	**Potential adverse contribution** - area closures implemented in other fisheries may require vessels to travel farther to harvest fish, thereby increasing safety risks.	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**S-/S+** increased area closures may cause vessels to fish farther from shore, thereby increasing safety risks. However, elimination of the race for fish will improve safety. Vessel safety remains a concern in all fisheries.

Notes: CV - catcher vessel
FGCV - fixed gear catcher vessel
FMP - fishery management plan
TAC - total allowable catch

Table 4.7-25. Cumulative effects analysis for inshore processors and motherships: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Develop-ment of surimi in 1985 increased demand. (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** current reductions in the salmon and crab fisheries are adversely affecting the fishing fleet. Those processors that rely on a mix of species are less sensitive to these reductions. The increases projected for Pacific cod are expected to mitigate some of these reductions. Therefore, insignificant cumulative effects are likely.

Table 4.7-25 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Not a contributing factor** - changes in climate are note expected to affect gross product value directly	**I** cumulative effects are not expected under FMP 3.1. Although there are currently reductions in other fisheries, the projected increase for harvest of some groundfish species is likely to offset this effect.

Table 4.7-25 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential beneficial/adverse contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**I** although there are currently reductions in other fisheries, the projected increases in some groundfish fisheries are likely to result in insignificant cumulative effects.

Table 4.7-25 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries may influence payments to labor in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**I** cumulative effects are not expected under FMP 3.1. Although an increase in payments to labor are projected, it is not significant.
Product Quality and Product Utilization	CS+	Yes, historical race for fish and increased demand for seafood (see section 3.9).	Potential adverse/beneficial contribution - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality and utilization.	**Not a contributing factor** - not expected to affect product quality and utilization.	**Not a contributing factor** - not expected to affect product quality and utilization.	**CS+** although advancements in technology are improving product quality and utilization, conditionally significant beneficial cumulative effects are likely. Closures in other fisheries could hinder these improvements.

Table 4.7-25 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 3.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	CS+	Yes, history of excess capacity (see section 3.9)	**Potential beneficial/adverse contribution**- an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**CS+** short term excess capacity may increase in the processing sector due to expanded use of rights-base management. However, a longterm reduction is predicted.
Average Costs	CS+	Yes, historical race for fish increased costs (see section 3.9).	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**CS+** cumulative effects are expected depending upon the extent to which rights-based management is implemented and the likelihood of increases in municipal taxes.

Notes: FMP - fishery management plan

Table 4.7-26. Cumulative effects analysis for inshore processors and motherships: FMP 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Develop-ment of surimi in 1985 increased demand. (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group.	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** insignificant cumulative effects are expected due to a projected increase in Pacific cod which will likely offset reductions in the salmon and crab fisheries.
Groundfish Gross Product Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Not a contributing factor** - changes in climate are note expected to affect gross product value directly	**I** although recent changes in revenue streams in Alaska villages may potentially reduce gross product value, it will be offset by the slight increase projected under FMP 3.2. Insignificant cumulative effects are likely.

Table 4.7-26 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential beneficial/adverse contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**I** although an increase in employment is projected under FMP 3.1, this increase is not expected to be significant. Other employment opportunities are possible though not likely to be significant

Table 4.7-26 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries may influence payments to labor in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**I** insignificant cumulative effects are expected under FMP 3.1. Although an increase in payments to labor are projected, reductions in other fisheries may offset this increase.
Product Quality and Product Utilization	S+/S-	Yes, history of the race for fish negatively affected product quality.	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**S-/S+** additional area closures would cause product quality to decline. However, rights-based management would result in higher product quality and utilization.

Table 4.7-26 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S+	Yes, history of excess capacity (see section 3.9)	**Potential beneficial/adverse contribution**- an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S+/S-** cumulative effects are beneficial as a result of a comprehensive rationalization program although a transition period between the race for fish and rights-based management may create excess capacity.
Average Costs	S+/S-	Yes, historical race for fish increased costs (see section 3.9).	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Not a contributing factor** - not expected to affect average costs	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**S+/S-** cumulative effects depend on the constraints put on the transfer and consolidation of harvesting and processing rights in groundfish and non-groundfish fisheries.

Notes: FMP - fishery management plan

Table 4.7-27. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 3.1

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Processing/ municipal revenue	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA, municipal reliance on revenue from fish tax	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - Direct/indirect effects are beneficial for Southcentral Alaska and insignificant for the other five regions. Trends in multi-species fisheries and other sources of municipal and state revenue result in adverse effects on in-region processing and municipal revenue. These effects offset each other and result in insignificant cumulative effects, except in portions of the Alaska Peninsula/ Aleutian Islands Region where external effects are likely result in conditionally significant adverse cumulative effects. Fishery rationalization will have cumulative effects in conjunction with other fisheries, but cannot be assessed at this time.

Table 4.7-27 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 3.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Regionally Owned At-sea Processors	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - Direct/indirect effects are beneficial for Southcentral Alaska, and Southeast Alaska; external effects will not contribute much to cumulative effects, given the size and diversity of the regional economies. Direct/ indirect effects are insignificant in the Alaska Peninsula/ Aleutian Islands, Kodiak Island, Washington Inland Waters, and Oregon Coast regions; external effects are adverse but are offset by direct/indirect effects.
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - direct/indirect effects are insignificant for five of the six regions. In Southcentral Alaska, Washington Inland Waters, the Oregon Coast, and to a lesser extent Kodiak Island, potential adverse external effects are offset and cumulative effects are insignificant. Extra-regional deliveries decrease to the Alaska Peninsula/ Aleutian Islands; adverse external effects related to other fisheries and revenue sharing results in a conditionally significant adverse cumulative effect for some communities within this region.

Table 4.7-27 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 3.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Deliveries of Regionally Owned Catcher Vessels	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - the direct/indirect effects are insignificant for five of the six regions. In Southcentral Alaska, Washington Inland Waters, the Oregon Coast, and to a lesser extent Kodiak Island, potential adverse external effects are offset and cumulative effects are insignificant. Extra-regional deliveries decrease to the Alaska Peninsula/Aleutian Islands; adverse external effects related to other fisheries and revenue sharing results in a conditionally significant adverse cumulative effect for some communities within this region.

Table 4.7-27 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 3.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Total Direct, Indirect, and Induced Labor Income and FTEs	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Potential Adverse/ Beneficial Contribution**- Trends in other economic development activities, particularly state and municipal capital projects	**Potential Adverse Contribution -** decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** -Direct/indirect effects on labor income and employment are beneficial for Southcentral Alaska and insignificant for the other five regions. Within Southcentral Alaska, Washington Inland Waters, and Oregon Coast Regions, fisheries are a small part of the regional economies and effects are dwarfed by other trends. Adverse trends in other fisheries and reductions on municipal revenue, decrease regional labor income and employment benefits, particularly in the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska regions. Cumulative effects are generally insignificant in all regions, except for portions of the Alaska Peninsula/Aleutian Islands, where effects are conditionally significant adverse.

Notes: AFA - American Fisheries Act
FMP - fishery management plan
FTE - full-time equivalent
TAC - total allowable catch

Table 4.7-28. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 3.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Processing/ municipal revenue	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA, municipal reliance on revenue from fish tax	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** -Direct/indirect effects are insignificant for all regions except Southeast Alaska, where they are significant adverse.. Adverse external effects in other fisheries, economic development and state and municipal revenue will result in conditionally significant adverse cumulative effects for Southeast Alaska, and portions of Alaska Peninsula/Aleutian Islands. For Southcentral Alaska, the Washington Inland Waters and Oregon Coast regions, the relatively diversified economies and small contribution of groundfish result in insignificant cumulative effects.
Regionally Owned At-sea Processors	**I**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - direct/indirect effects are insignificant for all six regions. For Southcentral Alaska, the and the Washington Inland Waters regions, the relatively diversified economies and small contribution of groundfish result in insignificant cumulative effects. For the Alaska Peninsula/ Aleutian Islands and Kodiak Island; external effects are adverse but are offset by direct/indirect effects.

Table 4.7-28 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 3.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - direct/indirect effects are insignificant for five of the six regions. Given the size and diversity of regional economies, in Southcentral Alaska, Washington Inland Waters, the Oregon Coast, and to a lesser extent Kodiak Island, potential adverse external effects are offset and cumulative effects are insignificant. Direct/indirect effects are adverse for the Alaska Peninsula/Aleutian Islands; adverse external effects related to other fisheries and revenue sharing results in a conditionally significant adverse cumulative effect for some communities within this region.

Table 4.7-28 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 3.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Deliveries of Regionally Owned Catcher Vessels	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - direct/indirect effects are insignificant for four of the six regions. Given the size and diversity of regional economies, in Southcentral Alaska, Washington Inland Waters, the Oregon Coast, and to a lesser extent Kodiak Island, potential adverse external effects are offset and cumulative effects are insignificant. Direct/indirect effects are adverse for the Alaska Peninsula/Aleutian Islands and Southeast Alaska; adverse external effects related to other fisheries and revenue sharing results in a conditionally significant adverse cumulative effect for some communities within these regions.

Table 4.7-28 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 3.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Total Direct, Indirect, and Induced Labor Income and FTEs	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Potential Adverse/ Beneficial Contribution**- Trends in other economic development activities, particularly state and municipal capital projects	**Potential Adverse Contribution -** decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - employment decreases in all is insignificant except in Southeast Alaska where effects are significant adverse. Within Southcentral Alaska, Washington Inland Waters, and Oregon Coast Regions, fisheries are a small part of the regional economies and effects are dwarfed by other trends. Adverse trends in other fisheries and reductions on municipal revenue, decrease regional labor income and employment benefits, particularly in the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska regions. Cumulative effects are generally insignificant in all regions, except for portions of the Alaska Peninsula/Aleutian Islands and Southeast Alaska Regions, where effects are conditionally significant adverse.

Notes: AFA - American Fisheries Act
FMP - fishery management plan
FTE - full-time equivalent
TAC - total allowable catch

Table 4.7-29. Cumulative effects analysis for community development quota groups: FMPs 3.1 and 3.2.

Direct/ Indirect Effects of FMPs	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Allocations	I	Yes - The trend of increases in species and percent for which shares have been allocated to CDQs has increased their involvement in multi-species fisheries.	**Potential adverse or beneficial contribution -** many CDQs participate in multiple fisheries, including salmon, crab, federal groundfish, and halibut. The relative reliance of harvesters and processors on these fisheries varies on a regional basis and on the status of the individual stocks	**Potential adverse or beneficial contribution -** village infrastructure projects create employment and income opportunities for CDQ communities	**Potential adverse or beneficial contribution** - less revenue sharing from state and federal government, public funding of infrastructure, changes in fiscal policies are likely to affect CDQ communities	**Not a contributing factor** - fluctuations in groundfish stocks drive fishery opening and closures	**Insignificant** - no negative indirect impacts to CDQ program

Notes: CDQ - community development quota
FMP - fishery management plan

Table 4.7-30. Cumulative effects analysis for subsistence: FMPs 3.1 and 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Subsistence use of groundfish	I/I	Yes - foreign JV, domestic, and State managed fisheries have decreased populations of some species	**Potential adverse contribution**- state managed groundfish fishery activity could impact subsistence groundfish fishing	**Not a contributing factor** - infrastructure development unlikely to affect groundfish stocks	**Not a contributing factor -**sport and personal use unlikely to adversely affect groundfish stocks	**Potential adverse or beneficial contribution -** fluctuations in groundfish stocks affect availability for subsistence	**FMP 3.1 and 3.2 Insignificant** - adverse cumulative effects are not enough to have significant impacts on subsistence
Subsistence use of salmon	I/I	Yes - reduced runs in western Alaska based on past natural events, domestic and foreign commercial fisheries and subsistence harvests	**Potential adverse contribution** - salmon intercept potentially has contributed to poor returns in western Alaska	**Potential adverse contribution** - infrastructure development could effect salmon spawning and rearing habitat	**Not a contributing factor** - sport and personal use is not expected to adversely affect the salmon population	**Potential adverse contribution** - long-term climate change could potentially effect at-sea salmon survival and reduce salmon runs	**FMP 3.1 and 3.2 Insignificant** - adverse cumulative effects are not enough to have significant impacts on subsistence
Subsistence use of Steller sea lions	I/I	Yes - long term decline in population from a combination of effect of commercial fisheries and natural factors	**Potential adverse contribution -** other commercial fisheries have contributed to competition for Steller sea lion prey	**Potential adverse contribution -** marine port and harbor development could potentially impact habitat and increase disturbance	**Not a contributing factor** - sport hunting of Steller sea lions is not permitted	**Potential adverse contribution** - long-term climate change could potentially effect recovery Steller populations	**FMP 3.1 and 3.2 Insignificant** - adverse cumulative effects are not enough to have significant impacts on subsistence

Table 4.7-30 (cont.). Cumulative effects analysis for subsistence: FMPs 3.1 and 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Indirect subsistence impacts: income and joint production	I/I	Yes - commercial fishing provides platform for joint production and income to support subsistence	**Potential adverse or beneficial contribution -** income and joint production from other fisheries could affect indirect subsistence impacts	**Potential adverse or beneficial contribution -** income from other economic development activities could affect indirect subsistence impacts	**Not a contributing factor** - impacts to subsistence through sport and personal use is minimal	**Potential adverse or beneficial contribution -** affects on groundfish stocks and opportunity for joint production and income	**FMP 3.1 and 3.2 Insignificant** - adverse cumulative effects are not enough to have significant impacts on subsistence

Notes: FMP - fishery management plan

Table 4.7-31. Cumulative effects analysis for environmental justice: FMPs 3.1 and 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Environmental Justice	I/ CS-	Yes - Fisheries Resource Landing tax increased revenues to communities, MSA and CDQ program, commercial fishing source of employment and income in Native Alaskan communities.	**Potential adverse or beneficial contribution-** changes in other fisheries could impact environmental justice issues in Native communities	**Potential adverse contribution-** infrastructure development trends, effects of other economic activities	**Potential Adverse Contribution-** decrease in other state and municipal revenue sources	**Potential adverse or beneficial contribution-** fluctuations in fish stocks affect availability for Alaska Native subsistence use	**FMP 3.1 Insignificant** - -*Direct/indirect effects* include increased availability for income through subsistence pursuits participation and employment opportunities for Alaska Natives in the fishery; reductions in revenues to local communities and in catcher vessel employment and value in the Alaska Peninsula/Aleutian Islands; effects from by-catch of salmon and Steller sea lion subsistence activities are beneficial - *External effects* from the crab closures and downturn in the salmon industry, but not of a magnitude to be significant -*Cumulative effects* are insignificant **FMP 3.2 Conditionally Significant Adverse** -*Direct/indirect effects* include beneficial effects from by-catch of salmon and Steller sea lion subsistence activities; income and joint production activities related to subsistence in the Alaska Peninsula/Aleutian Islands region are adverse but insignificant. -*External effects* from the crab closures and downturn in the salmon industry and reductions in employment funded by public revenue, and reductions in revenue to Native communities are adverse, and conditionally significant adverse in the Alaska Peninsula/Aleutian Islands, cumulative effects are conditionally significant adverse due to downturns on other fisheries and decreased income and opportunities for joint production. -*Cumulative effects* are insignificant, except for the Alaska Peninsula/Aleutian Islands, which are conditionally significant adverse.

Notes: CDQ - community development quota
FMP - fishery management plan
MSA - Magnuson-Stevens Fishery Conservation Management Plan

Table 4.7-32. Cumulative effects analysis for market channels and benefits to U.S. consumers: FMPs 3.1 and 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects		Cumulative Effect
			Human Controlled	Natural Events	
			Other Fisheries	Long-term Climate Changes and Regime Shift	
Benefits to U.S. consumers	I	Alaska Seafood Marketing Institute product promotion activities Research and Public awareness of health benefits of seafood consumption Aquaculture development increased overall demand for seafood products Changes in processing technology increased seafood quality	**Potential adverse/beneficial contribution** - other fisheries are providing relatively stable levels of seafood products to domestic and foreign markets; supply of fish products that may be influenced by competition in markets, over fishing foreign fisheries, and increased domestic consumption	**Potential adverse/beneficial contribution** - fluctuations in groundfish stocks may potentially affect availability for market channels	**Insignificant** - wholesale groundfish product value in conjunction with products from other fisheries is not expected to change benefits to U.S. consumers

Notes: FMP - fishery management plan

Table 4.7-33. Cumulative effects analysis for the value of the Bering Sea and Gulf of Alaska marine ecosystems (including non-consumptive and non-use benefits): FMPs 3.1 and 3.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects		Cumulative Effect
			Human Controlled	Natural Events	
			Other Fisheries	Long-term Climate Changes and Regime Shift	
Benefits derived from marine ecosystems and associated species (Including non-consumptive and non-use benefits)	I, S+	Increased public awareness of marine ecosystems (e.g., BSAI and GOA marine ecosystems) and associated endangered species (e.g., Steller sea lions) Increased participation in recreational fishing and eco-tourism activities Lawsuits challenging NOAA Fisheries for failing to meet the requirements of the Endangered Species Act in its management of Alaska groundfish fisheries	**Potential adverse contribution** - fishing levels in other domestic and foreign fisheries may be affecting the productivity of the marine ecosystem	**Potential adverse beneficial contribution** - fluctuations in groundfish stocks may potentially affect ecosystems and associated species	**Conditionally Significant Adverse** - FMP 3.1 and 3.2 would result in changes that would increase benefits the public derives for the ecosystem and associated species. However, due to external factors, cumulative effects would be conditionally significantly adverse. - Under FMP 3.1 management measures could continue the introduction of non-native species. - FMP 3.2 could reduce the spatial and temporal pressures of the groundfish fisheries on forage species, removal of top predators (potential for seabird bycatch and subsistence harvests of marine mammals), and have a direct/indirect beneficial effect on structural habitat. Long-term climate changes and regime shifts could offset some of these benefits.

Notes: BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
GOA - Gulf of Alaska
NOAA Fisheries - National Marine Fisheries Service

Table 4.7-34. Cumulative Effects Analysis for the Bering Sea/Aleutian Islands and Gulf of Alaska Ecosystem: FMP 3.1 and PPA.1.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.7.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in pelagic forage availability	**I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries) and pollock and Atka mackerel catch • State of Alaska directed capelin and herring fishery • Subsistence removals • Climatic effects on recruitment and distribution	**Not a contributing factor:** The halibut fishery will not remove pelagic forage species.	**Not a contributing factor:** These fisheries affect distinct sub-populations and are not expected to reduce pelagic forage biomass in the BSAI.	**Potential negative contribution:** The herring fishery will remove an annual increment of pelagic forage biomass.	**Not a contributing factor:** Salmon farming will not affect pelagic forage species.	**Potential negative contribution:** Subsistence harvests will annually remove a small increment of pelagic forage biomass.	**Not a contributing factor:** Regulated marine mammal removals will not measurably affect pelagic forage biomass.	**Potential negative contribution:** Oil and fuel spills during herring or capelin spawning could depress populations of pelagic forage species.	**Potential positive or negative contribution:** Climate change could alter productivity and affect the total pelagic forage biomass.	**CS-** Rating is driven by commercial shipping: A large oil spill in the GOA involving key spawning times and/or areas could substantially reduce herring and capelin populations. This impact would not be offset, but could be intensified, by a climatic regime shift. ADF&G will annually review and set herring exploitation rates. Annual subsistence removals will not measurably affect pelagic forage biomass.
Spatial and temporal concentration of fishery impact on forage	**I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries), herring bycatch and pollock and Atka mackerel catch by area and season • State of Alaska directed capelin and herring fishery by area and season • Subsistence removals by area and season • Climatic effects on recruitment and distribution	**Not a contributing factor:** The halibut fishery will not remove pelagic forage species.	**Not a contributing factor:** These fisheries affect distinct sub-populations and are not expected to interact synergistically with spatial and temporal patterns of fishing effort in the BSAI.	**Potential negative contribution:** The herring fishery could affect local concentrations of herring and other forage fish. Because the herring fishery is mainly inshore, overlaps with the groundfish fishery would be more likely temporal than spatial.	**Not a contributing factor:** Salmon farming will not affect pelagic forage species.	**Potential negative contribution:** Subsistence fishing will most likely not be annually adjusted to offset FMP effects and will sometimes overlap with the spatial and temporal pattern of the groundfish fishery.	**Not a contributing factor:** Regulated marine mammal removals will not add to the spatial and temporal impacts of the groundfish fishery.	**Potential negative contribution:** Persistent effects of oil and fuel spills could sporadically intensify spatial and temporal impacts of the groundfish fishery on forage species.	**Potential positive or negative contribution:** Climate change could alter the spatial and temporal distributions of pelagic forage species in ways that might be synergistic with spatial and temporal concentrations of groundfish fishery impacts.	**CS-** Rating reflects the potential for incremental contributions from the herring fishery, subsistence fishing, sporadic fuel and oil spills, and climate change to converge and affect pelagic forage species in ways that could add to, or interact with, spatial and temporal patterns of groundfish fishery impacts on forage species.
Removal of top predators	**I, U**	• Domestic groundfish fishery shark, seabird, and pinniped bycatch • Commercial whaling and fur seal harvests • State of Alaska directed fisheries removals • Shark, pinniped, and seabird bycatch in State of Alaska fisheries • Shark, pinniped, and seabird bycatch in foreign groundfish fishery • Subsistence mammal harvests • Climate variability effects on top predator species recruitment and distribution	**Potential negative contribution:** The IPHC longline fishery annually removes an increment of halibut, a top predator.	**Potential negative contribution:** The seabird bycatch in the Western Bering Sea longline fisheries, and removals of targeted top predators such as Greenland turbot, will result in annual removals.	**Not a contributing factor:** Salmon are not top predators.	**Not a contributing factor:** Salmon farming will not affect top predators.	**Not a contributing factor:** Subsistence fishing will not affect top predators.	**Potential negative contribution:** Subsistence harvests will annually remove a small increment of marine mammals.	**Potential negative contribution:** Oil and fuel spills could sporadically remove portions of top predator populations through direct mortality.	**Potential positive or negative contribution:** A regime shift could affect the recruitment and distribution of top predator populations. A regime shift would not remove top predators through direct mortality but could alter the total number of top predators in the system by affecting recruitment.	**CS-** Rating is driven by the condition that Western Bering Sea fisheries bycatch continues to remove seabirds, but also reflects the potential for incremental contributions from the IPHC longline fishery, subsistence harvests of marine mammals, sporadic fuel and oil spills, and future climatic regime shifts to push the biomass of one or more top predator species below minimum biologically acceptable limits.

Table 4.7-34 (cont.). Cumulative Effects Analysis for the Bering Sea/Aleutian Islands and Gulf of Alaska Ecosystem: FMP 3.1 and PPA.1.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.7.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Introduction of non-native species	**I**	• Domestic groundfish fishery ballast • Commercial shipping • Climate variability effects on probability of successful introduction	**Potential negative contribution:** Ballast water release and hull-fouling organisms may introduce exotic marine species on a recurring basis.	**Not a contributing factor:** Predominant westward currents would tend to prevent exotics introduced to the Western Bering Sea from being carried eastward to the Alaskan shelf.	**Potential negative contribution:** Ballast water release and hull-fouling organisms associated with fishing vessels from outside Alaska may introduce exotic marine species on a recurring basis.	**Potential negative contribution:** Farmed Atlantic salmon is an exotic species. Escapes may reproduce and establish runs, competing with native species. Introduced pathogens and parasites could infect wild stocks.	**Not a contributing factor:** Subsistence fish harvests provide no evident mechanism or pathway for the introduction of exotic species.	**Not a contributing factor:** Subsistence marine mammal harvests provide no evident mechanism or pathway for the introduction of exotic species.	**Potential negative contribution:** Ballast water and hull-fouling organisms may introduce non-native species on a recurring basis. Many other pathways for the introduction of exotic marine species to Alaska have been identified (ADF&G 2002a,b).	**Potential negative contribution**: A warming trend may allow exotic populations that are currently limited by low seawater temperatures to become viable. Potential positive contribution: Low seawater temperatures may continue to limit the viability of introduced marine species.	**CS-** Rating reflects the potential for FMP 3.1, in combination with the IPHC and State of Alaska commercial fisheries and commercial shipping, to introduce one or more exotic species that establish viable BSAI or GOA populations. Atlantic salmon escapes from farms could also establish viable populations, and many other pathways for introductions have been identified. If a future regime shift produces warmer conditions, exotics currently limited by low ambient seawater temperatures could establish viable populations.
Energy removal	**I**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Halibut fishery removals • Subsistence removals • Climate variability effects on system production	**Potential negative contribution:** The halibut fishery will annually remove energy from the system.	**Potential negative contribution:** Fishing effort outside the EEZ will annually remove energy from the Bering Sea ecosystem. Juvenile pollock removed by western harvests will not be available as adults for the BSAI groundfish fishery.	**Potential negative contribution:** State of Alaska directed fisheries will annually remove energy from the system.	**Not a contributing factor:** Salmon farming will not remove energy from the ecosystem.	**Potential negative contribution:** Subsistence fish harvests will annually remove an increment of energy from the ecosystem.	**Potential negative contribution:** Subsistence marine mammal harvests will annually remove an increment of energy from the ecosystem.	**Not a contributing factor:** There is no evident pathway or mechanism by which commercial shipping will remove energy from the system.	**Not a contributing factor:** Climate variations will affect ecosystem productivity, and energy removals will follow climate-driven trends. Under these conditions, there would be (approximately) no net change in energy balance.	**I** Total groundfish catch is estimated to remove less than 1% of the total system energy. Energy removals from external sources are not likely to increase this level to the point where long-term changes in system biomass, production, or energy cycling occur outside the range of natural variability.

Table 4.7-34 (cont.). Cumulative Effects Analysis for the Bering Sea/Aleutian Islands and Gulf of Alaska Ecosystem: FMP 3.1 and PPA.1.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.7.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Energy redirection	**I**	• Domestic groundfish fishery discards, offal, and bottom gear effort • State of Alaska directed fisheries discards, offal, and bottom gear effort • Subsistence discards and offal • Halibut fishery discards and offal • Climate variability effects on energy cycling	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Not a contributing factor:** Discards and offal production in the Western Bering Sea will not measurably alter BSAI and GOA energy pathways.	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Not a contributing factor:** Salmon farms in B.C. and Washington State will not affect energy pathways in the GOA or BSAI.	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Potential negative contribution:** Offal from subsistence marine mammal harvests will produce incremental changes to energy distribution in the BSAI and GOA.	**Potential negative contribution:** Releases of graywater and refuse from cruise ships and other vessels will produce incremental changes to energy distribution, primarily in the GOA.	**Potential positive or negative contribution:** Climate variations will affect energy cycling in the ecosystem, but information is insufficient to allow a reliable prediction of the consequences.	**I** Discards, offal, or gear-related mortality from external sources are not likely to supplement effects of the groundfish fisheries sufficiently to produce long-term changes in system biomass, respiration, production, or energy cycling outside the range of natural variability. Local water quality degradation in the immediate vicinity of fish processing facilities will occur if local conditions allow contaminants to concentrate in limited areas. Fish processing waste discharge is regulated through USEPA and Alaska Department of Environmental Conservation permitting programs.
Change in species diversity	**I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on species level diversity	**Potential negative contribution:** Seabird bycatch levels associated with the IPHC longline fishery are unknown and could be high enough to affect species diversity.	**Potential negative contribution:** Seabird bycatch by Western Bering Sea fisheries could be high enough to affect BSAI species diversity.	**Not a contributing factor:** State of Alaska directed fisheries are managed to avoid depletions near or below minimum biologically acceptable limits.	**Potential negative contribution:** Escapes could establish viable populations. These could add to species diversity or, alternatively, reduce native stock through successful competition for spawning and rearing habitat.	**Not a contributing factor:** Subsistence fish harvests will not selectively remove enough individuals to affect species diversity.	**Potential negative contribution:** Subsistence marine mammal harvests have the potential to deplete some species to levels below minimum biologically acceptable limits.	**Potential negative contribution:** Introduced exotic species from hulls and ballast water may establish viable populations and thus alter species diversity.	**Potential positive or negative contribution:** Future climate variations may alter the productivity and distribution of individual species. A regime shift during heavy fishing effort could result in overfishing if the climatic effect is not recognized and mitigated.	**CS-** Rating reflects the potential for seabird bycatch and subsistence harvests of marine mammals, in combination with potential effects of FMP 3.1, to remove sufficient numbers of individuals to influence species diversity within trophic guilds. The introduction of exotic species, currently limited by unknown factors, could increase the potential for changes in species diversity. Future climatic conditions, in combination with fisheries-related pressures, could also affect species diversity.

Table 4.7-34 (cont.). Cumulative Effects Analysis for the Bering Sea/Aleutian Islands and Gulf of Alaska Ecosystem: FMP 3.1 and PPA.1.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.7.10.1)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in functional (trophic) diversity	**I**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on trophic diversity	**Not a contributing factor:** The IPHC fishery will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	**Not a contributing factor:** These fisheries will not affect species or size diversity within BSAI or GOA trophic guilds.	**Not a contributing factor:** State of Alaska directed fisheries will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	**Potential negative contribution:** Diversity within a trophic guild would increase if Atlantic salmon established a viable population at the trophic level occupied by Pacific salmon.	**Not a contributing factor:** Subsistence fish harvests will not selectively remove enough individuals to affect trophic diversity.	**Potential negative contribution:** Subsistence marine mammal harvests have the potential to affect species diversity within piscivore guilds.	**Potential negative contribution:** Introduced exotic species from hulls and ballast water may establish viable populations and thus alter trophic diversity.	Potential positive or negative contribution: A future regime shift could affect trophic diversity by forcing trends that expand some trophic levels and contract others. A warming trend could allow exotic species to establish viable populations, thus altering trophic diversity.	**CS-** Rating reflects the potential for incremental contributions from salmon farming, subsistence harvests of marine mammals, exotic species introduced through commercial shipping traffic, and a future climatic regime shift, in combination with the potential effects of FMP 3.1, to alter the diversity of species within a trophic guild beyond the range of natural variability.
Change in functional (structural habitat) diversity	**I**	• Foreign groundfish fishery pre-MSA (1960s–1976) bottom gear effort • JV groundfish fishery bottom gear effort • Domestic groundfish bottom gear effort • Climate variability effects on structural habitat diversity	**Not a contributing factor:** This fishery does not employ bottom gear.	**Not a contributing factor:** These fisheries will not affect structural habitat in the BSAI and GOA.	**Potential negative contribution:** The scallop fishery will employ bottom dredges that will damage structural habitat and contribute a small increment in combination with the larger cumulative area affected by the BSAI and GOA groundfish fisheries.	**Not a contributing factor:** Salmon farming will not affect marine structural habitat.	**Not a contributing factor:** Subsistence fish harvests will not affect marine structural habitat.	**Not a contributing factor:** Subsistence marine mammal harvests will not affect marine structural habitat.	**Potential negative contribution:** A large oil or fuel spills could damage sensitive bottom-dwelling organisms that provide structural habitat.	Potential positive or negative contribution: A regime shift could change the mean annual seawater temperature sufficiently to increase or retard the growth of bottom-dwelling organisms, thus altering structural habitat diversity.	**CS -** FMP 3.1 could contribute to a significant negative cumulative effect under at least three conditions: (1) the additive effect of bottom dredging by the scallop fishery, (2) a large petroleum spill affecting a broad geographic area of bottom habitat, and/or (3) a climatic regime shift that reduces the population size and distribution of bottom-dwelling organisms that provide structural habitat.
Change in genetic diversity	**I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on genetic diversity	**Not a contributing factor:** The IPHC longline fishery is managed to avoid the concentrated targeting of fish with a narrow range of attributes.	**Not a contributing factor:** Catch removals potentially altering the genetic diversity of Western Bering Sea stocks are not expected to affect BSAI stocks, because distinct subpopulations are involved.	**Not a contributing factor:** MSST, TAC, and other catch regulation of future directed fisheries will be managed by ADF&G to sustain genetic diversity, including stocks associated with individual salmon streams.	**Potential negative contribution:** Escaped Atlantic salmon may establish viable populations that affect the genetic diversity of the GOA and BSAI ecosystems. Populations established by escaped Pacific salmon species could produce similar effects.	**Potential negative contribution:** Subsistence fish harvests may focus on particular spawning aggregations or larger fish, thus adding an annual increment to removals with the potential to decrease genetic diversity.	**Potential negative contribution:** Subsistence marine mammal harvests may concentrate on particular resident subpopulations defined by location, e.g., Cook Inlet belugas.	**Potential negative contribution:** Hull-fouling invertebrates and exotics introduced through ballast water discharge may establish viable populations in the future, potentially out-competing and displacing native species.	**Potential positive or negative contribution:** A climatic regime shift could increase the mean annual temperature of seawater sufficiently to allow exotic species to establish viable populations.	**I** Although the identified external factors could cumulatively influence genetic diversity within the BSAI and GOA ecosystems, the rating reflects the low potential for these factors to significantly affect the genetic diversity of species targeted or taken incidentally by the BSAI and GOA groundfish fisheries.

Table 4.7-34 (cont.). Cumulative Effects Analysis for the Bering Sea/Aleutian Islands and Gulf of Alaska Ecosystem: FMP 3.1 and PPA.1.

Notes:

ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
B.C. - British Columbia, Canada
CS- - conditionally significant negative
EEZ - exclusive economic zone
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
JV - joint venture
IPHC - International Pacific Halibut Commission
MSA - Magnuson-Stevens Fishery Conservation Management Act
MSST - minimum stock size threshold
TAC - total allowable catch
U - Unknown
USEPA - U.S. Environmental Protection Agency

Table 4.7-35. Cumulative Effects Analysis for the Bering Sea/Aleutian Islands and Gulf of Alaska Ecosystem: FMP 3.2 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.7.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in pelagic forage availability	**I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries) and pollock and Atka mackerel catch • State of Alaska directed capelin and herring fishery • Subsistence removals • Climatic effects on recruitment and distribution	**Not a contributing factor:** The halibut fishery will not remove pelagic forage species.	**Not a contributing factor:** These fisheries affect distinct sub-populations and are not expected to reduce pelagic forage biomass in the BSAI.	**Potential negative contribution:** The herring fishery will remove an annual increment of pelagic forage biomass.	**Not a contributing factor:** Salmon farming will not affect pelagic forage species.	**Potential negative contribution:** Subsistence harvests will annually remove a small increment of pelagic forage biomass.	**Not a contributing factor:** Regulated marine mammal removals will not measurably affect pelagic forage biomass.	**Potential negative contribution:** Oil and fuel spills during herring or capelin spawning could depress populations of pelagic forage species.	**Potential positive or negative contribution:** Climate change could alter productivity and affect the total pelagic forage biomass.	**CS-** Rating is driven by commercial shipping: A large oil spill in the GOA involving key spawning times and/or areas could substantially reduce herring and capelin populations. This impact would not be offset, but could be intensified, by a climatic regime shift. ADF&G will annually review and set herring exploitation rates. Annual subsistence removals will not measurably affect pelagic forage biomass.
Spatial and temporal concentration of fishery impact on forage	**CS+, I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries), herring bycatch and pollock and Atka mackerel catch by area and season • State of Alaska directed capelin and herring fishery by area and season • Subsistence removals by area and season • Climatic effects on recruitment and distribution	**Not a contributing factor:** The halibut fishery will not remove pelagic forage species.	**Not a contributing factor:** These fisheries affect distinct sub-populations and are not expected to interact synergistically with spatial and temporal patterns of fishing effort in the BSAI.	**Potential negative contribution:** The herring fishery could affect local concentrations of herring and other forage fish. Because the herring fishery is mainly inshore, overlaps with the groundfish fishery would be more likely temporal than spatial.	**Not a contributing factor:** Salmon farming will not affect pelagic forage species.	**Potential negative contribution:** Subsistence fishing will most likely not be annually adjusted to offset FMP effects and will sometimes overlap with the spatial and temporal pattern of the groundfish fishery.	**Not a contributing factor:** Regulated marine mammal removals will not add to the spatial and temporal impacts of the groundfish fishery.	**Potential negative contribution:** Persistent effects of oil and fuel spills could sporadically intensify spatial and temporal impacts of the groundfish fishery on forage species.	**Potential positive or negative contribution:** Climate change could alter the spatial and temporal distributions of pelagic forage species in ways that might be synergistic with spatial and temporal concentrations of groundfish fishery impacts.	**I** Rating reflects the potential for incremental contributions from the herring fishery, subsistence fishing, sporadic fuel and oil spills, and climate change to converge and affect pelagic forage species in ways that could add to, or interact with, spatial and temporal patterns of groundfish fishery impacts on forage species. Although FMP 3.2 could reduce the spatial and temporal pressures of the groundfish fisheries on forage species, this conditionally beneficial effect could be offset by the external factors noted above.
Removal of top predators	**I, U**	• Domestic groundfish fishery shark, seabird, and pinniped bycatch • Commercial whaling and fur seal harvests • State of Alaska directed fisheries removals • Shark, pinniped, and seabird bycatch in State of Alaska fisheries • Shark, pinniped, and seabird bycatch in foreign groundfish fishery • Subsistence mammal harvests • Climate variability effects on top predator species recruitment and distribution	**Potential negative contribution:** The IPHC longline fishery annually removes an increment of halibut, a top predator.	**Potential negative contribution:** The seabird bycatch in the Western Bering Sea longline fisheries, and removals of targeted top predators such as Greenland turbot, will result in annual removals.	**Not a contributing factor:** Salmon are not top predators.	**Not a contributing factor:** Salmon farming will not affect top predators.	**Not a contributing factor:** Subsistence fishing will not affect top predators.	**Potential negative contribution:** Subsistence harvests will annually remove a small increment of marine mammals.	**Potential negative contribution:** Oil and fuel spills could sporadically remove portions of top predator populations through direct mortality.	**Potential positive or negative contribution:** A regime shift could affect the recruitment and distribution of top predator populations. A regime shift would not remove top predators through direct mortality but could alter the total number of top predators in the system by affecting recruitment.	**CS-** Rating is driven by the condition that Western Bering Sea fisheries bycatch continues to remove seabirds, but also reflects the potential for incremental contributions from the IPHC longline fishery, subsistence harvests of marine mammals, sporadic fuel and oil spills, and future climatic regime shifts to push the biomass of one or more top predator species below minimum biologically acceptable limits.

Table 4.7-35 (cont.). Cumulative effects analysis for the Bering Sea/Aleutian Islands and Gulf of Alaska ecosystem: FMP 3.2 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.7.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Introduction of non-native species	**I**	• Domestic groundfish fishery ballast • Commercial shipping • Climate variability effects on probability of successful introduction	**Potential negative contribution:** Ballast water release and hull-fouling organisms may introduce exotic marine species on a recurring basis.	**Not a contributing factor:** Predominant westward currents would tend to prevent exotics introduced to the Western Bering Sea from being carried eastward to the Alaskan shelf.	**Potential negative contribution:** Ballast water release and hull-fouling organisms associated with fishing vessels from outside Alaska may introduce exotic marine species on a recurring basis.	**Potential negative contribution:** Farmed Atlantic salmon is an exotic species. Escapes may reproduce and establish runs, competing with native species. Introduced pathogens and parasites could infect wild stocks.	**Not a contributing factor:** Subsistence fish harvests provide no evident mechanism or pathway for the introduction of exotic species.	**Not a contributing factor:** Subsistence marine mammal harvests provide no evident mechanism or pathway for the introduction of exotic species.	**Potential negative contribution:** Ballast water and hull-fouling organisms may introduce non-native species on a recurring basis. Many other pathways for the introduction of exotic marine species to Alaska have been identified (ADF&G 2002a,b).	**Potential negative contribution:** A warming trend may allow exotic populations that are currently limited by low seawater temperatures to become viable. Potential positive contribution: Low seawater temperatures may continue to limit the viability of introduced marine species.	**CS-** Rating reflects the potential for FMP 3.2, in combination with the IPHC and State of Alaska commercial fisheries and commercial shipping, to introduce one or more exotic species that establish viable BSAI or GOA populations. Atlantic salmon escapes from farms could also establish viable populations, and many other pathways for introductions have been identified. If a future regime shift produces warmer conditions, exotics currently limited by low ambient seawater temperatures could establish viable populations.
Energy removal	**I**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Halibut fishery removals • Subsistence removals • Climate variability effects on system production	**Potential negative contribution:** The halibut fishery will annually remove energy from the system.	**Potential negative contribution:** Fishing effort outside the EEZ will annually remove energy from the Bering Sea ecosystem. Juvenile pollock removed by western harvests will not be available as adults for the BSAI groundfish fishery.	**Potential negative contribution:** State of Alaska directed fisheries will annually remove energy from the system.	**Not a contributing factor:** Salmon farming will not remove energy from the ecosystem.	**Potential negative contribution:** Subsistence fish harvests will annually remove an increment of energy from the ecosystem.	**Potential negative contribution:** Subsistence marine mammal harvests will annually remove an increment of energy from the ecosystem.	**Not a contributing factor:** There is no evident pathway or mechanism by which commercial shipping will remove energy from the system.	**Not a contributing factor:** Climate variations will affect ecosystem productivity, and energy removals will follow climate-driven trends. Under these conditions, there would be (approximately) no net change in energy balance.	**I** Total groundfish catch is estimated to remove less than 1% of the total system energy. Energy removals from external sources are not likely to increase this level to the point where long-term changes in system biomass, production, or energy cycling occur outside the range of natural variability.

Table 4.7-35 (cont.). Cumulative effects analysis for the Bering Sea/Aleutian Islands and Gulf of Alaska ecosystem: FMP 3.2 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.7.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Energy redirection	**I**	• Domestic groundfish fishery discards, offal, and bottom gear effort • State of Alaska directed fisheries discards, offal, and bottom gear effort • Subsistence discards and offal • Halibut fishery discards and offal • Climate variability effects on energy cycling	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Not a contributing factor:** Discards and offal production in the Western Bering Sea will not measurably alter BSAI and GOA energy pathways.	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Not a contributing factor:** Salmon farms in B.C. and Washington State will not affect energy pathways in the GOA or BSAI.	**Potential negative contribution:** Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	**Potential negative contribution:** Offal from subsistence marine mammal harvests will produce incremental changes to energy distribution in the BSAI and GOA.	**Potential negative contribution:** Releases of graywater and refuse from cruise ships and other vessels will produce incremental changes to energy distribution, primarily in the GOA.	**Potential positive or negative contribution:** Climate variations will affect energy cycling in the ecosystem, but information is insufficient to allow a reliable prediction of the consequences.	**I** Discards, offal, or gear-related mortality from external sources are not likely to supplement effects of the groundfish fisheries sufficiently to produce long-term changes in system biomass, respiration, production, or energy cycling outside the range of natural variability. Local water quality degradation in the immediate vicinity of fish processing facilities will occur if local conditions allow contaminants to concentrate in limited areas. Fish processing waste discharge is regulated through USEPA and Alaska Department of Environmental Conservation permitting programs.
Change in species diversity	**I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on species level diversity	**Potential negative contribution:** Seabird bycatch levels associated with the IPHC longline fishery are unknown and could be high enough to affect species diversity.	**Potential negative contribution:** Seabird bycatch by Western Bering Sea fisheries could be high enough to affect BSAI species diversity.	**Not a contributing factor:** State of Alaska directed fisheries are managed to avoid depletions near or below minimum biologically acceptable limits.	**Potential negative contribution:** Escapes could establish viable populations. These could add to species diversity or, alternatively, reduce native stock through successful competition for spawning and rearing habitat.	**Not a contributing factor:** Subsistence fish harvests will not selectively remove enough individuals to affect species diversity.	**Potential negative contribution:** Subsistence marine mammal harvests have the potential to deplete some species to levels below minimum biologically acceptable limits.	**Potential negative contribution:** Introduced exotic species from hulls and ballast water may establish viable populations and thus alter species diversity.	**Potential positive or negative contribution:** Future climate variations may alter the productivity and distribution of individual species. A regime shift during heavy fishing effort could result in overfishing if the climatic effect is not recognized and mitigated.	**CS-** Rating reflects the potential for seabird bycatch and subsistence harvests of marine mammals, in combination with potential effects of FMP 3.2, to remove sufficient numbers of individuals to influence species diversity within trophic guilds. The introduction of exotic species, currently limited by unknown factors, could increase the potential for changes in species diversity. Future climatic conditions, in combination with fisheries-related pressures, could also affect species diversity.
Change in functional (trophic) diversity	**I**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on trophic diversity	**Not a contributing factor:** The IPHC fishery will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	**Not a contributing factor:** These fisheries will not affect species or size diversity within BSAI or GOA trophic guilds.	**Not a contributing factor:** State of Alaska directed fisheries will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	**Potential negative contribution:** Diversity within a trophic guild would increase if Atlantic salmon established a viable population at the trophic level occupied by Pacific salmon.	**Not a contributing factor:** Subsistence fish harvests will not selectively remove enough individuals to affect trophic diversity.	**Potential negative contribution:** Subsistence marine mammal harvests have the potential to affect species diversity within piscivore guilds.	**Potential negative contribution:** Introduced exotic species from hulls and ballast water may establish viable populations and thus alter trophic diversity.	**Potential positive or negative contribution:** A future regime shift could affect trophic diversity by forcing trends that expand some trophic levels and contract others. A warming trend could allow exotic species to establish viable populations, thus altering trophic diversity.	**CS-** Rating reflects the potential for incremental contributions from salmon farming, subsistence harvests of marine mammals, exotic species introduced through commercial shipping traffic, and a future climatic regime shift, in combination with the potential effects of FMP 3.2, to alter the diversity of species within a trophic guild beyond the range of natural variability.

Table 4.7-35 (cont.). Cumulative effects analysis for the Bering Sea/Aleutian Islands and Gulf of Alaska ecosystem: FMP 3.2 and PPA.2.

Direct/Indirect Effects of FMP	FMP Rating (Section 4.7.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and State of Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in functional (structural habitat) diversity	**S+**	• Foreign groundfish fishery pre-MSA (1960s–1976) bottom gear effort • JV groundfish fishery bottom gear effort • Domestic groundfish bottom gear effort • Climate variability effects on structural habitat diversity	**Not a contributing factor:** This fishery does not employ bottom gear.	**Not a contributing factor:** These fisheries will not affect structural habitat in the BSAI and GOA.	**Potential negative contribution:** The scallop fishery will employ bottom dredges that will damage structural habitat and contribute a small increment in combination with the larger cumulative area affected by the BSAI and GOA groundfish fisheries.	**Not a contributing factor:** Salmon farming will not affect marine structural habitat.	**Not a contributing factor:** Subsistence fish harvests will not affect marine structural habitat.	**Not a contributing factor:** Subsistence marine mammal harvests will not affect marine structural habitat.	**Potential negative contribution:** A large oil or fuel spills could damage sensitive bottom-dwelling organisms that provide structural habitat.	**Potential positive or negative contribution:** A regime shift could change the mean annual seawater temperature sufficiently to increase or retard the growth of bottom-dwelling organisms, thus altering structural habitat diversity.	**CS+** Rating reflects the potential of the predicted significant positive effect of FMP 3.2 to be offset under at least three conditions: (1) the additive effect of bottom dredging by the scallop fishery, (2) a large petroleum spill affecting a broad geographic area of bottom habitat, and/or (3) a climatic regime shift that reduces the population size and distribution of bottom-dwelling organisms that provide structural habitat.
Change in genetic diversity	**I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on genetic diversity	**Not a contributing factor:** The IPHC longline fishery is managed to avoid the concentrated targeting of fish with a narrow range of attributes.	**Not a contributing factor:** Catch removals potentially altering the genetic diversity of Western Bering Sea stocks are not expected to affect BSAI stocks, because distinct subpopulations are involved.	**Not a contributing factor:** MSST, TAC, and other catch regulation of future directed fisheries will be managed by ADF&G to sustain genetic diversity, including stocks associated with individual salmon streams.	**Potential negative contribution:** Escaped Atlantic salmon may establish viable populations that affect the genetic diversity of the GOA and BSAI ecosystems. Populations established by escaped Pacific salmon species could produce similar effects.	**Potential negative contribution:** Subsistence fish harvests may focus on particular spawning aggregations or larger fish, thus adding an annual increment to removals with the potential to decrease genetic diversity.	**Potential negative contribution:** Subsistence marine mammal harvests may concentrate on particular resident subpopulations defined by location, e.g., Cook Inlet belugas.	**Potential negative contribution:** Hull-fouling invertebrates and exotics introduced through ballast water discharge may establish viable populations in the future, potentially out-competing and displacing native species.	**Potential positive or negative contribution:** A climatic regime shift could increase the mean annual temperature of seawater sufficiently to allow exotic species to establish viable populations.	**I** Although the identified external factors could cumulatively influence genetic diversity within the BSAI and GOA ecosystems, the rating reflects the low potential for these factors to significantly affect the genetic diversity of species targeted or taken incidentally by the BSAI and GOA groundfish fisheries.

Notes:
ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
B.C. - British Columbia, Canada
CS- - conditionally significant negative
CS+ - conditionally significant positive
EEZ - exclusive economic zone
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
JV - joint venture
IPHC - International Pacific Halibut Commission
MSA - Magnuson-Stevens Fishery Conservation Management Act
MSST - minimum stock size threshold
S+ - significant positive
TAC - total allowable catch
U - Unknown
USEPA - U.S. Environmental Protection Agency

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Table 4.7-36 Target species direct/indirect and cumulative effects significance ratings under FMPs 3.1 and 3.2.

Direct/Indirect Effects	Effect	Pollock, Pacific Cod, Sablefish		AI Atka Mackerel		GOA Atka Mackerel		BSAI Flatfish*		BSAI Other Flatfish		GOA Flatfish*		GOA Arrowtooth Flounder		BSAI and GOA POP		GOA Thornyhead Rockfish		BSAI Rockfish *		GOA Rockfish*		GOA Northern Rockfish	
		3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
Mortality	DI	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Change in Biomass	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Spatial/ Temporal Concentration of Catch - change in genetic structure	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Spatial/ Temporal Concentration of Catch - change in reproductive success	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Change in prey availability	DI	I	I	I	I	I	I	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Change in Habitat	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I

Notes:
*BSAI Flatfish - BSAI yellowfin sole, BSAI flathead sole, BSAI rock sole, BSAI arrowtooth flounder, BSAI Greenland turbot and BSAI Alaska plaice
*GOA Flatfish - GOA shallow water flatfish, GOA flathead sole, GOA deep water flatfish and GOA rex sole
*BSAI Rockfish - BSAI northern rockfish, BSAI shortraker/rougheye rockfish and BSAI other rockfish
*GOA Rockfish - GOA shortraker/rougheye rockfish, GOA slope rockfish, GOA pelagic shelf rockfish and GOA demersal shelf rockfish
AI - Aleutian Islands
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
DI - direct/indirect effect
EBS - Eastern Bering Sea
GOA - Gulf of Alaska
I - insignificant
POP - Pacific ocean perch
U - unknown
Please refer to Table 4.1-1 for the significance criteria for target species.

Table 4.7-37 Prohibited, other, forage and non-specified species direct/indirect and cumulative effects significance ratings under FMPs 3.1 and 3.2.

Direct/Indirect Effects	Effect	Pacific Halibut		BSAI Chinook and other salmon		GOA Chinook and other salmon		Pacific Herring		Crab								Other Species		Forage Species		Non-specified Species	
										BSAI Crab*		GOA Crab*		GOA Red King		BSAI and GOA Golden King						Grenadier	
		3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
Mortality	**DI**	I	I	I	I	I	I	I	I	I	I	U	U	I	I	U	U	U	U	I	I	U	U
	CE	I	I	CS-	CS-	I	I	I	I	U	U	U	U	U	U	U	U	U	U	I	I	U	U
Change in biomass level	**DI**	NA	NA	NA	NA	NA	NA	NA	NA	I	I	U	U	I	I	U	U	U	U	U	U	U	U
	CE	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in reproductive success	**DI**	I	I	U	U	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	CE	I	I	CS-	CS-	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in prey availability	**DI**	I	I	U	U	U	U	I	I	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
Change in habitat	**DI**	I	I	I	I	I	I	I	I	I	I	U	U	U	U	I	I	U	U	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Change in genetic structure	**DI**	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U
	CE	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U

Notes: *BSAI Crab - BSAI bairdi Tanner, BSAI opilio Tanner, BSAI red king and BSAI blue king
*GOA Crab - GOA bairdi Tanner and GOA blue king
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
CS- - conditionally significant negative/adverse
DI - direct/indirect effect
GOA - Gulf of Alaska
I - insignificant
NA - not applicable
U - unknown
Please refer to Table 4.1-1 for the significance criteria for Pacific halibut, Pacific herring, other species, forage fish species and non-specified species.
Please refer to Table 4.1-2 for the significance criteria for crab.
Please refer to Table 4.1-3 for the significance criteria for salmon.

Table 4.7-38 Habitat direct/indirect and cumulative effects significance ratings under FMPs 3.1 and 3.2.

Direct/Indirect Effects	Effect	Bering Sea	Aleutian Islands	Gulf of Alaska	Bering Sea	Aleutian Islands	Gulf of Alaska
		3.1			3.2		
Changes to Living Habitat	**DI**	I	I	I	I/S+	S+	I/S-
Direct mortality of benthic organisms	**CE**	CS-	CS-	CS-	CS-	CS-	CS-
Changes to Benthic Community Structure	**DI**	I	I	I	CS+	S+	I
	CE	CS-	CS-	CS-	CS-	CS-	CS-
Changes in Distribution of Fishing Effort	**DI**	I	I	I	S+	S+	I
Geographic diversity of management measures	**CE**	CS-	CS-	CS-	CS-/CS+	CS-/CS+	CS-/CS+

Notes: CE - cumulative effect
CS- -conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
S- - significant adverse
S+ - significant beneficial
Refer to Table 4.1-4 for habitat significance criteria.

Table 4.7-39 Seabirds direct/indirect and cumulative effects significance ratings under FMPs 3.1 and 3.2.

Direct/Indirect Effects	Effect	Short-tailed Albatross		Other Albatross and Shearwaters*		Northern Fulmar		Species of Management Concern*		Other Piscivorous Species*		Other Planktivorous Species*		Spectacled and Steller's Eiders	
		3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
Mortality (Incidental Take)	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	CS-	CS-	S- Albatross	S- Albatross	I	I	CS- Kittiwakes	CS- Kittiwakes	I	I	I	I	I	I
				CS- Shearwaters	CS- Shearwaters			S- Murrelets	S- Murrelets						
Availability of Food	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Benthic Habitat	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	U
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	U

Notes: *Other Albatross and Shearwaters - Laysan and Black-footed Albatross,Sooty and Short-tailed Shearwaters
*Other Piscivorous Species - Alcids (except auklets), gulls, jaegers, terns, and cormorants
*Other Planktivorous Species - Auklets and storm-petrels
*Species of Management Concern - Red-legged Kittiwake, Marbled Murrelet, and Kittlitz's Murrelet
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
S- - significant adverse
U - unknown
Please refer to Table 4.1-5 for the significance criteria for seabirds.

Table 4.7-40 Marine mammals direct/indirect and cumulative effects significance ratings under FMPs 3.1 and 3.2.

Direct/Indirect Effects	Effect	W Steller Sea Lion		E Steller Sea Lion		Northern Fur Seal		Harbor Seal		Killer Whale (Transients)		Other Pinnipeds *		Other Toothed Whales*		Baleen Whales*		Sea Otters	
		3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
Mortality (Incidental Take and Entanglement)	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	S-	S-	I	I	I	I	I	I	I	I	CS-[1] I[2]	CS-[1] I[2]	I	I	CS-[3] I[4]	CS-[3] I[4]	CS-	CS-
Prey Availability	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	CS-	CS-	I	I	CS-	CS-	CS-	CS-	I	I	I	I	I	I	I	I	I	I
Spatial/Temporal Concentration of Fisheries	**DI**	I	CS+	I	CS+	I	CS+	I	CS+	I	I	I	I	I	I	I	I	I	I
	CE	CS-	CS+	I	CS+	CS-	CS+	CS-	CS-	I	I	I	I	I	I	I	I	I	I
Disturbance	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

Notes: [1] - Spotted, ringed, bearded and ribbon seals
[2] - Walrus and elephant seal
[3] - Fin, humpback and sei whales
[4] - Minke, gray, bowhead, northern right and blue whales
*Baleen Whales - Blue Whale, Fin Whale, Sei Whale, Minke Whale, Humpback Whale, Gray Whale, Northern Right Whale, Bowhead Whale.
*Other Pinnipeds - Pacific Walrus, Spotted Seal, Bearded Seal, Ringed Seal, Ribbon Seal, Elephant Seal
*Other Toothed Whales - Sperm Whales, Beaked Whales, White Sided Dolphin, Beluga Whale, Harbor Porpoise, Dall's Porpoise.
CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
E - eastern stock
I - insignificant
S- - significant adverse
W - western stock
Please refer to Table 4.1-6 for the significant criteria for marine mammals.

Table 4.7-41. Socioeconomics direct/indirect and cumulative effects significance ratings under FMPs 3.1 and 3.2.

Direct/Indirect Effects	Effect	Catcher Vessels		Catcher Processors		Inshore Processors/ Motherships	
		3.1	3.2	3.1	3.2	3.1	3.2
Groundfish Landings by Species Group	**DI**	I/S+	I/S+	I/S+	I/S+	I/S+	I/S+
	CE	I	I	I	I	I	I
Groundfish Gross Product Value	**DI**	I	I	I	I	I	I
	CE	I	I	I	I	I	I
Employment	**DI**	I	I	I	I	I	I
	CE	I	I	I	I	I	I
Payments to Labor	**DI**	I	I	I	I	I	I
	CE	I	I	I	I	I	I
Product Quality and Product Utilization Rate	**DI**	NA	NA	CS+	S-/S+	CS+	S-/S+
	CE	NA	NA	CS+	S-/S+	CS+	S-/S+
Excess Capacity	**DI**	CS+	S+	CS+	S+	CS+	S+
	CE	CS+	S+	CS+	S+	CS+	S-/S+
Average Costs	**DI**	CS+	S-/S+	CS+	S-/S+	CS+	S-/S+
	CE	CS+	S-/S+	CS+	S-/S+	CS+	S-/S+
Fishing Vessel Safety	**DI**	CS+	S-/S+	CS+	S-/S+	NA	NA
	CE	CS+	S-/S+	CS+	S-/S+	NA	NA

Direct/Indirect Effects	Effect	Regions and Communities	
		3.1	3.2
In-Region Processing	**DI**	I/S+	I/S-
	CE	I/CS-	I/CS-
Regionally Owned At-Sea Processors	**DI**	I/S+	I
	CE	I	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	**DI**	I/S+	I/S-
	CE	I/CS-	I/CS-
In-Regional Deliveries of Regionally Owned Catcher Vessels	**DI**	I/S+	I/S-
	CE	I/CS-	I/CS-
Total Direct, Indirect, and Induced Labor Income and FTEs	**DI**	I/S+	I/S-
	CE	I/CS-	I/CS-

Table 4.7-41 (cont.). Socioeconomics direct/indirect and cumulative effects significance ratings under FMPs 3.1 and 3.2.

Direct/Indirect Effects	Effect	CDQ		EJ		Market Channels		Non-Consumptive and Non-Use	
		3.1	3.2	3.1	3.2	3.1	3.2	3.1	3.2
CDQ	**DI**	I	I	NA	NA	NA	NA	NA	NA
	CE	I	I	NA	NA	NA	NA	NA	NA
EJ	**DI**	NA	NA	I/CS-	I/CS-	NA	NA	NA	NA
	CE	NA	NA	I	CS-	NA	NA	NA	NA
Benefits to U.S. Consumers	**DI**	NA	NA	NA	NA	I	I	NA	NA
	CE	NA	NA	NA	NA	I	I	NA	NA
Benefits Derived from Marine Ecoystems	**DI**	NA	NA	NA	NA	NA	NA	I	S+
	CE	NA	NA	NA	NA	NA	NA	CS-	CS-

Direct/Indirect Effects	Effect	Subsistence	
		3.1	3.2
Subsistence use of groundfish	**DI**	I	I
	CE	I	I
Subsistence Use of Salmon	**DI**	I	I
	CE	I	I
Subsistence Use of Steller sea lions	**DI**	I	I
	CE	I	I
Indirect subsistence use: income and joint	**DI**	I	I
	CE	I	I

Notes: In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. The same threshold is roughly used to assess changes in qualitative indicators (e.g. fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgement of the socioeconomic analysts.

CDQ - community development quota
CE - cumulative effect
CS+ - conditionally significant beneficial
CS- - conditionally significant adverse
DI - direct/indirect effect
EJ - environmental justice
FTE - full-time equivalent
I - insignificant
NA - not applicable
S+ - significant beneficial
S- - significant negative

Table 4.7-42 Ecosystem direct/indirect and cumulative effects significance ratings under FMPs 3.1 and 3.2.

Direct/Indirect Effects	Effect	Ecosystem	
		3.1	3.2
Change in Pelagic Forage Availability	DI	I	I
	CE	CS-	CS-
Spatial and Temporal Concentration of Fishery Impact on Forage	DI	I	CS+, I
	CE	CS-	I
Removal of Top Predators	DI	I, U	I, U
	CE	CS-	CS-
Introduction of Non-native Species	DI	I	I
	CE	CS-	CS-
Energy Removal	DI	I	I
	CE	I	I
Energy Redirection	DI	I	I
	CE	I	I
Change in Species Diversity	DI	I, U	I, U
	CE	CS-	CS-
Change in Functional (trophic) Diversity	DI	I	I
	CE	CS-	CS-
Change in Functional (structural habitat) Diversity	DI	I	S+
	CE	CS-	CS+
Change in Genetic Diversity	DI	I, U	I, U
	CE	I	I

Notes: CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
S- - significant adverse
S+ - significant beneficial
U - unknown
Please refer to Table 4.1-7 for the ecosystem significance criteria.

Table 4.8-1. Cumulative effects analysis for eastern Bering Sea pollock: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of AK Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**No**, large removals of pollock occurred in the foreign, domestic, JV and fisheries, but there does not appear to be a lingering effect on the BSAI pollock populations (See Section 3.5.1.1)	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue and is not accounted for in US harvest quotas.	**Not a contributing factor**: Future catch would be accounted for in annual harvest rate and therefore does not add additional fishing mortality.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of pollock.	**Yes, Insignificant** Pollock are fished at less than the OFL and are above the minimum stock size. The combined removals due to the federal groundfish fishery in combination with potential removals from external events are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass	**S+**	**No**, past large removals of pollock and other past effects (see Section 3.5.1.1) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of pollock.	**Yes, Significant Positive** The combination of internal and external factors is expected to sufficiently increase the pollock biomass such that the ability of the stock to maintain itself at or above MSST is improved.

Table 4.8-1 (cont.). Cumulative effects analysis for eastern Bering Sea pollock: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of AK Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**I**	**No**, see above.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Catch of pollock in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct localized mortality of pollock such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.
Change in Reproductive Success	**I**	**Yes**, past fisheries could have had a lingering beneficial effect on pollock recruitment by reducing the adult pollock biomass. Past commercial whaling and sealing also removed large predators. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.1)	**Potential Beneficial Contribution:** Fishery removals could have a beneficial effect on pollock recruitment by reducing the adult pollock biomass.	**Potential Beneficial Contribution:** Fishery removals could have a beneficial effect on pollock recruitment by reducing the adult pollock biomass.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.8-1 (cont.). Cumulative effects analysis for eastern Bering Sea pollock: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			Russian Pollock Fishery	State of AK Pollock Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.1). **No,** lingering population level effects from fisheries catch and bycatch of pollock prey species are not expected (see Section 3.5.1.1).	**Potential Adverse Contribution:** Bycatch of pollock forage fish is expected to continue.	**Potential Adverse Contribution:** Bycatch of pollock forage fish is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the pollock stock is unable to sustain itself at or above MSST
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.1)	**Potential Adverse Contribution:** Habitat disturbance that may cause change in spawning or rearing success is expected to continue.	**Potential Adverse Contribution:** Habitat disturbance that may cause change in spawning or rearing success is expected to continue.	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external habitat disturbance factors is not expected to lead to a detectable change in spawning or rearing success such that the ability of the pollock stock to sustain itself at or above MSST is jeopardized.

Table 4.8-1 (cont.). Cumulative effects analysis for eastern Bering Sea pollock: FMP 4.2.

Notes: AK - Alaska
BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
I - Insignificant
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level
S+ - Significantly Beneficial
US - United States

Table 4.8-2. Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMPs 4.1 and 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of AK Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**Yes**, large removals of Pacific cod occurred in the past foreign, domestic, and JV fisheries, and in the State of AK bait fisheries. The Pacific cod biomass is below $B_{40\%}$ and there are likely lingering effects from this past fishing pressure. (See Section 3.5.1.2)	**Not a contributing factor**: Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing factor** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contribu-ting factor**: Most future catch and bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, Insignificant** Pacific cod are fished at less than the OFL and stock size is projected to be above $B_{40\%}$ from 2003-2007. While an extreme pollution event could cause significant mortality in a localized area, the combined effect of internal removals and removals due to reasonably foreseeable external events is not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.

Table 4.8-2 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMPs 4.1 and 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of AK Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Biomass	**S+**	**No,** past large removals of Pacific cod and other past effects (see Section 3.5.1.2) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, S+** Under the FMP, the expected biomass in 2007 is greater than $B_{60\%}$ and the difference between the expected biomass in 2007 and the estimated biomass in 2002 is greater than 15% of the equilibrium unexploited biomass. Therefore combination of internal and external factors is expected to increase the Pacific cod biomass such that the ability of the stock to maintain itself at or above MSST is enhanced.
Change in Genetic Structure of Population	**I**	**No**, see above.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of Pacific cod such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.8-2 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMPs 4.1 and 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of AK Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	**I**	**Yes**, past fisheries could have had a lingering negative effect on Pacific cod recruitment. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.2)	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/ Averse Contribution**: Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.2). **No,** lingering population level effects from fisheries catch and bycatch of Pacific cod prey species are not expected (See Section 3.5.1.2).	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Pacific cod stock is unable to sustain itself at or above MSST

Table 4.8-2 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific cod: FMPs 4.1 and 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events				Natural Events	
			IPHC Longline Fishery	State of AK Crab Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.2)	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution:** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of habitat impacts are not expected to impact the Pacific cod stock such that it is unable to sustain itself at or above MSST

Notes: AK - Alaska
FMP - fishery management plan
I - Insignificant
IPHC - International Pacific Halibut Commission
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level
S+ - Significantly Beneficial

Table 4.8-3. Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of AK Crab Fishery	State of AK Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**Yes**, large removals of Pacific cod occurred in the past foreign, domestic, and JV fisheries, and in the State of AK groundfish, crab and bait fisheries. The Pacific cod biomass is below $B_{40\%}$ and there are likely lingering effects from this past fishing pressure. (See Section 3.5.1.2)	**Not a contributing factor :** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing factor:** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing factor:** Future bycatch removals would be accounted for in annual harvest rate and therefore do not add additional fishing mortality. However, a small amount of discards may not be included.	**Not a contributing factor:** Most future catch and bycatch removals would be accounted for in annual harvest rate and therefore do no add additional fishing mortality.	**Potential Adverse contribution** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific cod.	**Yes, Insignificant** Pacific cod are fished at less than the OFL and stock size is projected to be above $B_{40\%}$ from 2003-2007. While an extreme pollution event could cause significant mortality in a localized area, the combined effect of internal removals and removals due to reasonably foreseeable external events is not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.

Table 4.8-3 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of AK Crab Fishery	State of AK Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Biomass	**S+**	**No,** past large removals of Pacific cod and other past effects (see Section 3.5.1.2) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Pacific cod.	**Yes, S+** Under the FMP, the expected biomass in 2007 is greater than $B_{60\%}$ and the difference between the expected biomass in 2007 and the estimated biomass in 2002 is greater than 15% of the equilibrium unexploited biomass. Therefore combination of internal and external factors is expected to increase the Pacific cod biomass such that the ability of the stock to maintain itself at or above MSST is enhanced.

Table 4.8-3 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of AK Crab Fishery	State of AK Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	**I**	**No**, see above.	**Potential Adverse Contribution** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Catch and bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to direct localized mortality of Pacific cod such that stock genetics are threatened.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.8-3 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of AK Crab Fishery	State of AK Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	**I**	**Yes**, past fisheries could have had a lingering negative effect on Pacific cod recruitment, particularly in the GOA where the State groundfish fishery is very localized. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.2)	**Potential Adverse Contribution** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Bycatch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Catch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Catch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/ Averse Contribution** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.

Table 4.8-3 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of AK Crab Fishery	State of AK Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.2). **No,** lingering population level effects from fisheries catch and bycatch of Pacific cod prey species are not expected (see Section 3.5.1.2).	**Potential Adverse Contribution** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution** Bycatch of Pacific cod forage fish in this fishery is expected to continue.	**Potential Adverse Contribution** Bycatch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Bycatch and catch of Pacific cod in this fishery is expected to continue.	**Potential Adverse Contribution** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST	**Potential Beneficial/ Adverse Contribution** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Pacific cod stock is unable to sustain itself at or above MSST

Table 4.8-3 (cont.). Cumulative effects analysis for Gulf of Alaska Pacific cod: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						
			Human Controlled Events					Natural Events	
			IPHC Longline Fishery	State of AK Crab Fishery	State of AK Groundfish Fishery	Subsistence	Marine Pollution	Climate Changes and Regime Shifts	
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.2)	**Potential Adverse Contribution** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution** Habitat disturbance may cause change in spawning or rearing success	**Potential Adverse Contribution** Habitat degradation due to pollution events may cause change in spawning or rearing success	**Potential Beneficial/ Adverse Contribution** Strong Aleutian Low and high water temperatures tend to favor recruitment, likewise weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The combination of internal and external effects is not expected to impact the habitat suitability of pacific cod such that it is unable to sustain itself at or above MSST

Notes: AK - Alaska
FMP - fishery management plan
GOA - Gulf of Alaska
I - Insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
S+ - Significantly beneficial

Table 4.8-4. Cumulative effects analysis for Bering Sea and Aleutian Islands Atka mackerel: FMPs 4.1 and 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	**I**	**No**, large removals of Atka mackerel occurred in the foreign, domestic, JV and fisheries, but there does not appear to be a lingering effect on the BSAI Atka mackerel populations (see Section 3.5.1.4)	**Potential Adverse Contribution:** Acute and/or chronic pollution events could jeopardize capacity of the stock to produce MSY on a continuing basis.	**Not a contributing factor:** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Atka mackerel.	**Yes, Insignificant** Atka mackerel are fished at less than the OFL and are above the minimum stock size. Any potential removals due to marine pollution are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis.
Change in Biomass	**S+**	**No**, past large removals of Atka mackerel and other past effects (see Section 3.5.1.4) have not had a lingering effect on the ability of the stock to sustain itself above MSST.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could affect the ability of the stock to sustain itself above MSST.	**Not a contributing factor** Changes in water temperature due to climate and regime shifts are not expected to cause direct mortality of Atka mackerel.	**Yes, S+** The combination of internal and external factors could sufficiently reduce the Atka mackerel biomass such that the ability of the stock to maintain itself at or above MSST is enhanced.
Change in Genetic Structure of Population	**I**	**Unknown.** Since the Atka mackerel fishery was highly localized past foreign, JV, and domestic fisheries are found to have had lingering effects on the spatial/temporal distribution of the fish. However, the effect of this change in distribution on genetic structure is unknown.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population through localized mortality events.	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes, Insignificant** The combination of internal and external factors is not expected to sufficiently alter the genetic structure of the population such that the ability of the stock to maintain itself at or above MSST is jeopardized.
Change in Reproductive Success	**S+**	**Yes**, Past commercial whaling and removed large predators and could have had a beneficial effect. Also there are lingering past effects due to Climate Changes and Regime Shifts (refer to Section 3.5.1.4)	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes, S+** The combination of internal and external factors could sufficiently alter the reproductive success of the population such that the ability of the stock to maintain itself at or above MSST is enhanced.

Table 4.8-4 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Atka mackerel: FMPs 4.1 and 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	**I**	**Yes,** see above.	**Potential Adverse Contribution:** Reduced prey availability or reduced quality of prey could jeopardize the stock's ability to sustain itself above MSST	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes, Insignificant** The combination of internal and external removals of prey is not expected to decrease prey availability such that the Atka mackerel stock is unable to sustain itself at or above MSST
Change in Habitat Suitability	**I**	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.4)	**Potential Adverse Contribution:** Habitat degradation due to pollution events may cause change in spawning or rearing success	**Potential Beneficial/ Averse Contribution**: A shift toward colder waters favors recruitment and survival of Atka mackerel. Conversely, warmer waters are potentially adverse.	**Yes, Insignificant** The combination of internal and external habitat disturbance factors is not expected to lead to a detectable change in spawning or rearing success such that the ability of the Atka mackerel stock to sustain itself at or above MSST is jeopardized.

Notes: BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
I - Insignificant
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level
S+ - significantly beneficial

Table 4.8-5. Cumulative effects analysis for Gulf of Alaska shallow water flatfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**Yes**, Past JV and Domestic Fisheries (refer to Section 3.5.1.5)	**Not a Contributing Factor:** Bycatch of shallow water flatfish in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to shallow water flatfish mortality	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of shallow water flatfish	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	I	**Yes,** Past JV and Domestic Fisheries (refer to Section 3.5.1.5)	**Not a Contributing Factor:** Bycatch of shallow water flatfish in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to shallow water flatfish mortality and thus change the biomass level of the stock	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Genetic Structure of Population	I	**No**	**Not a Contributing Factor:** Bycatch of shallow water flatfish in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of shallow water flatfish such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Reproductive Success	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.5)	**Not a Contributing Factor:** Bycatch of shallow water flatfish in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-5 (cont.). Cumulative effects analysis for Gulf of Alaska shallow water flatfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.5)	**Potential Adverse Contribution:** Reduced prey availability and prey quality induced by habitat disturbance by fishing gear is expected to continue	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.5)	**Potential Adverse Contribution:** Habitat disturbance from fishery gear is expected to continue	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Notes: FMP - fishery management plan
I - Insignificant
JV - joint venture

Table 4.8-6. Cumulative effects analysis for Gulf of Alaska flathead sole: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**Yes,** Past JV and Domestic Fisheries (refer to Section 3.5.1.7)	**Not a Contributing Factor:** Bycatch of flathead sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of flathead sole	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	I	**Yes,** Past JV and Domestic Fisheries (refer to Section 3.5.1.7)	**Not a Contributing Factor:** Bycatch of flathead sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to flathead sole mortality and thus change the biomass level of the stock	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Genetic Structure of Population	I	**No**	**Not a Contributing Factor:** Bycatch of flathead sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of flathead sole such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Reproductive Success	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.7)	**Not a Contributing Factor:** Bycatch of flathead sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-6 (cont.). Cumulative effects analysis for Gulf of Alaska flathead sole: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.7)	**Potential Adverse Contribution:** Reduced prey availability and prey quality induced by habitat disturbance by fishing gear is expected to continue	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.7)	**Potential Adverse Contribution:** Habitat disturbance from fishery gear is expected to continue	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Notes: FMP - fishery management plan
I - Insignificant
JV - joint venture

Table 4.8-7. Cumulative effects analysis for Gulf of Alaska deep water flatfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**No**	**Not a Contributing Factor:** Bycatch of deep water flatfish in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to deep water flatfish mortality	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of deep water flatfish	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	I	**No**	**Not a Contributing Factor:** Bycatch of deep water flatfish in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to deep water flatfish mortality and thus change the biomass level of the stock	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Genetic Structure of Population	I	**No**	**Not a Contributing Factor:** Bycatch of deep water flatfish in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of deep water flatfish such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Reproductive Success	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.9)	**Not a Contributing Factor:** Bycatch of deep water flatfish in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-7 (cont.). Cumulative effects analysis for Gulf of Alaska deep water flatfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.9)	**Potential Adverse Contribution:** Reduced prey availability and prey quality induced by habitat disturbance by fishing gear is expected to continue	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.9)	**Potential Adverse Contribution:** Habitat disturbance from fishery gear is expected to continue	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Notes: FMP - fishery management plan
I - Insignificant
JV - joint venture

Table 4.8-8. Cumulative effects analysis for Bering Sea and Aleutian Islands other flatfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to other flatfish mortality	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of other flatfish	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis
Change in Biomass Level	I	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to other flatfish mortality and thus effect the biomass level	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to significantly alter the biomass toward levels that jeopardize the ability of the stock to sustain itself above MSST
Change in Genetic Structure of Population	I	**No**	**Potential Adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of other flatfish such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST
Change in Reproductive Success	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.10)	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST

Table 4.8-8 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands other flatfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events		Cumulative Effect?
			Human Controlled Events	Natural Events	
			Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.10)	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.10)	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Levels of habitat disturbance are not expected to lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself above the MSST

Notes:
FMP - fishery management plan
I - Insignificant
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield

Table 4.8-9. Cumulative effects analysis for Gulf of Alaska rex sole: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past JV and Domestic Fisheries (refer to Section 3.5.1.10)	**Not a Contributing Factor:** Bycatch of rex sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to rex sole mortality	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of rex sole	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	I	Yes, Past JV and Domestic Fisheries (refer to Section 3.5.1.10)	**Not a Contributing Factor:** Bycatch of rex sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could contribute to rex sole mortality and thus change the biomass level of the stock	**Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Genetic Structure of Population	I	No	**Not a Contributing Factor:** Bycatch of rex sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of rex sole such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to alter the genetic sub-population structure such that it jeopardizes the ability of the stock to maintain current population sizes
Change in Reproductive Success	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.10)	**Not a Contributing Factor:** Bycatch of rex sole in this fishery is not expected	**Potential adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to change the reproductive success of the stock such that is jeopardizes the ability of the stock to maintain current population sizes

Table 4.8-9 (cont.). Cumulative effects analysis for Gulf of Alaska rex sole: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Scallop Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.10)	**Potential Adverse Contribution:** Reduced prey availability and prey quality induced by habitat disturbance by fishing gear is expected to continue	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to change the prey availability of other flatfish such that it jeopardizes the ability of the stock to maintain current population sizes
Change in Habitat Suitability	I	Yes, Past Foreign, JV and Domestic Fisheries and Climate Changes and Regime Shifts (refer to section 3.5.1.10)	**Potential Adverse Contribution:** Habitat disturbance from fishery gear is expected to continue	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Beneficial/Adverse Contribution:** Strong Aleutian Low and high water temperatures tend to favor recruitment, on the contrary weak Aleutian Low and cooler water temperatures tend to result in weak recruitment	**Yes, Insignificant** Cumulative effects are not expected to be of a magnitude that would alter spawning or rearing success such that it jeopardizes the ability of the stock to maintain current stock sizes.

Notes: FMP - fishery management plan
I - Insignificant
JV - joint venture

Table 4.8-10. Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific ocean perch: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline FIsheries	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	Yes, Past Foreign, JV and Domestic Groundfish Fisheries (refer to Section 3.5.1.11)	**Not a Contributing Factor**: Bycatch of Pacific ocean perch is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Pacific ocean perch mortality	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of Pacific ocean perch.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to produce MSY on a continuing basis
Change in Biomass Level	S+	Yes, Past Foreign, JV and Domestic Groundfish Fisheries (refer to Section 3.5.1.11)	**Not a Contributing Factor**: Bycatch of Pacific ocean perch is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Pacific ocean perch mortality and thus change the biomass level	**Potential Beneficial/Adverse Contribution:** Recent climate changes and regime shifts have lead to increased advection of the Alaska current and is thought to have increased euphausiid productivity and thus Pacific ocean perch recruitment	**Yes, Significant Positive** Cumulative effects are expected to increase the biomass towards levels that will enhance the ability of the stock to sustain itself at or above the MSST
Change in Genetic Structure of Population	I	No	**Not a Contributing Factor**: Bycatch of Pacific ocean perch is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could contribute to Pacific ocean perch mortality in a directed manner and thus alter the genetic structure of the population	**Not a Contributing Factor:** Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of Pacific ocean perch	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST

Table 4.8-10 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands Pacific ocean perch: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline FIsheries	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	S+	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.11)	**Not a Contributing Factor**: Bycatch of Pacific ocean perch is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Recent climate changes and regime shifts have lead to increased advection of the Alaska current and is thought to have increased euphausiid productivity and thus Pacific ocean perch recruitment	**Yes, Significant Positive** Cumulative effects are expected to a detectable increase in reproductive success such that it enhances the ability of the stock to sustain itself at or above the MSST
Change in Prey Availability	I	Yes, Climate Changes and Regime Shifts (refer to Section 3.5.1.11)	**Not a Contributing Factor**: Bycatch of Pacific ocean perch prey is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution:** Recent climate changes and regime shifts have lead to increased advection of the Alaska current and is thought to have increased euphausiid productivity and thus Pacific ocean perch recruitment	**Yes, Insignificant** The change in prey availability are not expected to jeopardize the ability of the stock to sustain itself above the MSST
Change in Habitat Suitability	I	Yes, Past Foreign, JV and Domestic Fisheries, IPHC Longline Fisheries, and Climate Changes and Regime Shifts (refer to Section 3.5.1.11)	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of Pacific ocean perch spawning and/or rearing habitats	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution:** Climate changes and regime shifts and corresponding water temperature variation appear to influence Pacific ocean perch habitat suitability	**Yes, Insignificant** Trends in stock status do not indicate changes in spawning biomass. The stock is rebuilding. Therefore, cumulative effects are not expected to jeopardize the ability of the stock to sustain itself above the MSST

Notes: FMP - fishery management plan
I - Insignificant
IPHC - International Pacific Halibut commission
JV - joint venture
MSST - minimum stock size threshold
MSY - maximum sustainable yield
S+ - Significantly Beneficial

Table 4.8-11. Cumulative effects analysis for Bering Sea and Aleutian Islands northern rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**Yes**, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of northern rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to northern rockfish mortality	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of northern rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	I	**Yes**, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of northern rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to northern rockfish mortality and thus change the biomass level	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Genetic Structure of Population	I	**No**	**Not a Contributing Factor**: Bycatch of northern rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of northern rockfish such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Reproductive Success	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of northern rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-11 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands northern rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of northern rockfish prey is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Halibut Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of northern rockfish spawning and/or rearing habitats	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** The cumulative effects are not expected to include levels of disturbance that would lead to a detectable change in spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself at or above the MSST

Notes: FMP - fishery management plan
I - Insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture
MSST - minimum stock size threshold

Table 4.8-12. Cumulative effects analysis for Bering Sea and Aleutian Islands shortraker/rougheye rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**Yes,** Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to shortraker and rougheye rockfish mortality	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of shortraker and rougheye rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	I	**Yes,** Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to shortraker and rougheye rockfish mortality and thus change the biomass level	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Genetic Structure of Population	I	**No**	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of shortraker and rougheye rockfish such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-12 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands shortraker/rougheye rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Prey Availability	I	**Yes**, Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Potential Adverse Contribution:** The shrimp fishery is expected to continue and thus could influence the availability of prey to rougheye rockfish	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish prey is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Habitat Suitability	I	**Yes**, Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Longline Fishery and Climate Changes and Regime Shifts refer to Section 3.5.1.13)	**Not a Contributing Factor**: Habitat degradation by the State of Alaska shrimp fishery is not expected to occur	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of shortraker and rougheye rockfish spawning and/or rearing habitats	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Notes: FMP - fishery management plan
I - Insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture

Table 4.8-13. Cumulative effects analysis for Bering Sea and Aleutian Islands other rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**Yes**, Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to other rockfish mortality	**Not a contributing factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of other rockfish.	**Yes, Insignificant** The cumulative effects are not expected to jeopardize the ability of the stock to maintain current population sizes
Change in Biomass Level	I	**Yes,** Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to other rockfish mortality and thus change the biomass level	Beneficial/Adverse Contribution: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** The cumulative effects are not expected to significantly alter the biomass level
Change in Genetic Structure of Population	I	**No**	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a contributing factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of other rockfish such that stock genetics are threatened.	**Yes, Insignificant** The cumulative effects are not expected to significantly alter the genetic sub-population structure

Table 4.8-13 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands other rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	I	**No**	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of other rockfish species is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment	**Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** The cumulative effects are not expected to significantly change the reproductive success of the stock
Change in Prey Availability	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Potential Adverse Contribution:** The shrimp fishery is expected to continue and thus could influence the availability of prey to many other rockfish species	**Not a Contributing Factor**: Bycatch of other rockfish species prey is not expected to occur	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** The cumulative effects are not expected to change prey availability such that it jeopardizes the ability of the stock to maintain current population levels
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Longline Fishery and Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Habitat degradation by the State of Alaska shrimp fishery gear is not expected to occur	**Potential Adverse Contribution:** Habitat disruption by the IPHC longline fishery gear is expected to continue and could cause disruption of other rockfish species spawning and/or rearing habitats	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** The cumulative effects are not expected to cause habitat disturbance at levels that would significantly change the spawning or rearing success of the stock

Notes: FMP - fishery management plan
I - Insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture

Table 4.8-14. Cumulative effects analysis for Gulf of Alaska shortraker/rougheye rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**Yes,** Past Foreign, JV, and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery	**Not a Contributing Factor:** Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to shortraker and rougheye rockfish mortality	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of shortraker and rougheye rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	I	**Yes,** Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery	**Not a Contributing Factor:** Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to shortraker and rougheye rockfish mortality and thus change the biomass level	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Genetic Structure of Population	I	**No**	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery	**Not a Contributing Factor:** Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of shortraker and rougheye rockfish such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-14 (cont.). Cumulative effects analysis for Gulf of Alaska shortraker/rougheye rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Shrimp Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	I	**Yes**, Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery	**Not a Contributing Factor:** Bycatch of shortraker and rougheye rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Prey Availability	I	**Yes**, Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Potential Adverse Contribution:** Catch of shrimp, the main rougheye rockfish prey species is expected to continue	**Not a Contributing Factor**: Bycatch of shortraker and rougheye rockfish prey is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Halibut Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Shortraker and rougheye rockfish habitat degradation is not expected to occur in this fishery	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of shortraker and rougheye rockfish spawning and/or rearing habitats	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Notes:
FMP - fishery management plan
I - Insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture

Table 4.8-15. Cumulative effects analysis for slope rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**Yes,** Past Foreign, JV, and Domestic Fisheries and State of Alaska Groundfish Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Catch of slope rockfish is already accounted for by the domestic groundfish fishery	**Not a Contributing Factor**: Bycatch of slope rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to slope rockfish mortality	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of slope rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	I	**Yes,** Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Catch of slope rockfish is already accounted for by the domestic groundfish fishery	**Not a Contributing Factor**: Bycatch of slope rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to slope rockfish mortality and thus change the biomass level	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Genetic Structure of Population	I	**No**	**Not a Contributing Factor**: Catch of slope rockfish is already accounted for by the domestic groundfish fishery	**Not a Contributing Factor**: Bycatch of slope rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of slope rockfish such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-15 (cont.) Cumulative effects analysis for slope rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Reproductive Success	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Catch of slope rockfish is already accounted for by the domestic groundfish fishery	**Not a Contributing Factor**: Bycatch of slope rockfish is not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Prey Availability	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of slope rockfish prey is not expected to occur in this fishery	**Not a Contributing Factor**: Bycatch of slope rockfish prey is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Groundfish Fisheries, State of Alaska Groundfish Fisheries, IPHC Halibut Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Potential Adverse Contribution:** Habitat disruption by State of Alaska groundfish fishery gear is expected to continue and could cause disruption of slope rockfish spawning and/or rearing habitats	**Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of slope rockfish spawning and/or rearing habitats	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-15 (cont.) Cumulative effects analysis for slope rockfish: FMPs 4.1 and 4.2.

Notes: FMP - fishery management plan
I - Insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture

Table 4.8-16. Cumulative effects analysis for Gulf of Alaska pelagic shelf rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**Yes,** Past Foreign, JV, and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of pelagic shelf rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to pelagic shelf rockfish mortality	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of pelagic shelf rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	I	**Yes,** Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of pelagic shelf rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to pelagic shelf rockfish mortality and thus change the biomass level	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Genetic Structure of Population	I	**No**	**Not a Contributing Factor**: Bycatch of pelagic shelf rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population	**Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of pelagic shelf rockfish such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Reproductive Success	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Bycatch of pelagic shelf rockfish are not expected to occur in this fishery	**Potential Adverse Contribution**: Acute and/or chronic pollution events could result in reduced recruitment	**Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-16 (cont.). Cumulative effects analysis for Gulf of Alaska pelagic shelf rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events			Cumulative Effect?
			Human Controlled Events		Natural Events	
			State of Alaska Shrimp Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Potential Adverse Effect:** Catch of shrimp, a prey item of dusky rockfish is expected to continue	**Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Groundfish Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	**Not a Contributing Factor**: Pelagic shelf rockfish habitat degradation is not expected to occur in this fishery	**Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	**Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Notes: FMP - fishery management plan
I - Insignificant
JV - joint venture

Table 4.8-17. Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Mortality	I	**Yes**, Past Foreign, JV, and Domestic Fisheries (refer to Section 3.5.1.13)	• **Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery	• **Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery	• **Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery	• **Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery	• **Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to demersal shelf rockfish mortality	• **Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct mortality of demersal shelf rockfish.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Biomass Level	I	**Yes,** Past Foreign, JV and Domestic Fisheries (refer to Section 3.5.1.13)	• **Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery	• **Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery	• **Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery	• **Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery	• **Potential Adverse Contribution**: Acute and/or chronic pollution events could contribute to demersal shelf rockfish mortality and thus change the biomass level	• **Potential Beneficial/ Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-17 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Genetic Structure of Population	I	**No**	• **Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery	• **Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery	• **Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery	• **Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery	• **Potential Adverse Contribution**: Acute and/or chronic pollution events could alter the genetic structure of the population	• **Not a Contributing Factor**: Changes in water temperature due to climate and regime shifts are not expected to be of sufficient magnitude to cause direct localized mortality of demersal shelf rockfish such that stock genetics are threatened.	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Reproductive Success	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	• **Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery	• **Not a Contributing Factor**: Bycatch of demersal shelf rockfish are not expected to occur in this fishery	• **Not a Contributing Factor**: Catch is already accounted for by the domestic groundfish fishery	• **Not a Contributing Factor**: Bycatch is already accounted for by the domestic groundfish fishery	• **Potential Adverse Contribution** : Acute and/or chronic pollution events could result in reduced recruitment	• **Potential Beneficial/Adverse Contribution:** Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-17 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State of Alaska Herring Fishery	State of Alaska Shrimp Fishery	State of Alaska Groundfish Fishery	IPHC Longline Fishery	Marine Pollution	Climate Changes and Regime Shifts	
Change in Prey Availability	I	**Yes,** Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	• **Potential Adverse Contribution:** Catch of herring, a prey item of demersal shelf rockfish is expected to continue	• **Potential Adverse Contribution:** Catch of shrimp, a prey item of demersal shelf rockfish is expected to continue	• **Not a Contributing Factor**: Bycatch of demersal shelf rockfish prey is not expected in this fishery	• **Not a Contributing Factor**: Bycatch of demersal shelf rockfish prey is not expected to occur in this fishery	• **Potential Adverse Contribution:** Acute and/or chronic pollution events could result in reduced prey availability or reduced prey quality	• **Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels
Change in Habitat Suitability	I	**Yes,** Past Foreign, JV and Domestic Groundfish Fisheries, IPHC Halibut Longline Fisheries and Climate Changes and Regime Shifts (refer to Section 3.5.1.13)	• **Not a Contributing Factor**: Demersal shelf rockfish habitat degradation is not expected to occur in this fishery	• **Not a Contributing Factor**: Demersal shelf rockfish habitat degradation is not expected to occur in this fishery	• **Potential Adverse Contribution:** Habitat disruption by State of Alaska fishery gear is expected to continue and could cause disruption of demersal shelf rockfish spawning and/or rearing habitats	• **Potential Adverse Contribution:** Habitat disruption by IPHC longline fishery gear is expected to continue and could cause disruption of demersal shelf rockfish spawning and/or rearing habitats	• **Potential Adverse Contribution:** Acute and/chronic pollution events could result in habitat degradation which in turn may cause change in spawning or rearing success	• **Potential Beneficial/Adverse Contribution**: Whether recruitment is increased or reduced by warmer water temperatures affected by climatic changes and regime shifts is unknown	**Yes, Insignificant** Cumulative effects are not expected to jeopardize the capacity of the stock to maintain current population levels

Table 4.8-17 (cont.). Cumulative effects analysis for Gulf of Alaska demersal shelf rockfish: FMPs 4.1 and 4.2.

Notes:
FMP - fishery management plan
I - Insignificant
IPHC - International Pacific Halibut Commission
JV - joint venture

Table 4.8-18. Cumulative effects analysis for Chinook and other salmon in Bering Sea and Aleutian Islands: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	Land Management Practices	Long-term Climate Change and Regime Shift	
Mortality	**CS+**	**Yes**	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts of bycatch and state commercial fisheries could hinder recovery.	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impact of bycatch and state subsistence fisheries could hinder recovery.	**Not a contributing factor-** significant impacts causing direct mortality is not expected.	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally Significant Beneficial-** given the poor stock status of salmon runs in western Alaska*, decreasing bycatch in BSAI and GOA may help to restore stock and improve recovery. Bycatch of Chinook salmon originating in the Pacific Northwest could occur in Alaska but may be reduced under these FMPs. ADF&G intensely manages fisheries to ensure bycatch does not exceed limits set forth by the ESA (Section 7).
Change in Spawning Habitat	**I**	**Yes**	**Not a Contributing Factor**: no direct interaction between groundfish fisheries and salmon spawning habitat occurs because Pacific salmon species spawn in freshwater.	**Unknown**: potential interactions and effects have not been determined.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Not a contributing factor**- not expected to significantly change physical habitat.	**Unknown-**watersheds used by spawning salmon are managed by various agencies and groups and are influenced by land management practices as well.
Change in prey availability	**U**	**Not Determined**	**Unknown**: a relationship between prey catch and salmon prey availability has not been determined..	**Unknown**: a relationship between prey catch and salmon prey availability has not been determined.	**Not a contributing factor-** significant impacts causing change in prey structure and/or availability are not expected.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** potential changes to prey availability for salmon have not been determined and effects are unknown.

Table 4.8-18 (cont.). Cumulative effects analysis for Chinook and other salmon in Bering Sea and Aleutian Islands: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	Land Management Practices	Long-term Climate Change and Regime Shift	
Change in genetic structure of population	**U**	**Not Determined**	**Unknown**: composition of bycatch has not been determined.	**Unknown**: composition of bycatch has not been determined.	**Not a contributing factor-** significant impacts causing change in genetic structure of stock are not expected.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** bycatch composition has not been determined and current stock composition for all species of salmon is unknown.
Change in reproductive success	**CS+**	**Yes**	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impacts of bycatch and state commercial fisheries could hinder recovery.	**Potential Adverse Contribution**: current stock status of salmon runs in western Alaska* are depressed. Impact of bycatch and state subsistence fisheries could hinder recovery.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Conditionally Significant Beneficial-** given the poor stock status of salmon runs in western Alaska*, decreasing bycatch in BSAI and GOA may help to restore stock and improve recovery by enabling more spawners to reach the destined spawning location.

Notes: * Western Alaska incorporates Kuskokwim, Nushagak, and Yukon Rivers also referred to as the AYK region (Arctic-Yukon-Kuskokwim-region).
ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
CS+ - Conditionally significant beneficial
ESA - Endangered Species Act
FMP - fishery management plan
GOA - Gulf of Alaska
I - Insignificant
U - Unknown

Standard Language to Describe Effects:
Not a contributing factor
Potential adverse contribution
Potential beneficial contribution
Unknown

Table 4.8-19. Cumulative effects analysis for Chinook and other salmon in Gulf of Alaska: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Management Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Mortality	**CS+**	**Yes**	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor-** significant impacts causing direct mortality is not expected.	**Potential Beneficial Contribution:** may help to maintain GOA stock status	**Not a contributing factor**- not expected to result in direct mortality.	**Conditionally Significant Beneficial-** a combined decrease in bycatch in BSAI and GOA could help to restore salmon stocks in depressed areas and maintain stocks in stable areas of Alaska. Bycatch of Chinook salmon originating in the Pacific Northwest could occur in Alaska but may be reduced under these FMPs. ADF&G intensely manages fisheries to ensure bycatch does not exceed limits set forth by the ESA (Section 7).
Change in Spawning Habitat	**I**	**Yes**	**Not a Contributing Factor**: no direct interaction occurs between groundfish fisheries and salmon spawning habitat because Pacific salmon species spawn in freshwater.	**Unknown**: potential interactions and effects have not been determined.	**Unknown**: potential interactions and effects have not been determined.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Not a Contributing Factor**: program does not include natural spawning habitat of salmon	**Not a contributing factor**- not expected to significantly change physical habitat	**Unknown-**watersheds used by spawning salmon are managed by various agencies and groups and are influenced by land management practices as well.

Table 4.8-19 (cont.). Cumulative effects analysis for Chinook and other salmon in Gulf of Alaska: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Management Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in prey availability	**U**	**Not determined**	**Unknown**: a relationship between prey catch and salmon prey availability has not been determined.	**Unknown**: a relationship between prey catch and salmon prey availability has not been determined..	**Unknown**: a relationship between prey catch and salmon prey availability has not been determined.	**Not a contributing factor-** significant impacts causing change in prey structure and/or availability are not expected.	**Not a Contributing Factor**: program does not include prey species.	**Potential adverse or beneficial contributio n-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** potential changes to prey availability for salmon have not been determined and effects are unknown.
Change in genetic structure of population	**U**	**Not determined**	**Unknown**: composition of bycatch has not been determined.	**Unknown**: composition of bycatch has not been determined.	**Unknown**: composition of bycatch has not been determined.	**Not a contributing factor-** significant impacts causing change in genetic structure of stock are not expected.	**Unknown:** effects of salmon bycatch on biodiversity are unknown.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** bycatch composition has not been determined and current stock composition for all species of salmon is unknown.

Table 4.8-19 (cont.). Cumulative effects analysis for Chinook and other salmon in Gulf of Alaska: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects						Cumulative Effect?
			Human Controlled Events					Natural Events	
			State Commercial Fisheries	State Subsistence Fisheries	State Sport Fisheries	Land Management Practices	State Hatchery Enhancement Program	Long-term Climate Change and Regime Shift	
Change in reproductive success	**U**	**Yes**	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Not a contributing factor:** current stock status of salmon in this region is considered stable.	**Potential adverse contribution-** degradation of watersheds used by spawning salmon could significantly impact status and recovery of depressed stocks.	**Potential Beneficial Contribution:** may help to maintain GOA stock status	**Potential adverse or beneficial contribution-** warm trends favor recruitment whereas cool trends weaken recruitment	**Unknown-** although salmon stocks in this region are considered stable, decreasing bycatch in BSAI and GOA may help to restore depressed stocks in other areas, including Chinook originating in the Pacific Northwest. Thus, improving recovery by enabling more spawners to reach the destined spawning location .

Notes:
ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
CS+ - Conditionally significant beneficial
ESA - Endangered Species Act
FMP - fishery management plan
GOA - Gulf of Alaska
I - Insignificant
U - Unknown

Standard Language to Describe Effects:
Not a contributing factor
Potential adverse contribution
Potential beneficial contribution
Unknown

Table 4.8-20. Cumulative effects analysis for bairdi Tanner crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**CS+**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for these stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor-** not expected to result in direct mortality.	**Unknown-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and recovery has not occurred. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as decreasing or eliminating crab bycatch potential and expanding protection areas.
Change in Biomass	**CS+**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** Although bycatch limits and quota setting processes are responsive to changes in abundance, stocks are still considered overfished and recovery has not occurred. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as decreasing or eliminating crab bycatch potential and expanding protection areas.

Table 4.8-20 (cont.). Cumulative effects analysis for bairdi Tanner crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.8-20 (cont.). Cumulative effects analysis for bairdi Tanner crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Habitat	**CS+**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, stock has not shown signs of recovery to date. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as expanding protection areas and eliminating or severely restricting trawling.

Notes:
ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
CS+ - Conditionally significant beneficial
FMP - fishery management plan
NOAA - National Oceanic and Atmospheric Administration
U - Unknown

Table 4.8-21. Cumulative effects analysis for bairdi Tanner crab in Gulf of Alaska: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed. It is unknown if/how these stocks would respond to additional protection measures put forth under these FMPs.
Change in Biomass	**U**	**Yes**	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** Quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries. However, some stocks in GOA show signs of possible recovery while others are still considered depressed. It is unknown if/how these stocks would respond to additional protection measures put forth under these FMPs.

Table 4.8-21 (cont.). Cumulative effects analysis for bairdi Tanner crab in Gulf of Alaska: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Not determined**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods. However, some stocks in GOA show signs of possible recovery while others are still considered depressed.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined and potential changes to prey structure are unknown.
Change in Habitat	**U**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, ome stocks in GOA show signs of possible recovery while others are still considered depressed. It is unknown if/how these stocks would respond to additional protection measures put forth under these FMPs.

Notes: FMP - fishery management plan
GOA - Gulf of Alaska
U - Unknown

Table 4.8-22. Cumulative effects analysis for opilio Tanner crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**CS+**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are currently in decline.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor-** not expected to result in direct mortality.	**Unknown-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still in decline and recovery has not occurred. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as decreasing or eliminating crab bycatch potential and expanding protection areas.
Change in Biomass	**CS+**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are in decline.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are in decline and recovery has not occurred. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as decreasing or eliminating crab bycatch potential and expanding protection areas.

Table 4.8-22 (cont.). Cumulative effects analysis for opilio Tanner crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.

Table 4.8-22 (cont.). Cumulative effects analysis for opilio Tanner crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Habitat	**CS+**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished or in decline. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, stock has not shown signs of recovery to date. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as expanding protection areas and eliminating or severely restricting trawling.

Notes:
ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
CS+ - conditionally significant beneficial
FMP - fishery management plan
NOAA -National Oceanic and Atmospheric Administration
U - Unknown

Table 4.8-23. Cumulative effects analysis for red king crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**CS+**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, some of these stocks are still in decline and recovery has not occurred. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as decreasing or eliminating crab bycatch potential and expanding protection areas.
Change in Biomass	**CS+**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, some stocks are currently in decline.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, some of these stocks are in decline and recovery has not occurred. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as decreasing or eliminating crab bycatch potential and expanding protection areas.
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.

Table 4.8-23 (cont.). Cumulative effects analysis for red king crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Prey Availability	**U**	**No**	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.
Change in Habitat	**CS+**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, stock has not shown signs of recovery to date. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as expanding protection areas and eliminating or severely restricting trawling.

Notes:
BSAI - Bering Sea and Aleutian Islands
CS+ - Conditionally significant beneficial
FMP - fishery management plan
U - Unknown

Table 4.8-24. Cumulative effects analysis for red king crab in Gulf of Alaska: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**CS+**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are considered severely depressed.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are considered severely depressed and no immediate signs of recovery exist. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as decreasing or eliminating crab bycatch potential and expanding protection areas.
Change in Biomass	**CS+**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these stocks are showing historic populations lows.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are considered severely depressed and no immediate signs of recovery exist. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as decreasing or eliminating crab bycatch potential and expanding protection areas.

Table 4.8-24 (cont.). Cumulative effects analysis for red king crab in Gulf of Alaska: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined and potential changes to prey structure are not known.
Change in Habitat	**CS+**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, stock has not shown signs of recovery to date. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as expanding protection areas and eliminating or severely restricting trawling.

Notes: CS+ - Conditionally significant beneficial
FMP - fishery management plan
U - Unknown

Table 4.8-25. Cumulative effects analysis for blue king crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Mortality	**CS+**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, these crab stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for these stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, these stocks are still considered overfished and recovery has not occurred. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as decreasing or eliminating crab bycatch potential and expanding protection areas.
Change in Biomass	**CS+**	**Yes**	**Potential adverse contribution-** Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution**- state crab fisheries are managed by ADF&G in cooperation with NOAA Fisheries. Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential adverse contribution**- Although quota setting processes are responsive to fluctuations in stock status and incorporate crab bycatch in other state and federal fisheries, stocks are still considered overfished.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown**- Although bycatch limits and quota setting processes are responsive to changes in abundance, stocks are still considered overfished and recovery has not occurred. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as decreasing or eliminating crab bycatch potential and expanding protection areas.

Table 4.8-25 (cont.). Cumulative effects analysis for blue king crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects					Cumulative Effect?
			Human Controlled Events				Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Stock Rebuilding Plans (ADF&G and NOAA Fisheries)	Long-term Climate Change and Regime Shift	
Change in Reproductive Success	**U**	**Yes**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, however, stocks have not shown signs of recovery to date.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of BSAI crab has not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.	**Not a contributing factor-** diet composition of BSAI crab has not been determined, however prey catch is not expected.	**Not a contributing factor-** these plans do not address prey structure of crab.	**Unknown-** potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of BSAI crab has not been determined.
Change in Habitat	**CS+**	**Yes**	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution-** although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential beneficial contribution-** rebuilding plans and protection areas have been established for stocks that are currently overfished. However, potential for recovery of this stock as a whole is not known	**Not a contributing factor-** not expected to directly affect physical habitat.	**Unknown-** although some habitat areas are currently protected by no trawl zones and conservation zones, stock has not shown signs of recovery to date. It is unknown if/how these stocks will respond to measures put forth in these FMPs, such as expanding protection areas and eliminating or severely restricting trawling.

Table 4.8-25 (cont.). Cumulative effects analysis for blue king crab in Bering Sea and Aleutian Islands: FMP 4.1 and 4.2.

Notes:
ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
CS+ - conditionally significant beneficial
FMP - fishery management plan
NOAA - National Oceanic and Atmospheric Administration
U - Unknown

Table 4.8-26. Cumulative effects analysis for blue king crab in Gulf of Alaska: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** stock status is currently unknown due to lack of survey information. It is unknown if/how these stocks would respond to additional protection measures put forth under these FMPs.
Change in Biomass	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** stock status is currently unknown due to lack of survey information. It is unknown if/how these stocks would respond to additional protection measures put forth under these FMPs.
Change in Reproductive Success	**U**	**Not determined**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, but current stock status is unknown.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined.

Table 4.8-26 (cont.). Cumulative effects analysis for blue king crab in Gulf of Alaska: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Habitat	**U**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, stock status is unknown. It is unknown if/how these stocks would respond to additional protection measures put forth under these FMPs.

Notes: FMP - fishery management plan
U - Unknown

Table 4.8-27. Cumulative effects analysis for golden king crab in Bering Sea and Aleutian Islands and Gulf of Alaska: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Mortality	**U**	**Yes**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Not a contributing factor**- not expected to result in direct mortality.	**Unknown-** stock status is currently unknown due to lack of survey information. It is unknown if/how these stocks would respond to additional protection measures put forth under these FMPs.
Change in Biomass	**U**	**Not determined**	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** stock status is currently unknown due to lack of survey information.	**Unknown-** potential effects of climate change on biomass levels have not been determined.	**Unknown-** stock status is currently unknown due to lack of survey information. It is unknown if/how these stocks would respond to additional protection measures put forth under these FMPs.
Change in Reproductive Success	**U**	**Not determined**	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Not a contributing factor-** Crab seasons are set to avoid mating and molting periods.	**Unknown-** potential effects of climate change on reproductive behavior and success have not been determined.	**Unknown**: Crab seasons are set to avoid mating and molting periods, but current stock status is unknown.
Change in Prey Availability	**U**	**No**	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown-** diet composition of crab has not been determined.	**Unknown**- potential effects of climate change on prey structure of crab have not been determined.	**Unknown-** diet composition of crab has not been determined.

Table 4.8-27 (cont.). Cumulative effects analysis for golden king crab in Bering Sea and Aleutian Islands and Gulf of Alaska: FMP 4.1 and 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events			Natural Events	
			State Scallop Fisheries	State Crab Fisheries	State Subsistence Fisheries	Long-term Climate Change and Regime Shift	
Change in Habitat	**U**	**Yes**	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Potential adverse contribution**- although some habitat areas are currently protected by no trawl zones and conservation zones, it is possible that other habitat areas are not included in these measures.	**Not a contributing factor**- not expected to directly affect physical habitat.	**Unknown**- although some habitat areas are currently protected by no trawl zones and conservation zones, current stock status is unknown. It is unknown if/how these stocks would respond to additional protection measures put forth under these FMPs.

Notes: FMP - fishery management plan
U - Unknown

Table 4.8-28. Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.1.

Bering Sea

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **Direct Mortality of Benthic Organisms**	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Port Moller, Port Heiden, Dillingham, St. Paul and St. George.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential Adverse Contribution:** could cause direct mortality through physical alteration (burial).	**Not a contributing factor:** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes, CS+/CS-** While benefits accrue due to the extensive reductions in TAC and establishment of MPAs, the cumulative rating is conditionally adverse since that the baseline is already considered to be impacted and additional impacts both internal from the FMP and external as shown cannot be eliminated. However, if the closures proposed under FMP 4.1 were to be further defined based on additional information regarding important habitats in need of protection, cumulative effects may have more of a conditionally significant beneficial rating rather than conditionally significant adverse.

Table 4.8-28 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Benthic Community Structure	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Port Moller, Port Heiden, Dillingham, St. Paul and St. George.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause changes in the benthic community especially in nearshore/port areas.	**Potential Adverse Contribution:** If long term, could cause changes in the benthic community through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution**: Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes, CS+/CS-** However as described above for mortality, while the reduction in bottom trawling and major reductions in target species catches prescribed in the FMP could provide benefits to community structure, the baseline is already considered to be impacted and additional impacts both internal from the FMP and external as shown to the left cannot be eliminated. However, better definition and focus of the closures could lead to a conditionally significant beneficial rating.

Table 4.8-28 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Geographic Diversity of Impacts and Protection	**S+**	**Yes**, fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, less sensitive areas could be impacted by marine pollution.	**Not a Contributing Factor**	**Not a Contributing Factor**	**Yes, CS+/CS-** Several closure areas under this FMP cover a portion of high fishing intensity, thereby providing improvement in the geographic diversity of impacts. However, fishing will still occur, and the baseline is considered to be already adversely impacted. Therefore, the combination of the past external effects, along with the continuation of fishing effort in areas potentially already impacted, leads to the conditionally adverse conclusion in the cumulative case. However, better definition and focus of the closures could lead to a conditionally significant beneficial rating

Table 4.8-28 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.1.

Aleutian Islands

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **Direct Mortality of Benthic Organisms**	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. Prevalence of long lived species of coral makes impacts a particular concern in the Aleutians.	**Potential Adverse Contribution:** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution:** Impacts of long line fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution:** Impacts of pot fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Atkutan, Adak, Unalaska, Cold Bay Dutch Harbor and King Cove. Other sites possible for development.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/ port areas.	**Potential Adverse Contribution:** Could cause direct mortality through physical alteration (burial).	**Not a contributing factor:** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes, CS+/CS-** as described above for the Bering Sea, the rating is conditionally significant adverse in the cumulative case since fishing is still occurring and the baseline is considered to be adversely impacted. However, better definition and focus of the closures could lead to a conditionally significant beneficial rating

Table 4.8-28 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.1.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Changes to Benthic Community Structure	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution:** Impacts of long line fisheries on benthic community structure are expected to continue.	**Potential Adverse Contribution:** Impacts of pot fisheries on benthic community structure are expected to continue.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Atkutan, Adak, Unalaska, Cold Bay Dutch Harbor and King Cove. Other suites possible for development	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause changes in the benthic community especially in nearshore/ port areas.	**Potential Adverse Contribution:** Could cause direct mortality through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution**: Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes, CS+/CS-** As described above for morality, the baseline is considered to be adversely affected and due to the fact that impacts are not eliminated under this FMP, the cumulative effect is also rated conditionally significant adverse. However, better definition and focus of the closures could lead to a conditionally significant beneficial rating

Table 4.8-28 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.1. Gulf of Alaska

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Geographic Diversity of Impacts and Protection	**S+**	**Yes,** fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Not a contributing factor.**	**Potential Beneficial/ Averse Contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Beneficial/ Averse Contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by marine pollution.	**Not a contributing factor.**	**Not a contributing factor.**	**Yes, CS+/CS-** Since the baseline is considered to be adversely impacted and the impacts are not eliminated in either external or internal fisheries, the cumulative effect is rated as conditionally significant adverse. However, better definition and focus of the closures could lead to a conditionally significant beneficial rating

Table 4.8-28 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.1. Gulf of Alaska

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **Direct Mortality of Benthic Organisms**	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution:** Impacts of long line fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution:** Impacts of pot fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Kodiak, Sand Point, Chignik, Port Lions, Ouzinkie and Seward. Other sites possible for development.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential Adverse Contribution:** Could cause direct mortality through physical alteration (burial).	**Not a contributing factor:** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes, CS+/CS-** While reductions in bottom trawling and major reductions in target species catches are prescribed in the FMP, the baseline is considered to be impacted and additional impacts, both external and internal are not eliminated.However, better definition and focus of the closures could lead to a conditionally significant beneficial rating

Table 4.8-28 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.1. Gulf of Alaska

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Benthic Community Structure	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution:** Impacts of long line fisheries on the benthic community are expected to continue	**Potential Adverse Contribution:** Impacts of pot fisheries on the benthic community are expected to continue.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Kodiak, Sand Point, Chignik, Port Lions, Ouzinkie and Seward. Other sites possible for development.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause changes in the benthic community, especially in nearshore/port areas.	**Potential Adverse Contribution:** Could cause direct mortality through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution**: Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes, CS+/CS-** As described above for mortality, while reductions in bottom trawling and major reductions in target species catches are prescribed in the FMP, the baseline is considered to be impacted and additional impacts, both external and internal are not eliminated. However, better definition and focus of the closures could lead to a conditionally significant beneficial rating

Table 4.8-28 (cont.). Cumulative effects analysis of Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.1. Gulf of Alaska

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Geographic Diversity of Impacts and Protection	**I**	**Yes,** fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Not a contributing factor.**	**Potential Beneficial/ Averse Contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Beneficial/ Averse Contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by marine pollution.	**Not a contributing factor.**	**Not a contributing factor.**	**Yes, CS+/CS-** Since the baseline is considered to be adversely impacted and the impacts are not eliminated in either external or internal fisheries, the cumulative effect is rated as conditionally significant adverse. However, better definition and focus of the closures could lead to a conditionally significant beneficial rating

Notes: FMP - fishery management plan
I - Insignificant

Table 4.8-29. Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.2.

Bering Sea Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **a) Direct Mortality of Benthic Organisms**	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Port Moller, Port Heiden, Dillingham, St. Paul and St. George.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential Adverse Contribution:** could cause direct mortality through physical alteration (burial).	**Not a contributing factor:** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes, CS+/CS-** While beneficial effects of no fishing under the FMP accrue, the baseline is considered to be adversely impacted. Under this FMP fishing is not likely to be entirely eliminated and the combination of external and internal effects lead to the cumulative rating. However, definition and refinement of the areas eventually opened to fishing will occur and could lead to conditionally significant benefits

Table 4.8-29 (cont.). Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Benthic Community Structure	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Port Moller, Port Heiden, Dillingham, St. Paul and St. George.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause changes in the benthic community especially in nearshore/port areas.	**Potential Adverse Contribution:** If long term, could cause changes in the benthic community through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution**: Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes, CS+/CS-** while beneficial effects of no fishing under the FMP accrue, the baseline is considered to be adversely impacted. Under this FMP fishing is not likely to be entirely eliminated and the combination of external and internal effects lead to the cumulative rating. However, definition and refinement of the areas eventually opened to fishing will occur and could lead to conditionally significant benefits

Table 4.8-29 (cont.). Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events					Cumulative Effect?
			Human Controlled Events			Natural Events		
			Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes in Distribution of Fishing Effort **a) Geographic diversity of management measures**	**N/A**	**Yes**, fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, less sensitive areas could be impacted by marine pollution.	**Not a Contributing Factor**	**Not a Contributing Factor**	**No,** The predicted change to geographic diversity of impacts is not applicable in a scenario where no fishing occurs. Once fishing commences, impacts are expected to be similar as those described for the FMP 4.1 bookend.

Table 4.8-29 (cont.). Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.2.

Aleutian Islands Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **a) Direct Mortality of Benthic Organisms**	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. Prevalence of long lived species of coral makes impacts a particular concern in the Aleutians.	**Potential Adverse Contribution:** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution:** Impacts of long line fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution:** Impacts of pot fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Atkutan, Adak, Unalaska, Cold Bay Dutch Harbor and King Cove. Other sites possible for development.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/port areas.	**Potential Adverse Contribution:** Could cause direct mortality through physical alteration (burial).	**Not a contributing factor:** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes, CS+/CS-** As described for the Bering Sea benefits will accrue due to the cessation of fishing; however the baseline is considered to be adversely impacted and impacts are not eliminated under this FMP. However, definition and refinement of the areas eventually opened to fishing will occur and could lead to conditionally significant

Table 4.8-29 (cont.). Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
											benefits
Changes to Benthic Community Structure	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution:** Impacts of long line fisheries on benthic community structure are expected to continue.	**Potential Adverse Contribution:** Impacts of pot fisheries on benthic community structure are expected to continue.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Atkutan, Adak, Unalaska, Cold Bay Dutch Harbor and King Cove. Other suites possible for development	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause changes in the benthic community especially in nearshore/port areas.	**Potential Adverse Contribution:** Could cause direct mortality through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution**: Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes, CS+/CS-** benefits will accrue due to the cessation of fishing; however the baseline is considered to be adversely impacted and impacts are not eliminated under this FMP. However, definition and refinement of the areas eventually opened to fishing will occur and could lead to conditionally significant benefits

Table 4.8-29 (cont.). Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced Waves	Climate Changes and Regime Shifts	
Changes in Distribution of Fishing Effort **a) Geographic diversity of management measures**	**N/A**	**Yes,** fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Not a contributing factor.**	**Potential Beneficial/ Averse Contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Beneficial/ Averse Contribution**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contribution**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by marine pollution.	**Not a contributing factor.**	**Not a contributing factor.**	**No,** The predicted change to geographic diversity of impacts is not applicable in a scenario where no fishing occurs. Once fishing commences, impacts are expected to be similar as those described for the FMP 4.1 bookend.

Table 4.8-29 (cont.). Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.2.

Gulf of Alaska Habitat

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Living Habitat **a) Direct Mortality of Benthic Organisms**	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contributio n:** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contributio n:** Impacts of long line fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contributio n:** Impacts of pot fisheries on living habitat (coral) are expected to continue.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contributio n:** Likely to continue at Kodiak, Sand Point, Chignik, Port Lions, Ouzinkie and Seward. Other sites possible for development.	**Potential Adverse Contributio n:** Acute and/or chronic pollution events could cause direct mortality of benthic organisms, especially in nearshore/po rt areas.	**Potential Adverse Contributio n:** Could cause direct mortality through physical alteration (burial).	**Not a contributing factor:** Climate change and regime shifts are not expected to cause direct mortality of benthic organisms.	**Yes, CS+/CS-** While benefits will accrue due to the cessation of fishing; the baseline is considered to be adversely impacted and impacts are not eliminated under this FMP. However, definition and refinement of the areas eventually opened to fishing will occur and could lead to conditionally significant benefits.

Table 4.8-29 (cont.). Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes to Benthic Community Structure	**S+**	**Yes**, long-term, persistent adverse effects are expected in heavily fished areas. However, closed areas may be recovering.	**Potential Adverse Contribution:** Impacts of dredging are expected to continue in localized areas.	**Potential Adverse Contribution:** Impacts of long line fisheries on the benthic community are expected to continue	**Potential Adverse Contribution:** Impacts of pot fisheries on the benthic community are expected to continue.	**Potential Adverse Contribution:** From offshore catcher /processors and/or onshore processors.	**Potential Adverse Contribution:** Likely to continue at Kodiak, Sand Point, Chignik, Port Lions, Ouzinkie and Seward. Other sites possible for development.	**Potential Adverse Contribution:** Acute and/or chronic pollution events could cause changes in the benthic community, especially in nearshore/port areas.	**Potential Adverse Contribution:** Could cause direct mortality through physical alteration of the bottom, thereby changing the benthic community structure.	**Potential Beneficial/ Averse Contribution**: Regime shifts, and large-scale environmental fluctuations associated with *El Nino* and *La Nina* events have been identified as having impacts on both the physical and biological systems in the North Pacific	**Yes, CS+/CS-** Benefits will accrue due to the cessation of fishing; however the baseline is considered to be adversely impacted and impacts are not eliminated under this FMP. However, definition and refinement of the areas eventually opened to fishing will occur and could lead to conditionally significant benefits

Table 4.8-29 (cont.). Cumulative effects analysis for Bering Sea, Aleutian Islands and Gulf of Alaska habitat: FMP 4.2.

Direct/ Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Events								Cumulative Effect?
			Human Controlled Events						Natural Events		
			Dredging (fishery and/or navigation)	IPHC and other Longline Fisheries	State of Alaska and Other Pot fisheries	Offal Discharge	Port Expansion and Use	Marine Pollution	Storm surges and Wind-induced waves	Climate Changes and Regime Shifts	
Changes in Distribution of Fishing Effort **a) Geographic diversity of manageme nt measures**	**N/A**	**Yes,** fishing effort and distribution has changed over time as areas have been closed and remain closed.	**Not a contributing factor.**	**Potential Beneficial/ Averse Contributio n**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Beneficial/ Averse Contributio n**: Depending on changes in distribution of fishing effort, sensitive areas could either additionally impacted or allowed to recover.	**Potential Averse Contribution**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by offal discharge.	**Potential Beneficial/ Averse Contributio n**: New ports provide additional dock space for harboring the fleet. Fishing effort could be directed to more or less sensitive areas depending on the port locations.	**Potential Averse Contributio n**: Depending on the distribution of the fishing effort, sensitive areas could be impacted by marine pollution.	**Not a contributing factor.**	**Not a contributing factor.**	**No,** The predicted change to geographic diversity of impacts is not applicable in a scenario where no fishing occurs. Once fishing commences, impacts are expected to be similar as those described for the FMP 4.1 bookend.

Notes: FMP - fishery management plan
N/A - not applicable
S+ - Significantly beneficial

Table 4.8-30. Summary of the significance determinations for each of the effects on marine mammals under FMPs 4.1 and 4.2.

	Incidental take/entanglement in marine debris		Harvest of prey species		Spatial/temporal concentration		Disturbance	
FMP	**4.1**	**4.2**	**4.1**	**4.2**	**4.1**	**4.2**	**4.1**	**4.2**
Steller sea lions - Western Stock	I	I	S+	S+	S+	S+	I	I
Steller sea lions - Eastern Stock	I	I	S+	S+	S+	S+	I	I
Northern Fur Seal	I	I	CS+	CS+	CS+	CS+	I	I
Harbor Seals	I	I	S+	S+	S+	S+	I	I
Other Pinnipeds	I	I	I	I	I	I	I	I
Transient Killer Whales	I	I	I	I	I	I	I	I
Other Toothed Whales	I	I	I	I	I	I	I	I
Other Baleen Whales	I	I	I	I	I	I	I	I
Sea Otters	I	I	I	I	I	I	I	I

Table 4.8-31. Cumulative effects analysis for the western stock of Steller sea lions: FMP 4.1.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries State-Managed drift and set gillnet fisheries Commercial harvest of pups Subsistence harvest Intentional shootings Steep population declines from 1970's to 1990, less steep decline from 1990's to present	**Potential adverse contribution** Incidental take in State managed drift gill net fisheries	**Potential adverse contribution** Subsistence harvest throughout range of the western stock	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil spills	**Potential beneficial contribution** Endangered Species Act - listed as threatened in 1990 and endangered in 1993 Marine Mammal Protection Act (1972) - classified as depleted stock Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Significant adverse.** Mortality is considered a cumulative effect. Since the combined take for subsistence, other fisheries and in the groundfish fisheries is at or near the PBR, the continuing endangered status, long-term decline in abundance, cumulative effect is likely having population-level effects. Contribution of the groundfish fisheries is small.

Table 4.8-31 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 4.1.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Prey Availability	**S+**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries Past harvest by State-managed salmon and herring fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Significant Beneficial** Effects on prey availability is found to be cumulative. Significant beneficial internal effects of the groundfish fisheries and external effects. Based on reduction in harvest.
Spatial/temporal concentration of fisheries	**S+**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Significant Beneficial** Spatial and temporal effects of the fisheries identified for other fisheries therefore effect is cumulative. Significant beneficial base on increased closed areas and reduced fishing effort.

Table 4.8-31 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 4.1.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest Vessel traffic near rookeries and haulouts	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Since disturbance is identified for other fisheries, effect of disturbance are considered cumulative but insignificant at the population level.

Notes: FMP - fishery management plan
JV - joint venture
MPPRCA -Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.8-32. Cumulative effects analysis for the eastern stock of Steller sea lions: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries State-managed drift and set gillnet fisheries Commercial harvest of pups Subsistence harvest Predator control Intentional shootings Abundance of the eastern stock has increased over the last 20 years	**Potential adverse contribution** Incidental take in State managed drift gil net fisheries	**Potential adverse contribution** Subsistence harvest in Southeast Alaska Predator control at fish farms in British Columbia	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil spills	**Potential beneficial contribution** Endangered Species Act - listed as threatened in 1990. Restricts disturbance at rookeries and haulouts. Marine Mammal Protection Act (1972) - classified as strategic stock Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Since the combined take for subsistence, other fisheries and in the groundfish fisheries is below 10% of the PBR, cumulative effect of take is considered insignificant at the population level.

Table 4.8-32 (cont.). Cumulative effects analysis for the eastern stock of Steller sea lions: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Prey Availability	**S+**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries Past harvest by State-managed salmon and herring fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Significant Beneficial** Effect is cumulative based on internal effect of the groundfish fisheries on prey abundance and external effect of State-managed fisheries and possibly long-term climate change. Population level effects likely from substantial reduction in harvest and increase in prey availability relative to the baseline.
Spatial/temporal concentration of fisheries	**S+**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Significant Beneficial** Spatial and temporal effects of the fisheries are cumulative based on internal effect of the groundfish fishery and for other fisheries.. Population level effects likely from substantial reduction in fishing effort from the baseline.

Table 4.8-32 (cont.). Cumulative effects analysis for the eastern stock of Steller sea lions: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest and Intentional shootings	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest Vessel traffic near rookeries	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Disturbance is cumulative based on internal and external sources. Effect at the population level unlikely and therefore, are insignificant.

Notes: FMP - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.8-33. Cumulative effects analysis for northern fur seal: FMP 4.1 and 4.2.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries (high seas drift net) and Federal and and State-managed fisheries Commercial harvest on the Pribilof Islands Subsistence harvest Population declined substantially in 1970s to early 1980s, leading to "depleted" status under MMPA in 1988. Population was still declining in 2000.	**Potentially adverse contribution** Incidental take in State managed drift gill net fisheries. Incidental take in fisheries outside the EEZ	**Potentially adverse contribution** Subsistence harvest on the Pribilof Islands	**Potentially adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil spill	**Potentially beneficial contribution** Marine Mammal Protection Act (1972). UN Resolution 46/215 banning high seas driftnet fisheries. Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor.** Direct mortality would not be a primary effect of climate change	**Insignificant** Since the combined take for subsistence, other fisheries and in the groundfish fisheries is below the PBR, cumulative effect of take is considered insignificant at the population level.

Table 4.8-33 (cont.). Cumulative effects analysis for northern fur seal: FMP 4.1 and 4.2.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**CS+**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries	**Potentially adverse contribution** Little overlap in prey species with State-managed and foreign fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Beneficial** Effects on prey availability are cumulative based on internal effects and external from fisheries is identified for other fisheries and possibly long-term climate change. Cumulative effect are conditional on reduce pollock TAC under FMP 4.1 or closure of the fishery under FMP 4.2 providing more prey for fur seal.

Table 4.8-33 (cont.). Cumulative effects analysis for northern fur seal: FMP 4.1 and 4.2.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Spatial/temporal concentration of fisheries	**CS+**	Displacement of fisheries offshore increases interaction with fur seal.	**Potential adverse contribution** Foreign fisheries outside EEZ and State salmon gillnet fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Conditionally Significant Beneficial** Spatial and temporal effects are cumulative base on internal effect of the fisheries and potentially long-term climate change. Cumulative effect are conditional on whether separation of the fisheries and foraging fur seal or closure of the fisheries provide addition prey.
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest	**Potentially adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potentially adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant**. Since disturbance is identified for other fisheries, effect of disturbance are considered cumulative but insignificant at the population level.

Notes: EEZ - exclusive economic zone
FMP - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal
TAC - total allowable catch
UN - United Nations

Table 4.8-34. Cumulative effects analysis for harbor seal: FMP 4.1 and 4.2.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and Federal and State-managed fisheries State predator control programs Commercial harvest Subsistence harvest Increasing trend in Bristol Bay but decreasing around Pribilofs. Major declines in GOA from 1976 to1992 followed by steady increases. Generally increase in Southeast.	**Potential adverse contribution** Incidental take in State managed drift gillnet fisheries	**Potential adverse contribution** Subsistence harvest throughout region	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil	**Potential beneficial contribution** Marine Mammal Protection Act (1972). Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Insignificant** Mortality is cumulative with internal effects of fisheries and external effect of take from subsistence and other fisheries. Total is below the PBR, and is considered insignificant.

Table 4.8-34 (cont.). Cumulative effects analysis for harbor seal: FMP 4.1 and 4.2.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Prey Availability	**S+**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal domestic fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Significant Beneficial** Effects cumulative base on internal effect of fisheries and external effects of other fisheries. Significant rating based on substantial reduction in harvest of harbor seal prey from groundfish fisheries or closure of the fisheries under FMP 4.2. Population-level effects are likely..
Spatial/temporal concentration of fisheries	**S+**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potentially adverse contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Significant Beneficial** Spatial and temporal effects are cumulative based on internal and external effect of fisheries. Significant rating based on substantial reduction in harvest of harbor seal prey from groundfish fisheries or closure of fisheries under FMP 4.2. Population-level effects are likely .

Table 4.8-34 (cont.). Cumulative effects analysis for harbor seal: FMP 4.1 and 4.2.

Direct/Indirect Effects of Alternative(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Disturbance is cumulative based of internal and external sources. but insignificant at the population level.

Notes: FMP - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.8-35. Cumulative effects analysis for the western stock of Steller sea lions: FMP 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Mortality (incidental take and entanglement)	**I**	Incidental take in JV and foreign fisheries and federal fisheries State-managed drift and set gillnet fisheries Commercial harvest of pups Subsistence harvest Intentional shootings Steep population declines from 1970s to 1990, less steep decline from 1990s	**Potential adverse contribution** Incidental take in State- managed drift gill net fisheries	**Potential adverse contribution** Subsistence harvest throughout range of the western stock	**Potential adverse contribution** Loss of fishing gear and other material from all fishing and shipping vessels plus shoreside sources. Acute and/or chronic pollution events, especially involving oil spils	**Potential beneficial contribution** Endangered Species Act - listed as threatened in 1990 and endangered in 1993 Marine Mammal Protection Act (1972) - classified as depleted stock · Marine Plastic Pollution Research and Control Act (MPPRCA) (1987)	**Not a contributing factor** Direct mortality would not be a primary effect of climate change/regime shift.	**Significant adverse** Mortality is considered a cumulative effect. Since the combined take for subsistence, other fisheries and in the groundfish fisheries is at or near the PBR, the continuing endangered status, long-term decline in abundance, cumulative effect is likely having population-level effects. Contribution of the groundfish fisheries is small.

Table 4.8-35 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Prey Availability	**S+**	Past commercial groundfish fisheries harvest of prey by JV fisheries, foreign and federal fisheries Past harvest by State-managed salmon and herring fisheries	**Potential adverse contribution** Overlap in prey species and fish targeted in State managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Potential adverse or beneficial contribution** Climate and oceanic fluctuations impact abundance and distribution of prey	**Significant Beneficial** Effects prey availability is found to be cumulative. Significant beneficial internal effects of the groundfish fisheries and external effects. Closure of fisheries is the primary factor.
Spatial/temporal concentration of fisheries	**S+**	Harvest of prey species by foreign and domestic groundfish fisheries and State-managed salmon and herring fisheries	**Potential adverse contribution** Harvest of prey species by State-managed salmon and herring fisheries	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Significant Beneficial** Spatial and temporal effects of the fisheries identified for other fisheries. Cumulative effect rating based on closure of fisiheries and no adverse effect of new certified fisheries.

Table 4.8-35 (cont.). Cumulative effects analysis for the western stock of Steller sea lions: FMP 4.2.

Direct/Indirect Effects of FMP	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects					Cumulative Effect
			Human Controlled Events				Natural Events	
			Other U.S., State, and Foreign Fisheries	Subsistence harvest	Marine Pollution and Vessel Hazzards	Conservation Efforts	Long-term Climate Change and Regime Shift	
Disturbance	**I**	Disturbance from past commercial groundfish fisheries harvest by JV fisheries, foreign and federal domestic fisheries Subsistence harvest Vessel traffic near rookeries and haulouts	**Potential adverse contribution** Disturbance from fishing vessels in State fisheries and general vessel traffic	**Potential adverse contribution** Disturbance from subsistence harvest.	**Not a contributing factor**	**Not a contributing factor**	**Not a contributing factor**	**Insignificant** Since disturbance is identified for other fisheries, effect of disturbance are considered cumulative but insignificant at the population level.

Notes: FMP - fishery management plan
JV - joint venture
MPPRCA - Marine Plastic Pollution Research and Control Act
PBR - potential biological removal

Table 4.8-36. Summary of FMP bookend 4.1 on harvesting and processing sectors.

Sector	Volume (Thousands of Metric Tons)				Output Value ($ Millions)				Groundfish Output Value ($ Millions)	Groundfish Payments to Labor ($ Millions)	Groundfish Employment (FTE Positions)
	Pollock	Pacific Cod	Flatfish	A-R-S-O	Pollock	Pacific Cod	Flatfish	A-R-S-O			
Outcome Under FMP											
All Catcher Processors	191.0	28.4	155.0	27.0	114.9	33.8	73.8	21.4	243.9	84.3	1,342.6
All Inshore Processors and Motherships	233.4	64.1	10.9	11.9	148.6	77.1	3.8	35.0	264.6	103.3	1,795.3
All Catcher Vessels	233.0	63.0	7.3	7.9	56.1	34.4	2.3	25.8	118.7	47.5	1,229.8
All Sectors	424.4	92.4	165.9	38.8	263.6	110.9	77.6	56.4	508.5	235.1	4,367.7
Change from Comparative Baseline											
All Catcher Processors	-450.9	-123.7	4.3	-94.0	-279.6	-149.6	-6.2	-64.7	-500.0	-181.6	-2,534.1
All Inshore Processors and Motherships	-583.9	-2.3	-10.4	-15.3	-375.3	-3.8	-3.8	-35.5	-418.4	-163.6	-2,695.3
All Catcher Vessels	-581.7	-1.5	-4.5	-12.9	-139.9	-1.2	-1.3	-27.5	-169.8	-67.9	-785.9
All Sectors	-1,034.8	-125.9	-6.1	-109.3	-654.9	-153.4	-9.9	-100.1	-918.4	-413.1	-6,015.3
Percentage Change from Comparative Baseline											
All Catcher Processors	-70.2	-81.3	2.9	-77.7	-70.9	-81.6	-7.7	-75.2	-67.2	-68.3	-65.4
All Inshore Processors and Motherships	-71.4	-3.4	-48.9	-56.3	-71.6	-4.7	-49.5	-50.3	-61.3	-61.3	-60.0
All Catcher Vessels	-71.4	-2.3	-37.9	-62.2	-71.4	-3.3	-35.0	-51.6	-58.9	-58.9	-39.0
All Sectors	-70.9	-57.7	-3.5	-73.8	-71.3	-58.0	-11.3	-64.0	-64.4	-63.7	-57.9

Notes: The volume and values for “All Sectors” equal the sums of the volume and value for catcher processors and inshore processors and motherships. Adding the volume and value for catcher vessels would result in double counting. However, the payments to labor and employment for “All Sectors” equals the sum over all three sectors.
A-R-S-O - Atka mackerel, rockfish, sablefish, and other groundfish
FTE - full-time equivalent

Table 4.8-37. Cumulative effects analysis for catcher vessels: FMP 4.1.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S-	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see Section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S-** the limitation on the number of vessels permitted to fish will result in adverse cumulative effects on groundfish landings. Current reductions in other fisheries contribute to this effect.

Table 4.8-37 (cont.). Cumulative effects analysis for catcher vessels: FMP 4.1.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Ex-Vessel Value	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Not a contributing factor** - though marginal increases are expected these changes in value would not be significant.	**Not a contributing factor** - not expected to affect ex-vessel value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Not a contributing factor** - changes in climate are note expected to affect ex-vessel value directly	**S-** ex-vessel value is expected be reduced due to the limited number of vessels permitted to fish under this FMP. Potential increases in fish taxes in communities may contribute to this effect.

Table 4.8-37 (cont.). Cumulative effects analysis for catcher vessels: FMP 4.1.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S-	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see Section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management and market conditions. Current reductions in salmon and crab have put additional pressure on other fisheries.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish employment.	**Potential beneficial/adverse contribution** - an increase or decrease in other sources of revenue may result in greater or lesser competition for groundfish employment.	**Not a contributing factor** - not expected to affect employment	**S-** the great reduction in the number of vessels permitted to fish will result in significant adverse cumulative effects on employment opportunities. Reductions in salmon and crab contribute to this effect.

Table 4.8-37 (cont.). Cumulative effects analysis for catcher vessels: FMP 4.1.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries may set precedence for groundfish payments. Recent reductions in other fisheries such as salmon and crab may also influence payments.	**Not a contributing factor** - not expected to affect payments to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**S-** such a great reduction in the number of vessel fishing is expected to result in cumulative adverse effects on payments to labor.

Table 4.8-37 (cont.). Cumulative effects analysis for catcher vessels: FMP 4.1.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S-	Yes, history of excess capacity (refer to Section 3.9)	**Potential beneficial/adverse contribution** - an increase or decrease in the number of vessels in other fisheries may result in subsequent increases or decreases in the number of vessels participating in the groundfish fishery, particularly pot CVs and FGCVs in state waters.	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S-** due to the great reduction in fishing effort, fishing capacity will be reduced so severely that fishing would not be profitable.

Table 4.8-37 (cont.). Cumulative effects analysis for catcher vessels: FMP 4.1.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	S-	Yes, historical race for fish increased costs (see Section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor** - the effects of other economic development opportunities on average costs are minimal	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - the effects of climate change on average costs are minimal	**S-** the increased number of closed areas is expected to cause vessels to travel greater distances thereby increasing their average costs
Fishing Vessel Safety	S-	Yes, historical race for fish (see Section 3.9)	**Not a contributing factor** - the effects of other fisheries on fishing vessel safety are minimal	**Not a contributing factor** - the effects of other economic development opportunities on fishing vessel safety are minimal	**Not a contributing factor** - the effects of other revenue sources on fishing vessel safety are minimal	**Not a contributing factor** - the effects of climate change on fishing vessel safety are minimal	**S-** the large number of closure areas is expected to cause vessels to fish farther from shore thereby increasing safety risks. Fishing remains a concern in all fisheries.

Table 4.8-37 (cont.). Cumulative effects analysis for catcher vessels: FMP 4.1.

Notes: CV - catcher vessels
FGCV - fixed gear catcher vessel
FMP - fishery management plan
S- - significantly adverse

Table 4.8-38. Cumulative effects analysis for catcher vessels: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S-	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see Section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S-** the fishery would be closed for at least two years under this FMP. Reductions in salmon and crab will further exacerbate this effect.

Table 4.8-38(cont.). Cumulative effects analysis for catcher vessels: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Ex-Vessel Value	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish market value, these effects are minimal	**Not a contributing factor** - not expected to affect ex-vessel value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Not a contributing factor** - changes in climate are note expected to affect ex-vessel value directly	**S-** the fishery would be closed for at least two years under this FMP. Recent reductions in the salmon and, to some extent, the crab fisheries, contribute to these adverse effects.

Table 4.8-38(cont.). Cumulative effects analysis for catcher vessels: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S-	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see Section 3.9)	**Potential adverse or beneficial contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential adverse or beneficial contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential adverse or beneficial contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**S-** the fishery would be closed for at least two years under this FMP. Recent reductions in the salmon and, to some extent, the crab fisheries, contribute to these adverse effects.
Payments to Labor	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries may set precedence for groundfish payments. Reductions in other fisheries may exacerbate this effect.	**Not a contributing factor** - not expected to affect payment to labor	**Not a contributing factor** - not expected to affect payments to labor	**Not a contributing factor** - not expected to affect payments to labor	**S-** the fishery would be closed for at least two years under this FMP. Recent reductions in the salmon and, to some extent, the crab fisheries, contribute to these adverse effects.

Table 4.8-38(cont.). Cumulative effects analysis for catcher vessels: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S-	Yes, history of excess capacity (see Section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S-** the fishery would be closed for at least two years under this FMP.

Table 4.8-38(cont.). Cumulative effects analysis for catcher vessels: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	S-	Yes, historical race for fish increased costs (see Section 3.9	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**S-** the fishery would be closed for at least two years under this FMP
Fishing Vessel Safety	S+	Yes, history of race for fish (see Section 3.9)	**Potential adverse contribution** - closures in other fisheries can have an effect on vessel safety.	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**S+** fishing vessel safety would improve significantly due to the fishery being closed for at least two years. Safety is a serious concern in all fisheries.

Notes: FMP - fishery management plan
S- - significantly adverse
S+ - significantly beneficial

Table 4.8-39. Cumulative effects analysis for catcher processors: FMP 4.1.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S-/I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see Section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** - effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S-** the reduction in TAC significantly adversely affects groundfish landings. Reductions in other fisheries (e.g. salmon and crab) also contribute to this effect, particularly for catcher processors who rely on a mix of fisheries.

Table 4.8-39 (cont.). Cumulative effects analysis for catcher processors: FMP 4.1.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/adverse contribution** - substitute fish species may compete with groundfish species thereby increasing or decreasing their value.	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Not a contributing factor** - not expected to affect gross product value	**S-** gross product value are expected to decrease significantly due to the reduction in TAC. This, combined with potential increases in community pressure to increase fish taxes as a means of revenue building, could exacerbate this effect.

Table 4.8-39 (cont.). Cumulative effects analysis for catcher processors: FMP 4.1.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S-	Yes, increased global demand for seafood especially whitefish. Develop-ment of surimi in 1985 increased demand (see Section 3.9)	**Potential adverse or beneficial contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries, such as salmon or crab, may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential adverse or beneficial contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential adverse or beneficial contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**S-** cumulative effects are significant adverse due to the reduction in fishing effort as a result of FMP 4.1 and reductions in other fisheries such as salmon.

Table 4.8-39 (cont.). Cumulative effects analysis for catcher processors: FMP 4.1.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/ adverse contribution** - payments to labor in other fisheries may influence payments in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**S-** cumulative effects are significant adverse due to the reduction in fishing effort as a result of FMP 4.1 and reductions in other fisheries, such as salmon.

Table 4.8-39 (cont.). Cumulative effects analysis for catcher processors: FMP 4.1.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Product Quality and Product Utilization	CS-/CS+	Yes, history of the race for fish negatively affected product quality.	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization .	**Not a contributing factor** - not expected to affect product quality or utilization.	**CS-/CS+** additional closures may prohibit vessels from using historic fishing grounds that may produce high quality fish, or cause vessels to trave farther to harvest fish. This, combined with closures and reductions in other fisheries, results in significant adverse cumulative effects. Improved retention and utilization regulations to all target fisheries is expected to result in an increase in product utilization.

Table 4.8-39 (cont.). Cumulative effects analysis for catcher processors: FMP 4.1.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S-	Yes, history of excess capacity (see Section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	Potential beneficial/adverse contribution - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	Potential beneficial/adverse contribution - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S-** FMP 4.1 is expected to result in increased excess capacity. Due to the dramatic reduction in the number of vessels permitted to fish, many vessels may become useless.

Table 4.8-39 (cont.). Cumulative effects analysis for catcher processors: FMP 4.1.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	S-	Yes, historical race for fish increased costs (see Section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**S-** lower harvests and a smaller amount of product allocated would result in higher costs per unit of catch. Potential increases in fish taxes by communities could also result in increased costs.

Table 4.8-39 (cont.). Cumulative effects analysis for catcher processors: FMP 4.1.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Fishing Vessel Safety	S-	Yes, historical race for fish (see Section 3.9)	**Potential adverse contribution** - closures in other fisheries could increase safety risks.	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**S-** increased closures may cause vessels to fish farther from shore increasing safety risks. Safety is a concern for all fisheries.

Notes: CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
FMP - fishery management plan
I - insignificant
S- - significantly adverse
TAC - total allowable catch

Table 4.8-40. Cumulative effects analysis for catcher processors: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S-	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see Section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S-** no fishing until approved.

Table 4.8-40 (cont.). Cumulative effects analysis for catcher processors: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/adverse contribution** - substitute fish species may compete with groundfish species thereby increasing or decreasing their value.	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Not a contributing factor** - not expected to affect gross product value	**S-** no fishing until approved. Reductions in other fisheries contribute to this effect.

Table 4.8-40 (cont.). Cumulative effects analysis for catcher processors: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S-	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see Section 3.9)	**Potential adverse or beneficial contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential adverse or beneficial contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential adverse or beneficial contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**S-** no fishing until approved. Reductions in other fisheries contribute to this effect.
Payments to Labor	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/ adverse contribution** - recent harvest reductions and payments to labor in other fisheries may influence payments in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Not a contributing factor** - not expected to affect payments to labor	**Not a contributing factor** - not expected to affect payments to labor	**S-** no fishing until approved. Reductions in other fisheries contributes to this effect.

Table 4.8-40 (cont.). Cumulative effects analysis for catcher processors: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Product Quality and Product Utilization	S-	Yes, history of the race for fish negatively affected product quality.	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**S-** no fishing until approved.
Excess Capacity	S-	Yes, history of excess capacity (see Section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S-** no fishing until approved

Table 4.8-40 (cont.). Cumulative effects analysis for catcher processors: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	S-	Yes, historical race for fish increased costs (see Section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**S-** no fishing until approved
Fishing Vessel Safety	S+	Yes, historical race for fish (see Section 3.9)	**Potential adverse contribution** - closures in other fisheries may increase safety risks.	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**S+** no fishing until approved. Fishing vessel safety would improve significantly in the short term however, safety would remain a concern in other fisheries.

Notes: FMP - fishery management plan
S- - significantly adverse
S+ - significantly beneficial

Table 4.8-41. Cumulative effects analysis for inshore processors and motherships: FMP 4.1.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S-	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see Section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S-** the reduction in TAC and reductions in other fisheries will likely result in significant adverse cumulative effects.

Table 4.8-41. (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 4.1.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value .	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/adverse contribution** - substitute fish species may compete with groundfish species thereby increasing or decreasing their value. Recent declines in salmon prices may also have an effect.	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Not a contributing factor** - not expected to affect gross product value	**S-** reductions in TAC combined with recent declines in some fish prices (e.g. salmon) and potential increases in municipal taxes will likely result in significant adverse cumulative effects

Table 4.8-41. (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 4.1.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S-	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see Section 3.9)	**Potential adverse or beneficial contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential adverse or beneficial contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential adverse or beneficial contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**S-** cumulative effects are significant adverse due to the reduction in fishing effort as a result of FMP 4.1.

Table 4.8-41. (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 4.1.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/ adverse contribution** - payments to labor in other fisheries may influence payments in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**S**- cumulative effects are significant adverse due to the reduction in fishing effort as a result of FMP 4.1.

Table 4.8-41. (cont.). **Cumulative effects analysis for inshore processors and motherships: FMP 4.1.**

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Product Quality and Product Utilization	S-/CS+	Yes, history of the race for fish negatively affected product quality.	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**S-/CS+** additional closures may prohibit vessels from using historic fishing grounds that produce high quality fish or result in increased transit time between harvesting and processing thereby degrading product quality. Improved retention and utilization regulations to all target fisheries is expected to result in an increase in product utilization. A reduction in fishing effort may increase the rate of utilization due to less fish being processed.

Table 4.8-41. (cont.). **Cumulative effects analysis for inshore processors and motherships: FMP 4.1.**

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S-/I	Yes, history of excess capacity (see Section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S-** FMP 4.1 is expected to result in increased excess capacity, except for processors that are only marginally dependent on groundfish catch.

Table 4.8-41. (cont.). **Cumulative effects analysis for inshore processors and motherships: FMP 4.1.**

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	S-	Yes, historical race for fish increased costs (see Section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**S-** lower harvests and a smaller amount of product allocated would result in higher costs per unit of catch. Increased pressure by communities due to recent reductions in government subsidies may exacerbate this effect due to potential increases in fish taxes.

Notes: CS+ - conditionally significant beneficial
FMP - fishery management plan
I - insignificant
S- - significantly adverse
TAC - total allowable catch

Table 4.8-42. Cumulative effects for inshore processors and motherships: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	S-	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see Section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**S-** no fishing until approved.

Table 4.8-42 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/adverse contribution** - substitute fish species may compete with groundfish species thereby increasing or decreasing their value.	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Not a contributing factor** - not expected to affect gross product value	**S-** no fishing until approved.

Table 4.8-42 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	S-	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see Section 3.9)	**Potential adverse or beneficial contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential adverse or beneficial contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential adverse or beneficial contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**S-** no fishing until approved.
Payments to Labor	S-	Yes, collapse of Atlantic cod increased demand thereby increasing value (see Section 3.9)	**Potential beneficial/ adverse contribution** - payments to labor in other fisheries may influence payments in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Not a contributing factor** - not expected to affect payments to labor	**Not a contributing factor** - not expected to affect payments to labor	**S-** no fishing until approved.

Table 4.8-42 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Product Quality and Product Utilization	S-	Yes, history of the race for fish negatively affected product quality.	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**S-** no fishing until approved.
Excess Capacity	S-	Yes, history of excess capacity (see Section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S-** no fishing until approved

Table 4.8-42 (cont.). Cumulative effects analysis for inshore processors and motherships: FMP 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	S-	Yes, historical race for fish increased costs (see Section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**S-** no fishing until approved

Notes: FMP - fishery management plan
S- - significantly adverse

Table 4.8-43. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 4.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Processing/ municipal revenue	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA, municipal reliance on revenue from fish tax	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - direct/indirect effects are adverse for all four Alaska regions and insignificant for Washington Inland Waters and Oregon Coast. Trends in multi-species fisheries and other sources of municipal and state revenue result in adverse effects on in-region processing and municipal revenue. Cumulative effects are conditionally significant adverse for all four Alaska regions, and insignificant for Washington Inland Waters and Oregon Coast.
Regionally Owned At-sea Processors	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - Direct/indirect effects are insignificant or significant adverse. Within Southcentral Alaska and Washington Inland Waters, fisheries are a small part of the regional economies and effects are dwarfed by other trends. Cumulative effects for these regions are insignificant. Adverse trends in other fisheries and reductions on municipal revenue result in conditionally significant adverse cumulative effects for the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska regions.

Table 4.8-43 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 4.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	**S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - Direct/indirect effects are insignificant or significant adverse. Within Southcentral Alaska, Washington Inland Waters, and Oregon Coast Regions, fisheries are a small part of the regional economies and effects are dwarfed by other trends. Cumulative effects for these regions are insignificant. Adverse trends in other fisheries and reductions on municipal revenue result in conditionally significant adverse cumulative effects for the Alaska Peninsula/Aleutian Islands, Kodiak Island regions.
In-Region Deliveries of Regionally Owned Catcher Vessels	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - Direct/indirect effects are significant adverse for five of the six regions. Within Southcentral Alaska, Washington Inland Waters, and Oregon Coast Regions, fisheries are a small part of the regional economies and effects are dwarfed by other trends. Cumulative effects for these regions are insignificant. Adverse trends in other fisheries and reductions on municipal revenue result in conditionally significant adverse cumulative effects for the Alaska Peninsula/Aleutian Islands, Kodiak Island regions.

Table 4.8-43 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 4.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Total Direct, Indirect, and Induced Labor Income and FTEs	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Potential Adverse/ Beneficial Contribution**- Trends in other economic development activities, particularly state and municipal capital projects	**Potential Adverse Contribution -** decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - Direct/indirect effects on labor income and employment are significant adverse for all regions. Within Southcentral Alaska, Washington Inland Waters, and Oregon Coast Regions, fisheries are a small part of the regional economies and effects are dwarfed by other trends. Cumulative effects for these regions are insignificant. Adverse trends in other fisheries and reductions on municipal revenue result in conditionally significant adverse cumulative effects for the Alaska Peninsula/Aleutian Islands, Kodiak Island regions.

Notes: AFA - American Fisheries Act
FMP - fishery management plan
FTE - full-time equivalent
TAC - total allowable catch

Table 4.8-44. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Processing/ municipal revenue	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA, municipal reliance on revenue from fish tax	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Yes, Insignificant to Conditionally Significant Adverse** - direct/indirect effects are significant adverse in five of six regions. Adverse trends in multi-species fisheries and other sources of municipal and state revenue result in significant adverse cumulative effects for the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska Regions. Because of the diversity of regional economies for Southcentral Alaska, Washington Inland Waters, and Oregon Coast regions the cumulative effects would be insignificant.
Regionally Owned At-sea Processors	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Yes, Insignificant to Conditionally Significant Adverse**- direct/indirect effects are significant adverse in five of the six regions. Adverse trends in multi-species fisheries and other sources of municipal and state revenue result in significant adverse cumulative effects for the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska Regions. Because of the diversity of regional economies for Southcentral Alaska, Washington Inland Waters, and Oregon Coast regions the cumulative effects would be insignificant.

Table 4.8-44 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	**S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Yes, Insignificant to Conditionally Significant Adverse**- direct/indirect effects are significant adverse in all six regions. Adverse trends in multi-species fisheries and other sources of municipal and state revenue result in significant adverse cumulative effects for the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska Regions. Because of the diversity of regional economies for Southcentral Alaska, Washington Inland Waters, and Oregon Coast regions the cumulative effects would be insignificant.
In-Region Deliveries of Regionally Owned Catcher Vessels	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Yes, Insignificant to Conditionally Significant Adverse**- direct/indirect effects are significant adverse in five of the six regions. Adverse trends in multi-species fisheries and other sources of municipal and state revenue result in significant adverse cumulative effects for the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska Regions. Because of the diversity of regional economies for Southcentral Alaska, Washington Inland Waters, and Oregon Coast regions the cumulative effects would be insignificant.

Table 4.8-44 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: FMP 4.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Total Direct, Indirect, and Induced Labor Income and FTEs	**S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Potential Adverse/ Beneficial Contribution**- Trends in other economic development activities, particularly state and municipal capital projects	**Potential Adverse Contribution -** decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Yes, Insignificant to Conditionally Significant Adverse**- direct/indirect effects are significant adverse in all six regions. Adverse trends in multi-species fisheries and other sources of municipal and state revenue result in significant adverse cumulative effects for the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska Regions. Because of the diversity of regional economies for Southcentral Alaska, Washington Inland Waters, and Oregon Coast regions the cumulative effects would be insignificant.

Notes: AFA - American Fisheries Act
FMP - fishery management plan
FTE - full-time equivalent
TAC - total allowable catch

Table 4.8-45. Cumulative effects analysis for community development quota programs: FMPs 4.1 and 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Allocations	S-	Yes - The trend of increases in species and percent for which shares have been allocated to CDQs has increased their involvement in multi-species fisheries.	**Potential adverse or beneficial contribution -** many CDQs participate in multiple fisheries, including salmon, crab, federal groundfish, and halibut. The relative reliance of harvesters and processors on these fisheries varies on a regional basis and on the status of the individual stocks	**Potential adverse or beneficial contribution -** village infrastructure projects create employment and income opportunities for CDQ communities	**Potential adverse or beneficial contribution** - less revenue sharing from state and federal government, public funding of infrastructure, changes in fiscal policies are likely to affect CDQ communities	**Not a contributing factor** - fluctuations in groundfish stocks drive fishery opening and closures	**Significant adverse** - impacts to the CDQ region would be negative and significant due to declines in CDQ royalties, employment and income

Notes: CDQ - community development quota
FMP - fishery management plan
S- - significantly adverse

Table 4.8-46. Cumulative effects analysis for subsistence: FMPs 4.1 and 4.2.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Subsistence use of groundfish	I/I	Yes - foreign JV, domestic, and State managed fisheries have decreased populations of some species	**Potential adverse contribution**- state managed groundfish fishery activity could impact subsistence groundfish fishing	**Not a contributing factor** - infrastructure development unlikely to affect groundfish stocks	**Not a contributing factor -**sport and personal use unlikely to adversely affect groundfish stocks	**Potential adverse or beneficial contribution -** fluctuations in groundfish stocks affect availability for subsistence	**FMP 4.1 and 4.2 Insignificant** - adverse cumulative effects are not enough to have significant impacts on subsistence

Table 4.8-46 (cont.). Cumulative effects analysis for subsistence: FMPs 4.1 and 4.2.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Subsistence use of salmon	I/CS+	Yes - reduced runs in western Alaska based on past natural events, domestic and foreign commercial fisheries and subsistence harvests	**Potential adverse contribution** - salmon intercept potentially has contributed to poor returns in western Alaska	**Potential adverse contribution** - infrastructure development could effect salmon spawning and rearing habitat	**Not a contributing factor** - sport and personal use is not expected to adversely affect the salmon population	**Potential adverse contribution** - long-term climate change could potentially effect at-sea salmon survival and reduce salmon runs	**FMP 4.1 Insignificant** - Reduction in salmon bycatch is offset by external effects that adversely affect subsistence use of salmon; overall cumulative effects on subsistence use of salmon are insignificant **FMP 4.2 Conditionally Significant Beneficial** - given the poor stock status of salmon runs in western Alaska*, decreasing bycatch in BSAI and GOA could help to restore stock and improve recovery. Bycatch of Chinook salmon originating in the Pacific Northwest could occur in Alaska but could be reduced or eliminated under this FMP.

Table 4.8-46 (cont.). Cumulative effects analysis for subsistence: FMPs 4.1 and 4.2.

Direct/Indirect Effects	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Subsistence use of Steller sea lions	CS+/CS+	Yes - long term decline in population from a combination of effect of commercial fisheries and natural factors	**Potential adverse contribution -** other commercial fisheries have contributed to competition for Steller sea lion prey	**Potential adverse contribution -** marine port and harbor development could potentially impact habitat and increase disturbance	**Not a contributing factor** - sport hunting of Steller sea lions is not permitted	**Potential adverse contribution** - long-term climate change could potentially effect recovery Steller populations	**FMP 4.1 and 4.2 Conditionally Significant Beneficial** - reduction and closure of fisheries could have a beneficial impact on Steller population levels
Indirect subsistence impacts: income and joint production	S-/S-	Yes - commercial fishing provides platform for joint production and income to support subsistence	**Potential adverse or beneficial contribution -** income and joint production from other fisheries could affect indirect subsistence impacts	**Potential adverse or beneficial contribution -** income from other economic development activities could affect indirect subsistence impacts	**Not a contributing factor** - impacts to subsistence through sport and personal use is minimal	**Potential adverse or beneficial contribution -** affects on groundfish stocks and opportunity for joint production and income	**FMP 4.1 Significant adverse** - income, catcher vessel activity, and joint production opportunities are adversely affected by reduced fishing activities **FMP 4.2 Significant adverse** - income, catcher vessel activity, and joint production opportunities eliminated

Notes: BSAI - Bering Sea and Aleutian Islands
CS+ - conditionally significant beneficial
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
JV - joint venture
S- - significantly adverse

Table 4.8-47. Cumulative effects analysis for environmental justice: FMPs 4.1 and 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime	
Environmental Justice	S-/S-	Yes - Fisheries Resource Landing tax increased revenues to communities, MSA amendments and CDQ program established, commercial fishing source of employment and income in Native Alaskan communities.	**Potential adverse or beneficial contribution**- changes in other fisheries could impact Environmental Justice issues	**Potential adverse or beneficial contribution**- infrastructure development trends, effects of other economic activities	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential adverse or beneficial contribution-** fluctuations in fish stocks affect availability for Alaska Native subsistence use	**FMP 4.1 Significant Adverse** - -*Direct/indirect effects* include adverse effects on special population income and employment activities, CDQ region income/employment/ development funds, and income and joint production for subsistence pursuits -*External effects* include trends of salmon and crab downturns and reductions in municipal revenue in the Alaska Peninsula/Aleutian Islands, Kodiak Island, Washington Inland Waters, and CDQ regions. -*Cumulative effects* on subsistence harvest of salmon and Steller sea lion are beneficial but insignificant. **FMP 4.2 Significant Adverse** - -*Direct/indirect effects* include significant adverse effects on special population income and employment activities, CDQ region income/employment/ development funds, and income and joint production for subsistence pursuits -*External effects* and trends of salmon and crab, downturns and reductions in municipal revenue in the Alaska Peninsula/Aleutian Islands, Kodiak Island, Washington Inland Waters, and CDQ regions. -*Cumulative effects* on subsistence harvest of salmon and Steller sea lion are beneficial but insignificant.

Notes: CDQ - community development quota
FMP - fishery management plan
MSA - Magnuson-Stevens Fishery conservation Management Act
S- - significantly adverse
S+ - significantly beneficial

Table 4.8-48. Cumulative effects analysis for market channels and benefits to U.S. consumers: FMPs 4.1 and 4.2 .

Direct/Indirect Effects	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects		Cumulative Effect
			Human Controlled	Natural Events	
			Other Fisheries	Long-term Climate Changes and Regime Shift	
Benefits to U.S. consumers	I/CS-	Alaska Seafood Marketing Institute product promotion activities Research and Public awareness of health benefits of seafood consumption Aquaculture development increased overall demand for seafood products Changes in processing technology increased seafood quality	**Potential adverse/beneficial contribution** - other fisheries are providing relatively stable levels of seafood products to domestic and foreign markets; supply of fish products that may be influenced by competition in markets, over fishing foreign fisheries, and increased domestic consumption	**Potential adverse/beneficial contribution** - fluctuations in groundfish stocks may potentially affect availability for market channels	**4.1 - Insignificant** - wholesale groundfish product value in conjunction with products from other fisheries is not expected to change benefits to U.S. consumers **4.2 - Conditionally Significant Adverse** - suspension of production of groundfish products in fisheries occurring in the EEZ off Alaska could decrease product quality, supply, and production of pollock and Pacific cod fillets, offset the seafood trade balance as more groundfish products are imported, increase prices for groundfish products, and have an adverse effect on seafood consumers

Notes: CS- - conditionally significant adverse
EEZ - Exclusive Economic Zone
FMP - fishery management plan
I - insignificant

Table 4.8-49. Cumulative effects analysis for the value of the Bering Sea and Gulf of Alaska marine ecosystems (including non-consumptive and non-use benefits): FMPs 4.1 and 4.2.

Direct/ Indirect Effects	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects		Cumulative Effect
			Human Controlled	Natural Events	
			Other Fisheries	Long-term Climate Changes and Regime Shift	
Benefits derived from marine ecosystems and associated species (Including non-consumptive and non-use benefits)	CS+/S+	Increased public awareness of marine ecosystems (e.g., BSAI and GOA marine ecosystems) and associated endangered species (e.g., Steller sea lions) Increased participation in recreational fishing and eco-tourism activities Lawsuit brought by environmental groups challenging NOAA Fisheries for failing to meet the requirements of the Endangered Species Act in its management of Alaska groundfish fisheries	**Potential adverse contribution** - fishing levels in other domestic and foreign fisheries may be affecting the productivity of the marine ecosystem	**Potential adverse beneficial contribution** - fluctuations in groundfish stocks may potentially affect ecosystems and associated species	**FMP 4.1 Conditionally Significant Beneficial** - Overall, cumulative impacts on the level of benefits derived from these ecosystems (recreational fishing, wildlife viewing, subsistence and non-consumptive activities) and associated species areconditionally beneficial. FMP 4.1 management measures could have adverse effects on the introduction of non-native species but would have beneficial effects on the change in pelagic forage availability, spacial and temporal concentration of fishery impact on forage, removal of top predators (potential for seabird bycatch and subsistence harvests of marine mammals), energy removal and energy redirection, changes in species, functional, and structural habitat diversity for the ecosystem. Future climatic conditions, in combination with fisheries-related pressures, could also affect species diversity. The decrease of the fishing effort under FMP 4.1 would beneficially effect the habitat and overall ecosystem **FMP 4.2 Significant Beneficial** - the elimination of fishing under this FMP will provide increased protection for the habitat and overall ecosystem. FMP 4.2 could have beneficial effects on the change in pelagic forage availability, spacial and temporal concentration of fishery impact on forage, removal of top predators (potential for seabird bycatch and subsistence harvests of marine mammals), energy removal and energy redirection, changes in species, functional, and structural habitat diversity for the ecosystem. Future climatic conditions, in combination with fisheries-related pressures, could also affect species diversity.

Table 4.8-49 (cont.). Cumulative effects analysis for the value of the Bering Sea and Gulf of Alaska marine ecosystems (including non-consumptive and non-use benefits): FMPs 4.1 and 4.2.

Notes: BSAI - Bering Sea and Aleutian Island
CS+ - conditionally significant beneficial
FMP- fishery management plan
GOA - Gulf of Alaska
NOAA - National Oceanic and Atmospheric Administration
S+ - significantly beneficial

Table 4.8-50. Cumulative effects analysis of the ecosystem: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP	FMP Rating (Sections 4.8.10.1 and 4.8.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in pelagic forage availability	**S+, CS+, I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries) and pollock and Atka mackerel catch • State of Alaska directed capelin and herring fishery • Subsistence removals • Climatic effects on recruitment and distribution	Not a contributing factor: The halibut fishery will not remove pelagic forage species.	Not a contributing factor: These fisheries affect distinct sub-populations and are not expected to reduce pelagic forage biomass in the BSAI.	Potential negative contribution: The herring fishery will remove an annual increment of pelagic forage biomass.	Not a contributing factor: Salmon farming will not affect pelagic forage species.	Potential negative contribution: Subsistence harvests will annually remove a small increment of pelagic forage biomass.	Not a contributing factor: Regulated marine mammal removals will not measurably affect pelagic forage biomass.	Potential negative contribution: Oil and fuel spills during herring or capelin spawning could depress populations of pelagic forage species.	Potential positive or negative contribution: Climate change could alter productivity and affect the total pelagic forage biomass.	**CS+** The significant and positive contribution of FMP 4.1/4.2 relative to the baseline could be offset under the condition that a large oil spill in the GOA involving key spawning times and/or areas substantially reduces herring and capelin populations in the reasonably foreseeable future. This potential cumulative effect could be influenced in either direction by a climatic regime shift. ADF&G will annually review and set herring exploitation rates. Annual subsistence removals will not significantly reduce total pelagic forage biomass.
Spatial and temporal concentration of fishery impact on forage	**S+, CS+, I**	• Domestic groundfish fishery forage fish bycatch (i.e., BSAI pollock and GOA rockfish fisheries), herring bycatch and pollock and Atka mackerel catch by area and season • State of Alaska directed capelin and herring fishery by area and season • Subsistence removals by area and season • Climatic effects on recruitment and distribution	Not a contributing factor: The halibut fishery will not remove pelagic forage species.	Not a contributing factor: These fisheries affect distinct sub-populations and are not expected to interact synergistically with spatial and temporal patterns of fishing effort in the BSAI.	Potential negative contribution: The herring fishery could affect local concentrations of herring and other forage fish. Because the herring fishery is mainly inshore, overlaps with the groundfish fishery would be more likely temporal than spatial.	Not a contributing factor: Salmon farming will not affect pelagic forage species.	Potential negative contribution: Subsistence fishing will most likely not be annually adjusted to offset FMP effects and will sometimes overlap with the spatial and temporal pattern of the groundfish fishery.	Not a contributing factor: Regulated marine mammal removals will not add to the spatial and temporal impacts of the groundfish fishery.	Potential negative contribution: Persistent effects of oil and fuel spills could sporadically intensify spatial and temporal impacts of the groundfish fishery on forage species.	Potential positive or negative contribution: Climate change could alter the spatial and temporal distributions of pelagic forage species in ways that might be synergistic with spatial and temporal concentrations of groundfish fishery impacts.	**CS+** Although FMP 4.1/4.2 would greatly reduce/eliminate spatial and temporal pressures of the groundfish fisheries on forage species relative to the baseline, this significant beneficial contribution is conditional because it could be offset by cumulative negative contributions from the herring fishery, subsistence fishing, a large fuel or oil spill, and/or a future climatic regime shift.

Table 4.8-50 (cont.). Cumulative effects analysis of the ecosystem: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP	FMP Rating (Sections 4.8.10.1 and 4.8.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Removal of top predators	**S+**	• Domestic groundfish fishery shark, seabird, and pinniped bycatch • Commercial whaling and fur seal harvests • State of Alaska directed fisheries removals • Shark, pinniped, and seabird bycatch in State of Alaska fisheries • Shark, pinniped, and seabird bycatch in foreign groundfish fishery • Subsistence mammal harvests • Climate variability effects on top predator species recruitment and distribution	Potential negative contribution: The IPHC longline fishery annually removes an increment of halibut, a top predator.	Potential negative contribution: The seabird bycatch in the Western Bering Sea longline fisheries, and removals of targeted top predators such as Greenland turbot, will result in annual removals.	Not a contributing factor: Salmon are not top predators.	Not a contributing factor: Salmon farming will not affect top predators.	Not a contributing factor: Subsistence fishing will not affect top predators.	Potential negative contribution: Subsistence harvests will annually remove a small increment of marine mammals.	Potential negative contribution: Oil and fuel spills could sporadically remove portions of top predator populations through direct mortality.	Potential positive or negative contribution: A regime shift could affect the recruitment and distribution of top predator populations. A regime shift would not remove top predators through direct mortality but could alter the total number of top predators in the system by affecting recruitment.	**CS+** Rating reflects the reduced/eliminated potential of the groundfish fisheries under FMP 4.1/4.2 to remove top predators relative to the baseline. This significant positive contribution could be offset by increased removals of top predators by external fisheries, subsistence harvests of marine mammals, marine petroleum spills, and a regime shift negatively affecting recruitment in top predator populations.
Introduction of non-native species	**CS+**	• Domestic groundfish fishery ballast • Commercial shipping • Climate variability effects on probability of successful introduction	Potential negative contribution: Ballast water release and hull-fouling organisms may introduce exotic marine species on a recurring basis.	Not a contributing factor: Predominant westward currents would tend to prevent exotics introduced to the Western Bering Sea from being carried eastward to the Alaskan shelf.	Potential negative contribution: Ballast water release and hull-fouling organisms associated with fishing vessels from outside Alaska may introduce exotic marine species on a recurring basis.	Potential negative contribution: Farmed Atlantic salmon is an exotic species. Escapes may reproduce and establish runs, competing with native species. Introduced pathogens and parasites could infect wild stocks.	Not a contributing factor: Subsistence fish harvests provide no evident mechanism or pathway for the introduction of exotic species.	Not a contributing factor: Subsistence marine mammal harvests provide no evident mechanism or pathway for the introduction of exotic species.	Potential negative contribution: Ballast water and hull-fouling organisms may introduce non-native species on a recurring basis. Many other pathways for the introduction of exotic marine species to Alaska have been identified (ADF&G 2002a,b).	Potential negative contribution: A warming trend may allow exotic populations that are currently limited by low seawater temperatures to become viable. Potential positive contribution: Low seawater temperatures may continue to limit the viability of introduced marine species.	**CS+** Rating reflects the potential for FMP 4.1/4.2 to reduce the likelihood for the introduction of exotic species relative to the baseline. This significant positive contribution could be offset by the IPHC and State of Alaska commercial fisheries and by commercial shipping, which could introduce one or more exotic species that establish viable BSAI or GOA populations. Atlantic salmon escapes from farms could also establish viable populations, and many other pathways for introductions have been identified. If a future regime shift produces warmer conditions, exotics currently limited by low ambient seawater temperatures could establish viable populations.

Table 4.8-50 (cont.). Cumulative effects analysis of the ecosystem: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP	FMP Rating (Sections 4.8.10.1 and 4.8.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Energy removal	**CS+**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Halibut fishery removals • Subsistence removals • Climate variability effects on system production	Potential negative contribution: The halibut fishery will annually remove energy from the system.	Potential negative contribution: Fishing effort outside the EEZ will annually remove energy from the Bering Sea ecosystem. Juvenile pollock removed by western harvests will not be available as adults for the BSAI groundfish fishery.	Potential negative contribution: State of Alaska directed fisheries will annually remove energy from the system.	Not a contributing factor: Salmon farming will not remove energy from the ecosystem.	Potential negative contribution: Subsistence fish harvests will annually remove an increment of energy from the ecosystem.	Potential negative contribution: Subsistence marine mammal harvests will annually remove an increment of energy from the ecosystem.	Not a contributing factor: There is no evident pathway or mechanism by which commercial shipping will remove energy from the system.	Not a contributing factor: Climate variations will affect ecosystem productivity, and energy removals will follow climate-driven trends. Under these conditions, there would be (approximately) no net change in energy balance.	**CS+** FMP 4.1/4.2 would greatly reduce/eliminate energy removals from the BSAI and GOA groundfish fisheries. This significant positive contribution could be offset by external sources to some degree, making this cumulative effect conditional. However, these external sources are not likely to increase removals to the point where long-term changes in system biomass, production, or energy cycling occur outside the range of natural variability.
Energy redirection	**CS+**	• Domestic groundfish fishery discards, offal, and bottom gear effort • State of Alaska directed fisheries discards, offal, and bottom gear effort • Subsistence discards and offal • Halibut fishery discards and offal • Climate variability effects on energy cycling	Potential negative contribution: Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	Not a contributing factor: Discards and offal production in the Western Bering Sea will not measurably alter BSAI and GOA energy pathways.	Potential negative contribution: Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	Not a contributing factor: Salmon farms in B.C. and Washington State will not affect energy pathways in the GOA or BSAI.	Potential negative contribution: Discards and offal production will produce incremental changes to energy distribution in the BSAI and GOA.	Potential negative contribution: Offal from subsistence marine mammal harvests will produce incremental changes to energy distribution in the BSAI and GOA.	Potential negative contribution: Releases of graywater and refuse from cruise ships and other vessels will produce incremental changes to energy distribution, primarily in the GOA.	Potential positive or negative contribution: Climate variations will affect energy cycling in the ecosystem, but information is insufficient to allow a reliable prediction of the consequences.	**CS+** The significant positive contribution of FMP 4.1/4.2 could be offset by discards, offal, or gear-related mortality from external sources, making this cumulative effect conditional. However, external sources are not likely to remove sufficient energy to produce long-term changes in system biomass, respiration, production, or energy cycling outside the range of natural variability. Local water quality degradation in the immediate vicinity of fish processing facilities will occur if local conditions allow contaminants to concentrate in limited areas. Fish processing waste discharge is regulated through USEPA and Alaska Department of Environmental Conservation permitting programs.
Change in species diversity	**S+**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on species level diversity	Potential negative contribution: Seabird bycatch levels associated with the IPHC longline fishery are unknown and could be high enough to affect species diversity.	Potential negative contribution: Seabird bycatch by Western Bering Sea fisheries could be high enough to affect BSAI species diversity.	Not a contributing factor: State of Alaska directed fisheries are managed to avoid depletions near or below minimum biologically acceptable limits.	Potential negative contribution: Escapes could establish viable populations. These could add to species diversity or, alternatively, reduce native stock through successful competition for spawning and rearing habitat.	Not a contributing factor: Subsistence fish harvests will not selectively remove enough individuals to affect species diversity.	Potential negative contribution: Subsistence marine mammal harvests have the potential to deplete some species to levels below minimum biologically acceptable limits.	Potential negative contribution: Introduced exotic species from hulls and ballast water may establish viable populations and thus alter species diversity.	Potential positive or negative contribution: Future climate variations may alter the productivity and distribution of individual species.	**CS+** Rating reflects the reduced/eliminated fishing effort under FMP 4.1/4.2, which would correspondingly reduce the cumulative fishing pressure on species diversity relative to the baseline. Seabird bycatch by external fisheries and subsistence harvests of marine mammals could offset this positive contribution, making it conditional. Future climate change could influence this cumulative effect in either direction.

Table 4.8-50 (cont.). Cumulative effects analysis of the ecosystem: FMPs 4.1 and 4.2.

Direct/Indirect Effects of FMP	FMP Rating (Sections 4.8.10.1 and 4.8.10.2)	Persistent Past Effects	Reasonably Foreseeable Future Effects								Cumulative Effects?
			Human Actions							Natural Events	
			IPHC Longline Fishery	Western Bering Sea Longline and Groundfish Fisheries	State of Alaska Commercial Fisheries	Salmon Farming in B.C. and Washington	Subsistence Fish Harvests	Subsistence Marine Mammal Harvests	Commercial Shipping	Climate Variability	
Change in functional (trophic) diversity	**S+**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on trophic diversity	Not a contributing factor: The IPHC fishery will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	Not a contributing factor: These fisheries will not affect species or size diversity within BSAI or GOA trophic guilds.	Not a contributing factor: State of Alaska directed fisheries will not produce removals large enough to cause a change in trophic diversity outside the range of natural variability for the system.	Potential negative contribution: Diversity within a trophic guild would increase if Atlantic salmon established a viable population at the trophic level occupied by Pacific salmon.	Not a contributing factor: Subsistence fish harvests will not selectively remove enough individuals to affect trophic diversity.	Potential negative contribution: Subsistence marine mammal harvests have the potential to affect species diversity within piscivore guilds.	Potential negative contribution: Introduced exotic species from hulls and ballast water may establish viable populations and thus alter trophic diversity.	Potential positive or negative contribution: A future regime shift could affect trophic diversity by forcing trends that expand some trophic levels and contract others. A warming trend could allow exotic species to establish viable populations, thus altering trophic diversity.	**CS+** Rating reflects the reduced/eliminated fishing effort under FMP 4.1/4.2, which would correspondingly reduce the cumulative fishing pressure on trophic diversity relative to the baseline. This positive contribution could be offset under the conditions of incremental contributions from salmon farming, subsistence harvests of marine mammals, exotic species introduced through commercial shipping traffic, and a future climatic regime shift.
Change in functional (structural habitat) diversity	**S+**	• Foreign groundfish fishery pre-MSA (1960s–1976) bottom gear effort • JV groundfish fishery bottom gear effort • Domestic groundfish bottom gear effort • Climate variability effects on structural habitat diversity	Not a contributing factor: This fishery does not employ bottom gear.	Not a contributing factor: These fisheries will not affect structural habitat in the BSAI and GOA.	Potential negative contribution: The scallop fishery will employ bottom dredges that will damage structural habitat and contribute a small increment in combination with the larger cumulative area affected by the BSAI and GOA groundfish fisheries.	Not a contributing factor: Salmon farming will not affect marine structural habitat.	Not a contributing factor: Subsistence fish harvests will not affect marine structural habitat.	Not a contributing factor: Subsistence marine mammal harvests will not affect marine structural habitat.	Potential negative contribution: A large oil or fuel spills could damage sensitive bottom-dwelling organisms that provide structural habitat.	Potential positive or negative contribution: A regime shift could change the mean annual seawater temperature sufficiently to increase or retard the growth of bottom-dwelling organisms, thus altering structural habitat diversity.	**CS+** Rating reflects the potential for the significant and positive contribution of FMP 4.1/4.2 to be offset under at least three future conditions: (1) an increase in bottom dredging by the scallop fishery, (2) a large petroleum spill affecting a broad geographic area of bottom habitat, and/or (3) a climatic regime shift that reduces the population size and distribution of bottom-dwelling organisms that provide structural habitat.
Change in genetic diversity	**I, U**	• Domestic groundfish fishery removals • State of Alaska directed fisheries removals • Subsistence removals • Foreign groundfish fishery pre-MSA (1960s–1976) removals • Halibut fishery removals • Climate variability effects on genetic diversity	Not a contributing factor: The IPHC longline fishery is managed to avoid the concentrated targeting of fish with a narrow range of attributes.	Not a contributing factor: Catch removals potentially altering the genetic diversity of Western Bering Sea stocks are not expected to affect BSAI stocks, because distinct subpopulations are involved.	Not a contributing factor: MSST, TAC, and other catch regulation of future directed fisheries will be managed by ADF&G to sustain genetic diversity, including stocks associated with individual salmon streams.	Potential negative contribution: Escaped Atlantic salmon may establish viable populations that affect the genetic diversity of the GOA and BSAI ecosystems. Populations established by escaped Pacific salmon species could produce similar effects.	Potential negative contribution: Subsistence fish harvests may focus on particular spawning aggregations or larger fish, thus adding an annual increment to removals with the potential to decrease genetic diversity.	Potential negative contribution: Subsistence marine mammal harvests may concentrate on particular resident subpopulations defined by location, e.g., Cook Inlet belugas.	Potential negative contribution: Hull-fouling invertebrates and exotics introduced through ballast water discharge may establish viable populations in the future, potentially out-competing and displacing native species.	Potential positive or negative contribution: A climatic regime shift could increase the mean annual temperature of seawater sufficiently to allow exotic species to establish viable populations.	**I** Although the identified external factors could cumulatively influence genetic diversity within the BSAI and GOA ecosystems, the rating reflects the low potential for these factors to significantly affect the genetic diversity of species targeted or taken incidentally by the BSAI and GOA groundfish fisheries.

Table 4.8-50 (cont.). Cumulative effects analysis of the ecosystem: FMPs 4.1 and 4.2.

Notes:

ADF&G - Alaska Department of Fish and Game
BSAI - Bering Sea and Aleutian Islands
B.C. - British Columbia, Canada
CS- - conditionally significant negative
CS+ - conditionally significant positive
EEZ - exclusive economic zone
FMP - fishery management plan
GOA - Gulf of Alaska
I - insignificant
JV - joint venture
IPHC - International Pacific Halibut Commission
MSA - Magnuson-Stevens Fishery Conservation Management Act
MSST - minimum stock size threshold
S+ - significant positive
TAC - total allowable catch
U - Unknown
USEPA - U.S. Environmental Protection Agency

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Table 4.8-51. Target species direct/indirect and cumulative effects significance ratings under FMPs 4.1 and 4.2.

Direct/Indirect Effects	Effect	EBS Walleye Pollock		GOA Walleye Pollock		BSAI Pacific Cod		GOA Pacific Cod		Sablefish		AI Atka Mackerel		GOA Atka Mackerel		BSAI Flatfish*		GOA Flatfish*		BSAI POP		GOA POP		GOA Thornyhead Rockfish		BSAI Rockfish*		GOA Rockfish*	
		4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
Mortality	DI	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Change in Biomass	DI	I	S+	I	I	S+	S+	I	S+	I	I	S+	S+	U	U	I	I	I	I	S+	S+	I	I	I	I	I	I	I	I
	CE	I	S+	I	I	S+	S+	I	S+	I	I	S+	S+	U	U	I	I	I	I	S+	S+	I	I	I	I	I	I	I	I
Spatial/Temporal Concentration of Catch - change in genetic structure	DI	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Spatial/Temporal Concentration of Catch - change in reproductive success	DI	I	I	I	I	I	I	I	I	I	I	S+	S+	U	U	I	I	I	I	S+	S+	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	S+	S+	U	U	I	I	I	I	S+	S+	I	I	I	I	I	I	I	I
Change in prey availability	DI	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Change in habitat	DI	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I

Notes: *BSAI Flatfish - BSAI yellowfin sole, BSAI flathead sole, BSAI rock sole, BSAI arrowtooth flounder, BSAI Greenland turbot, BSAI Alaska plaice and BSAI other flatfish
*GOA Flatfish - GOA shallow water flatfish, GOA arrowtooth flounder, GOA flathead sole, GOA deep water flatfish and GOA rex sole
*BSAI Rockfish - BSAI northern rockfish, BSAI shortraker/rougheye rockfish and BSAI other rockfish
*GOA Rockfish - GOA northern rockfish, GOA shortraker/rougheye rockfish, GOA slope rockfish, GOA pelagic shelf rockfish and GOA demersal shelf rockfish
AI - Aleutian Islands
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
DI - direct/indirect effect
EBS - Eastern Bering Sea
GOA - Gulf of Alaska
I - insignificant
S+ - significant positive
POP - Pacific ocean perch
U - unknown
Please refer to Table 4.1-1 for the significance criteria for target species.

Table 4.8-52. Prohibited, other, forage and non-specified species direct/indirect and cumulative effects significance ratings under FMPs 4.1 and 4.2.

Direct/Indirect Effects	Effect	Pacific Halibut		BSAI Chinook and other salmon		GOA Chinook and other salmon		Pacific Herring		Crab								Other Species		Forage Fish		Non-specified species	
										BSAI Crab*		GOA Crab*		GOA Red King		BSAI and GOA Golden King						Grenadier	
		4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
Mortality	**DI**	I	I	CS+	CS+	CS+	CS+	I	I	CS+	CS+	U	U	CS+	CS+	U	U	U	U	I	I	U	U
	CE	I	I	CS+	CS+	CS+	CS+	I	I	U	U	U	U	U	U	U	U	U	U	I	I	U	U
Change in biomass level	**DI**	NA	NA	NA	NA	NA	NA	NA	NA	CS+	CS+	U	U	CS+	CS+	U	U	U	U	U	U	U	U
	CE	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in reproductive success	**DI**	I	I	CS+	CS+	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	CE	I	I	CS+	CS+	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in prey availability	**DI**	I	I	U	U	U	U	I	I	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
Change in habitat	**DI**	I	I	I	I	I	I	I	I	CS+	CS+	U	U	CS+	CS+	U	U	U	U	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Change in genetic structure	**DI**	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U
	CE	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U

Notes: *BSAI Crab - BSAI bairdi Tanner, BSAI opilio Tanner, BSAI red king and BSAI blue king
*GOA Crab - GOA bairdi Tanner and GOA blue king
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
CS- - conditionally significant negative/adverse
CS+ - conditionally significant positive/beneficial
DI - direct/indirect effect
GOA - Gulf of Alaska
I - insignificant
NA - not applicable
U - unknown
Please refer to Table 4.1-1 for the significance criteria for Pacific halibut, Pacific herring, other species, forage fish species and non-specified species.

Table 4.8-53 Habitat direct/indirect and cumulative effects significance ratings under FMPs 4.1 and 4.2.

Direct/Indirect Effects	Effect	Bering Sea	Aleutian Islands	Gulf of Alaska	Bering Sea	Aleutian Islands	Gulf of Alaska
		4.1			4.2		
Changes to Living Habitat Direct Mortality of benthic organisms	**DI**	S+	S+	S+	S+	S+	S+
	CE	CS-	CS-	CS-	CS-	CS-	CS-
Changes to Benthic Community Structure	**DI**	S+	S+	S+	S+	S+	S+
	CE	CS-	CS-	CS-	CS-	CS-	CS-
Changes in Distribution of Fishing Effort Geographic diversity of management measures	**DI**	S+	S+	I	NE	NE	NE
	CE	CS-/CS+	CS-/CS+	CS-/CS+	NE	NE	NE

Notes: CE - cumulative effect
CS- -conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
NE - no effect
S- - significant adverse
S+ - significant beneficial
Refer to Table 4.1-4 for habitat significance criteria.
Please refer to Table 4.1-2 for the significance criteria for crab.
Please refer to Table 4.1-3 for the significance criteria for salmon.

Table 4.8-54. Seabirds direct/indirect and cumulative effects significance ratings under FMPs 4.1 and 4.2.

Direct/Indirect Effects	Effect	Short-tailed Albatross		Other Albatross and Shearwaters*		Northern Fulmar		Species of Management Concern*		Other Piscivorous Species*		Other Planktivorous Species*		Spectacled and Steller's Eiders	
		4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
Mortality (Incidental Take)	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	CS-	I	S- Albatross CS- Shearwaters	I	I	I	CS- Kittiwakes S- Murrelets	I	I	I	I	I	I	I
Availability of Food	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Benthic Habitat	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	U	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	I

Notes: *Other Albatross and Shearwaters - Laysan and Black-footed Albatross,Sooty and Short-tailed Shearwaters
*Other Piscivorous Species - Alcids (except auklets), gulls, jaegers, terns, and cormorants
*Other Planktivorous Species - Auklets and storm-petrels
*Species of Management Concern - Red-legged Kittiwake, Marbled Murrelet, and Kittlitz's Murrelet
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
S- - significant adverse
U - unknown
Please refer to Table 4.1-5 for the significance criteria for seabirds.

Table 4.8-55. Marine mammals direct/indirect and cumulative effects significance ratings under FMPs 4.1 and 4.2.

Direct/Indirect Effects	Effect	W Steller Sea Lion		E Steller Sea Lion		Northern Fur Seal		Harbor Seal		Killer Whale (Transients)		Other Pinnipeds*		Other Toothed Whales*		Baleen Whales*		Sea Otters	
		4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
Mortality (Incidental Take and Entanglement)	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	S-	S-	I	I	I	I	I	I	I	I	CS-[1] I[2]	CS-[1] I[2]	I	I	CS-[3] I[4]	CS-[3] I[4]	CS-	CS-
Prey Availability	**DI**	S+	S+	S+	S+	CS+	CS+	I	I	I	I	I	I	I	I	I	I	I	I
	CE	S+	S+	CS+	CS+	CS+	CS+	CS-	CS-	I	I	I	I	I	I	I	I	I	I
Spatial/Temporal Concentration of Fisheries	**DI**	S+	S+	S+	S+	CS+	CS+	I	CS+	I	I	I	I	I	I	I	I	I	I
	CE	S+	S+	S+	S+	CS+	CS+	CS-	CS-	I	I	I	I	I	I	I	I	I	I
Disturbance	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

Notes:
[1] - Spotted, ringed, bearded and ribbon seals
[2] - Walrus and elephant seal
[3] - Fin, humpback and sei whales
[4] - Minke, gray, bowhead, northern right and blue whales
*Baleen Whales - Blue Whale, Fin Whale, Sei Whale, Minke Whale, Humpback Whale, Gray Whale, Northern Right Whale, Bowhead Whale.
*Other Pinnipeds - Pacific Walrus, Spotted Seal, Bearded Seal, Ringed Seal, Ribbon Seal, Elephant Seal
*Other Toothed Whales - Sperm Whales, Beaked Whales, White Sided Dolphin, Beluga Whale, Harbor Porpoise, Dall's Porpoise.
CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
E - eastern stock
I - insignificant
S- - significant adverse
S+ - significant beneficial
W - western stock
Please refer to Table 4.1-6 for the significant criteria for marine mammals.

Table 4.8-56. Socioeconomics direct/indirect and cumulative effects significance ratings under FMPs 4.1 and 4.2.

Direct/Indirect Effects	Effect	Catcher Vessels		Catcher Processors		Inshore Processors/ Motherships	
		4.1	4.2	4.1	4.2	4.1	4.2
Groundfish Landings by Species Group	**DI**	S-	S-	S-/I	S-	S-	S-
	CE	S-	S-	S-	S-	S-	S-
Groundfish Gross Product Value	**DI**	S-	S-	S-	S-	S-	S-
	CE	S-	S-	S-	S-	S-	S-
Employment	**DI**	S-	S-	S-	S-	S-	S-
	CE	S-	S-	S-	S-	S-	S-
Payments to Labor	**DI**	S-	S-	S-	S-	S-	S-
	CE	S-	S-	S-	S-	S-	S-
Product Quality and Product Utilization Rate	**DI**	NA	NA	CS-/CS+	S-	S-/CS+	S-
	CE	NA	NA	CS-/CS+	S-	S-/CS+	S-
Excess Capacity	**DI**	S-	S-	S-	S-	S-	S-
	CE	S-	S-	S-	S-	S-	S-
Average Costs	**DI**	S-	S-	S-	S-	S-	S-
	CE	S-	S-	S-	S-	S-	S-
Fishing Vessel Safety	**DI**	S-	S+	S-	S+	NA	NA
	CE	S-	S+	S-	S+	NA	NA

Direct/Indirect Effects	Effect	Regions and Communities	
		4.1	4.2
In-Region Processing	**DI**	I/S-	I/S-
	CE	I/CS-	I/CS-
Regionally Owned At-Sea Processors	**DI**	I/S-	I/S-
	CE	I/CS-	I/CS-
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	**DI**	S-	S-
	CE	I/CS-	I/CS-
In-Regional Deliveries of Regionally Owned Catcher Vessels	**DI**	I/S-	I/S-
	CE	I/CS-	I/CS-
Total Direct, Indirect, and Induced Labor Income and FTEs	**DI**	I/S-	S-
	CE	I/CS-	I/CS-

Table 4.8-56 (cont.). Socioeconomics direct/indirect and cumulative effects significance ratings under FMPs 4.1 and 4.2.

Direct/Indirect Effects	Effect	CDQ		EJ		Market Channels		Non-Consumptive and Non-Use	
		4.1	4.2	4.1	4.2	4.1	4.2	4.1	4.2
CDQ	**DI**	S-	S-	NA	NA	NA	NA	NA	NA
	CE	S-	S-	NA	NA	NA	NA	NA	NA
EJ	**DI**	NA	NA	S-	S-	NA	NA	NA	NA
	CE	NA	NA	S-	S-	NA	NA	NA	NA
Benefits to U.S. Consumers	**DI**	NA	NA	NA	NA	I	CS-	NA	NA
	CE	NA	NA	NA	NA	I	CS-	NA	NA
Benefits Derived from Marine Ecoystems	**DI**	NA	NA	NA	NA	NA	NA	CS+	S+
	CE	NA	NA	NA	NA	NA	NA	CS+	S+

Direct/Indirect Effects	Effect	Subsistence	
		4.1	4.2
Subsistence use of groundfish	**DI**	I	I
	CE	I	I
Subsistence Use of Salmon	**DI**	I	CS+
	CE	I	CS+
Subsistence Use of Steller sea lions	**DI**	CS+	CS+
	CE	CS+	CS+
Indirect subsistence use: income and joint	**DI**	S-	S-
	CE	S-	S-

Notes: In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. The same threshold is roughly used to assess changes in qualitative indicators (e.g. fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgement of the socioeconomic analysts.

CDQ - community development quota
CE - cumulative effect
CS+ - conditionally significant beneficial
CS- - conditionally significant adverse
DI - direct/indirect effect
EJ - environmental justice
FTE - full-time equivalent
I - insignificant
NA - not applicable
S+ - significant beneficial
S- - significant negative

Table 4.8-57 Ecosystem direct/indirect and cumulative effects significance ratings under FMPs 4.1 and 4.2.

Direct/Indirect Effects	Effect	Ecosystem	
		4.1	4.2
Change in Pelagic Forage Availability	DI	S+, CS+, I	S+, CS+, I
	CE	CS+	CS+
Spatial and Temporal Concentration of Fishery Impact on Forage	DI	S+, CS+, I	S+, CS+, I
	CE	CS+	CS+
Removal of Top Predators	DI	S+	S+
	CE	CS+	CS+
Introduction of Non-native Species	DI	CS+	CS+
	CE	CS+	CS+
Energy Removal	DI	CS+	CS+
	CE	CS+	CS+
Energy Redirection	DI	CS+	CS+
	CE	CS+	CS+
Change in Species Diversity	DI	S+	S+
	CE	CS+	CS+
Change in Functional (trophic) Diversity	DI	S+	S+
	CE	CS+	CS+
Change in Functional (structural habitat) Diversity	DI	S+	S+
	CE	CS+	CS+
Change in Genetic Diversity	DI	I, U	I, U
	CE	I	I

Notes: CE - cumulative effect
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
S+ - significant beneficial
U - unknown
Please refer to Table 4.1-7 for the ecosystem significance criteria.

Table 4.9-1. Target species direct/indirect and cumulative effects significance ratings under PPA.1 and PPA.2.

Direct/Indirect Effects	Effect	Pollock, Pacific Cod, Sablefish		AI Atka Mackerel		GOA Atka Mackerel		BSAI Flatfish*		BSAI Other Flatfish		GOA Flatfish*		GOA Arrowtooth Flounder		BSAI and GOA POP		GOA Thornyhead Rockfish		BSAI Rockfish*		GOA Rockfish*		GOA Northern Rockfish	
		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Mortality	DI	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	U	U	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Change in Biomass	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Spatial/ Temporal Concentration of Catch - change in genetic structure	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Spatial/ Temporal Concentration of Catch - change in reproductive success	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Change in prey availability	DI	I	I	I	I	I	I	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
Change in Habitat	DI	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I
	CE	I	I	I	I	U	U	I	I	U	U	U	U	I	I	I	I	I	I	U	U	U	U	I	I

Table 4.9-1 (cont.). Target species direct/indirect and cumulative effects significance ratings under PPA.1 and PPA.2.

Notes: *BSAI Flatfish - BSAI yellowfin sole, BSAI flathead sole, BSAI rock sole, BSAI arrowtooth flounder, BSAI Greenland turbot and BSAI Alaska plaice
*GOA Flatfish - GOA shallow water flatfish, GOA flathead sole, GOA deep water flatfish and GOA rex sole
*BSAI Rockfish - BSAI northern rockfish, BSAI shortraker/rougheye rockfish and BSAI other rockfish
*GOA Rockfish - GOA shortraker/rougheye rockfish, GOA slope rockfish, GOA pelagic shelf rockfish and GOA demersal shelf rockfish
1 - PPA.1
2 - PPA.2
AI - Aleutian Islands
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
DI - direct/indirect effect
EBS - Eastern Bering Sea
GOA - Gulf of Alaska
I - insignificant
PPA - preliminary preferred alternative
POP - Pacific ocean perch
U - unknown
Please refer to Table 4.1-1 for the significance criteria for target species.

Table 4.9-2. Prohibited, other, forage and non-specified species direct/indirect and cumulative effects significance ratings under PPA.1 and PPA.2.

Direct/Indirect Effects	Effect	Pacific Halibut		BSAI Chinook and other salmon		GOA Chinook and other salmon		Pacific Herring		Crab								Other Species		Forage Fish		Non-specified Species	
										BSAI Crab*		GOA Crab*		Red King GOA		BSAI and GOA Golden King						Grenadier	
		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Mortality	**DI**	I	I	I	I	I	I	I	I	I	I	U	U	I	I	U	U	U	U	I	I	U	U
	CE	I	I	CS-	CS-	I	I	I	I	U	U	U	U	U	U	U	U	U	U	I	I	U	U
Change in biomass level	**DI**	NA	NA	NA	NA	NA	NA	NA	NA	I	I	U	U	I	I	U	U	U	U	U	U	U	U
	CE	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in reproductive success	**DI**	I	I	U	U	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
	CE	I	I	CS-	CS-	U	U	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Change in prey availability	**DI**	I	I	U	U	U	U	I	I	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA	U	U	NA	NA
Change in habitat	**DI**	I	I	I	I	I	I	I	I	I	I	U	U	U	U	I	I	U	U	U	U	NA	NA
	CE	I	I	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	NA	NA
Change in genetic structure	**DI**	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U
	CE	NA	NA	U	U	U	U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	U	U	U	U	U	U

Table 4.9-2 (cont.). **Prohibited, other, forage and non-specified species direct/indirect and cumulative effects significance ratings under PPA.1 and PPA.2.**

Notes: *BSAI Crab - BSAI bairdi Tanner, BSAI opilio Tanner, BSAI red king and BSAI blue king
*GOA Crab - GOA bairdi Tanner and GOA blue king
1 - PPA.1
2 - PPA.2
BSAI - Bering Sea and Aleutian Islands
CE - cumulative effect
CS- - conditionally significant negative/adverse
CS+ - conditionally significant positive/beneficial
DI - direct/indirect effect
GOA - Gulf of Alaska
I - insignificant
NA - not applicable
PPA - preliminary preferred alternative
U - unknown
Please refer to Table 4.1-1 for the significance criteria for Pacific halibut, Pacific herring, other species, forage fish species and non-specified species.
Please refer to Table 4.1-2 for the significance criteria for crab.
Please refer to Table 4.1-3 for the significance criteria for salmon.

Table 4.9-3 Habitat direct/indirect and cumulative effects significance ratings under PPA.1 and PPA.2.

Direct/Indirect Effects	Effect	Bering Sea	Aleutian Islands	Gulf of Alaska	Bering Sea	Aleutian Islands	Gulf of Alaska
		1			2		
Changes to Living Habitat	**DI**	I	I	I	I	S+	CS-
Direct mortality of benthic organisms	**CE**	CS-	CS-	CS-	CS-/CS+	CS-/CS+	CS-/CS+
Changes to Benthic Community Structure	**DI**	I	I	I	CS+	S+	I
	CE	CS-	CS-	CS-	CS-/CS+	CS-/CS+	CS-/CS+
Changes in Distribution of Fishing Effort	**DI**	I	I	I	S+	S+	I
Geographic diversity of management measures	**CE**	CS-	CS-	CS-	CS-/CS+	CS-/CS+	CS-/CS+

Notes: 1 - PPA.1
2 - PPA.2
CE - cumulative effect
CS- -conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
PPA - preliminary preferred altermative
S+ - significant beneficial
Refer to Table 4.1-4 for habitat significance criteria.

Table 4.9-4 Seabirds direct/indirect and cumulative effects significance ratings under PPA.1 and PPA.2

Direct/Indirect Effects	Effect	Short-tailed Albatross		Other Albatross and Shearwaters		Northern Fulmar		Species of Management Concern		Other Piscivorous Species		Other Planktivorous Species		Spectacled and Steller's Eiders	
		1	2	1	2	1	2	1	2	1	2	1	2	1	2
Mortality (Incidental Take)	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	CS-	CS-	S- Albatross CS- Shearwaters	S- Albatross CS- Shearwaters	I	I	CS- Kittiwakes S- Murrelets	CS- Kittiwakes S- Murrelets	I	I	I	I	I	I
Availability of Food	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	U	U	I	I	I	I	I	I
Benthic Habitat	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	U	U

Notes: *Other Albatross and Shearwaters - Laysan and Black-footed Albatross,Sooty and Short-tailed Shearwaters
*Other Piscivorous Species - Alcids (except auklets), gulls, jaegers, terns, and cormorants
*Other Planktivorous Species - Auklets and storm-petrels
*Species of Management Concern - Red-legged Kittiwake, Marbled Murrelet, and Kittlitz's Murrelet
1 - PPA.1
2 - PPA.2
CE - cumulative effect
CS- - conditionally significant adverse
DI - direct/indirect effect
I - insignificant
PPA - preliminary preferred alternative
S- - significant adverse
U - unknown
Please refer to Table 4.1-5 for the significance criteria for seabirds.

Table 4.9-5. Marine mammals direct/indirect and cumulative effects significance ratings under PPA.1 and PPA.2.

Direct/Indirect Effects	Effect	W Steller Sea Lion		E Steller Sea Lion		Northern Fur Seal		Harbor Seal		Killer Whale (Transients)		Other Pinnipeds *		Other Toothed Whales*		Baleen Whales*		Sea Otters	
		1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Mortality (Incidental Take and Entanglement)	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	S-	S-	I	I	I	I	I	I	I	I	CS-[1] I[2]	CS-[1] I[2]	I	I	CS-[3] I[4]	CS-[3] I[4]	CS-	CS-
Prey Availability	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	CS-	CS-	I	I	CS-	CS-	CS-	CS-	I	I	I	I	I	I	I	I	I	I
Spatial/Temporal Concentration of Fisheries	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	CS-	CS-	I	I	CS-	CS-	CS-	CS-	I	I	I	I	I	I	I	I	I	I
Disturbance	**DI**	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	CE	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

Notes: 1 - PPA.1
2 - PPA.2
[1] - Spotted, ringed, bearded and ribbon seals
[2] - Walrus and elephant seal
[3] - Fin, humpback and sei whales
[4] - Minke, gray, bowhead, northern right and blue whales
*Baleen Whales - Blue Whale, Fin Whale, Sei Whale, Minke Whale, Humpback Whale, Gray Whale, Northern Right Whale, Bowhead Whale.
*Other Pinnipeds - Pacific Walrus, Spotted Seal, Bearded Seal, Ringed Seal, Ribbon Seal, Elephant Seal
*Other Toothed Whales - Sperm Whales, Beaked Whales, White Sided Dolphin, Beluga Whale, Harbor Porpoise, Dall's Porpoise.
CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
E - eastern stock
I - insignificant
PPA - preliminary preferred alternative
S- - significant adverse
W - western stock
Please refer to Table 4.1-6 for the significant criteria for marine mammals.

Table 4.9-6. Socioeconomics direct/indirect and cumulative effects significance ratings under PPA.1 and PPA.2

Direct/Indirect Effects	Effect	Catcher Vessels		Catcher Processors		Inshore Processors/ Motherships	
		1	2	1	2	1	2
Groundfish Landings by Species Group	DI	I/S+	I/S+/S-	I/S+	I/S+/S-	I/S+	I/S+/S-
	CE	I	I	I	I	I	I
Groundfish Gross Product Value	DI	I	I	I	I	I	I
	CE	I	I	I	I	I	I
Employment	DI	I	I	I	I	I	I
	CE	I	I	I	I	I	I
Payments to Labor	DI	I	I	I	I	I	I
	CE	I	I	I	I	I	I
Product Quality and Product Utilization Rate	DI	NA	NA	CS+	CS-/S+	CS+	CS-/S+
	CE	NA	NA	CS+	CS-/S+	CS+	CS-/S+
Excess Capacity	DI	CS+	S+	CS+	S+	CS+	S+
	CE	CS+	S+	CS+	S+	CS+	S+
Average Costs	DI	CS+	CS-/S+	CS+	CS-/S+	CS+	CS-/S+
	CE	CS+	CS-/S+	CS+	CS-/S+	CS+	CS-/S+
Fishing Vessel Safety	DI	CS+	S-/S+	CS+	CS-/S+	NA	NA
	CE	CS+	S-/S+	CS+	CS-/S+	NA	NA

Direct/Indirect Effects	Effect	Regions and Communities	
		1	2
In-Region Processing	DI	I/S+	I/S-
	CE	I/CS-	I/CS-
Regionally Owned At-Sea Processors	DI	I/S+	I
	CE	I	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	DI	I	I/S-
	CE	I/CS-	I/CS-
In-Regional Deliveries of Regionally Owned Catcher Vessels	DI	I/S+	I/S-
	CE	I/CS-	I/CS-
Total Direct, Indirect, and Induced Labor Income and FTEs	DI	I/S+	I/S-
	CE	I/CS-	I/CS-

Table 4.9-6 (cont.). Socioeconomics direct/indirect and cumulative effects significance ratings under PPA.1 and PPA.2.

Direct/Indirect Effects	Effect	CDQ		EJ		Market Channels		Non-Consumptive and Non-Use	
		1	2	1	2	1	2	1	2
CDQ	**DI**	I	I	NA	NA	NA	NA	NA	NA
	CE	I	I	NA	NA	NA	NA	NA	NA
EJ	**DI**	NA	NA	I/CS-	I/CS-	NA	NA	NA	NA
	CE	NA	NA	I	I/CS-	NA	NA	NA	NA
Benefits to U.S. Consumers	**DI**	NA	NA	NA	NA	I	I	NA	NA
	CE	NA	NA	NA	NA	I	I	NA	NA
Benefits Derived from Marine Ecoystems	**DI**	NA	NA	NA	NA	NA	NA	I	CS+
	CE	NA	NA	NA	NA	NA	NA	I	CS+

Direct/Indirect Effects	Effect	Subsistence	
		1	2
Subsistence use of groundfish	**DI**	I	I
	CE	I	I
Subsistence Use of Salmon	**DI**	I	I
	CE	I	I
Subsistence Use of Steller sea lions	**DI**	I	I
	CE	I	I
Indirect subsistence use: income and joint	**DI**	I	I
	CE	I	I

Notes: In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. The same threshold is roughly used to assess changes in qualitative indicators (e.g. fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgement of the socioeconomic analysts.

1 - PPA.1
2 - PPA.2
CDQ - community development quota
CE - cumulative effect
CS+ - conditionally significant beneficial
CS- - conditionally significant adverse
DI - direct/indirect effect
EJ - environmental justice
FTE - full-time equivalent
I - insignificant
NA - not applicable
PPA - preliminary preferred alternative
S+ - significant beneficial
S- - significant negative

Table 4.9-7. Cumulative effects analysis for catcher vessels: PPA.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** overall, insignificant cumulative effects are expected as the projected TAC, especially for Pacific cod, is likely to offset some of the recent reductions in other fisheries, such as salmon

Table 4.9-7 (cont.). Cumulative effects analysis for catcher vessels: PPA.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Ex-Vessel Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though marginal increases are expected these changes in value would not be significant.	**Not a contributing factor** - not expected to affect ex-vessel value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - changes in climate are note expected to affect ex-vessel value directly	**I** insignificant cumulative effects on ex-vessel value are likely as slight increases in TAC may offset reductions in other fisheries

Table 4.9-7 (cont.). Cumulative effects analysis for catcher vessels: PPA.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish employment.	**Potential beneficial/adverse contribution** - an increase or decrease in other sources of revenue may result in greater or lesser competition for groundfish employment.	**Not a contributing factor** - not expected to affect employment	**I** insignificant cumulative effects are expected for employment as the slight increase in projected employment may offset reductions in other fisheries

Table 4.9-7 (cont.). Cumulative effects analysis for catcher vessels: PPA.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries may influence payments to labor. Reductions in the salmon fisheries may also influence payments, as many vessels rely on a mix of fisheries as a source of revenue.	**Not a contributing factor** - not expected to affect payments to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**I** cumulative effects on payments to labor are not significant. Although an increase is projected, it is likely this increase will offset the reductions in other fisheries and increased pressure from communities to raise fish taxes.

Table 4.9-7 (cont.). Cumulative effects analysis for catcher vessels: PPA.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	CS+	Yes, history of excess capacity (refer to section 3.9)	**Potential beneficial/adverse contribution** - an increase or decrease in the number of vessels in other fisheries may result in subsequent increases or decreases in the number of vessels participating in the groundfish fishery, particularly pot CVs and FGCVs in state waters.	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**CS+** reduction in fishing capacity could result from the expanded use of rights-based management. It is uncertain to what extent rights-based management would be used under PPA.1

Table 4.9-7 (cont.). Cumulative effects analysis for catcher vessels: PPA.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	CS+	Yes, historical race for fish increased costs (see section 3.9	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor** - the effects of other economic development opportunities on average costs are minimal	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - the effects of climate change on average costs are minimal	**CS+** under PPA.1 average costs could decrease as a result of expanded use of rights-based management. It is uncertain to what extent rights-based management would be used under PPA.1
Fishing Vessel Safety	CS+	Yes, historical race for fish (see section3.9)	**Potential adverse contribution** - area closures implemented in other fisheries could have an effect on fishing vessel safety	**Not a contributing factor** - the effects of other economic development opportunities on fishing vessel safety are minimal	**Not a contributing factor** - the effects of other revenue sources on fishing vessel safety are minimal	**Not a contributing factor** - the effects of climate change on fishing vessel safety are minimal	**CS+** safety remains a concern for all fisheries. However, cumulative effects are conditionally beneficial because to the extent that a rights-based management regime is extended to other groundfish fisheries, vessel safety would improve.

Table 4.9-7 (cont.). Cumulative effects analysis for catcher vessels: PPA.1.

Notes: CV - catcher vessel
FGCV - fixed gear catcher vessel
FMP - fishery management plan
PPA - preliminary preferred alternative
TAC - total allowable catch

Table 4.9-8. Cumulative effects analysis for catcher vessels: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may also impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** overall, insignificant cumulative effects are expected as the increases projected, particularly for Pacific cod may offset the projected reductions in ARSO and flatfish, and the recent reduction in the salmon and crab fisheries.

Table 4.9-8 (cont.). Cumulative effects analysis for catcher vessels: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Ex-Vessel Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though marginal increases are expected these changes in value would not be significant.	**Not a contributing factor** - not expected to affect ex-vessel value.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Not a contributing factor** - changes in climate are note expected to affect ex-vessel value directly.	**I** insignificant cumulative effects are likely because the increase projected for Pacific cod may mitigate the projected decrease in ARSO and recent reductions in salmon and crab.

Table 4.9-8 (cont.). Cumulative effects analysis for catcher vessels: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish employment.	**Potential beneficial/adverse contribution** - an increase or decrease in other sources of revenue may result in greater or lesser competition for groundfish employment.	**Not a contributing factor** - not expected to affect employment.	**I** insignificant cumulative effects are likely due to the slight increase projected which may mitigate reductions in other fisheries such as salmon and crab.

Table 4.9-8 (cont.). Cumulative effects analysis for catcher vessels: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries and recent reductions in the salmon and crab fisheries may influence groundfish payments.	**Not a contributing factor** - not expected to affect payments to labor.	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor.	**I** insignificant cumulative effects are likely due to the slight increase projected which may mitigate reductions in other fisheries such as salmon and crab.

Table 4.9-8 (cont.). Cumulative effects analysis for catcher vessels: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S+	Yes, history of excess capacity (refer to section 3.9)	**Potential beneficial/adverse contribution** - an increase or decrease in the number of vessels in other fisheries may result in subsequent increases or decreases in the number of vessels participating in the groundfish fishery, particularly pot CVs and FGCVs in state waters.	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S+** reduction in fishing capacity will result from the use of rights-based management.

Table 4.9-8 (cont.). Cumulative effects analysis for catcher vessels: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	CS-/S+	Yes, historical race for fish increased costs (see section 3.9	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor** - the effects of other economic development opportunities on average costs are minimal	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - the effects of climate change on average costs are minimal	**CS-/S+** to the extent that additional area closures are implemented, average costs may increase. However, rationalization will reduce average costs. Depending on how communities impose fish taxes, average costs could increase or decrease as a result.
Fishing Vessel Safety	CS-/S+	Yes, historical race for fish (see section3.9)	**Potential adverse contribution** - area closures in other fisheries may increase the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - the effects of other economic development opportunities on fishing vessel safety are minimal	**Not a contributing factor** - the effects of other revenue sources on fishing vessel safety are minimal	**Not a contributing factor** - the effects of climate change on fishing vessel safety are minimal	**CS-/S+** to the extent that additional area closures are implemented, vessels may have to fish farther from shore, thereby increasing safety risks. However, elimination of the race for fish will improve safety. Vessel safety remains a concern in all fisheries.

Table 4.9-8 (cont.). Cumulative effects analysis for catcher vessels: PPA.2.

Notes: A-R-S-O - Atka mackerel, rockfish, sablefish, and other groundfish
CV - catcher vessel
FGCV - fixed gear catcher vessel
FMP - fishery management plan
PPA - preliminary preferred alternative
TAC - total allowable catch

Table 4.9-9. Cumulative effects analysis for catcher processors: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may also impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** insignificant cumulative effects are expected. The large increase in TAC projected for Pacific cod will likely mitigate the reductions in other fisheries such as salmon and crab.

Table 4.9-9 9 (cont.). Cumulative effects analysis for catcher processors: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Not a contributing factor** - not expected to affect gross product value	**I** insignificant cumulative effects on gross product value are expected. Though product value has recently dropped in other fisheries, particularly salmon, slight increases projected under PPA.1 may offset this effect.

Table 4.9-9 (cont.). Cumulative effects analysis for catcher processors: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential beneficial/ adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/ adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish fishery employment	**Potential beneficial/ adverse contribution** - an increase or decrease in other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**I** cumulative effects on employment expected to increase although not significantly from the baseline

Table 4.9-9 (cont.). Cumulative effects analysis for catcher processors: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/ adverse contribution** - payments to labor in other fisheries and recent reductions in those fisheries may influence payments in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**I** cumulative effects on payments to labor expected to increase although not significantly from the baseline.
Product Quality and Product Utilization	CS+	Yes, history of the race for fish negatively affected product quality and utilization.	**Potential adverse/beneficial contribution -** area closures, or lack thereof, in other fisheries can affect groundfish quality by altering access to traditional fishing grounds	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**CS+** cumulative effects are conditionally beneficial because to the extent that a rights-based management regime is extended to other groundfish fisheries, product quality and utilization would increase

Table 4.9-9 (cont.). Cumulative effects analysis for catcher processors: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	CS+	Yes, history of excess capacity (see section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, thereby affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**CS+** cumulative effects are conditionally beneficial because to the extent that a rights-based management regime is extended to other groundfish fisheries, excess capacity would be reduced.
Average Costs	CS+	Yes, historical race for fish increased costs (see section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**CS+** cumulative effects are conditionally beneficial because to the extent that a rights-based management regime is extended to other groundfish fisheries, average costs would decline. Potential increases in fish taxes by communities may increase average costs.

Table 4.9-9 (cont.). Cumulative effects analysis for catcher processors: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Fishing Vessel Safety	CS+	Yes, historical race for fish (see section 3.9)	**Potential adverse contribution**- closures implemented in other fisheries could require vessels to travel farther to harvest fish, thereby increasing safety risks	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**CS+** cumulative effects are conditionally beneficial because to the extent that a rights-based management regime is extended to other groundfish fisheries, vessel safety would improve.

Notes: FMP - fishery management plan
PPA - preliminary preferred alternative

Table 4.9-10. Cumulative effects analysis for catcher processors: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group.	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential adverse or beneficial contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** overall, insignificant cumulative effects are expected. The increase in Pacific cod harvest may mitigate some of the reductions in other fisheries.

Table 4.9-10 9 (cont.). Cumulative effects analysis for catcher processors: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect ex-vessel value.	**Not a contributing factor** - not expected to affect gross product value	**I** insignificant cumulative effects on gross product value are expected. Though product value has recently dropped in other fisheries, particularly salmon, slight increases in groundfish value projected under PPA.2 may offset this effect.

Table 4.9-10 (cont.). Cumulative effects analysis for catcher processors: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand (see section 3.9)	**Potential beneficial/ adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/ adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish employment. Increased opportunities elsewhere may reduce competition for groundfish fishery employment	**Potential beneficial/ adverse contribution** - an increase or decrease in other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**I** cumulative effects are not expected to result in significant changes from the baseline as slight increases in employment may offset reductions in other fisheries.

Table 4.9-10 (cont.). Cumulative effects analysis for catcher processors: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/ adverse contribution** - payments to labor in other fisheries and recent reductions in those fisheries may influence payments in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**I** cumulative effects on payments to labor expected to increase although not significantly from the baseline
Product Quality and Product Utilization	CS+/S-	Yes, history of the race for fish negatively affected product quality.	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by altering access to traditional fishing grounds	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**CS-/S+** to the extent that additional area closures are implemented, product quality may decline. However, rights-based management would result in higher product quality and utilization.

Table 4.9-10 (cont.). Cumulative effects analysis for catcher processors: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S+	Yes, history of excess capacity (see section 3.9)	**Potential adverse or beneficial contribution** - an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S+** a rights-based management regime extended to other groundfish fisheries would significantly reduce excess capacity
Average Costs	CS+/S-	Yes, historical race for fish increased costs (see section 3.9)	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**CS-/S+** to the extent that additional area closures are implemented, average costs may increase. However, rationalization will reduce average costs. Depending on how communities impose fish taxes, average costs could increase or decrease as a result.

Table 4.9-10 (cont.). Cumulative effects analysis for catcher processors: PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Fishing Vessel Safety	CS+/S-	Yes, historical race for fish (see section 3.9)	**Potential adverse contribution** - area closures implemented in other fisheries may require vessels to travel farther to harvest fish, thereby increasing safety risks.	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**Not a contributing factor** - not expected to affect safety	**CS-/S+** to the extent that additional area closures are implemented, vessels may have to fish farther from shore, thereby increasing safety risks. However, elimination of the race for fish will improve safety. Vessel safety remains a concern in all fisheries.

Notes: FMP - fishery management plan
PPA - preliminary preferred alternative

Table 4.9-11. Cumulative effects analysis for inshore processors and motherships: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** current reductions in the salmon and crab fisheries are adversely affecting the fishing fleet. Those processors that rely on a mix of species are less sensitive to these reductions. The increases projected for Pacific cod are expected to mitigate some of these reductions. Therefore, insignificant cumulative effects are likely.

Table 4.9-11 (cont.). Cumulative effects analysis for inshore processors and motherships: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Not a contributing factor** - changes in climate are note expected to affect gross product value directly	**I** cumulative effects are not expected under PPA.1. Although there are currently reductions in other fisheries, the projected increase for harvest of some groundfish species is likely to offset this effect.

Table 4.9-11 (cont.). Cumulative effects analysis for inshore processors and motherships: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential beneficial/adverse contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**I** although there are currently reductions in other fisheries, the projected increases in some groundfish fisheries are likely to result in insignificant cumulative effects.

Table 4.9-11 (cont.). Cumulative effects analysis for inshore processors and motherships: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries may influence payments to labor in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**I** cumulative effects are not expected under PPA.1. Although an increase in payments to labor are projected, it is not significant.

Table 4.9-11 (cont.). Cumulative effects analysis for inshore processors and motherships: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Product Quality and Product Utilization	CS+	Yes, historical race for fish and increased demand for seafood (see section 3.9).	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality and utilization.	**Not a contributing factor** - not expected to affect product quality and utilization.	**Not a contributing factor** - not expected to affect product quality and utilization.	**CS+** although advancements in technology are improving product quality and utilization, conditionally significant beneficial cumulative effects are likely. Closures in other fisheries could hinder these improvements.
Excess Capacity	CS+	Yes, history of excess capacity (see section 3.9)	**Potential beneficial/adverse contribution**- an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**CS+** short term excess capacity may increase in the processing sector due to expanded use of rights-base management. However, a long-term reduction is predicted.

Table 4.9-11 (cont.). Cumulative effects analysis for inshore processors and motherships: PPA.1.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Average Costs	CS+	Yes, historical race for fish increased costs (see section 3.9).	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may increase average costs.	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**CS+** cumulative effects are expected depending upon the extent to which rights-based management is implemented and the likelihood of increases in municipal taxes.

Notes: FMP - fishery management plan
PPA - preliminary preferred alternative

Table 4.9-12. Cumulative effects analysis for inshore processors and motherships: PPA.2.

Direct Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Landings by Species Group	I/S+	Yes, increased global demand for seafood especially whitefish. Development of surimi in 1985 increased demand. (see section 3.9)	**Potential adverse contribution** - reliance on a mix of fisheries such as salmon, crab, and halibut may have an effect on groundfish landings by species group. The salmon fishery, in particular, has been declining in recent years. Bycatch of groundfish species in other fisheries may impact groundfish landings by species group.	**Not a contributing factor** -effects of other economic activities do not affect the number of groundfish landed	**Not a contributing factor** -effects of other sources of municipal and state revenue do not affect the number of groundfish landed	**Potential beneficial/adverse contribution** - warm trends favor fish recruitment whereas cool trends weaken fish recruitment	**I** insignificant cumulative effects are expected due to a projected increase in Pacific cod which will likely offset reductions in the salmon and crab fisheries.

Table 4.9-12 (cont.). Cumulative effects analysis for inshore processors and motherships: PPA.2.

Direct Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Groundfish Gross Product Value	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Not a contributing factor** - though other fisheries may influence groundfish gross product value, these effects are minimal	**Not a contributing factor** - not expected to affect gross product value	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may affect gross product value.	**Not a contributing factor** - changes in climate are note expected to affect gross product value directly	**I** although recent changes in revenue streams in Alaska villages may potentially reduce gross product value, it will be offset by the slight increase projected under PPA.2. Insignificant cumulative effects are likely.

Table 4.9-12 (cont.). Cumulative effects analysis for inshore processors and motherships: PPA.2.

Direct Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Employment	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - opportunities may increase or decrease in other fisheries depending on management. Reduced opportunities in other fisheries may result in a more competitive groundfish workforce. An increase in opportunities in other fisheries may open positions in the groundfish fishery.	**Potential beneficial/adverse contribution** - reduction in employment opportunities in other economic pursuits may result in higher competition for groundfish positions. Increased opportunities eliminate competition for groundfish fishery positions.	**Potential beneficial/adverse contribution** - an increase or decrease in the employment opportunities due to other sources of revenue may increase or decrease the employment pressure on the groundfish fishery	**Not a contributing factor** - climate change is not expected to affect opportunities in employment	**I** although an increase in employment is projected under PPA.2, this increase is not expected to be significant. Other employment opportunities are possible though not likely to be significant

Table 4.9-12 (cont.). Cumulative effects analysis for inshore processors and motherships: PPA.2.

Direct Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Payments to Labor	I	Yes, collapse of Atlantic cod increased demand thereby increasing value (see section 3.9)	**Potential beneficial/adverse contribution** - payments received in other fisheries may influence payments to labor in the groundfish fishery	**Not a contributing factor** - not expected to affect payment to labor	**Potential adverse contribution** - recent reductions in municipal revenue sharing, power cost equalization, and education funds have elevated the importance of fisheries revenue in rural Alaska communities. This may increase the likelihood of increases in fish taxes which may indirectly reduce payments to labor.	**Not a contributing factor** - not expected to affect payments to labor	**I** insignificant cumulative effects are expected under PPA.2. Although an increase in payments to labor are projected, reductions in other fisheries may offset this increase.
Product Quality and Product Utilization	CS+/S-	Yes, history of the race for fish negatively affected product quality.	**Potential adverse/beneficial contribution** - area closures, or lack thereof, in other fisheries can affect groundfish quality by either increasing or decreasing the distance vessels must travel to harvest and then deliver fish.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**Not a contributing factor** - not expected to affect product quality or utilization.	**CS-/S+** additional area closures, if implemented, would cause product quality to decline. However, rights-based management would result in higher product quality and utilization.

Table 4.9-12 (cont.). Cumulative effects analysis for inshore processors and motherships: PPA.2.

Direct Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects?	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Excess Capacity	S+	Yes, history of excess capacity (see section 3.9)	**Potential beneficial/adverse contribution**- an increase or decrease in the number of vessels permitted in other fisheries may affect the number of vessels entering the groundfish fishery	**Potential beneficial/adverse contribution** - the extent to which other economic development activities available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Potential beneficial/adverse contribution** - the extent to which other sources of revenue are available for the workforce, people may attempt to enter or exit the fishery, there by affecting capacity.	**Not a contributing factor** - not expected to affect excess capacity	**S+/S-** cumulative effects are beneficial as a result of a comprehensive rationalization program although a transition period between the race for fish and rights-based management may create excess capacity.
Average Costs	CS+/S-	Yes, historical race for fish increased costs (see section 3.9).	**Potential beneficial/adverse contribution**- associated or shared costs with participation in other fisheries may affect average costs in the groundfish fishery depending on the fixed and variable costs in those fisheries.	**Not a contributing factor -** not expected to affect average costs	**Not a contributing factor** - not expected to affect average costs	**Not a contributing factor** - although climate can affect fish populations, it is not expected to affect average costs	**CS+/S-** cumulative effects depend on the extent to which additional area closures are implemented and the constraints put on the transfer and consolidation of harvesting and processing rights in groundfish and non-groundfish fisheries.

Notes: FMP - fishery management plan
PPA - preliminary preferred alternative

Table 4.9-13. Direct and indirect effects summary for Alaska Peninsula and Aleutian Islands region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4		Preferred Alternative	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2	PPA.1	PPA.2
In Region Processing	I	S+	S+	I	I	S-	S-	I	I
Regionally Owned At-Sea Processors	I	I	I	I	I	I	S-	I	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	I	S+	I	I	I	S-	S-	I	I
In-Region Deliveries of Regionally Owned Catcher Vessels	I	I	I	I	S-	S-	S-	I	S-
Total Direct, Indirect, and Induced Labor Income and FTEs	I	S+	S+	I	I	S-	S-	I	I
Environmental Justice Impacts	I	I	I	I	CS-	S-	S-	I	CS-

Notes: CS- - conditionally significant adverse
FMP - fishery management plan
FTE - full-time employment
I - insignificant
PPA - preliminary preferred alternative
S- - significant adverse
S+ - significant beneficial

Table 4.9-14. Direct and indirect effects summary for Kodiak Island region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4		Preferred Alterantive	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2	PPA.1	PPA.2
In Region Processing	S+	S+	I	I	I	S-	S-	I	I
Regionally Owned At-Sea Processors	I	I	S+	I	I	S-	S-	S+	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	I	S+	S+	I	I	S-	S-	I	I
In-Region Deliveries of Regionally Owned Catcher Vessels	S+	S+	I	I	I	S-	S-	I	I
Total Direct, Indirect, and Induced Labor Income and FTEs	S+	S+	I	I	I	S-	S-	I	I
Environmental Justice Impacts	I	I	I	I	I	S-	S-	I	I

Notes: FMP - fishery management plan
FTE - full-time employment
I - insignificant
PPA - preliminary preferred alternative
S- - significant adverse
S+ - significant beneficial

Table 4.9-15. Direct and indirect effects summary for Southcentral Alaska region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4		Preferred Alternative	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2	PPA.1	PPA.2
In Region Processing	S+	S+	S+	S+	I	S-	S-	S+	I
Regionally Owned At-Sea Processors	I	S+	S+	S+	I	S-	S-	S+	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	S+	S+	I	S+	I	S-	S-	I	I
In-Region Deliveries of Regionally Owned Catcher Vessels	S+	S+	S+	S+	I	S-	S-	S+	I
Total Direct, Indirect, and Induced Labor Income and FTEs	S+	S+	S+	S+	I	S-	S-	S+	I
Environmental Justice Impacts	I	I	I	I	I	I	I	I	I

Notes: FMP - fishery management plan
FTE - full-time employment
I - insignificant
PPA - preliminary preferred alternative
S- - significant adverse
S+ - significant beneficial

Table 4.9-16. Direct and indirect effects summary for Southeast Alaska region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4		Preferred Alternative	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2	PPA.1	PPA.2
In Region Processing	I	S+	I	I	S-	S-	S-	I	S-
Regionally Owned At-Sea Processors	I	S-	S+	S+	I	S-	S-	S+	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	I	S+	S+	I	S-	S-	S-	I	S-
In-Region Deliveries of Regionally Owned Catcher Vessels	I	S+	I	I	S-	S-	S-	I	S-
Total Direct, Indirect, and Induced Labor Income and FTEs	I	I	I	I	S-	S-	S-	I	S-
Environmental Justice Impacts	I	I	I	I	I	I	I	I	I

Notes: FMP - fishery management plan
FTE - full-time employment
I - insignificant
PPA - preliminary preferred alternative
S- - significant adverse
S+ - significant beneficial

Table 4.9-17. Direct and indirect effects summary for Washington Inland Waters region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4		Preferred Alternative	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2	PPA.1	PPA.2
In Region Processing	I	I	I	I	I	I	S-	I	I
Regionally Owned At-Sea Processors	I	S+	S+	I	I	S-	S-	I	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	I	S+	S+	I	I	S-	S-	I	I
In-Region Deliveries of Regionally Owned Catcher Vessels	I	S+	S+	I	I	S-	S-	I	I
Total Direct, Indirect, and Induced Labor Income and FTEs	I	S+	S+	I	I	S-	S-	I	I
Environmental Justice Impacts	I	I	I	I	I	S-	S-	I	I

Notes: FMP - fishery management plan
FTE - full-time employment
I - insignificant
PPA - preliminary preferred alternative
S- - significant adverse
S+ - significant beneficial

Table 4.9-18. Direct and indirect effects summary for Oregon Coast region.

Direct/Indirect Effects of FMPs	FMP 1	Alternative 2		Alternative 3		Alternative 4		Preferred Alternative	
		FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2	PPA.1	PPA.2
In Region Processing	I	I	I	I	I	I	I	I	I
Regionally Owned At-Sea Processors	I	I	I	I	I	I	I	I	I
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	I	S+	S+	I	I	S-	S-	I	I
In-Region Deliveries of Regionally Owned Catcher Vessels	I	I	I	I	I	I	I	I	I
Total Direct, Indirect, and Induced Labor Income and FTEs	I	S+	S+	I	I	S-	S-	I	I
Environmental Justice Impacts	I	I	I	I	I	I	I	I	I

Notes: FMP - fishery management plan
FTE - full-time employment
I - insignificant
PPA - preliminary preferred alternative
S- - significant adverse
S+ - significant beneficial

Table 4.9-19. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: PPA.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Processing/ municipal revenue	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA, municipal reliance on revenue from fish tax	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - Direct/indirect effects are beneficial for Southcentral Alaska and insignificant for the other five regions. Trends in multi-species fisheries and other sources of municipal and state revenue result in adverse effects on in-region processing and municipal revenue. These effects offset each other and result in insignificant cumulative effects, except in portions of the Alaska Peninsula/ Aleutian Islands Region where external effects are likely result in conditionally significant adverse cumulative effects. Fishery rationalization will have cumulative effects in conjunction with other fisheries, but cannot be assessed at this time.

Table 4.9-19 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: PPA.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Regionally Owned At-sea Processors	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant** - Direct/indirect effects are beneficial for Kodiak Island, Southcentral Alaska, and Southeast Alaska; external effects will not contribute much to cumulative effects, given the size and diversity of the regional economies. Direct/ indirect effects are insignificant in the Alaska Peninsula/ Aleutian Islands and Washington Inland Waters, and Oregon Coast regions; external effects are adverse but are offset by direct/indirect effects.
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	**I**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - direct/indirect effects are insignificant for five of the six regions. In Southcentral Alaska, Washington Inland Waters, the Oregon Coast, and to a lesser extent Kodiak Island, potential adverse external effects are offset and cumulative effects are insignificant. Extra-regional deliveries decrease to the Alaska Peninsula/ Aleutian Islands and Southeast Alaska; adverse external effects related to other fisheries and revenue sharing results in a conditionally significant adverse cumulative effect for some communities within this region.

Table 4.9-19 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: PPA.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Deliveries of Regionally Owned Catcher Vessels	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** - the direct/indirect effects range from beneficial to mostly insignificant. In Southcentral Alaska, Washington Inland Waters, the Oregon Coast, and to a lesser extent Kodiak Island, potential adverse external effects are offset and cumulative effects are insignificant. Extra-regional deliveries decrease to the Alaska Peninsula/Aleutian Islands; adverse external effects related to other fisheries and revenue sharing results in a conditionally significant adverse cumulative effect for some communities within this region.

Table 4.9-19 (cont.). Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: PPA.1.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Total Direct, Indirect, and Induced Labor Income and FTEs	**I/S+**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Potential Adverse/ Beneficial Contribution**- Trends in other economic development activities, particularly state and municipal capital projects	**Potential Adverse Contribution -** decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Insignificant to Conditionally Significant Adverse** -Direct/indirect effects on labor income and employment are beneficial for Southcentral Alaska and insignificant for the other five regions. Within Southcentral Alaska, Washington Inland Waters, and Oregon Coast Regions, fisheries are a small part of the regional economies and effects are dwarfed by other trends. Adverse trends in other fisheries and reductions on municipal revenue, decrease regional labor income and employment benefits, particularly in the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska regions. Cumulative effects are generally insignificant in all regions, except for portions of the Alaska Peninsula/Aleutian Islands, where effects are conditionally significant adverse.

Notes: AFA - American Fisheries Act
FMP - fishery management plan
FTE - full-time equivalent
PPA - preliminary preferred alternative
TAC - total allowable catch

Table 4.9-20. Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Processing/ municipal revenue	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA, municipal reliance on revenue from fish tax	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Yes, Insignificant to Conditionally Significant Adverse** -Direct/indirect effects are insignificant for all regions except Southeast Alaska, which is significant adverse. Adverse external effects in other fisheries, economic development and state and municipal revenue will result in conditionally significant adverse cumulative effects for Southeast Alaska, and portions of Alaska Peninsula/Aleutian Islands. For Kodiak Island, Southcentral Alaska, the Washington Inland Waters and Oregon Coast regions, the relatively diversified economies and small contribution of groundfish result in insignificant cumulative effects.
Regionally Owned At-sea Processors	**I**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Potential Adverse Contribution**- decrease in other revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Yes, Insignificant** - direct/indirect effects are insignificant for all six regions. For Southcentral Alaska, the and the Washington Inland Waters regions, the relatively diversified economies and small contribution of groundfish result in insignificant cumulative effects. For the Alaska Peninsula/ Aleutian Islands and Kodiak Island; external effects are adverse but are offset by direct/indirect effects.

Table 4.9-20 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Extra-Regional Deliveries of Regionally Owned Catcher Vessels	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Yes, Insignificant to Conditionally Significant Adverse** - direct/indirect effects are insignificant for all regions except Southeast Alaska. Given the size and diversity of regional economies, in Southcentral Alaska, Washington Inland Waters, the Oregon Coast, and to a lesser extent Kodiak Island, potential adverse external effects are offset and cumulative effects are insignificant. Direct/indirect effects are adverse for the Alaska Peninsula/Aleutian Islands; adverse external effects related to other fisheries and revenue sharing results in a conditionally significant adverse cumulative effect for some communities within this region.

Table 4.9-20 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
In-Region Deliveries of Regionally Owned Catcher Vessels	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Not a contributing factor** -effects of other economic activities do not affect processing	**Not a contributing factor** -other revenue sources have no effect	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Yes, Insignificant to Conditionally Significant Adverse** - direct/indirect effects are insignificant for all regions except Alaska Peninsula/Aleutian Islands and Southeast Alaska, where effects are significant adverse. Given the size and diversity of regional economies, in Southcentral Alaska, Washington Inland Waters, the Oregon Coast, and to a lesser extent Kodiak Island, potential adverse external effects are offset and cumulative effects are insignificant. Direct/indirect effects are adverse for the Alaska Peninsula/Aleutian Islands and Southeast Alaska; adverse external effects related to other fisheries and revenue sharing results in a conditionally significant adverse cumulative effect for some communities within these regions.

Table 4.9-20 (cont.). **Cumulative effects analysis for Bering Sea and Aleutian Islands and Gulf of Alaska regions and communities: PPA.2.**

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect?
			Human Controlled Events				
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime Shift	
Total Direct, Indirect, and Induced Labor Income and FTEs	**I/S-**	**Yes** - inshore/ offshore processor allocations, AFA	**Potential Adverse/ Beneficial Contribution**- Trends in salmon, crab and halibut fisheries affect multi-species plant operations	**Potential Adverse/ Beneficial Contribution**- Trends in other economic development activities, particularly state and municipal capital projects	**Potential Adverse Contribution -** decrease in other state and municipal revenue sources	**Potential Adverse/ Beneficial Contribution**- fluctuations in fish stocks drive TACs, fishery closures, and decisions regarding when and where to participate in fisheries	**Yes, Insignificant to Conditionally Significant Adverse** - employment decreases in all is insignificant except in Southeast Alaska where effects are significant adverse. Within Southcentral Alaska, Washington Inland Waters, and Oregon Coast Regions, fisheries are a small part of the regional economies and effects are dwarfed by other trends. Adverse trends in other fisheries and reductions on municipal revenue, decrease regional labor income and employment benefits, particularly in the Alaska Peninsula/Aleutian Islands, Kodiak Island, and Southeast Alaska regions. Cumulative effects are generally insignificant in all regions, except for portions of the Alaska Peninsula/Aleutian Islands and Southeast Alaska Regions, where effects are conditionally significant adverse.

Notes: AFA - American Fisheries Act
FMP - fishery management plan
FTE - full-time equivalent
PPA - preliminary preferred alternative
TAC - total allowable catch

Table 4.9-21. Cumulative effects analysis for community development quota groups: PPA.1 and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal and State Revenue	Long-term Climate Changes and Regime Shift	
Allocations	I	Yes - The trend of increases in species and percent for which shares have been allocated to CDQs has increased their involvement in multi-species fisheries.	**Potential adverse or beneficial contribution -** many CDQs participate in multiple fisheries, including salmon, crab, federal groundfish, and halibut. The relative reliance of harvesters and processors on these fisheries varies on a regional basis and on the status of the individual stocks	**Potential adverse or beneficial contribution -** village infrastructure projects create employment and income opportunities for CDQ communities	**Potential adverse or beneficial contribution** - less revenue sharing from state and federal government, public funding of infrastructure, changes in fiscal policies are likely to affect CDQ communities	**Not a contributing factor** - fluctuations in groundfish stocks drive fishery opening and closures	**PPA.1, PPA.2 Insignificant** - no adverse direct/indirect effects on the CDQ program, and external factors related to salmon and crab fisheries and other revenue sources are adverse, but are cumulatively insignificant

Notes: CDQ - community development quota
FMP - fishery management plan
PPA - preliminary preferred alternative

Table 4.9-22. Cumulative effects analysis for subsistence: PPA.1 and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Subsistence use of groundfish	I/I	Yes - foreign JV, domestic, and State managed fisheries have decreased populations of some species	**Potential adverse contribution**- state managed groundfish fishery activity could impact subsistence groundfish fishing	**Not a contributing factor** - infrastructure development unlikely to affect groundfish stocks	**Not a contributing factor -**sport and personal use unlikely to adversely affect groundfish stocks	**Potential adverse or beneficial contribution -** fluctuations in groundfish stocks affect availability for subsistence	**PPA.1 and PPA.2 Insignificant** - adverse external effects are not enough to have significant impacts on subsistence
Subsistence use of salmon	I/I	Yes - reduced runs in western Alaska based on past natural events, domestic and foreign commercial fisheries and subsistence harvests	**Potential adverse contribution** - salmon intercept potentially has contributed to poor returns in western Alaska	**Potential adverse contribution** - infrastructure development could effect salmon spawning and rearing habitat	**Not a contributing factor** - sport and personal use is not expected to adversely affect the salmon population	**Potential adverse contribution** - long-term climate change could potentially effect at-sea salmon survival and reduce salmon runs	**PPA.1 and PPA.2 Insignificant** - adverse external effects are not enough to have significant impacts on subsistence
Subsistence use of Steller sea lions	I/I	Yes - long term decline in population from a combination of effect of commercial fisheries and natural factors	**Potential adverse contribution -** other commercial fisheries have contributed to competition for Steller sea lion prey	**Potential adverse contribution -** marine port and harbor development could potentially impact habitat and increase disturbance	**Not a contributing factor** - sport hunting of Steller sea lions is not permitted	**Potential adverse contribution** - long-term climate change could potentially effect recovery Steller populations	**PPA.1 and PPA.2 Insignificant** - adverse external effects are not enough to have significant impacts on subsistence

Table 4.9-22 (cont.). Cumulative effects analysis for subsistence: PPA.1 and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Sport and Personal use	Long-term Climate Change and Regime Shift	
Indirect subsistence impacts: income and joint production	I/I	Yes - commercial fishing provides platform for joint production and income to support subsistence	**Potential adverse or beneficial contribution -** income and joint production from other fisheries could affect indirect subsistence impacts	**Potential adverse or beneficial contribution -** income from other economic development activities could affect indirect subsistence impacts	**Not a contributing factor** - impacts to subsistence through sport and personal use is minimal	**Potential adverse or beneficial contribution -** affects on groundfish stocks and opportunity for joint production and income	**PPA.1 and PPA.2 Insignificant** - adverse external effects are not enough to have significant impacts on subsistence

Notes: FMP - fishery management plan
PPA - preliminary preferred alternative

Table 4.9-23. Cumulative effects analysis for environmental justice: PPA.1 and PPA.2.

Direct/ Indirect Effects of FMP(s)	FMP Rating	Persistent Past Effects	Reasonably Foreseeable Future External Effects				Cumulative Effect
			Human Controlled			Natural Events	
			Other Fisheries	Other Economic Development Activities	Other Sources of Municipal/ State Revenue	Long-term Climate Change and Regime	
Environmental Justice	I/CS-	Yes - Fisheries Resource Landing tax increased revenues to communities, MSA amendments and CDQ program established, commercial fishing source of employment and income in Native Alaskan communities.	**Potential adverse or beneficial contribution**- changes in other fisheries could impact Environmental Justice issues	**Potential adverse or beneficial contribution**- infrastructure development trends, effects of other economic activities	**Potential Adverse Contribution**- decrease in other state and municipal revenue sources	**Potential adverse or beneficial contribution-** fluctuations in fish stocks affect availability for Alaska Native subsistence use	**PPA.1 Insignificant** - -*Direct/indirect effects* include increased availability for income through subsistence pursuits participation and employment opportunities for Alaska Natives in the fishery (except for Alaska Peninsula/Aleutian Islands); reductions in revenues to local communities in the Alaska Peninsula/Aleutian Islands; effects from by-catch of salmon and Steller sea lion subsistence activities are beneficial - *External effects* on community revenue and joint production from the crab closures and downturn in the salmon industry are adverse, but not of a magnitude to be significant -*Cumulative effects* are insignificant **PPA.2** - **Insignificant to Conditionally Significant Adverse** -*Direct/indirect effects* include beneficial effects from by-catch of salmon and Steller sea lion subsistence activities; income and joint production activities related to subsistence in the Alaska Peninsula/Aleutian Islands region are adverse; reductions in value and employment for Alaska Peninsula/Aleutian Island catcher vessels are conditionally significant adverse . -*External effects* from the crab closures and downturn in the salmon industry and reductions in employment funded by public revenue, and reductions in revenue to Native communities are adverse, and conditionally significant adverse in the Alaska Peninsula/Aleutian Islands,

Notes: CDQ - community development quota
FMP - fishery management plan
MSA - Magnson-Stevens Fishery Conservation Management Act
PPA - preliminary preferred alternative

Table 4.9-24. Cumulative effects analysis for market channels and benefits to U.S. consumers: PPA.1 and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects		Cumulative Effect
			Human Controlled	Natural Events	
			Other Fisheries	Long-term Climate Changes and Regime Shift	
Benefits to U.S. consumers	I	Alaska Seafood Marketing Institute product promotion activities Research and Public awareness of health benefits of seafood consumption Aquaculture development increases overall demand for seafood, but products (e.g., farmed catfish) may compete with groundfish products Changes in processing technology increased seafood quality	**Potential adverse/beneficial contribution** - other fisheries are providing relatively stable levels of seafood products to domestic and foreign markets; supply of fish products that may be influenced by competition in markets, over fishing foreign fisheries, and increased domestic consumption	**Potential adverse/beneficial contribution** - fluctuations in groundfish stocks may potentially affect availability for market channels	**Insignificant** - wholesale groundfish product value in conjunction with products from other fisheries is not expected to change benefits to U.S. consumers

Notes: FMP - fishery management plan
PPA - preliminary preferred alternative

Table 4.9-25. Cumulative effects analysis for the value of the Bering Sea and Gulf of Alaska marine ecosystems (including non-consumptive and non-use benefits): PPA.1 and PPA.2.

Direct/Indirect Effects of FMP(s)	FMP Rating	Persistent Past Influence	Reasonably Foreseeable Future External Effects		Cumulative Effect
			Human Controlled	Natural Events	
			Other Fisheries	Long-term Climate Changes and Regime Shift	
Benefits derived from marine ecosystems and associated species (Including non-consumptive and non-use benefits)	I, S+	Increased public awareness of marine ecosystems (e.g., BSAI and GOA marine ecosystems) and associated endangered species (e.g., Steller sea lions) Increased participation in recreational fishing and eco-tourism activities Lawsuits challenging NOAA Fisheries for failing to meet the requirements of the Endangered Species Act in its management of Alaska groundfish fisheries	**Potential adverse contribution** - fishing levels in other domestic and foreign fisheries may be affecting the productivity of the marine ecosystem	**Potential adverse beneficial contribution** - fluctuations in groundfish stocks may potentially affect ecosystems and associated species	**PPA.1 Insignificant** - Under PPA.1 the change in the level of benefits groundfish fishery ecosystems provide is not expected to be significant. **PPA.2 Conditionally Significant Beneficial** - Under PPA.2 the establishment of additional area closure; comprehensive rationalization of all fisheries; potential to provide increased protection, reduction in bycatch, and depletions of fish stocks and the associated negative impacts on marine mammals and other species could have beneficial impacts on groundfish fishery ecosystems.

Notes: BSAI - Bering Sea and Aleutian Islands
FMP - fishery management plan
GOA - Gulf of Alaska
NOAA Fisheries - National Marine Fisheries Service
PPA - preliminary preferred alternative

Table 4.9-26. Ecosystem direct/indirect and cumulative effects significance ratings under PPA.1 and PPA.2.

Direct/Indirect Effects	Effect	Ecosystem	
		1	2
Change in Pelagic Forage Availability	**DI**	I	I
	CE	CS-	CS-
Spatial and Temporal Concentration of Fishery Impact on Forage	**DI**	I	CS+, I
	CE	CS-	I
Removal of Top Predators	**DI**	I, U	I, U
	CE	CS-	CS-
Introduction of Non-native Species	**DI**	I	I
	CE	CS-	CS-
Energy Removal	**DI**	I	I
	CE	I	I
Energy Redirection	**DI**	I	I
	CE	I	I
Change in Species Diversity	**DI**	I, U	I, U
	CE	CS-	CS-
Change in Functional (trophic) Diversity	**DI**	I	I
	CE	CS-	CS-
Change in Functional (structural habitat) Diversity	**DI**	I	S+
	CE	CS-	CS+
Change in Genetic Diversity	**DI**	I, U	I, U
	CE	I	I

Notes: 1 - PPA.1
2 - PPA.2
CE - cumulative effect
CS- - conditionally significant adverse
CS+ - conditionally significant beneficial
DI - direct/indirect effect
I - insignificant
PPA - preliminary preferred alternative
S- - significant adverse
S+ - significant beneficial
U - unknown
Please refer to Table 4.1-7 for the ecosystem significance criteria.

Table 4.10-1 Elements of the analytical framework that are exclusively dealt with in the FMP component qualitative assessment papers.

FMP Component Qualitative Assessment Paper	Analytical Framework Elements Discussed Exclusively in the Qualitative Assessment Papers
TAC-setting Process	• description of the current harvest strategy • discussion of the impacts of TAC management measures under the alternatives • discussion of F_{40} review recommendations • implications of incorporating ecosystem considerations in the TAC-setting process
Spatial and Temporal Management of TAC	• discussion of potential objectives and criteria that could be used to allocate TAC in space and time • implications of distributing TAC on smaller spatial scales
MPAs and EFH	• discussion of goals, objectives and criteria that could be used to develop an MPA program methodology
Steller Sea Lion Measures	• discussion of management measures that could modify or extend the 2002 Steller sea lion closures based on newly available data
Bycatch and Incidental Catch Restrictions	• discussion of incentive programs for incidental catch and bycatch reduction
Seabird Measures	• discussion of impacts of seabird protection measures • discussion of USFWS consultation and cooperation for ESA-listed and other seabird protection measures
Gear Restrictions and Allocations	• implications of repealing closure areas • implications of restricting fishing to areas of historic concentration
Overcapacity	• range and implications of management measures that can be used to deal with overcapacity (including IFQs, cooperatives, and vessel and effort-based limitation programs)
Alaska Native Issues	• implications of incorporating traditional knowledge into fishery management • discussion of measures to increase participation and consultation
Observer Program	• implications of repealing the observer program • implications of changing the level of observer coverage over the alternatives • implications of addressing the conflict of interest in the funding mechanism • implications of developing uncertainty estimates other efforts to improve observer data
Data and Reporting Requirements	• description of current catch accounting and reporting requirements • implications of expanding the collection and verification of economic data • implications of changing VMS or at-sea scales requirements

Notes: EFH - essential fish habitat
ESA - Endangered Species Act
IFQ - individual fishing quota
MPA - marine protected area
TAC - total allowable catch
VMS - vessel monitoring system

Table 4.10-2a. Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Target Species							
35 target species groups (stocks or stock complexes) were analyzed; 32 are considered here and 3 (BSAI squid, BSAI Other species, GOA Other species) are considered in the Squid and Other species table 17 of the stocks or stock complexes have age-structured models and are analyzed in Tiers 1-3; 14 are managed in Tiers 4-5; and 1 is managed in Tier 6 (for further detail on the tier system, see Appendix F-1) Stocks in Tiers 1-3: EBS and GOA Walleye Pollock, BSAI and GOA Pacific cod, BSAI/GOA sablefish, BSAI Atka mackerel, BSAI yellowfin sole, BSAI rock sole, BSAI flathead sole, BSAI and GOA arrowtooth flounder, BSAI Greenland turbot, BSAI Alaska plaice, BSAI and GOA Pacific ocean perch, GOA thornyhead rockfish, GOA northern rockfish Stocks in Tiers 4-6: GOA Atka mackerel, GOA shallow water flatfish complex, GOA deep water flatfish complex, BSAI other flatfish, GOA rex sole, BSAI northern rockfish, BSAI and GOA shortraker/ rougheye rockfish, BS and AI Other rockfish, GOA Other slope rockfish, GOA pelagic shelf						
Mortality	The intent of this FMP is not to allow overfishing for any of the groundfish target species Overfishing is not expected to occur for 33 out of 32 stocks or stock complexes, and cannot be determined for GOA Atka mackerel as the biomass is not known; this fishery is purposely managed as a small bycatch fishery The BSAI OY cap and PSC caps are constraints to the expansion of the fishery 'Unknown's in mortality indicate Tier 6 species	With the exception of demersal shelf rockfish, overfishing is not expected to occur under this alternative; management of stocks does not allow the fishing mortality rate to exceed the OFL Catch is expected to increase for most species under Alternative 2		As with FMP 1, overfishing is not expected to occur under this alternative; management of stocks does not allow the fishing mortality rate to exceed the OFL		As with FMP 1, overfishing is not expected to occur under this alternative; management of stocks does not allow the fishing mortality rate to exceed the OFL Catch is expected to decrease for most species under Alternative 4	
		A general caveat for FMP 2.1 is that this harvest policy imposes a more aggressive harvest policy during periods of poor recruitment and associated declines in spawning biomass. The harvest policy was not successful in maintaining stocks above the MSST. The risk of inadvertantly overfishing is greater because the buffer between OFL and ABC has been deleted Relaxing the OY cap by setting the cap at the sum of OFLs, and PSC caps, will allow an increase in fishing mortality	Fishing mortality will expand as a result of setting the OY cap at the sum of ABCs PSC caps remain a constraint to expansion of the fishery	Catch is expected to be similar to FMP 1 for most species The BSAI OY cap and PSC caps are constraints to the expansion of the fishery Breaking sharks and skates out from the 'other species' management category was not modeled, but if implemented may act as a constraint on the fisheries	Catch is expected to be less than FMP 1 due to conservative harvest strategy that replace the OY cap The uncertainty correction factor, F_{60} for rockfish, and PSC caps are constraints to the expansion of the fishery	More conservative harvest strategy for SSL prey species and rockfish Reduced bycatch and PSC are constraints on fishing mortality Setting ABCs for species managed in complexes at the lowest single species ABC would constrain fishing mortality	Catch is reduced to zero for all species

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Biomass	17 of the stocks or stock complexes are not overfished or approaching being overfished; the remainder are unknown For 17 stocks, current levels of spawning biomass will tend towards levels that maintain the ability of the stock to sustain itself above the MSST 'Unknown's indicate no MSSTs (Tier 4,5,6 stocks)	With the exception of demersal shelf rockfish, Tier 4, 5, 6 stocks remain unknown		For all 17 age-structured stocks whose biomass is known, the comparison of the impacts to the baseline case is similar to that in FMP 1 Tier 4, 5, 6 stocks remain unknown		For most age-structured stocks whose biomass is known, the comparison of the impacts to the baseline case is similar to that in FMP 1 Tier 4, 5, 6 stocks remain unknown	
		Under this example FMP, stocks are expected to tend toward biomass levels at or near B_{MSY}. In the next 5 years, 6 stocks are expected to fall below their MSSTs because the condition of the stock in 2002 would not be capable of sustaining the stock above the MSST if harvest levels were increased to F_{MSY} or the proxy thereof. The impacts of FMP 2.1 on demersal shelf rockfish are significant adverse a general caveat for FMP 2.1 is that this harvest policy imposes a more aggressive harvest policy during periods of poor recruitment and associated declines in spawning biomass. The harvest policy was not successful in maintaining stocks above the MSST. The risk of inadvertantly overfishing is greater because the buffer between OFL and ABC has been deleted Relaxing the OY cap by setting the cap at the sum of OFLs, and PSC caps, will allow an increase in fishing mortality	The biomass of all 17 age-structured stocks remains at or above MSST, and the comparison of the impacts to the baseline case is similar to that in FMP 1 The impacts of FMP 2.2 on demersal shelf rockfish are conditionally significant adverse expansion of the fishery	Catch is expected to be similar to FMP 1 for most species The BSAI OY cap and PSC caps are constraints to the expansion of the fishery Breaking sharks and skates out from the 'other species' management category was not modeled, but if implemented may act as a constraint on the fisheries	Catch is expected to be less than FMP 1 due to conservative harvest strategy that replace the OY cap The uncertainty correction factor, F60 for rockfish, and PSC caps are constraints to the expansion of the fishery	BSAI Pacific cod, BSAI Atka mackerel, BSAI POP have a significant increase in biomass	EBS pollock, BSAI and GOA Pacific cod, BSAI Atka mackerel, BSAI POP have a significant increase in biomass

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Spatial/ Temporal Concentration of Catch, Prey Availability, Habitat Suitability	Time and area restrictions on harvest reduce potential for problems due to spatial or temporal concentration of catch for most stocks None of the age-structured (Tiers 1-3) stocks had a detectable trend in growth that can be attributed to fishing effects on prey species None of the age-structured stocks had a detectable trend in growth or reproduction that can be attributed to fishing effects on habitat • gear allocations and trawl restrictions reduce trawl impacts on habitat • 'Unknown's indicate stocks in Tiers 4, 5 and 6 where these stocks lack and MSST and/or knowledge of life history parameters • rockfish species managed in Tier 3 are sustainable under this harvest strategy	The difference in time, area and gear restrictions in Alternative 2 causes different impacts to spatial and temporal concentration of catch, prey availability and changes to habitat Stocks or stock complexes in Tiers 4, 5 and 6 remain unknown due to lack of MSST and/or life history parameters		For all age-structured stocks, the comparison of the impacts to the baseline case is similar to that in FMP 1 Time and area restrictions on harvest (under FMP 3.1, the same as FMP 1; restrictions are extended under FMP 3.2) help to diffuse impacts of spatial and temporal concentration of catch Stocks or stock complexes in Tiers 4, 5 and 6 remain unknown due to lack of MSST and/or life history parameters		For most age-structured stocks, the comparison of the impacts to the baseline case is similar to that in FMP 1 For Alternative 4, impacts on spatial/temporal concentration of catch is expected to be significantly beneficial for BSAI Atka mackerel and BSAI POP Stocks or stock complexes in Tiers 4, 5 and 6 remain unknown due to lack of MSST and/or life history parameters	
		The impacts of trawling in regions that have previously been closed are unknown For Atka mackerel and Pacific cod, it is unknown whether the spatial/ temporal concentration of catch and the change in habitat would affect the ability of the stocks to maintain themselves at or above MSST For sablefish, the spatial/ temporal concentration is not affecting the ability of the stock to maintain itself at or above MSST, but the change in habitat effect is unknown For EBS pollock, the spatial/ temporal concentration of catch is still restricted due to SSL protection measures; habitat impacts are considered insignificant as pollock occupy pelagic habitats For Greenland turbot, spatial/ temporal concentration of catch would not affect genetic diversity or reproductive success, and impacts on habitat suitability are expected to be insignificant For demersal shelf rockfish, the impact of spatial/ temporal concentration of catch on genetic diversity and reproductive success, and the impacts on habitat suitability, are expected to be conditionally significant adverse	For age-structured stocks whose biomass remains at or above MSST, the comparison of the impacts to the baseline case is similar to that in FMP 1				

Prohibited Species

All species within this category are managed by other agencies (federal management is deferred); directed fishery management plans incorporate bycatch mortality from the groundfish fisheries
PSC limits exist for halibut in the GOA and halibut, herring, salmon and crab in the BSAI; PSC limits are apportioned by area, gear type, and season
Herring limits are variable based on biomass; halibut limits are stair-stepped; crab limits are variable based on biomass with upper and lower caps; salmon limits incorporate fixed caps
EXTERNALS:
Allocation implications of groundfish bycatch mortality on directed commercial fisheries are discussed in the Socioeconomic section
Halibut, salmon, herring and crab stocks are all affected by state commercial, recreational (for salmon in the GOA) and subsistence fisheries
Herring stocks are more vulnerable to marine pollution as they are nearshore spawners; lingering effects from EVOS in the GOA may still exist
State hatchery programs exist for salmon stocks in the GOA; land management practices may impact freshwater spawning habitat for salmon
Some crab stocks in the BSAI are overfished; rebuilding plans are either in effect or under development for St. Matthew and Pribilof Islands blue king crab, and BSAI opilio tanner crab stocks
All prohibited species stocks are potentially affected by regime shifts, however the directional impact cannot be predicted

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Pacific Halibut Stock Levels	If changes to the baseline condition of the stock occur, quotas set by the IPHC for the directed fishery will be adjusted accordingly and account for all removals of halibut by other fisheries. Harvest practices under this FMP are expected to have insignificant impacts on prey availability and reproductive success of halibut.	At the Alternative 2 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1		At the Alternative 3 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1		At the Alternative 4 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1	
		FMP 2.1 repeals the Observer Program for non-AFA fisheries, which would result in an absence of data with which to account for groundfish fishery removals In the long-term (beyond the 5-year scope of this analysis), unregulated discards of halibut may affect stock levels					
Pacific Salmon or Steelhead Trout Stock Levels	Projected groundfish bycatch removals under this FMP are not expected to significantly impact salmon stocks when compared to the baseline condition. However, some Pacific salmon stocks are currently depressed. Reproductive/recruitment success and stock composition are unknown. Potential competition for prey with groundfish fisheries and changes to genetic structure of salmon populations are unknown due to lack of bycatch and stock composition data. No direct interaction between groundfish fisheries and freshwater salmon spawning habitat occurs.	Reproductive success of BSAI salmon stocks may be adversely impacted by potential increases in bycatch of adult salmon under this alternative. Potential effects on GOA stocks are unknown.		At the Alternative 3 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1		Projected decreases in groundfish bycatch under this FMP may have conditionally significant beneficial impacts on BSAI and GOA salmon stocks. Although bycatch is expected to decrease under this FMP, potential population-level effects of this decrease cannot be determined. Reproductive success of BSAI salmon stocks may benefit from projected decreases in bycatch of adult salmon under this FMP by allowing for a greater number of spawning adults to reach destined spawning grounds. Potential effects on GOA stocks are unknown.	Elimination of groundfish bycatch under this FMP may benefit BSAI and GOA salmon stocks due to their currently depressed status and lack of recovery shown to date. However, the magnitude of this effect cannot be determined. Beneficial effects of this FMP on reproductive success of BSAI salmon stocks are considered conditionally significant by allowing for a greater number of spawning adults to reach destined spawning grounds. Potential effects on GOA stocks are unknown.
		Projected groundfish bycatch under this FMP may have conditionally significant adverse impacts on BSAI and GOA salmon stocks due to their currently depressed status and the lack of recovery shown to date.	Projected groundfish bycatch under this FMP may have conditionally significant adverse impacts on BSAI salmon stocks due to their currently depressed status and lack of recovery shown to date. Potential effects on GOA stocks are insignificant based on minimal projected increases in bycatch that would result from this FMP.				
Pacific Herring Stock Levels	Groundfish bycatch removals are expected to have insignificant impacts on mortality and reproductive success of herring. Harvest practices are expected to have insignificant impacts on prey availability for herring. Changes to herring habitat due to groundfish fishery management are insignificant; lingering contamination from EVOS in the GOA on certain herring habitat exists, but effects are unknown.	At the Alternative 2 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1		At the Alternative 3 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1		At the Alternative 4 stock and harvest levels, there would be no population-level effect on sustainability, and effects would be similar to those described under FMP 1	

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Crab Stock Levels (opilio Tanner, other Tanner, red, blue and golden king)	Effects on mortality and biomass of GOA red king crab stocks and all BSAI crab stocks (except golden king) are insignificant when compared to current baseline condition. Potential effects on BSAI golden king crab stocks and GOA crab stocks (other than red king crab) are unknown although some of these stocks are currently considered depressed. Changes to BSAI and GOA crab habitat due to groundfish fishery management are insignificant. It is inferred that current crab management and rebuilding plans are mitigating past habitat disruption and providing protection for crab stocks. Potential impacts of harvest practices on crab prey availability are unknown due to lack of information on prey composition; potential effects on reproductive success of BSAI and GOA crab stocks are unknown.	Effects of FMP 2.1 on mortality and biomass of GOA crab stocks (except golden and blue king) and BSAI crab stocks (except golden king) are considered significantly adverse to the sustainability of these stocks. Potential effects on BSAI and GOA golden king crab stocks and GOA blue king crab stocks are unknown although they are considered generally depressed. Removal of current trawl closures and protection areas for crab habitat under this FMP may have adverse implications on many GOA and BSAI crab stocks; the possible adverse effects to habitat could indirectly affect the reproductive success of crab stocks by negatively impacting EFH.	FMP 2.2 is considered to have a conditionally significant adverse effect on mortality and biomass of bairdi Tanner, opilio Tanner, red king, and blue king crab stocks in BSAI given the potential for increased bycatch of these species combined with the apparent lack of recovery for these stocks to date; effects on mortality and biomass of BSAI and GOA golden king crab as current stock status is unknown due to lack of survey information. Potential impacts on crab habitat are insignificant, and effects on reproductive success are unknown.	Although bycatch of crab could decrease under this alternative, and additional protection measures to crab habitat could assist a possible recovery of depressed stocks, these changes are not expected to significantly affect BSAI crab at the population level. Effects on reproductive success of BSAI and GOA crab stocks are unknown.		Alternative 4 has conditionally significant beneficial effects on bairdi Tanner, opilio Tanner, red king, and blue king crab stocks in BSAI as the decrease in bycatch of crab, and potential for additional protection to crab habitat, may result in possible recovery of depressed stocks. However, the rating is conditional as no signs of recovery for these stocks have yet been seen under current management and rebuilding plans. Potential effects of Alternative 4 on GOA stocks cannot be determined. Effects on reproductive success of BSAI and GOA crab stocks are unknown.	
Squid and Other Species							
BSAI manages squid, and 'Other species' categories (latter includes skates, sharks, sculpin and octopi); GOA manages 'Other species' category that includes squid, skates, sharks, sculpin and octopi In BSAI, managed in Tier 6; in GOA, 5% of the sum of all of the groundfish ABCs = 'other species' TAC EXTERNAL: Human-controlled and climatic effects may impact the 'other species' complex, but current stock status is unknown so potential effects cannot be determined.							
	No comparative baseline exists and potential impacts/changes to stock sustainability are unknown.	No comparative baseline exists and impacts of Alternative 2, as with FMP 1, are unable to be determined.		No comparative baseline exists and impacts of Alternative 3, as with FMP 1, are unable to be determined.		No comparative baseline exists and impacts of Alternative 4, as with FMP 1, are unable to be determined.	
Forage Fish Species							
Management category that includes Osmeridae, Myctophidae, Bathylagidae, Ammodytidae, Trichodontidae, Pholidae, Stichaeidae, Gonostomatidae, and Euphausiacae Special management where not allowed to keep more than 2% of the landed catch EXTERNAL: Forage fish are more likely to be sensitive to marine pollution as they utilize inshore areas for spawning or foraging that are likely to be more impacted by oil spills than other areas All stocks are potentially affected by a regime shifts, however the directional impact cannot be predicted							
	Insignificant fishing mortality because the level of catch is very small Fishery independent surveys for forage fish have not been implemented therefore biomass estimates remain uncertain, however preliminary estimates for ecosystem models suggest that standing stocks of forage fish are stable No comparative baseline exists to determine prey availability, habitat suitability and spatial temporal catch distribution impacts	Removes the ban on a directed forage fish fishery; if a fishery were to be developed, for biological and economic reasons, the most likely forage species group to be exploited would be the smelts (Osmeridae). A directed fishery for smelt would likely result in a negative impact on forage fish populations; however on the large scale, due to economic factors, it is unlikely that a fishery with enough intensity would be able to developed sufficiently to reduce forage fish populations to below a sustainable level. It is possible that a fishery could create localized forage fish depletions that could place competitive stress on predator populations.	The comparison of impacts to the baseline case is similar to FMP 1	The comparison of impacts to the baseline case is similar to FMP 1		The comparison of impacts to the baseline case is similar to FMP 1	

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Non-Specified Species							
Management category consists of many species. This document only analyzes impacts to grenadiers; grenadiers make up the largest proportion of non-specified species bycatch. Although coral species are included in the non-specified species management category, impacts are summarized under the EFH section of this document. EXTERNAL: Human-controlled and climatic effects may impact non-specified species, but current stock status is unknown so potential effects cannot be determined.							
	No comparative baseline exists and potential impacts/changes to stock sustainability are unknown.	No comparative baseline exists and potential impacts of Alternative 2, as with FMP 1, are unknown.		No comparative baseline exists and potential impacts of Alternative 3, as with FMP 1, are unknown.		No comparative baseline exists and potential impacts of Alternative 4, as with FMP 1, are unknown.	
Habitat							
Careful placement of closures is needed for habitat to benefit: majority of closures in lightly fished/unfished areas to avoid and minimize future impacts; minimal small closures within heavily fished areas primarily to provide impact diversity and determine closure mitigation efficacy, and to reduce the changes of unintended consequences The potential effects of the groundfish fisheries used to compare the alternatives were the mortality of and damage to living habitat, changes to benthic community diversity, and changes to the geographic diversity of impacts and protection. Specific impacts are very difficult to predict. Evaluation of effects requires detailed information on the distribution and abundance of habitat types, the life history of living habitat, habitat recovery rates, and the natural disturbance regime. This information is generally incomplete. Qualitative judgements as to the significance of effects were made after considering information on 1) bycatch of living habitat derived from the multi-species projection model; 2) the results of a habitat impacts model for estimates of the equilibrium levels of living habitat in fishable and currently fished areas; 3) estimates of the amount of area by habitat type and geographic zone closed year round to bottom trawling for all species; and 4) evaluation of the spatial distribution of bottom trawl closures relative to fishing intensity and habitat types. This analysis does not include impacts of the alternatives on non-living habitat.							
Direct Mortality of Benthic Organisms: Impact to Habitat Features	BS: Insignificant relative to the baseline; conditionally significant adverse when cumulative impacts are considered because of historical impacts coupled with large areas of intense fishing being fished at rate to potentially reduce bioshelter habitat to low % of unfished level. AI: Insignificant relative to the baseline, cumulatively, conditionally signficant adverse because of historical impacts and coral habitat may still be decreasing to low equilibrium level. GOA: Insignificant relative to the baseline, conditionally signficant adverse when cumulative impacts are considered because of historical impacts coupled with areas of intense fishing being fished at rate to potentially reduce bioshelter habitat to low % of unfished level.	BS: Significant adverse, opens up currently unfished habitat and increases effort as necessary to take increased TACs AI: Significant adverse, increases effort necessary to take increased TACs GOA: Significant adverse, opens up currently unfished habitat and increases effort as necessary to take increased TACs.	BS: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered AI: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered GOA: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered	BS: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered AI: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered GOA: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered	BS: Insignificant / Conditionally Significant Beneficial, closed areas are lightly fished, not much effort diverted, one would expect only slight decrease in impact from this closure distribution. Reduction in ABCs may provide benefit. AI: Significant Beneficial, closures often bisect fishing concentrations which is good strategy; reduction in ABCs, due to F60% and implementation of uncertainty correction, should provide benefit. GOA: Significant Adverse / Insignificant, many closures encompass high fishing concentrations, resulting in much higher effort in current lightly fished areas. Reduction in ABCs may not compensate for probable increase in effort/catch. Cumulative for BS, AI, GOA: Could be significantly improved with strategically placed, smaller closures that mitigate historical impacts, resulting in conditionally significant beneficial cumulative effects. However, could be conditionally significant adverse if closure areas are not adequate to protect most sensitive areas.	BS: Significant Beneficial, closure of an entire major fishing area, requiring displacement of effort to take catch from low density, lightly impacted area. Reduction in TAC and restrictions to trawling likely to compensate. AI: Signficant Beneficial, high proportion, most of the region is closed. GOA: Significant Beneficial, most of the region closed, however, all heavily fished areas are closed and effort transferred to lightly fished areas. Reduction in TAC and restrictions to trawling likely to compensate. Cumulative for BS, AI, GOA: Could be significantly improved with strategically placed, smaller closures that mitigate historical impacts, resulting in conditionally significant beneficial cumulative effects. However, could be conditionally significant adverse if closure areas are not adequate to protect most sensitive areas.	BS, AI, GOA: Significant Beneficial, benthic organisms will begin to increase in abundance toward the unfished equilibrium from their baseline levels. Returning to equilibrium levels may take an extremely long time for species like tree corals. Could be significantly improved with strategically placed, smaller closures that mitigate historical impacts, resulting in conditionally significant beneficial cumulative effects. However, could be conditionally significant adverse if closure areas are not adequate to protect most sensitive areas.

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Benthic Community Structure: Benthic Community Diversity	BS, AI, GOA: Insignificant change relative to baseline; conditionally significant adverse, when historical fishing considered along with continued fishing at FMP 1 levels. Closure areas are mostly in one habitat type.	BS: Significant Adverse, lack of closure areas and increased effort would reduce diversity. AI: Significant Adverse, increased impact from increased effort would decrease diversity. GOA: Significant Adverse, lack of closure areas and increased effort would reduce diversity.	BS, AI, GOA: Insignificant change relative to baseline; conditionally significant adverse, when historical fishing considered along with continued fishing at FMP 1 levels. Closure areas are mostly in one habitat type.	BS, AI, GOA: Insignificant change relative to baseline; conditionally significant adverse, when historical fishing considered along with continued fishing at FMP 1 levels. Closure areas are mostly in one habitat type.	BS: Conditionally Significant Beneficial, may be some gain in diversity by closing lightly fished areas and effort reduction due to any reduction in catch. AI: Significant Beneficial GOA: Insignificant, transferring impact from already heavily impacted area to lightly impacted area may not provide gain in overall diversity.	BS, AI, GOA: Significant Beneficial. Benthic community may progress toward unfished level and composition. Some species may recover extremely slowly or not all, depending on life history requirements. Could be significantly improved with strategically placed, smaller closures that mitigate historical impacts, resulting in conditionally significant beneficial cumulative effects. However, could be conditionally significant adverse if closure areas are not adequate to protect most sensitive areas.Benthic Community Structure: Geographic Diversity of Impacts and ProtectionBS: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. AI: Insignificant relative to baseline; when cumulative impacts considered, conditionally significant adverse as very little closure area, restricted to small radius around SSL habitat haulouts. GOA: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. BS: Conditionally Significant / Significant Adverse; baseline closure area, with boundary that abuts an area of intermediate fishing intensity and provides some diversity of impact, is eliminated in 2.1. AI: Insignificant, baseline has no closed area boundaries to eliminate. GOA: Conditionally Significant/ Significant Adverse, baseline closure area, with boundary that abuts an area of intermediate fishing intensity and provides some diversity of impact, is eliminated in 2.1.BS: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. AI: Insignificant relative to baseline, when cumulative impacts considered, conditionally significant adverse as very little closure area, restricted to small radius around SSL habitat haulouts. GOA: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. BS: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. AI: Insignificant relative to baseline, when cumulative impacts considered, conditionally significant adverse as very little closure area, restricted to small radius around SSL habitat haulouts. GOA: Insignificant relative to baseline, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. BS: Significant Beneficial, one closure boundary bisects a high F concentration providing diversity. Could be significantly improved with smaller closure areas strategically located. AI: Significant Beneficial, some closure areas bisect high F clusters. Closures placed somewhat randomly along the AI. GOA: Insignificant, closures encompass habitat units and high F clusters, leaving little contrast or diversity in impact levels within habitat. Could be significantly improved with smaller closure areas strategically located. Cumulative for BS, AI, GOA: Could be significantly improved with strategically placed, smaller closures that mitigate historical impacts, resulting in conditionally significant beneficial cumulative effects. However, could be conditionally significant adverse if closure areas are not adequate to protect most sensitive areas.BS:	

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Seabirds							
The potential effects of the groundfish fishery that were used to compare the alternatives included incidental take in fishing gear and vessel strikes, changes in prey availability and offal, and changes in benthic habitat that affect the food web Significance criteria were based on whether the proposed action would be likely to result in population level effects, which are defined as changes in the population trend outside the range of natural fluctuations. Although the number of individual seabirds that would be expected to be taken under the FMPs varies considerably, this difference may not be discernible by looking at a shared rating. Except for the supplemental food provided by the fisheries in the form of offal, the effects of the fisheries are all considered adverse to individual birds. Low levels of incidental take are better for conservation purposes than high levels of take, but no amount of incidental take can be considered beneficial to a seabird population. The significance ratings for incidental take are therefore only insignificant or adverse. EXTERNAL: Potential effects that are the result of vessel traffic rather than fishing effort, such as oil spills, plastic pollution, and introduction of nest predators Similar effects from other U.S. and foreign fisheries, subsistence and commercial harvests Pollution from marine and terrestrial sources, conservation efforts for particular species and seabirds in general, and natural events such as climate and oceanographic fluctuations							
Incidental Take	Incidental take of surface-feeding seabirds substantially reduced from baseline levels due to new mitigation measures on longline fleet.	Incidental take of seabirds on longline gear likely to remain near baseline levels due retention of existing avoidance regulations and similar longline effort under both FMP bookends. Incidental take from trawls expected to vary from substantial to moderate increases above baseline levels in proportion to increased trawl effort under the different bookends.		Incidental take of albatross, fulmars, shearwaters, and gulls substantially reduced from baseline levels due to new mitigation measures on longline fleet. New mitigation measures for trawl fleet likely to reduce collisions with trawl third wires.		Incidental take of albatross, fulmars, shearwaters, and gulls greatly reduced from baseline levels due to new mitigation measures on longline fleet and greatly reduced fishing effort. New mitigation measures for trawl fleet and greatly reduced fishing effort likely to substantially reduce collisions with trawl third wires.	
Risk to ESA-listed Species	Risk of exceeding ESA threshold for mortality of short-tailed albatross reduced from baseline level.	Risk of exceeding ESA threshold for mortality of short-tailed albatross increased above baseline level under both bookends.		Risk of exceeding ESA threshold for mortality of short-tailed albatross reduced from baseline level due to longline and trawl mitigation measures.		Risk of exceeding ESA threshold for mortality of short-tailed albatross greatly reduced from baseline level due to longline and trawl mitigation measures and reduced fishing effort.	
Population-level Effects	Groundfish fishery not expected to have population level effects on any species through mortality, changes in food availability, or benthic habitat.	Potential effects on northern fulmars range from colony level effects through increased mortality around the Pribilof Islands to less serious effects, similar to the baseline. Potential effects on piscivorous species, including species of management concern, range from substantial to minimal, depending on the development of a directed forage fish fishery and increases in trawl effort.		Groundfish fishery not expected to have population level effects on any species through mortality, changes in food availability, or benthic habitat.		Groundfish fishery not expected to have population level effects on any species through mortality, changes in food availability, or benthic habitat.	
Cumulative Effects	Conditionally significant adverse for short-tailed albatross through mortality, with a potential catastrophic contribution from volcanic eruptions on Torishima Island Significant adverse for Laysan and black-footed albatross through mortality, mostly in foreign longline fisheries Conditionally significant adverse for both shearwaters through mortality, with major contributions from harvest on breeding grounds in southern hemisphere Conditionally significant adverse for red-legged kittiwakes because of concentrated population distribution and declining population on Pribilof colony. Mechanisms for decline under investigation. Significant adverse for marbled and Kittlitz's murrelets because of substantial population declines with major contributions of mortality from coastal net fisheries Insignificant for all other species through mortality, prey availability, and benthic habitat						

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Marine Mammals							
Marine mammal species groups were aggregated in this comparison table to combine marine mammal species which are consumers of groundfish (with the exception of the western stock of SSL which was separated from this group) and marine mammal species that do not consume groundfish of commercial size as a primary component of their diet as the effects are similar within the alternatives for all of the species included in each of these categories. Species in the groundfish consuming category include the eastern stock of SSL, harbor seals, and northern fur seals. Species groups in the non-groundfish consuming category include transient killer whales, other pinnipeds, other toothed whales, and sea otters. As defined here, "effects" refers to effects expected to occur at the population level.							
Western stock of SSL: Incidental Take/ Entanglement in Marine Debris	The groundfish fishery does not result in increased levels of incidental takes such that population level effects would occur and is determined to be insignificant to the western stock of SSL. Cumulatively, significant adverse population level effects are expected on western SSL due to additional external effects including subsistence harvest, takes in state and other fisheries, and marine pollution. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock of Steller sea lion recovery and survival in the wild.	No change from effects described under FMP 1		No change from effects described under FMP 1		No change from effects described under FMP 1	
Western stock of SSL: Spatial/ Temporal Concentration	The groundfish fishery is determined to be insignificant to SSL under this FMP scenario. Cumulatively, significant adverse population level effects are expected on western SSL due to additional external effects including state and other fisheries, harvest of prey in the past, and marine pollution. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock of Steller sea lion recovery and survival in the wild. Dispersion of the fisheries over time and space have been retained under this FMP; additional effects to marine mammals that consume groundfish are not expected under this FMP Cumulatively, with past and external effects, significant adverse effects on SSL may still occur due to state and other fisheries. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock of Steller sea lion recovery and survival in the wild.	The groundfish fishery will result in significant adverse population level effects due to increased catch of all key groundfish prey species (EBS and GOA pollock, BSAI and GOA Pacific cod, and AI Atka mackerel)dispersing the fisheries over time and space have been retained under this FMP; however other area closures are repealed and significant adverse effects to this species may occur due to these changes, especially when past and external effects of state and other fisheries are considered	The groundfish fishery will have conditionally significant adverse effects on SSL due to increased catch of EBS pollock, BSAI Pacific cod, and AI Atka mackerel. Considering past and external effects on the prey field, such as state and other fisheries, and past harvest of prey, significant adverse effects on SSL are expected	No change from effects described under FMP 1		The groundfish fishery will result in significant beneficial population level effects on SSL due to decreased catch of EBS and GOA pollock, BSAI and GOA Pacific cod, and AI Atka mackerel. Cumulatively, this FMP may result in significant beneficial population level effects on SSL due to the overall improvement in the prey field which may occur under this regime.	No change from effects described under FMP 1 for Steller sea lion stocks

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Western stock of SSL: Disturbance	This groundfish fishery is insignificant in regarding disturbance of SSL	This groundfish fishery is expected to result in conditionally significant effects if disturbance increases due to opening new areas and increasing TAC	No change from effects described under FMP 1	No change from effects described under FMP 1		No change from effects described under FMP 1	
Groundfish Consumers: Incidental Take/ Entanglement in Marine Debris	The groundfish fishery does not result in increased levels of incidental take such that population level effects would occur and is determined to be insignificant to marine mammals. Cumulatively, conditionally significant adverse effects are expected for northern fur seals and harbor seals due to their past and present population declines; effects on the eastern stock of SSL will be insignificant	No change from effects described under FMP 1		No change from effects described under FMP 1		No change from effects described under FMP 1	
Groundfish Consumers: Harvest of Prey Species	The groundfish fishery is determined to be insignificant to these marine mammals under this FMP scenario. Cumulatively, significant adverse population level effects are expected on northern fur seals and harbor seals due to their past and present population declines and additional external effects from state and other fisheries, past harvest of prey, and marine pollution.	The groundfish fishery will result in significant adverse population level effects due to increased catch of all key groundfish prey species (EBS and GOA pollock, BSAI and GOA Pacific cod, and AI Atka Mackerel)	The groundfish fishery will have conditionally significant adverse effects on these marine mammal species due to increased catch of EBS pollock, BSAI Pacific cod, and AI Atka mackerel. Considering past and external effects on the prey field, such as state and other fisheries, and their past and present population declines, conditionally significant adverse effects on northern fur seals and harbor seals are expected; cumulatively, these effects are determined to be insignificant for the eastern stock of SSL	No change from effects described under FMP 1		The groundfish fishery will result in significant beneficial population level effects on these marine mammal species due to decreased catch of EBS and GOA pollock, BSAI and GOA Pacific cod, and AI Atka mackerel Cumulatively, this FMP may result in significant beneficial population level effects on these marine mammal species due to the overall improvement in the prey field which may occur under this regime.	The groundfish fishery is expected to result in conditionally significant beneficial effects on fur and harbor seals as catch of these key prey species is eliminated (at least in the short term); the effect is conditional due to the uncertainty of the dependance of northern fur seals on the size class of pollock harvested in the groundfish fishery
Groundfish Consumers: Spatial/ Temporal Concentration	Steller sea lion protective measures disperse the fisheries over time and space and have been retained under this FMP; these protective measures provide benefits to other marine mammals that consume groundfish; the groundfish fishery is expected to be insignificant to species in this category With past and external effects, significant adverse effects may still occur to northern fur seals and harbor seals due to their past and present population declines although effects are expected to be insignificant to the eastern stock of SSL	Measures to decrease competition between SSL and fisheries by dispersing the fisheries over time and space have been retained under this FMP; however other area closures are repealed and adverse effects to these species may occur due to these changes, especially when past and external effects are considered	No change from effects described under FMP 1	No change from effects described under FMP 1	Measures to decrease competition between SSL and fisheries by dispersing the fisheries over time and space have been retained under this FMP; additional benefits to marine mammals that consume groundfish may occur due to closures out to 15nm and designation of MPAs under this FMP even when past and external effects are taken into account; although no change is expected for the eastern stock of SSL	Under this FMP spatial and temporal protective measures are substantially increased in addition to Steller sea lion protective measures; therefore, significant beneficial effects are expected when considering this FMP and past and external effects	This FMP eliminates spatial and temporal competition between marine mammal species and fisheries at least in the short term; over the long term, fisheries would not be permitted until they could be shown to be inconsequential to marine mammal species in this group, thus this FMP is expected to result in significant beneficial effects in regards to spatial and temporal concentration
Groundfish Consumers: Disturbance	This groundfish fishery is insignificant regarding disturbance to these marine mammal species	This groundfish fishery is expected to result in conditionally significant adverse effects if disturbance increases due to opening new areas and increasing TAC	No change from effects described under FMP 1	No change from effects described under FMP 1		No change from effects described under FMP 1	

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Non-groundfish Consumers: Incidental Take/ Entanglement in Marine Debris	The groundfish fishery under this FMP does not result in increased levels of incidental take such that population level effects would occur and is determined to be insignificant to marine mammals. Cumulatively, the effect of incidental take and entanglement was determined to be insignificant for almost all species within this group. For some species in the 'other pinniped' group, spotted, ringed, bearded and ribbon seal, conditionally significant adverse effects could occur due to high subsistence harvest level without an accurate population size for these species. For sea otters and endangered whales, conditionally significant adverse effects could occur due to recent declines or endangered status. Groundfish fisheries' contribution to any of these cumulative effects is very low.	No change from effects described under FMP 1		No change from effects described under FMP 1		No change from effects described under FMP 1	
Non-groundfish Consumers: Harvest of Prey Species	The groundfish fishery is determined to be insignificant to these marine mammals for prey availability under this FMP. Cumulatively, effect on availability of prey is insignificant at the population level for all of these species primarily due to limited prey overlap with species caught by the groundfish fisheries.	No change from effects described under FMP 1		No change from effects described under FMP 1		No change from effects described under FMP 1	
Non-groundfish Consumers: Spatial/ Temporal Concentration	Steller sea lion protection measures disperse the fisheries over time and space and have been retained under this FMP; these protective measures provide benefits to other marine mammals; the groundfish fishery is expected to be insignificant to species in this category Cumulatively, the spatial and temporal concentration of the groundfish fisheries under the FMP is found to be insignificant for all species in this group.	No change from effects described under FMP 1		No change from effects described under FMP 1		No change from effects described under FMP 1	Closure of the fishery in the short-term would provide benefits to marine mammals The impact of the groundfish fishery is expected to be insignificant to species in this group Cumulatively, the spatial and temporal concentration of the groundfish fisheries under the FMP is found to be insignificant for all species in this group.

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Non-groundfish Consumers: Disturbance	This impacts of disturbance by the groundfish fishery of these marine mammal species is insignificant Cumulatively, disturbance is found to be insignificant for all species in this group as there is no change from the baseline level of disturbance.	The groundfish fishery under this FMP is expected to result in conditionally significant adverse effects on all species in this group except sea otters, if disturbance increases due to opening new areas and increasing harvest levels Cumulatively, disturbance is found to be conditionally significant adverse for all species in this group, resulting in potential population level effects. This is conditional on the actual location and timing of new disturbance.	No change from effects described under FMP 1	No change from effects described under FMP 1		No change from effects described under FMP 1	
Socioecomonics							
Assessment of socioeconomic impacts considers important factors including: Impacts on harvesting and processing sectors, including 1) CVs, 2) CPs, and 3) inshore processors and motherships; using catches of all groundfish species, groundfish ex-vessel value and product value, groundfish employment and payments to labor, excess capacity, product quality, product utilization rates, average costs, and fishing vessels safety as variables Impacts of groundfish alternatives on other non-groundfish directed commercial fisheries, such as halibut, salmon, crab and herring Regional impacts, on 6 regions (AKAPAI, AKKO, AKSC, AKSE, ORCO, WAIW), using processing, harvesting, payments to labor, and employment variables CDQ-related impacts, including changes to the CDQ program and changes to the CDQ species TACs Subsistence-related impacts on groundfish, Steller sea lion and salmon subsistence, as well as opportunities for practicing subsistence Environmental justice impacts resulting from changes in fishing activity, or impacts to the CDQ program or subsistence Impacts on consumer benefits (U.S. consumers of groundfish products) Impacts on benefits from marine ecosystems (other than those benefits related to commercial groundfish fisheries) including non-market (existence value and option value, etc.) and other uses of the ecosystem such as recreational fishing or tourism						
Significance Thresholds: In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. The same threshold is roughly used to assess changes in qualitative indicators (e.g., fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgment of the socioeconomic analysts.							

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Harvesting and Processing Sectors: Catch, value, employment and income	Under FMP 1, projected changes in groundfish harvests are insignificant, except Pacific cod, sablefish and rockfish catch increases significantly due to a TAC increase Changes in total groundfish ex-vessel value, product value, employment, and payments to labor are insignificant The total ex-vessel value of groundfish landed by CVs and the total groundfish product value of CPs and inshore processors/ motherships are expected to increase but not significantly. Increased Pacific cod harvests by smaller trawl CVs and pot CVs account for much of the increase in groundfish ex-vessel value Increased Pacific cod harvests by head-and-gut trawl CPs, longline CPs and pot CPs account for much of the increase in product value for CPs Increased deliveries of Pacific cod to BS pollock, AKAPAI and AKKO shore plants, and floating inshore processors, account for much of the increase in groundfish product value for inshore processors	Under FMP 2.1, the higher TACs and elimination of PSC limits cause harvests of all groundfish species to increase significantly.	Under FMP 2.2, the higher TACs cause harvests of pollock and Pacific cod to increase significantly, but catches of flatfish and the A-R-S-O complex as a whole will not change significantly.	Under FMP 3.1, projected changes in groundfish harvests are insignificant, except Pacific cod, sablefish and rockfish catch increases significantly due to a TAC increase.	Under FMP 3.2, Pacific cod catch increases significantly due to a TAC increase and catches of sablefish and rockfish decrease significantly because of a more conservative TAC.	Under FMP 4.1, the lower TACs cause harvests of groundfish species to decrease significantly, except catches of flatfish are not expected to change significantly. The decreases lead to significant decreases in total groundfish ex-vessel value, product value, employment, and payments to labor. Decreases in ex-vessel value are significant for all classes of CVs. Decreases in product value are significant for all classes of CPs, inshore processors and motherships.	Under FMP 4.2 while vessels and processing facilities across and within various classes differ in their dependence on groundfish fisheries, the suspension of the groundfish fisheries is expected to have a significant negative effect on the average vessel and plant in all classes in terms of catches of all groundfish species, groundfish ex-vessel value and product value, groundfish employment and payments to labor.
		These increases lead to significant increases in total groundfish ex-vessel value, product value, employment, and payments to labor. Increases in ex-vessel value are significant for all classes of CVs. Increased pollock harvests by the three classes of AFA-eligible trawl CVs account for much of the increase in groundfish ex-vessel value. Increases in product value are significant for all classes of CPs, inshore processors and motherships. Increased harvests of pollock by surimi trawl CPs and fillet trawl CPs account for much of the increase in product value for CPs, while increased deliveries of pollock and Pacific cod to BS pollock shore plants account for much of the increase in product value for inshore processors.		Changes in total groundfish ex-vessel value, product value, employment, and payments to labor are insignificant. The total ex-vessel value of groundfish landed by CVs and the total groundfish product value of CPs and inshore processors/motherships are expected to increase but not significantly. Increased Pacific cod harvests by smaller trawl CVs and pot CVs account for much of the increase in groundfish ex-vessel value. Increased Pacific cod harvests by head-and-gut trawl CPs, longline CPs and pot CPs account for much of the increase in product value for CPs. Increased deliveries of Pacific cod to BS pollock, AKAPAI and AKKO shore plants, and floating inshore processors, account for much of the increase in groundfish product value for inshore processors.			
					Longline vessels are expected to experience a significant reduction in ex-vessel value due to the decrease in the catch of sablefish and rockfish. Decreased deliveries of rockfish and sablefish will have a significant negative impact on the product value of AKSE and AKSC shore plants.		
Harvesting and Processing Sectors: Excess capacity, product quality and utilization, costs, vessel safety	FMP 1 is expected to result in insignificant changes in product quality, product utilization rates, excess capacity, average costs, and fishing vessel safety for all harvesting and processing sectors.	The repeal of overcapacity measures is expected to result in significantly higher excess capacity and higher average costs in the harvesting sector, but excess capacity and average costs are expected to be significantly lower for inshore processors as a result of increased throughput. Elimination of area closures could result in a significant improvement in fishing vessel safety, while intensification of the race for fish could result in a significant reduction in vessel safety. Changes in product quality and product utilization rates are expected to be insignificant, except the quality of sablefish may be adversely affected by the resumption of the race for fish.	FMP 2.2 is expected to result in insignificant changes in product quality, product utilization rates, excess capacity, average costs, and fishing vessel safety for all harvesting and processing sectors, except excess capacity and average costs are expected to be significantly lower for inshore processors as a result of increased throughput.	FMP 3.1 is expected to result in a conditionally significant increase in product quality, product utilization rates and fishing vessel safety and a conditionally significant decrease in excess capacity and average costs for all harvesting and processing sectors, depending on the extent to which additional fisheries are rationalized.	As the result of comprehensive rationalization of the fisheries, FMP 3.2 is expected to result in a significant decrease in excess capacity in the harvesting and processing sectors. Rationalization is expected to result in a significant increase in product quality and a significant decrease in average costs and increase in fishing vessel safety, while the additional area closures are predicted to result in a significant decrease in product quality and a significant increase in average costs and decrease in fishing vessel safety	The reduced TACs are expected to result in a significant increase in excess capacity and average costs. The expanded area closures are expected to result in a significant increase in average costs and reduction in fishing vessel safety. As the result of the area closures, product quality for CPs is expected to experience a conditionally significant decrease, while product quality for inshore processors is expected to experience a significant decrease. In contrast, FMP 4.1 is expected to result in a conditionally significant increase in product utilization rates as a result of the extension of IR/IU regulations to all target fisheries.	Under FMP 4.2, the suspension of the groundfish fisheries is expected to have a significant negative effect on the average vessel and plant in all classes in terms of excess capacity, product quality, product utilization rates, and average costs. In the absence of the groundfish fisheries, fishing vessel safety is expected to significantly improve.

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Effects on Other Commercial Fisheries (halibut, salmon, crab, and herring)	Effects on prohibited species harvested in other commercial fisheries (salmon, crab, and herring) are expected to be insignificant, resulting in insignificant cumulative effects on these commercial fisheries.	The repeal of bycatch restrictions, coupled with elimination of observers and a more aggressive fishing policy, is likely to result in significant increases in catch of prohibited species. Increased halibut bycatch could result in a decrease in commercial halibut catch of up to 20%. Increases in bycatch of herring and crab would adversely effect those commercial fisheries. In the case of salmon, significant increases in salmon bycatch would contribute to the continued suspension of commercial salmon fishing in western Alaska, and could adversely effect commercial fishing for Chinook salmon in the GOA.	PSC limits are the same as FMP 1, and cumulative effects on Prohibited Species harvested in other commercial fisheries (salmon, crab, and herring) are expected to be insignificant	Reductions in bycatch of prohibited species by 10%, while not having a significant effect on status those stocks, would have some beneficial effects on availability to the commercial halibut fishery. Cumulative effects of reduced bycatch on salmon, herring, and commercial fisheries are expected to be insignificant.	Reductions in bycatch of prohibited species by 10 to 30%, while not having a significant effect on status those stocks, would have some beneficial effects on availability to the commercial halibut fishery. Cumulative effects of reduced bycatch on salmon, herring, and commercial fisheries are expected to be insignificant.	Reductions in bycatch of prohibited species by 50%, while not having a significant effect on status those stocks, would have beneficial effects on their availability to other commercial fisheries. Halibut available to commercial harvest could increase by up to 5%. The reduction in bycatch of salmon would not likely contribute enough to re-establish western Alaska commercial fisheries, but would make additional catch available to GOA commercial fisheries. Additional herring would be available to commercial fishing but would be considered insignificant. Based on other external factors that affect the status of crab stocks and availability for commercial fishing in is uncertain whether more crab would become available for commercial fishing.	Suspension of the groundfish fishery would temporarily eliminate PSC. Current halibut bycatch would be potentially available to commercial harvest, representing up to 10% of the current catch. Elimination of salmon bycatch by itself would not likely contribute enough to re-establish western Alaska commercial fisheries, but would make additional catch available to GOA commercial fisheries. Additional herring would be available to commercial fishing but would be considered insignificant. Based on other external factors that affect the status of crab stocks and availability for commercial fishing in is uncertain whether more crab would become available for commercial fishing.
Regional Impacts	Under FMP 1, impacts to most sectors in most regions are insignificant, for the reasons outlined under harvesting and processing sectors. Exceptions are seen for in-region processing in the AKKO region, in-region deliveries for the AKKO and AKSC owned harvest fleets, extra-region deliveries for the AKSC-owned harvest fleet, and total direct, indirect, and induced labor income and FTEs in the AKKO and AKSC regions.	Under FMP 2.1, no significant negative impacts are experienced by any sector in any region, except for regionally owned at-sea processors for the AKSE region (and this is a relatively small sector). With the exception of the AKSE region (where impacts are insignificant), all regions experience significant positive impacts in total direct, indirect, and induced labor income and FTEs. In-region processing volume and value increases significantly for all Alaska regions. All regions experience significant positive benefits for extra-region CV deliveries, as do all regions for in-region deliveries, except for the AKAPAI and the ORCO regions (where the change is insignificant).	Under FMP 2.2, no significant negative impacts are experienced by any sector in any region. All regions experience significant benefits to total direct, indirect, and induced labor income and FTEs, except for the AKKO and AKSE regions, where the change is insignificant. In-region processing does not experience significant change, except in the AKAPAI region and the AKKO region, where significant beneficial impacts are seen. Regionally owned at-sea processors would experience significant positive benefits in the AKKO, AKSC, and AKSE regions, and change would be insignificant in the other regions. CV extra-regional deliveries would be significant and beneficial for all regions except for the AKAPAI and AKSC regions. In-region deliveries do not change significantly in any region except for AKSC and the WAIW region, where the change is beneficial and significant.	Under FMP 3.1, change is insignificant for all harvester, processor, income, and employment variables in all regions, with the following exceptions: in the AKSC region, change in all variables listed is beneficial and significant, and in the AKSE region, impacts to regionally owned at-sea processors is beneficial and significant (although this is a small sector). • Impacts to coastal Alaska communities, particularly in the AKAPAI and AKKO regions, resulting from consolidation (for direct fishery sectors) and other changes accompanying the change from a race-for-fish to a rationalized fishery (especially for support service sectors) would be conditionally significant. This would be driven by yet-to-be-designed consolidation restrictions and community protection features of the alternative.	Under FMP 3.2, for all regions except AKAPAI and AKSE, change is insignificant for all processor, harvester, income, and employment variables. Within the AKAPAI region, in-region deliveries by regionally owned CVs decline significantly, but this is a small sector. In the AKSE region, change to regionally owned at-sea processors is insignificant, but in-region processing, extra- and in-region CV deliveries, and total direct, indirect, and induced labor income and FTEs all decline significantly from baseline conditions. • Additionally, Alaska coastal communities with small vessel fleets would experience conditionally significant impacts from the expansion of MPA set-asides; level of impact would be conditional based on the efficacy of features designed to respect traditional fishing grounds and maintain open area access for coastal communities.	Under FMP 4.1, for all regions outside of the ORCO region, significant negative impacts would be experienced in all processing, vessel, labor income, and employment categories, except for regionally owned at-sea processors in the AKAPAI region, and in-region processing in the WAIW region (and in both of these exceptions the sectors are very small).	Under FMP 4.2, except for the ORCO region, all regions experience significant negative impacts for all processing, harvesting, payments to labor, and employment variables. In the ORCO region, significant negative impacts are experienced in extra region deliveries by regionally owned CVs, as well as in total direct, indirect, and included labor income and FTEs; all other variables for the ORCO region have extremely low (or zero) baseline values and do not change significantly under this FMP.

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
CDQ Program	Under FMP 1, CDQ quota increases as a percentage of TAC, resulting in a beneficial impact to the program and region.	Under Alternative 2, the multi-species CDQ program may be repealed resulting in adverse impacts, but the CDQ program would benefit from expanded pollock TAC. Net effect is unknown.		Under Alternative 3, the CDQ program would continue to operate as it does under base case conditions and no significant impacts are foreseen.		Under Alternative 4, steep declines in the fishery would result in significant negative impacts to the CDQ program and region.	
Subsistence	FMP 1 is predicted to have no significant effects on the level of benefits from subsistence use of groundfish or SSL. Impacts on subsistence salmon fisheries are predicted to be insignificant, as are indirect impacts to subsistence (income and joint production opportunities).	Under FMP 2.1, no significant changes to subsistence use of groundfish are predicted. Increased TAC and changes in protection measures would have an unknown impact on subsistence use of SSL. Increased bycatch would have an unknown impact on subsistence salmon fisheries. Increased CV activity may increase indirect subsistence activity, but impacts are not predicted to be significant.	Under FMP 2.2, no significant changes to subsistence use of groundfish are predicted. Increased TAC combined with retention of Steller sea lion protection measures would likely have an insignificant impact on subsistence use of SSL. Bycatch measures are expected to result in no significant impacts subsistence salmon fisheries. Increased CV activity may increase indirect subsistence activity, but impacts are not predicted to be significant.	Under FMPs 3.1 and 3.2, no significant changes to the subsistence use of groundfish or SSL are predicted. Salmon bycatch would likely be decreased but the impacts of this reduction on subsistence salmon fishing are unknown. CV activity increases are not predicted to result in significant beneficial impacts to indirect subsistence opportunities.		Under FMP 4.1, steep declines in the commercial groundfish fishery would have unknown impacts on the subsistence groundfish fishery. Steller sea lion populations may benefit from pelagic forage availability, but impacts to Steller subsistence use is unknown. Impact of reduced salmon bycatch on subsistence salmon fisheries is unknown. Reduction of CV activity is expected to result in significant negative impacts to indirect subsistence opportunities (both joint production and income).	Effects are similar to those described for FMP 4.1, although potential increased benefits to Steller sea lion populations may result in additional benefits to Steller sea lion subsistence use. This impact, however, is not predicted to be significant.
Environmental Justice Issues	Under FMP 1, no significant environmental justice impacts are predicted from changes in fishery activity in any of the regions, nor are any adverse changes anticipated to the CDQ program or subsistence activities that would result in environmental justice impacts.	Under FMP 2.1, no significant environmental justice impacts are predicted from changes in direct fishery activity in any of the regions. While impacts to the CDQ program and subsistence activities are unknown to a degree, it is not considered likely that these changes would rise to the level of disproportionate high and adverse impacts that would trigger environmental justice concerns. No environmental justice concerns associated with subsistence activities are predicted.		Under FMP 3.1, no significant environmental justice impacts are predicted from changes in direct fishery activity in any of the regions. No environmental justice concerns associated with either the CDQ program or subsistence activities are predicted.	Under FMP 3.2, environmental justice impacts to the CV fleet in the AKAPAI region would be conditionally significant depending upon the specific design of MPA and rationalization features of this FMP. No other changes in direct fishery sector activity are predicted to result in environmental justice impacts due to the demographics of the specific sectors. No environmental justice concerns associated with either the CDQ program or subsistence activities are predicted.	Under FMP 4.1, significant environmental justice issues would result from declines in the fishery. These would be seen in Alaska Native communities in the AKAPAI region through loss of revenues and fishing related activities. CV and processor related loss of employment and income would be an environmental justice issue in this region, as would processor related loss of employment and income in the AKKO and WAIW regions, if not elsewhere. Impacts to the CDQ program and region would be environmental justice impacts. Indirect impacts to subsistence activities would also be considered environmental justice impacts.	
Consumer Benefits	Under FMP 1, changes in benefits to U.S. consumers of groundfish products would be insignificant.	Effects as described in FMP 1		Effects as described in FMP 1		Effects as described in FMP 1	FMP 4.2 would have a conditionally significant negative effect on benefits to U.S. consumers of groundfish products due to the possible decrease in the supply of these products.
Benefits from Marine Ecosystems (other than those benefits related to commercial groundfish fisheries)	FMP 1 is predicted to have no significant effects relative to the comparative baseline on the level of benefits the BS and GOA marine ecosystems and associated species provide.	FMP 2.1 is predicted to have a significant negative impact on the levels of many of the benefits these ecosystems and associated species generate.	FMP 2.2 is predicted to have a conditionally significant negative impact on the levels of some of the benefits these ecosystems and associated species generate. FMP 2.1 is predicted to have a significant negative impact on the levels of many of the benefits these ecosystems and associated species generate.	Effects as described in FMP 1	FMP 3.2 is predicted to significantly increase the levels of some of the benefits these marine ecosystems and associated species provide relative to the comparative baseline.	FMP 4.1 is predicted to significantly increase the levels of some of the benefits these marine ecosystems and associated species provide relative to the comparative baseline.	FMP 4.2 is predicted to significantly increase the levels of some of the benefits these marine ecosystems and associated species provide relative to the comparative baseline.

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Ecosystem							
Assessment of ecosystem impacts considers important factors influencing: Predator/prey relationships: 1) pelagic forage availability because pelagic forage form the central part of BSAI and GOA food webs, channeling energy from the bottom of the food web to the many species at the top that rely on pelagic forage, 2) spatial/temporal concentration of fishery removals of forage have the potential to affect top predators such as marine mammals and seabirds that make feeding forays from land, 3) Top predators receive energy from lower trophic levels and provide energy storage and stabilization effects on marine food webs, their removal may increase variability and instability in the ecosystem. Energy removal and re-direction by fisheries could affect total ecosystem production levels and characteristics that influence energy cycling. Diversity of various ecosystem characteristics such as species diversity, functional diversity, and genetic diversity helps maintain stability in ecosystem functioning and provide a kind of ecological "insurance" to protect ecosystem functioning.						
Significance Thresholds for ecosystem effects relate fishing induced changes that are sufficient to bring any population below minimum biologically acceptable limits (MSSTs for target species, status listing of others) or to prevent a population that is already below a limit from recovering. Some ecosystem level thresholds are defined as changes in system level characteristics that are outside the range of natural variability. In cases where thresholds cannot be defined quantitatively, indicators of change are used to determine direction and magnitude of the fishing effect. Some indicators include population trends of indicator species relative to fishing effects, degree of fishery concentration, trophic level of the catch, total catch, bycatch, discards, and offal production levels, bottom gear effort, amount and location of area closures. Indicator species include a variety of target and non-target forage species, target, non-target and PSC species that are top predators, scavenger species, and HAPC biota (organisms that form structural bottom habitat: corals, seapens/whips, sponges, and anemones). See Section 4.1 for details on the significance thresholds for ecosystem effects and quantitative indicators used in the analysis.						

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Predator/prey Relationships: Change in pelagic forage availability	The groundfish fishery does not significantly impact pelagic forage availability as evidenced by either positive or small negative total biomass changes in target species that are forage (pollock and Atka mackerel) and small bycatch levels of other forage species, including herring. Cumulatively, oil spills could have a conditionally significant impact on forage species that use inshore habitat. Climate exerts an important positive or negative effect on forage species biomass levels, depending on the climatic regime.	The amount of decline in target species that are pelagic forage (BSAI walleye pollock and Atka mackerel) and the potential for a forage fish fishery to be initiated produce a significant adverse impact on forage availability to some marine mammals and potentially adverse effects on seabirds. Cumulatively, oil spills could augment the significant impact if it involved key spawning times or areas of forage species. Climate exerts an important positive or negative effect on forage species biomass levels, depending on the climatic regime.	The amount of decline in target species that are pelagic forage (BSAI walleye pollock and Atka mackerel) produce a significant adverse impact on forage availability to Steller sea lion and harbor seals and potentially adverse effects on northern fur seals. Cumulatively, oil spills could have a conditionally significant impact on forage species that use inshore habitat. Climate exerts an important positive or negative effect on forage species biomass levels, depending on the climatic regime.	Effects as described in FMP 1		This alternative produces relatively large increases in forage species that are targets of groundfish fisheries and thus provides significant benefits to SSL and harbor seals and potentially provides significant benefits to northern fur seals. External factors such as a large oil spill in forage spawning times or areas and a climatic regime shift could moderate the beneficial effects of these forage biomass increases.	
Predator/prey Relationships: Spatial and temporal concentration of forage	Spatial and temporal concentrations of fishery removals on forage (pollock, Atka mackerel, herring, managed forage species category) do not change significantly from the baseline. External effects such as the herring fishery, subsistence removals, oil spills, and climate variability could potentially converge and cause a significant adverse impact on spatial/temporal availability of forage.	Spatial and temporal concentrations of fishery removals on forage have the potential to increase adverse impacts in this FMP due to opening of some previously closed areas that might be in proximity to areas used by mammals. Non-federal forage fisheries, oils spills, and climate change could interact with these patterns to continue the potential for adverse impacts.	Effects as described in FMP 1	Effects as described in FMP 1	Area closures in this FMP have the potential to reduce the spatial/temporal concentration of fisheries in foraging areas of SSL, northern fur seals, and harbor seals and thus make thus make target species prey more available to these mammals. External effects such as herring fishery, subsistence fishing, oil spills and climate change could offset this conditionally beneficial effect.	Areas opened to fishing in this alternative would be designed to reduce the spatial/temporal concentration of fisheries in foraging areas of mammals and thus causing a significant beneficial change in prey availability for SSL and harbor seals and a potentially beneficial change in prey for northern fur seals. External effects such as herring fishery, subsistence fishing, oil spills and climate change could offset these beneficial effects.	

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Predator/prey Relationships: Removal of top predators	There are no significant impacts to most top predator populations in this FMP because of low direct takes of seabirds and marine mammals, bycatch limits on halibut, and overfishing limits on target species top predators such as Greenland turbot and arrowtooth flounder. There are unknown impacts on shark species due to uncertainty about abundance. Conditionally significant adverse impacts could occur from external factors such as subsistence harvest of mammals, international longline bycatch of seabirds, oil spills effects, and climate regime shifts.	Increases in trawling and the opening of areas around the Pribilof Islands could lead to a conditionally significant adverse impact on seabirds such as short-tailed albatross and fulmars. Effects on sharks are unknown and trophic level of the catch indicates insignificant impacts on other top predators such as pinnipeds, whales, target and PSC species. External effects such as Western BS fisheries, international and halibut longline takes of seabirds, subsistence harvests of marine mammals, oil spills, and climate shifts could potentially act to push the biomass of one or more top predator species below minimum biologically acceptable limits.	Effects as described in FMP 1	Effects as described in FMP 1		There are significant positive impacts to top predator populations in this FMP relative to the baseline because of increased protection measures for seabirds, breaking sharks out of the other species group and TAC based on the least abundant member of this group, bycatch limits on halibut, and overfishing limits on target species top predators such as Greenland turbot and arrowtooth flounder. External effects would not be sufficient to change these impacts.	
Predator/prey Relationships: Introduction of non-native species	The potential for non-native species introductions via ballast water exchange or hull-fouling organism release from fishing vessels that come from areas already infested with invasive species are unchanged relative to the baseline. Commercial shipping, particularly oil tankers, escaped Atlantic salmon from farming, and future climate warming could all act keep the possibility of successful introduction of non-native species similar to the baseline.	Potential for non-native species introductions via ballast water exchange or hull-fouling organism release from fishing vessels that come from areas already infested with invasive species are increased relative to the baseline. These conditionally significant adverse effects in combination with commercial shipping, particularly oil tankers, escaped Atlantic salmon from farming, and future climate warming could all act to increase the possibility of successful introduction of non-native species.	Effects as described in FMP 1	Effects as described in FMP 1		The largely decreased catch under this alternative would likely ensure that exotic species introductions via ballast water exchange or hull fouling organisms of fishing vessels would not occur. However, ballast water from commercial shipping still have the potential to produce successful introductions.	
Energy Removal	Total groundfish fishery catches are estimated to remove less than 1% of the total system energy. Energy removals from other fisheries are not likely to increase this level to the point where long-term changes in system biomass, production, or energy cycling outside the range of natural variability.	The large increases in catch removals relative to the baseline in this FMP could result in long-term changes in system biomass, production, or energy cycling that are outside the range of natural variability.	Effects as described in FMP 1	Effects as described in FMP 1		The large decreases in catch removals relative to the baseline in this alternative could result in long-term changes in system biomass, production, or energy cycling that are more within the range of natural variability.	
Energy Redirection	Discards, offal, or gear-related mortality from groundfish fisheries do not appear to produce significant adverse impacts via redirection of energy in marine ecosystems of the BSAI and GOA, as evidenced by lack of scavenger population increases and lack of local water quality degradation in the vicinity of groundfish processing facilities.	The large increases in discards relative to the baseline in this FMP could result in long term changes in system biomass, production, or energy cycling that are outside the range of natural variability.	Effects as described in FMP 1	Effects as described in FMP 1		The large decreases in discards relative to the baseline in this alternative could result in long term changes in system biomass, production, or energy cycling that are more within the range of natural variability.	

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Species Diversity	Catch amounts of target, prohibited species, seabirds, and marine mammals are insufficient to bring these species below minimum population thresholds. It is unknown whether bycatch amounts of species with vulnerable life history characteristics, for which species level biomass estimates (e.g., skates, sharks, and grenadiers) is lacking, are at levels that might cause significant adverse impacts. International longline catches, subsistence harvest of marine mammals, and introduced non-native species have the potential to have a significantly adverse impact on species diversity.	This FMP has the potential to affect species diversity by bringing several species below minimum population thresholds or preventing others from recovery, including corals and seabirds. Some target species are significantly adversely affected while the effects on some such as sharks, are unknown. External factors such as seabird bycatch in other fisheries, subsistence harvests of marine mammals, and introduced exotic species may act in combination with the adverse direct effects of FMP 2.1, to significantly adversely affect species diversity.	Effects as described in FMP 1	Effects as described in FMP 1		Catch amounts of target, prohibited species, seabirds, and marine mammals are largely decreased in this FMP relative to the baseline and would provide a significant positive effect on species diversity. Setting TAC for groups based on the least abundant species in the complex and breaking species out of the complex when possible would prevent skates, sharks, and grenadiers from reaching minimum population thresholds. External effects would not be sufficient to change this determination	Catch amounts of target, prohibited species, seabirds, and marine mammals are largely decreased in this FMP relative to the baseline and would provide a significant positive effect on species diversity. External effects would not be sufficient to change this determination.
Functional (Trophic) Diversity	Diversity of species groups with similar trophic roles does not appear to be impacted by groundfish fisheries based on qualitative analysis of diversity changes relative to fishery removals and bottom effort changes that might disturb benthic trophic guilds. Introductions of Atlantic salmon or other exotic species, subsistence harvest of marine mammals, and future climate regime shifts could significantly alter trophic guild diversity beyond the range of natural variability.	This FMP has the potential to affect trophic guild diversity by fishing more heavily on target species that tend to be dominant members of their trophic guilds, such as walleye pollock and Atka mackerel. External factors such as salmon farming, subsistence harvests of marine mammals, introduced exotic species through commercial shipping, and future climate regime shifts have the potential to alter the diversity of species within a trophic guild beyond the range of natural variability.	Effects as described in FMP 1	Effects as described in FMP 1		This alternative will positively affect trophic guild diversity by fishing less heavily on target species that tend to be dominant members of their trophic guilds, such as walleye pollock and Atka mackerel. External factors such as salmon farming, subsistence harvests of marine mammals, introduced exotic species through commercial shipping, and future climate regime shifts have the potential to alter the diversity of species within a trophic guild beyond the range of natural variability.	
Functional (Structural Habitat) Diversity	Living organisms such as corals, seapens/whips, sponges, and anemones provide structural habitat for other marine life. The long-lived nature of some of these organisms and the lack of understanding of amounts needed to serve their functional role means that bottom gear damage from groundfish fisheries could potentially cause adverse impacts on this guild of organisms. The magnitude of the effect of fishing associated with FMP 1 is similar to the baseline. The additive effects of the scallop fishery, large petroleum spill affect a broad area of bottom habitat, and/or climate regime shifts that reduce the population abundance or distribution of bottom-dwelling organisms that provide structural habitat could combine to cause significant adverse impacts.	Living organisms such as corals, seapens/whips, sponges, and anemones provide structural habitat for other marine life. The long-lived nature of some of these organisms and the lack of understanding of amounts needed to serve their functional role means that the increased bottom habitat damage from groundfish fisheries in this FMP would cause significant adverse impacts to this guild of organisms. The significant adverse effect of bottom fishing associated with Alternative 2 could be intensified by the additive effects of the scallop fishery, large petroleum spill affect a broad area of bottom habitat, and/or climate regime shifts that reduce the population abundance or distribution of bottom-dwelling organisms that provide structural habitat.	Effects as described in FMP 1	Effects as described in FMP 1	The area closures in this FMP have been designed with corals in mind and will ensure a broad spatial distribution of corals in the AI, in particular. Groundfish fisheries will thus have an insignificant impact on structural habitat diversity. The additive effects of other factors such as the small incremental effect of scallop dredging, a large petroleum spill affecting bottom habitat, and/or climate regime shift that reduces the population size of bottom dwelling organisms that provide structural habitat could create a potential significant impact.	Effects as described in 3.2	

Table 4.10-2a (cont.). Comparison of example FMPs by resource category.

	Alternative 1	Alternative 2		Alternative 3		Alternative 4	
	FMP 1	FMP 2.1	FMP 2.2	FMP 3.1	FMP 3.2	FMP 4.1	FMP 4.2
	A detailed summary of Alternative 1 can be found in section 4.5.11	A detailed summary of Alternative 2 can be found in section 4.6.11		A detailed summary of Alternative 3 can be found in section 4.7.11		A detailed summary of Alternative 4 can be found in section 4.8.11	
Genetic Diversity	Effects on genetic diversity through heavy exploitation of spawning aggregations or systematic targeting of older age classes is insignificant for most species in this FMP although the impacts on some species remains unknown. Salmon farming release of fish that might interbreed with natural salmon stocks, exotic species introductions, and subsistence harvests of local marine mammal stocks could potentially cause significant adverse impacts.	Effects as described in FMP 1		Effects as described in FMP 1		Effects as described in FMP 1	

Notes:
ABC - acceptable biological catch
AFA - American Fisheries Act
AI - Aleutian Islands
AKAPAI - Alaska Peninsula and Aleutian Islands
AKKO - Kodiak Island
AKSC - Alaska Southcentral
AKSE - Alaska Southeast
A-R-S-O - Atka mackerel, rockfish, sablefish and other groundfish species
B_{MSY} -
BS - Bering Sea
BSAI - Bering Sea and Aleutian Islands
CDQ - community development program
CP - catcher processor
CV - catcher vessel
EFH - essential fish habitat
ESA - Endangered Species Act
EVOS - *Exxon Valdez* oil spill
F_{MSY} -
FTE - full-time equivalent
GOA - Gulf of Alaska
HAPC - habitat areas of particular concern
IPHC - International Pacific Halibut Commission
IR/IU - improved retention/improved utilization
MPA - marine protection areas
MSST - minimum stock size threshold
MSY - maximum sustainable yield
OFL - overfishing level
ORCO - Oregon Coast
OY - optimum yield
PSC - prohibited species catch
SSL - Steller sea lions
TAC - total allowable catch
WAIW - Washington Inland Waters

Table 4.10-2b. Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Target Species		
• 35 target species groups (stocks or stock complexes) were analyzed; 32 are considered here and 3 (BSAI squid, BSAI Other species, GOA Other species) are considered in the Other species and Squid table • 17 of the stocks or stock complexes have age-structured models and are analyzed in Tiers 1-3; 14 are managed in Tiers 4-5; and 1 is managed in Tier 6 (for further detail on the tier system, see Appendix F-1) • Stocks in Tiers 1-3: EBS and GOA Walleye Pollock, BSAI and GOA P. cod, BSAI/GOA sablefish, BSAI Atka mackerel, BSAI yellowfin sole, BSAI rock sole, BSAI flathead sole, BSAI and GOA arrowtooth flounder, BSAI Greenland turbot, BSAI Alaska plaice, BSAI and GOA Pacific ocean perch, GOA thornyhead rockfish, GOA northern rockfish • Stocks in Tiers 4-6: GOA Atka mackerel, GOA shallow water flatfish complex, GOA deep water flatfish complex, BSAI other flatfish, GOA rex sole, BSAI northern rockfish, BSAI and GOA shortraker/ rougheye rockfish, EBS and AI Other rockfish, GOA Other slope rockfish, GOA pelagic shelf rockfish and GOA demersal shelf rockfish • 'Unknown' is rated for stocks for which existing survey methodology is unable assess the appropriate life history parameters (i.e., natural mortality and maturity schedule), reliable species-level identification in the catch, and a reliable biomass estimate **EXTERNALS:** • Several stocks may be externally impacted by the halibut fishery [landed fish are accounted for, but no observers so don't know how much discarded] • All stocks are potentially affected by a regime shift, however the directional impact cannot be predicted		
Mortality	• As with Alternative 1, overfishing is not expected to occur under this alternative;management of stocks does not allow the fishing mortality rate to exceed the overfishing level	
	• Catch is expected to be similar to FMPs 1 and 3.1 for most species • The BSAI OY cap and PSC caps are constraints to the expansion of the fishery • Harvest control rules used to maintain spawning biomass with the potential to produce sustained yields on a continuing basis will reduce the TAC for GOA pollock, and BSAI and GOA Pacific cod • NPFMC would review cumulative impacts of opening the Aleutian Islands pollock fishery	• Catch is expected to be similar to or less than FMPs 1 and 3.1 due to the BSAI OY cap, the uncertainty correction factor, F_{60} for rockfish, and PSC caps, which are constraints to the expansion of the fishery • Criteria for breaking sharks and skates from the "other species" group and criteria to bring non-specified species into a management group may constrain the fisheries under this FMP. • Development of criteria for 'splitting and lumping' of stock complexes could benefit species that may be fished disproportionately compared to other species in the same complex • Expansion and improvement of the Observer Program may benefit stock complex species (i.e., flatfish and rockfish species)
Biomass	• For all 17 age-structured stocks whose biomass is known, the comparison of the impacts to the baseline case is similar to that in FMP 1 • Tier 4, 5, 6 stocks remain unknown	

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
		• Collection of biological information necessary to determine spawning stock biomass estimates for species in Tiers 4-5 would improve • Expansion and improvement of the Observer Program may benefit stock complex species (i.e., flatfish and rockfish species)
Spatial/ Temporal Concentration of Catch, Prey Availability, Habitat Suitability	• For all age-structured stocks, the comparison of the impacts to the baseline case is similar to that in FMP 1, existing closures would remain • Time and area restrictions on harvest (the same as FMPs 1 and 3.1) help to diffuse impacts of spatial and temporal concentration of catch • Stocks or stock complexes in Tiers 4, 5 and 6 remain unknown due to lack of MSST and/or life history parameters • EFH and HAPC identification and designation would continue (same as FMPs 1 and 3.1).	• For all age-structured stocks, the comparison of the impacts to the baseline case is similar to that in FMP 3.2; closures would be similar to those described under FMP 3.2. • PSC limits and inseason hotspot bycatch closures along with 0-20% of the BSAI and GOA established as MPAs and no-take reserves could restrict the fishery spatially and temporally. • Rationalization of the fisheries could slow the pace of the fisheries and spread catch out over time • Stocks or stock complexes in Tiers 4, 5 and 6 remain unknown due to lack of MSST and/or life history parameters • EFH and HAPC mitigation measures would be implemented as necessary and could improve habitat suitability for all species • The pollock bottom trawl closure would be expanded throughout the GOA which may reduce adverse impacts to habitat of some target species

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Prohibited Species		
• All species within this category are managed by other agencies (federal management is deferred); management plans incorporate bycatch mortality in the groundfish fisheries • PSC limits exist for halibut in the GOA and halibut, herring, salmon and crab in the BSAI; PSC limits are apportioned by area, gear type, and season • Herring limits are variable based on biomass; halibut limits are stairstepped; crab limits are variable based on biomass with upper and lower caps; salmon limits incorporate fixed caps **EXTERNALS:** • Halibut, salmon, herring and crab stocks are all affected by state commercial, recreational (for salmon in the GOA) and subsistence fisheries • Herring stocks are more vulnerable to marine pollution as they are nearshore spawners; lingering effects from EVOS in the GOA may still exist • State hatchery programs exist for salmon stocks in the GOA; land management practices may impact freshwater spawning habitat for salmon • Some crab stocks in BSAI and GOA are overfished; rebuilding plans are either in effect or under development for specific BSAI stocks • All prohibited species stocks are potentially affected by regime shifts, however the directional impact cannot be predicted		
Pacific Halibut	• If changes to the baseline condition of the stock occur, quotas set by the IPHC for the directed fishery will be adjusted accordingly and account for all removals of halibut by other fisheries. • Harvest practices under this alternative are expected to have insignificant impacts on prey availability and reproductive success of halibut.	
Pacific Salmon or Steelhead Trout	• Projected groundfish bycatch under this alternative is not expected to significantly impact BSAI and GOA salmon stocks. • Reproductive/recruitment success and stock composition are unknown and it is unclear if these stocks would be significantly affected by changes to bycatch resulting from this alternative. • Potential competition for prey with groundfish fisheries is unknown due to lack of bycatch composition information. • No direct interaction between groundfish fisheries and freshwater salmon spawning habitat occurs. • Potential changes to genetic structure of salmon populations are unknown due to lack of bycatch and stock composition data.	
Pacific Herring	• Groundfish bycatch removals are expected to have insignificant impacts on mortality and reproductive success of herring. • Harvest practices under Alt 1 are expected to have insignificant impacts on prey availability for herring. • Changes to herring habitat due to groundfish fishery management are considered insignificant under FMP 1; lingering contamination from EVOS in the GOA on certain herring habitat exists, but effects are unknown.	

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Crab (Opilio Tanner, other Tanner, Red, Blue and Golden King)	• Under PPA.1 and PPA.2, bycatch of crab may decrease and additional protection measures could enhance habitat and possible recovery of depressed stocks, but population-level effects to crab populations in BSAI as a whole cannot be determined. • Potential impacts of harvest practices under this alternative on crab prey availability and reproductive success are unknown in BSAI and GOA. • Proposed protection measures could enhance recovery and sustainability of crab habitat but potential population-level effects that may result in GOA and BSAI crab stocks are unknown.	
Other Species and Squid		
• BSAI management categories are ‘Squid’ and 'Other species' (latter includes skates, sharks, sculpin and octopi); GOA management category is 'Other species' that includes squid, skates, sharks, sculpin and octopi • Species are managed as a Tier 6 complex in the BSAI; in GOA, 5 percent of the sum of all ABCs = TAC **EXTERNAL:** • Human controlled and climatic effects may also be impacting the other species complex; information is lacking on the current status of stocks and significance of potential effects cannot be determined.		
Other species and Squid	• No comparative baseline has been established for these species, the potential impacts of the PPA, as with Alternative 1, are unable to be determined.	
Forage Fish Species		
• Management category includes Osmeridae, Myctophidae, Bathylagidae, Ammodytidae, Trichontidae, Pholidae, Stichaeidae, Gonostomatidae, and Euphausiacae • Special management where not allowed to keep more than 2% of the landed catch **EXTERNALS:** • Forage fish are more likely to be sensitive to marine pollution as they utilize inshore areas for spawning or foraging that are likely to be more impacted by oil spills than other areas. • All stocks are potentially affected by regime shifts, however, the directional impact cannot be predicted for most species		

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Forage Fish Species	• insignificant fishing mortality because the level of catch is very small • PSC limits and the OY caps that restrict the target fisheries would likely reduce forage fish mortality • fishery independent surveys for forage fish have not been implemented therefore biomass estimates remain uncertain, however preliminary estimates for ecosystem models suggest that standing stocks of forage fish are stable • no comparative baseline exists to determine prey availability, habitat suitability and spatial temporal catch distribution impacts	
Non-specified Species		
• This category consists of many species, this document only discusses impacts to grenadier; grenadier make up the largest proportion of non-specified species bycatch • Coral is included in this category, but impacts are discussed under the habitat section of this document (Section 4.9.6). **EXTERNAL:** • Human controlled and climatic effects may also be influencing non-specified species; information is lacking on the current status of stocks and significance of potential effects cannot be determined.		
Grenadiers	• No comparative baseline has been established for these species, the potential impacts of the PPA, as with Alternative 1, are unable to be determined.	
Habitat		
• Careful placement of closures is needed for habitat to benefit: majority of closures in lightly fished/unfished areas to avoid and minimize future impacts; minimal small closures within heavily fished areas primarily to provide impact diversity and determine closure mitigation efficacy, and to reduce the changes of unintended consequences • The potential effects of the groundfish fisheries used to compare the alternatives were the mortality of and damage to living habitat, changes to benthic community diversity, and changes to the geographic diversity of impacts and protection. • Specific impacts are very difficult to predict. Evaluation of effects requires detailed information on the distribution and abundance of habitat types, the life history of living habitat, habitat recovery rates, and the natural disturbance regime. This information is generally incomplete. • Qualitative judgements as to the significance of effects were made after considering information on 1) bycatch of living habitat derived from the multi-species projection model; 2) the results of a habitat impacts model for estimates of the equilibrium levels of living habitat in fishable and currently fished areas; 3) estimates of the amount of area by habitat type and geographic zone closed year round to bottom trawling for all species; and 4) evaluation of the spatial distribution of bottom trawl closures relative to fishing intensity and habitat types. • This analysis does not include impacts of the alternatives on non-living habitat.		

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Direct Mortality of Benthic Organisms: Impact to Habitat Features	• BS: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered. • AI: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered. • GOA: Insignificant relative to baseline; as with FMP 1, conditionally significant adverse when cumulative impacts are considered.	• BS: Insignificant / Conditionally Significant Beneficial, closed areas are lightly fished, not much effort diverted, one would expect only slight decrease in impact from this closure distribution. Reduction in ABCs may provide benefit. Could be significantly improved with strategically placed, smaller closures that mitigate historical impacts, resulting in conditionally significantly beneficial cumulative effects. However, could be conditionally significant adverse if closure areas are not adequate to protect most sensitive areas. • AI: Significant Beneficial, closures often bisect fishing concentrations which is good strategy; reduction in ABCs, due to $F_{60\%}$ for rockfish and implementation of uncertainty correction, should provide benefit. Depending on location and size of closures, could provide beneficial mitigation for the adverse baseline condition that results from cumulative historical impacts. • GOA: Significant Adverse / Insignificant, many closures encompass high fishing concentrations, resulting in much higher effort in current lightly fished areas. Reduction in ABCs may not compensate for probable increase in effort/catch. Could be significantly improved with strategically placed, smaller closures that mitigate historical impacts, resulting in conditionally significantly beneficial cumulative effects. However, could be conditionally significant adverse if closure areas are not adequate to protect most sensitive areas.

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Benthic Community Structure: Benthic Community Diversity	• BS, AI, GOA: Insignificant change relative to baseline; conditionally significant adverse, when historical fishing considered along with continued fishing at FMP 1 levels. Closure areas are mostly in one habitat type.	• BS: Conditionally Significant Beneficial, may be some gain in diversity by closing lightly fished areas and effort reduction due to any reduction in catch. Could be conditionally significant adverse or beneficial in the cumulative case, depending on placement of closures and ability to mitigate historical impacts. • AI: Significant Beneficial - see BS above • GOA: Insignificant, transferring impact from already heavily impacted area to lightly impacted area may not provide gain in overall diversity. Could be conditionally significant adverse or beneficial in the cumulative case, depending on placement of closures and ability to mitigate historical impacts.
Benthic Community Structure: Geographic Diversity of Impacts and Protection	• BS: Insignificant, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types. • AI: Insignificant relative to baseline, when cumulative impacts considered, conditionally significant adverse as very little closure area, restricted to small radius around SSL habitat haulouts. • GOA: Insignificant relative to baseline, some intermediate levels of contrast along existing closure areas. When cumulative impacts considered, conditionally significant adverse since the spatial distribution of the closed areas under the FMP may not protect the full range of habitat types.	• BS: Significant Beneficial, one closure boundary bisects a high *F* concentration providing diversity. Could be significantly improved with smaller closure areas strategically located. Could be conditionally significant adverse or beneficial when considered with cumulative impacts. • AI: Significant Beneficial, some closure areas bisect high F clusters. Closures placed somewhat randomly along the AI. Could be conditionally significant adverse or beneficial when considered with cumulative impacts. • GOA: Insignificant, closures encompass habitat units and high *F* clusters, leaving little contrast or diversity in impact levels within habitat. Could be significantly improved with smaller closure areas strategically located. Could be conditionally significant adverse or beneficial when considered with cumulative impacts.
Seabirds		

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
• the potential effects of the groundfish fishery that were used to compare the alternatives included incidental take in fishing gear and vessel strikes, changes in prey availability and offal, and changes in benthic habitat that affect the food web • significance criteria were based on whether the proposed action would be likely to result in population level effects, which are defined as changes in the population trend outside the range of natural fluctuations. Although the number of individual seabirds that would be expected to be taken under the Alternative FMPs varies considerably, this difference may not be discernible by looking at a shared rating. • except for the supplemental food provided by the fisheries in the form of offal, the effects of the fisheries are all considered adverse to individual birds. Low levels of incidental take are better for conservation purposes than high levels of take, but no amount of incidental take can be considered beneficial to a seabird population. The significance ratings for incidental take are therefore only insignificant or adverse. **EXTERNAL:** • potential effects that are the result of vessel traffic rather than fishing effort, such as oil spills, plastic pollution, and introduction of nest predators • similar effects from other U.S. and foreign fisheries, subsistence and commercial harvests • pollution from marine and terrestrial sources, conservation efforts for particular species and seabirds in general, and natural events such as climate and oceanographic fluctuations		
Incidental Take	• Incidental take of albatross, fulmars, shearwaters, and gulls substantially reduced from baseline levels due to new mitigation measures on longline fleet. • Potential new mitigation measures for trawl fleet (PPA .2) likely to reduce collisions of albatross, shearwaters, and fulmars with trawl third wires.	
Risk to ESA-listed Species	• Risk of exceeding ESA threshold for mortality of short-tailed albatross reduced from baseline level due to longline and potential trawl mitigation measures.	
Population-level Effects	• Groundfish fishery is not expected to have population level effects on any species through mortality, changes in food availability, or benthic habitat.	
Cumulative Effects	• conditionally significant adverse for short-tailed albatross through mortality, with a potential catastrophic contribution from volcanic eruptions on Torishima Island • significant adverse for Laysan and black-footed albatross through mortality, mostly in foreign longline fisheries • conditionally significant adverse for both shearwaters through mortality, with major contributions from harvest on breeding grounds in southern hemisphere • conditionally significant adverse for red-legged kittiwakes because of concentrated population distribution and declining population on Pribilof colony. Mechanisms for decline under investigation. • significant adverse for marbled and Kittlitz's murrelets because of substantial population declines with major contributions of mortality from coastal net fisheries • insignificant for all other species through mortality, prey availability, and benthic habitat	
Marine Mammals		

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
• Marine mammal species groups were aggregated in this comparison table to combine marine mammal species which are consumers of groundfish (with the exception of the western stock of Steller sea lions which was separated from this group) and marine mammal species that do not consume groundfish of commercial size as a primary component of their diet as the effects are similar within the alternatives for all of the species included in each of these categories. • Species in the groundfish consuming category include the eastern stock of Steller sea lions, harbor seals, and northern fur seals. Species groups in the non-groundfish consuming category include transient killer whales, other pinnipeds, other toothed whales, and sea otters. • As defined here, "effects" refers to effects expected to occur at the population level.		
Western stock of Steller sea lions: Incidental Take / Entanglement in Marine Debris	• The groundfish fishery does not result in increased levels of incidental takes such that population level effects would occur and is determined to be insignificant to the western stock of Steller sea lions. • Cumulatively, significant adverse population level effects are expected on western Steller sea lions due to additional external effects including subsistence harvest, takes in state and other fisheries, and marine pollution. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock of Steller sea lion recovery and survival in the wild.	
Western stock of Steller sea lions: Harvest of Prey Species	• The groundfish fishery is determined to be insignificant to Steller sea lions under this FMP scenario. • Cumulatively, significant adverse population level effects are expected on western Steller sea lions due to additional external effects including state and other fisheries, harvest of prey in the past, and marine pollution. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock of Steller sea lion recovery and survival in the wild.	
Western stock of Steller sea lions: Spatial/ Temporal Concentration	• Measures to decrease competition between Steller sea lions and fisheries by dispersing the fisheries over time and space have been retained under this FMP; additional effects to marine mammals that consume groundfish are not expected under this FMP • Cumulatively, with past and external effects, significant adverse effects on Steller sea lions may still occur due to state and other fisheries. Although the cumulative effects are expected to be adverse, they are not expected to appreciably reduce the likelihood of the western stock of Steller sea lion recovery and survival in the wild.	• Measures to decrease competition between Steller sea lions and fisheries by dispersing the fisheries over time and space have been retained under this FMP and these measure would be modified as additional scientific information becomes available ; additional effects to marine mammals that consume groundfish are not expected under this FMP. • Cumulatively, with past and external effects, significant adverse effects on Steller sea lions may still occur due to State and other fisheries; they are not expected to appreciably reduce the likelihood of western stock of Steller sea lion recovery and survival in the wild.
Western stock of Steller sea lions: Disturbance	• This groundfish fishery is insignificant in regarding disturbance of Steller sea lions	

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Groundfish Consumers: Incidental Take/ Entanglement in Marine Debris	• The groundfish fishery does not result in increased levels of incidental take such that population level effects would occur and is determined to be insignificant to marine mammals. • Cumulatively, conditionally significant adverse effects are expected for northern fur seals and harbor seals due to their past and present population declines; effects on the eastern stock of Steller sea lions will be insignificant	
Groundfish Consumers: Harvest of Prey Species	• The groundfish fishery is determined to be insignificant to these marine mammals under this FMP scenario. • Cumulatively, significant adverse population level effects are expected on northern fur seals and harbor seals due to their past and present population declines and additional external effects from state and other fisheries, past harvest of prey, and marine pollution.	
Groundfish Consumers: Spatial/ Temporal Concentration	• Steller sea lion protective measures that disperse the fisheries over time and space have been retained under this FMP; these protective measures provide benefits to other marine mammals that consume groundfish, and the impact of the groundfish fishery is expected to be insignificant to species in this category • With past and external effects, significant adverse effects may still occur to northern fur seals and harbor seals due to their past and present population declines although effects are expected to be insignificant to the eastern stock of Steller sea lions	• Steller sea lion protective measures that disperse the fisheries over time and space have been retained under this FMP, and would be modified as additional scientific information becomes available; these protective measures provide benefits to other marine mammals that consume groundfish and the impact of the groundfish fishery is expected to be insignificant to species in this category • With past and external effects, significant adverse effects may still occur due to their past and present population declines although effects are expected to be insignificant to the eastern stock of Steller sea lions
Groundfish Consumers: Disturbance	• This groundfish fishery is insignificant regarding disturbance to these marine mammal species	
Non-Groundfish Consumers: Incidental Take/ Entanglement in Marine Debris	• The groundfish fishery under this FMP does not result in increased levels of incidental take such that population level effects would occur and is determined to be insignificant to marine mammals. • Cumulatively, the effect of incidental take and entanglement was determined to be insignificant for almost all species within this group. For some species in the 'other pinniped' group, spotted, ringed, bearded and ribbon seal, conditionally significant adverse effects could occur due to high subsistence harvest level without an accurate population size for these species. For sea otters and endangered whales, conditionally significant adverse effects could occur due to recent declines or endangered status. Groundfish fisheries' contribution to any of these cumulative effects is very low.	
Non-Groundfish Consumers: Harvest of Prey Species	• The groundfish fishery is determined to be insignificant to these marine mammals for prey availability under this FMP. • Cumulatively, effect on availability of prey is insignificant at the population level for all of these species primarily due to limited prey overlap with species caught by the groundfish fisheries.	

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Non-Groundfish Consumers: Spatial/ Temporal Concentration	• Steller sea lion protection measures disperse the fisheries over time and space and have been retained under this FMP; these protective measures provide benefits to other marine mammals; the groundfish fishery is expected to be insignificant to species in this category • Cumulatively, the spatial and temporal concentration of the groundfish fisheries under the FMP is found to be insignificant for all species in this group.	
Non-Groundfish Consumers: Disturbance	• This impacts of disturbance by the groundfish fishery of these marine mammal species is insignificant • Cumulatively, disturbance is found to be insignificant for all species in this group as there is no change from the baseline level of disturbance.	
Socioeconomic		
Assessment of socioeconomic impacts considers important factors including: • Impacts on harvesting and processing sectors, including 1) catcher vessels (CVs), 2) catcher processors (CPs), and 3) inshore processors and motherships; using catches of all groundfish species, groundfish ex-vessel value and product value, groundfish employment and payments to labor, excess capacity, product quality, product utilization rates, average costs, and fishing vessels safety as variables • Impacts of groundfish alternatives on other non-groundfish directed commercial fisheries, such as halibut, salmon, crab and herring • Regional impacts, on 6 regions (Alaska Peninsula and Aleutian Islands (AKAPAI), Kodiak Island (AKKO), Alaska Southcentral (AKSC), Southeast Alaska (AKSE), Oregon coast (ORCO), Washington Inland Waters (WAIW)), using processing, harvesting, payments to labor, and employment variables • Community Development Quota-related impacts, including changes to the CDQ program and changes to the CDQ species TACs • Subsistence-related impacts on groundfish, Steller sea lion and salmon subsistence, as well as opportunities for practicing subsistence • Environmental justice impacts resulting from changes in fishing activity, or impacts to the CDQ program or subsistence • Impacts on consumer benefits (U.S. consumers of groundfish products) • Impacts on benefits from marine ecosystems (other than those benefits related to commercial groundfish fisheries) including non-market (existence value and option value, etc.) and other uses of the ecosystem such as recreational fishing or tourism **Significance Thresholds:** • In the socioeconomic impact analysis, the term "significant" for an expected change in a quantitative indicator means a 20 percent or more change (either plus or minus) relative to the comparative baseline. If the expected change is less than 20 percent, the change is not considered to be significant. • The same threshold is roughly used to assess changes in qualitative indicators (e.g., fishing vessel safety). However, whereas changes in quantitative indicators are based on model projections, predicted changes in qualitative indicators are based on the judgment of the socioeconomic analysts.		

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Harvesting and Processing Sectors: Excess capacity, product quality and utilization, costs, vessel safety	• PPA.1 is expected to result in a conditionally significant increase in product quality, product utilization rates and fishing vessel safety and a conditionally significant decrease in excess capacity and average costs for all harvesting and processing sectors, depending on the extent to which additional fisheries are rationalized.	• As the result of comprehensive rationalization of the fisheries, PPA.2 is expected to result in a significant decrease in excess capacity in the harvesting and processing sectors. • Rationalization is expected to result in a significant increase in product quality and a significant decrease in average costs and increase in fishing vessel safety. If additional area closures are established, they are predicted to result in a conditionally significant decrease in product quality and fishing vessel safety and conditionally significant increase in average costs.
Harvesting and Processing Sectors: Catch, value, employment and income	• Under PPA.1, projected changes in groundfish harvests are insignificant, except Pacific cod, sablefish and rock fish catch increases significantly due to a TAC increase.	• Under PPA.2, Pacific cod catch increases significantly due to a TAC increase and catches of sablefish and rockfish decrease significantly because of a more conservative TAC.
	• Changes in total groundfish ex-vessel value, product value, employment, and payments to labor are insignificant. - The total ex-vessel value of groundfish landed by catcher vessels and the total groundfish product value of catcher processors and inshore processors/ motherships are expected to increase but not significantly. - Increased Pacific cod harvests by smaller trawl catcher vessels and pot catcher vessels account for much of the increase in groundfish ex-vessel value. - Increased Pacific cod harvests by head-and-gut trawl catcher processors, longline catcher processors and pot catcher processors account for much of the increase in product value for catcher processors. - Increased deliveries of Pacific cod to BS pollock shore plants, AKAPAI shore plants, AKKO shore plants, and floating inshore processors account for much of the increase in groundfish product value for inshore processors.	
		- Longline vessels are expected to experience a significant reduction in ex-vessel value due to the decrease in the catch of sablefish and rockfish. - Decreased deliveries of rockfish and sablefish will have a significant negative impact on the product value of AKSE shore plants and AKSC shore plants.
Effects on other commercial fisheries (halibut, salmon, crab, and herring)	• Effects on Prohibited Species harvested in other commercial fisheries (salmon, crab, and herring) are expected to be insignificant, resulting in insignificant cumulative effects on these commercial fisheries.	• Reductions in bycatch of Prohibited Species by 10 to 20%, while not having a significant effect on status those stocks, would have some beneficial effects on availability to the commercial halibut fishery. • Cumulative effects of reduced bycatch on salmon, herring, and commercial fisheries are expected to be insignificant.

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
CDQ Program and Region	• Under the Preliminary Preferred Alternative, the CDQ program would continue to operate as it does under base case conditions and no significant impacts are foreseen.	
Subsistence	• Under PPA.1 and PPA.2, no significant changes to the subsistence use of groundfish or Steller sea lions are predicted. • Salmon bycatch would potentially be decreased but the impacts of this reduction on subsistence salmon fishing are unknown. • Catcher vessel activity increases are not predicted to result in significant beneficial impacts to indirect subsistence opportunities.	
Regional impacts	• Change is insignificant for all harvester, processor, income, and employment variables in all regions, with the following exceptions: in the AKSC region, change in all variables listed is beneficial and significant (aside from extra-regional deliveries by catcher vessels, which is insignificant), and in the case of regionally owned catcher processors in both the AKKO and AKSE regions, where impacts are beneficial and significant (although these are relatively small sectors).	• For all regions except AKAPAI and AKSE, change is insignificant for all processor, harvester, income, and employment variables. • Within the AKAPAI region, in-region deliveries by regionally owned CVs decline significantly, but this is a small sector. • In the AKSE region, change to regionally owned at-sea processors is insignificant, but in-region processing, extra- and in-region catcher vessel deliveries, and total direct, indirect, and induced labor income and FTEs all decline significantly from baseline conditions.
	• Impacts to coastal Alaska communities, particularly in the AKAPAI and AKKO regions, resulting from consolidation (for direct fishery sectors) and other changes accompanying the change from a race-for-fish to a rationalized fishery (especially for support service sectors) would be conditionally significant. This would be driven by yet-to-be-designed consolidation restrictions and community protection features of the alternative.	
		• Additionally, Alaska coastal communities with small vessel fleets would experience conditionally significant impacts from the expansion of MPA set-asides; level of impact would be conditional based on the efficacy of features designed to respect traditional fishing grounds and maintain open area access for coastal communities.

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Environmental Justice Issues	• Under PPA.1, no significant environmental justice impacts are predicted from changes in direct fishery activity in any of the regions. • No environmental justice concerns associated with either the CDQ program or subsistence activities are predicted.	• Under PPA.2, environmental justice impacts to the catcher vessel fleet in the AKAPAI region would be conditionally significant depending upon the specific design of MPA and rationalization features of this alternative. • No other changes in direct fishery sector activity are predicted to result in environmental justice impacts due to the demographics of the specific sectors. • No environmental justice concerns associated with either the CDQ program or subsistence activities are predicted.
Consumer Benefits	• Changes in benefits to U.S. consumers of groundfish products would be insignificant.	
Benefits from marine ecosystems (other than those benefits related to commercial groundfish fisheries)	• PPA.1 is predicted to have no significant effects relative to the comparative baseline on the level of benefits the Bering Sea and GOA marine ecosystems and associated species provide.	• PPA.2 is predicted to have a conditionally significant positive impact on the levels of some of the benefits these ecosystems and associated species generate. Positive effects depend primarily on the extent to which additional area closures to protect habitat are implemented.

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Ecosystem		
Assessment of ecosystem impacts considers important factors influencing: • **predator/prey relationships**: 1) pelagic forage availability because pelagic forage form the central part of BSAI and GOA food webs, channelling energy from the bottom of the food web to the many species at the top that rely on pelagic forage, 2) spatial/temporal concentration of fishery removals of forage have the potential to affect top predators such as marine mammals and seabirds that make feeding forays from land, 3) Top predators receive energy from lower trophic levels and provide energy storage and stabilization effects on marine food webs, their removal may increase variability and instability in the ecosystem. • **Energy removal and re-direction** by fisheries could affect total ecosystem production levels and characteristics that influence energy cycling. • **Diversity** of various ecosystem characteristics such as species diversity, functional diversity, and genetic diversity helps maintain stability in ecosystem functioning and provide a kind of ecological "insurance" to protect ecosystem functioning. **Significance Thresholds** for ecosystem effects relate fishing induced changes that are sufficient to bring any population below minimum biologically acceptable limits (minimum stock size thresholds for target species, status listing of others) or to prevent a population that is already below a limit from recovering. Some ecosystem level thresholds are defined as changes in system level characteristics that are outside the range of natural variability. • In cases where thresholds cannot be defined quantitatively, indicators of change are used to determine direction and magnitude of the fishing effect. Some indicators include population trends of indicator species relative to fishing effects, degree of fishery concentration, trophic level of the catch, total catch, bycatch, discards, and offal production levels, bottom gear effort, amount and location of area closures. Indicator species include a variety of target and nontarget forage species, target, nontarget and PSC species that are top predators, scavenger species, and HAPC biota (organisms that form structural bottom habitat: corals, seapens/whips, sponges, and anemones). • See Section 4.1 for details on the significance thresholds for ecosystem effects and quantitative indicators used in the analysis.		
Predator/ prey relationships: Change in pelagic forage availability	• Spatial and temporal concentration of fishing effort on forage species does not change significantly from the baseline. • External effects such as the herring fishery, subsistence removals, oil spills/contamination, and climate variability could result in significant adverse impacts on forage availability.	• Area closures in this alternative have the potential to reduce the spatial/temporal concentration of fisheries in foraging areas of Steller sea lions, northern fur seals, and harbor seals, making target species prey more available to these mammals. • External effects such as herring fisheries, subsistence fishing, petroleum contamination, and climate change could offset this conditionally beneficial effect.
Predator/ prey relationships: Spatial and temporal concentration of forage	• There are no significant impacts to most top predator populations in PPA.1 and PPA.2. • There are unknown impacts on shark species due to uncertainty regarding abundance. • Conditionally significant adverse impacts could occur from external factors such as subsistence harvest of mammals, international longline bycatch of seabirds, petroleum contamination, and climate regime shifts.	
Predator/ prey relationships: Removal of top predators	• The potential for non-native species introductions via ballast water exchange or hull-fouling organism release from fishing vessels is insignificant relative to the baseline.	

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Energy removal	• Total groundfish fishery catches are estimated to remove less than one percent of the total system energy. • Energy removals from other fisheries are not likely to significantly increase this level outside the range of natural variability.	

Table 4.10-2b (cont.). Comparison of example FMPs by resource category: the preliminary preferred alternative.

	Preliminary Preferred Alternative	
	PPA.1	**PPA.2**
	A detailed summary of the Preliminary Preferred Alternative can be found in Section 4.9.11	
Energy redirection	• Discards, offal, or gear-related mortality from groundfish fisheries do not appear to produce significant impacts to BSAI and GOA ecosystems via redirection.	
Species Diversity	• Catch amounts of target species, prohibited species, seabirds, and marine mammals are insufficient to bring these species below minimum population thresholds. • It is unknown whether bycatch amounts of species with vulnerable life history characteristics lacking species-level biomass estimates (e.g., skates, sharks, and grenadiers) would result in significant population-level effects.	
Functional (trophic) Diversity	• Trophic diversity does not appear to be impacted by groundfish fisheries based on qualitative analysis of diversity changes relative to fishery removals and bottom effort changes that might disturb benthic trophic guilds. • Introductions of Atlantic salmon or other exotic species, subsistence harvest of marine mammals, and future climatic regime shifts could significantly alter trophic guild diversity beyond the range of natural variability.	
Functional (structural habitat) Diversity	• Living organisms, such as corals, seapens/ whips, sponges, and anemones, provide structural habitat for other marine life. Bottom gear damage from groundfish fisheries could potentially cause adverse impacts to this guild of organisms. • The additive effects of the scallop fishery, petroleum contamination in areas of bottom habitat, and climatic regime shifts could combine to cause significant adverse impacts.	• The area closures proposed in PPA.1 and PPA.2 are designed with coral in mind and may provide protection for the broad spatial distribution of corals in the Aleutian Islands, in particular. • Effects of groundfish fisheries on structural habitat diversity are insignificant. • The additive effects of other factors such as scallop dredging, petroleum contamination of bottom habitat, and/or climatic regime shift, could result in potentially significant impacts.
Genetic Diversity	• Effects on genetic diversity through heavy exploitation of spawning aggregations or systematic targeting of older age classes is insignificant for most species in this alternative, although the impacts on some species remains unknown. • Release of farm-raised salmon, exotic species introductions, and subsistence harvests of local marine mammal stocks could potentially result in significant adverse impacts.	

Table 4.10-3. Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA
	NOTE: Language taken from text of alternative policy statements.				
Philosophy	Management process will be adaptive to new information and reactive to new environmental issues.	Establishes a more aggressive harvest strategy, goal would be to maximize biological and economic yield from the resource.	Additional conservation and management measures will be taken as necessary to respond to social, economic or conservation needs, or if scientific evidence indicates that the fishery is negatively impacting the environment.	Extremely precautionary approach to managing fisheries under scientific uncertainty in which the burden of proof is shifted to the user of the resource.	Forward looking conservation measures that address differing levels of uncertainty; precautionary approach that applies judicious and responsible fisheries management practices, based on sound scientific research and analysis, proactively rather than reactively, to ensure the sustainability of fishery resources and associated ecosystems for the benefit of future as well as current generations
Assumptions	Based on the assumption that fishing does produce some adverse impact to the environment.	Based on the assumption that fishing does not have an adverse impact on the environment except in specific cases as noted.	Recognizes need to balance many competing uses of marine resources and different social and economic goals for fishery management.	Based on the assumption that fishing does produce adverse impacts on the environment, but due to lack of information and uncertainty, we know little about these impacts.	Recognizes that potential changes in productivity may be caused by fluctuations in natural oceanographic conditions, fisheries, and other, non-fishing activities, and intends to continue to take appropriate measures to insure the continued sustainability of the managed species.
Plan of Action	As adverse impacts become known, mitigation measures are developed and FMP amendments are implemented; goals will be addressed through existing institutions and processes.		Will utilize and improve upon existing processes to involve a broad range of the public in decisionmaking.	Strategy will result in changes that will significantly curtail the groundfish fisheries until more is knows about impacts; once more is known, initial measures will be modified or relaxed.	Will utilize and improve upon existing open and transparent process to involve the public in decisionmaking; will review, modify, eliminate, or consider new issues as appropriate to best carry out the goals and objectives; objectives will be reviewed annually, and PSEIS will be used as a planning document

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA
	NOTE: Language taken from text of alternative policy statements.				
Prevent Overfishing **Harvest Strategy**	• conservative harvest levels for single species fisheries		• conservative harvest levels for multispecies and single species fisheries • evaluate F_{40} and implement improvements	• transition from single-species to ecosystem-oriented management of fishing activities • establish a program to maintain ecological relationships among exploited, dependent and related species as well as ecosystem processes that sustain them	• conservative harvest levels for multispecies and single species fisheries and specify OY • scientific review of F_{40} and adopt improvements as appropriate
OY	• specify OY as a range with the cap at 2 mill mt in BSAI, .8 mill mt in GOA	• specify OY as a range • set OY cap at the sum of OFLs or ABCs for each species	• specify OY as a range or a formula		• specify OY as a range with the cap at 2 mill mt in BSAI, .8 mill mt in GOA
Other			• improve biological information necessary to determine MSSTs particularly for Tier 4 species		• close % of known target stock spawning area
Promote Sustainable Fisheries and Communities[1] Benefit to the Nation					• provide for OY in terms of providing the greatest overall benefit to the nation with particular reference to food production
Efficiency					• increase the efficient use of fishery resources taking into account the interest of harvesters, processors, and communities
Stability					• avoid significant disruption of existing social and economic structures

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA
	NOTE: Language taken from text of alternative policy statements.				
Equity					• promote fair and equitable allocation of identified available resources
Safety					• promote increased safety at sea
Preserve Food Web **Ecosystem Considerations**	• incorporate ecosystem considerations into fishery management decisions • consider the impact of fishing on predator-prey and other ecological relationships	(none)	• incorporate ecosystem considerations into fishery management decisions	• address the impact of fishing on predator-prey and other important ecological relationships • conserve native species and biological diversity	• incorporate ecosystem considerations into fishery management decisions as appropriate
Fishing Levels	• limit harvest of forage species		• improve procedure to account for uncertainty and ecosystem factors in ABCs	• reduce ABCs/set highly precautionary fishing levels to account for uncertainty and ecological considerations	• improve procedure to account for uncertainty and ecosystem factors in ABCs • limit harvest of forage species
Research			• develop indices of ecosystem health as targets for management • initiate research program to identify the habitat needs of the significant food web	• develop and implement a Fishery Ecosystem Plan	• develop indices of ecosystem health as targets for management
Reduce and Avoid Bycatch[2] **Level**	• current bycatch and incidental catch management program • require full utilization of target species		• continue and improve bycatch and incidental catch program • develop incentive programs for bycatch and incidental catch reduction • develop management measures that encourage gear or	• reduce bycatch, incidental catch and PSC • phase out fisheries with >25% bycatch or incidental catch	• continue and improve bycatch and incidental catch program • develop incentive programs for bycatch and incidental catch reduction • develop management measures that encourage gear or techniques that reduce bycatch which includes economic discards

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA
	NOTE: Language taken from text of alternative policy statements.				
			techniques that reduce discards		

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA
	NOTE: Language taken from text of alternative policy statements.				
Closures	• manage bycatch and incidental catch through seasonal TAC distribution and geographic gear restrictions • respond to population and decline by area, gear and seasonal closures	• manage incidental catch and bycatch through gear closure areas			• manage bycatch and incidental catch through seasonal TAC distribution and geographic gear restrictions
PSC	• control PSC through limits	• monitor PSC bycatch and adjust or eliminate limits		• establish GOA PSC limits for salmon, crab and herring	• control PSC through limits or other appropriate measures
TAC	• account for bycatch mortality in TAC accounting			• include mortality in TAC accounting and improve accuracy of mortality including unobserved	• account for bycatch mortality in TAC accounting
Non-Target Species			• encourage research on population estimates for non-target species with a view to setting bycatch limits	• set stringent bycatch limits for vulnerable non-target species	• encourage research on population estimates for non-target species with a view to setting bycatch limits
Avoid Impacts to Seabirds and Marine Mammals **Seabirds**	• protect ESA-listed and other seabird species	• maintain protection measures for ESA-listed species	• protect ESA-listed and other seabirds • joint research program to establish population estimates for all seabird species	• set protection measures for all seabirds and develop methods to reduce the incidental take levels • joint research program to establish population estimates for all seabird species, and modify protection measures as appropriate	• protect ESA-listed and other seabird species

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA
	NOTE: Language taken from text of alternative policy statements.				
Marine Mammals	• maintain protection measures to avoid jeopardy to ESA-listed Steller sea lions	• maintain protection measures to avoid jeopardy to ESA-listed Steller sea lions	• maintain or adjust protection measures for ESA-listed Steller sea lions • review status of other marine mammal and fishery interactions and develop appropriate measures	• increase Steller sea lion protection measures by further restricting gear in critical habitat and setting more conservative harvest levels for prey base species	• maintain or adjust protection measures for ESA-listed Steller sea lions • review status of endangered and threatened marine mammal and fishery interactions and develop appropriate measures
Reduce and Avoid Impacts to Habitat **Closures**	• close important habitat to all fishing in response to new scientific information • evaluate candidate areas for MPAs	• evaluate candidate areas for MPAs	• develop goals and criteria to evaluate the efficacy MPAs, consider implementation	• establish 20-50% of area as no-take marine reserves • prohibit trawling where fishery can be prosecuted with other gear types, and establish trawl closure areas	• review and evaluate efficacy of existing habitat protection measures for managed species • develop a MPA policy in coordination with national and state policies • develop goals and criteria to evaluate the efficacy MPAs, implement if and where appropriate
EFH		• identify EFH and determine appropriate habitat measures	• identify EFH and HAPC	• protect habitat including EFH, HAPC, ESA critical habitat, etc.	• identify EFH and HAPC
Research	• implement research to evaluate impacts of trawl gear on habitat	• implement research to evaluate impacts of trawl gear on habitat	• implement research to evaluate impacts of all gear on habitat • develop regional baseline habitat information and mapping	• manage adaptively, using large no take areas as experimental controls to facilitate learning	• encourage development of regional baseline habitat information and mapping
Allocation Issues[3]	• provide economic and community stability through maintaining allocation percentages		• provide economic and community stability through fair allocation of fishery resources	• consider non-consumptive values	• provide economic and community stability through fair allocation of fishery resources

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA
	NOTE: Language taken from text of alternative policy statements.				
Excess Capacity	• reduce excess capacity, overcapitalization and the adverse effects of the race for fish	• maintain AFA and CDQ as authorized by MSA	• maintain LLP and reduce capacity and other adverse effects of the race for fish by extending rights-based management to some or all fisheries • periodically evaluate the effectiveness of rationalization	• reduce excess capacity, employ equitable allocative or cooperative programs to end the race for fish, reduce waste, increase safety and promote stability and benefits to communities	• maintain LLP and decrease excess capacity and overcapitalization by eliminating latent licences and extending rights-based management to some or all fisheries • periodically evaluate the effectiveness of rationalization
Increase Alaska Native Consultation **Traditional Knowledge**	• continue incorporating traditional knowledge into fisheries management	• continue incorporating traditional knowledge into fisheries management	• continue incorporating traditional knowledge into fisheries management, increase traditional knowledge data collection	• utilize traditional knowledge, including monitoring and data gathering, through co-management and cooperative research programs	• continue incorporating traditional knowledge into fisheries management, increase traditional knowledge data collection
Consultation	• continue Alaska Native consultation and participation in fisheries management	• continue Alaska Native consultation and participation in fisheries management	• increase Alaska Native consultation and participation in fisheries management	• increase participation of and consultation with Alaska Native subsistence users	• increase Alaska Native consultation and participation in fisheries management
Data Quality, Monitoring and Enforcement[4] **Observer Program**	• continue Observer Program for catch estimates	• consider repealing the Observer Program	• increase the utility of observer data • improve the Observer Program, including the funding mechanism	• increase the precision of observer data through increased coverage and enhanced sampling protocols, address the funding issue	• increase the utility of observer data • improve the Observer Program, including the funding mechanism
Reporting	• continue industry reporting, and efforts to improve economic impact assessments	• continue industry reporting, and efforts to improve economic impact assessments	• increase data and reporting requirements in order to improve economic impact assessments		• increase data and reporting requirements in order to improve economic impact assessments
Technology	• increase quality of monitoring data through technology		• increase quality of monitoring data through technology	• improve enforcement and inseason management through technology	• increase quality of monitoring data through technology

Table 4.10-3 (cont.). Comparative summary of alternative policy statements.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA
	NOTE: Language taken from text of alternative policy statements.				
Research			• establish a baseline ecosystem monitoring program • adopt recommended research plan in the PSEIS • cooperate with research institutions to identify research priorities	• establish a baseline monitoring program, use to improve the Fishery Ecosystem Plan • adopt recommended research plan in the PSEIS	• establish a baseline ecosystem monitoring program • cooperate with research institutions to identify research needs and develop programs
Enforcement					• promote enhanced enforceability

Notes: [1]This heading was added to the PPA by the Council to incorporate objectives from the existing BSAI and GOA policy statements (Alt 1(a))
[2]In the PPA, this heading was changed to: Manage, Reduce and Avoid Bycatch and Incidental Catch
[3]In the PPA, this heading was changed to: Promote Equitable and Efficient Use of Fishery Resources
[4]In the PPA, this heading was changed to: Improve Data Quality, Monitoring and Enforcement
ABC - acceptable biological catch
AFA - American Fisheries Act
BSAI - Bering Sea and Aleutian Island
CDQ - community development quota
EFH - essential fish habitat
ESA - Endangered Species Act
FMP - fishery management plan
GOA - Gulf of Alaska
HAPC - habitat area of particular concern
LLP - License Limitation Program
MPA - marine protected area
MSA - Magnuson-Stevens Fishery conservation and Management Act
MSST - minimum stock size threshold
mt - metric ton
OFL - overfishing level
OY - optimum yield
PPA - Preliminary Preferred Alternative
PSC - prohibited species catch
PSEIS - Programmatic Supplemental Environmental Impact
TAC - total allowable catch

Table 4.11-1. Comparison of alternatives to federal requirements.

Federal Law	Requirement	Alternative 1	Alternative 2	Alternative 3 (PPA is Bolded)	Alternative 4
MSA National Standards	**1** prevent overfishing while achieving on a continuing basis optimum yield	Perhaps. Acknowledges that OY will be defined based on consideration of all ecosystem needs and that management will continue to be adaptive and risk-averse. Have learned that there exist different interpretations of the meaning of "optimum". MSSTs are specified in the SAFEs not FMPs and although operationally MSSTs are taken into account in the management of the fisheries, this may not satisfy the MSA requirement to specify MSSTs in FMPs and the National Standard Guidelines for determining whether a stock is currently overfished or approaching an overfished definition. [MA, O-1, O-2, O-3]	Perhaps. Goals include maximizing biological and economic yield while preventing overfishing. PSEIS says that risks of overfishing go up the closer you get to OFL due to uncertainty. MSSTs are specified in the SAFEs not FMPs and although operationally MSSTs are taken into account in the management of the fisheries, this may not satisfy the MSA requirement to specify the MSSTs in FMPs National Standard Guidelines for determining whether a stock is currently overfished or approaching an overfished definition. [MA, O-1,O-2]	Yes. Policy seeks to provide sound conservation of living marine resources, provide socially and economically viable fisheries and fishing communities, minimize threats to listed species, and maintain a healthy habitat. [MA, O-1, O-2, O-3, O-4, O-5, O-6, O-7] **PPA: same as Alt 3 [with the following changes: MA, O-1, O-2, O-3, O-4, O-5, O-10, O-11]**	Yes. Policy would substantially reduce harvests and may even temporarily suspend commercial groundfish fishing. Policy shifts burden of proof and gives decreased emphasis in addressing industry and community concerns. [MA, O-1, O-2, O-3, O-6]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal Law	Requirement	Alternative 1	Alternative 2	Alternative 3 (PPA is Bolded)	Alternative 4
MSA National Standards (cont)	**2** based on the best scientific info available	Yes. Have learned that most consider the best scientific information available as the most recent. That may not be the case I all instances. [MA]	Yes. Goals include maximizing biological and economic yield while preventing overfishing. [MA, O-1,O-2]	Yes. Policy seeks to balance goals of MSA based on best scientific information available. [MA, O-3, O-4, O-6, O-8, O-11, O-14, O-16, O-18, O-19, O-23, O-25, O-26, O-27, O-28, O-30, O-32, O-33, O-34] **PPA: includes a recognition that adaptive management requires regular and periodic review; objectives will be reviewed annually to determine progress and incorporate best scientific information. [MA, O-3, O-4, O-5, O-10, O-11, O-13, O-14, O-16, O-19, O-23, O-24, O-27, O-31, O-32, O-33, O-36, O-37, O-38, O-39]**	Yes. Policy requires that scientific evidence be obtained that can conclusively prove that fishing has no significant adverse impacts to the marine ecosystem. [MA, O-13, O-15, O-17, O-19, O-22, O-24, O-26, O-27]
	3 individual stock shall be managed as a unit throughout its range, and interrelated stocks shall be managed in close coordination	Yes. Individual stocks would continue to be managed throughout their range under the existing FMPs. [MA, O-4,O-5,O-6, O-9, O-10, O-12, O-15]	Yes. Individual stocks would continue to be managed throughout their range under the existing FMPs. [MA, O-3,O-4,O-5,O-6,O-11,O-13,O-14,O-15]	Yes. Individual stocks would continue to be managed throughout their range under the existing FMPs. [MA, O-1, O-5, O-7, O-11, O-13, O-14, O-15] **PPA [MA, O-1, O-10, O-11, O-16, O-21, O-22, O-23]**	Yes. Individual stocks would continue to be managed throughout their range under the existing FMPs. [MA, O-1, O-3, O-4, O-5, O-12, O-13, O-14, O-19, O-27]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal Law	Requirement	Alternative 1	Alternative 2	Alternative 3 (PPA is Bolded)	Alternative 4
MSA National Standards (cont)	**4** measures shall not discriminate between residents of different States; allocation shall be fair and equitable to all fishermen, shall promote conservation, and not allow anyone to acquire an excessive share	Yes. Considerable effort has been devotes to ensure that groundfish measures do not discriminate among residents. Have learned that almost all actions can result in allocative effects, leading to controversy.	Yes. Shares same problems as Alternative 1.	Yes. Policy recognizes the need to balance many competing uses and to improve public involvement. [MA, O-21, O-22, O-23, O-27] **PPA [MA, O-5, O-6, O-7, O-8, O-9, O-29, O-30, O-31]**	Yes. Decisions will involve the public but decrease emphasis on economic and community concerns. Equitable allocative or cooperative programs will be developed. [MA, O- 20]
	5 measures shall consider efficiency in use of fishery resources, except no measures shall have economic allocation as its sole purpose	Yes. Economic efficiency a primary objective behind reducing overcapacity. Have m also learned that introducing inefficiencies can serve as economic incentives to modify fishing behavior.	Yes. Maintain existing IFQ and LLP programs. [MA, O-10]	Yes. Expand rights-based management to other groundfish fisheries and communities. [MA, O-21, O-22, O-23] **PPA [MA, O-5, O-6, O-7, O-8, O-9, O-29, O-30, O-31]**	Yes. Decisions will involve the public but decrease emphasis on economic and community concerns. Equitable allocative or cooperative programs will be developed. [MA, O- 20]
	6 allow for variations and contingencies in fisheries, fishery resources and catches	Yes. FMPs would retain flexibility and continue risk-averse harvest strategy.	Yes. OY would continue to be stated as a range. [MA, O-1, O-2, O-13, O-14]	Yes. Adaptive management and frameworked measures provide flexibility. [MA, O-2, O-5, O-7, O-11, O-13, O-15, O-16, O-17, O-19, O-23] **PPA [MA, O-2, O-3, O-10,O-19, O-22, O-24, O-31, O-34, O-37, O-38]**	Yes. FMPs will be adaptive but guided by strict interpretation of the precautionary principle. [MA, O-3, O-13, O-15, O-17, O-19, O-26]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal Law	Requirement	Alternative 1	Alternative 2	Alternative 3 (PPA is Bolded)	Alternative 4
MSA National Standards (cont)	**7** where practicable minimize costs and avoid unnecessary duplication	Yes. Record keeping and reporting requirements aim to avoid unnecessary duplication; electronic reporting reduces cost to industry. Technological advances will reduce costs.	Yes. Policy assumes that fishing has no, or few, adverse environmental effects. Consider repealing the Observer Program to reduce costs. [O-15]	Yes. Policy will require expanded research and data collection, increased analysis of fishery effects, and potential expansion of MPAs that will result in increased management and enforcement costs. **PPA goes further in seeking funds for observer program and research and to reduce costs of recordkeeping and enforcement through technological improvements.**	Yes. Policy will require expanded research and data collection, increased analysis of fishery effects, and potential expansion of MPAs and No-Take Reserves that will result in increased management and enforcement costs.
	8 measures shall take into account the importance of fishery resources to fishing communities to provide for sustained participation and to minimize adverse economic impacts where practicable	Yes. Inshore and offshore allocations, seasonal allocations, and CDQ program are examples of actions to promote economic stability.	Yes. Although a more aggressive harvest policy could result in changes in gear and community share of TAC. Higher exploitation could provide short-term economic benefits at the risk of long-term sustainability.	Yes. Policy seeks to provide socially and economically viable fisheries and fishing communities. [MA, O-21, O-22, O-23, O-27, O-33] **PPA [MA, O-5, O-6, O-7, O-8, O-9, O-29, O-30, O-31]**	Yes, but industry and community considerations are given less emphasis in decision making in favor of ecosystem considerations. [MA]
	9 minimize bycatch or where unavoidable, minimize mortality of bycatch to the extent practicable	Yes. Bycatch limits, caps, and other economic incentives are used to reduce bycatch and waste. [MA, O-7, O-8, O-9, O-10, O-11, O-12]	Perhaps. Bycatch would continue to be monitored and PSC limits adjusted as necessary. PSC limits not needed would be eliminated. Depending on applications of the policy, bycatch measures may not necessarily satisfy the requirements of this standard. [MA, O-3, O-4]	Yes. Existing bycatch measures would continue and be expanded as appropriate to further reduce bycatch and waste. [MA, O-9, O-10, O-11, O-12] **PPA [MA, O-14, O-15, O-16, O-17, O-18, O-19, O-20]**	Yes. Policy would expand and reduce bycatch limits and phase out fisheries with high bycatch rates. [MA, O-7, O-8, O-9, O-10, O-11, O-12, O-16]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal Law	Requirement	Alternative 1	Alternative 2	Alternative 3 (PPA is Bolded)	Alternative 4
MSA National Standards (cont)	**10** promote safety of human life at sea, to the extent practicable	Yes. Selection of season dates and IFQ program are examples where actions were taken to reduce risk to human life among other objectives.	Yes, although a more aggressive harvest policy combined with possible relaxation of overcapacity measures could result in increased risk to fishermen and vessels.	Yes. A more precautionary management policy would promote human safety at sea by improving public involvement in decision making. **PPA [O9]**	Yes. An extremely precautionary management policy would promote human safety at sea by involving and being responsive to the public. Indirectly, risk to human safety will occur through decreased harvest opportunities.
MSA EFH	Agency/Council shall consult/comment on any action that may adversely affect the habitat, including EFH, of any anadromous fishery resource, and SOC will recommend measures to conserve such habitat	Yes. EFH explicitly incorporated into policy with a commitment to research and the development of mitigations measures as determined necessary. [MA, O-15, O-16, O-17]	Yes. Research would continue on the effects of fishing on EFH and mitigation measures taken as appropriate. [MA, O-8, O-9]	Yes. Policy seeks to maintain and protect EFH and will consider implementation of a MPA program to mitigate adverse effects and protect important HAPC. [MA, O-17, O-18, O-19, O-20] **PPA [O-24, O-25, O-26, O-27, O-28]**	Yes. Policy seeks to protect EFH and HAPC through implementation of MPA program that includes No-Take Reserves. [MA, O-15, O-16, O-17, O-18, O-19]
ESA	To provide for the protection and conservation of endangered and threatened species. To avoid jeopardy and adverse modification to critical habitat.	Yes. Protection to threatened and endangered species is explicitly incorporated into policy with a commitment to modify its FMPs as new scientific evidence becomes available. [MA, O-13, O-14]	Yes. Protection to threatened and endangered species is explicitly incorporated into policy. [MA, O-6, O-7]	Yes. Protection to threatened and endangered species is explicitly incorporated into policy with a commitment to modify its FMPs as new scientific evidence becomes available. [MA, O-13, O-14, O-15] **PPA [MA, O-21, O-22, O-23]**	Yes. Protection to threatened and endangered species is explicitly incorporated into policy with a commitment to expand research and monitoring programs. [MA, O-12, O-13, O-14]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal Law	Requirement	Alternative 1	Alternative 2	Alternative 3 (PPA is Bolded)	Alternative 4
MMPA	Protect marine mammals and their habitats from the adverse effects of man's actions. If the incidental take of marine mammals is found to in a significant adverse impact, the responsible federal agency must consult with the NPFMC and develop emergency measures to limit that take.	While not explicitly referring to MMPA, policy statement sets as a goal the compliance with other applicable federal law and the minimization of fishing impacts on the environment. [MA]	While not explicitly referring to MMPA, policy includes objectives aimed at protecting marine mammals and their habitats.	Yes. Policy statement sets as a goal the periodic review of marine mammal populations and fishing interactions and to develop fishery management measures as necessary. [O-16] **PPA [O23]**	While not explicitly referring to MMPA, policy includes objectives aimed at protecting marine mammals and their habitats.
EO 12898 Environmental Justice	Each federal agency must make achieving environmental justice a part of its mission.	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decisionmaking process. [O-21]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decisionmaking process. [O-11, O-12]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decisionmaking process. [O-25, O-26, O-27] **PPA [O-32, O-33, O-34]**	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decisionmaking process. [O-23]
EO 12866 Regulatory Planning and Review	Each agency must prepare a regulatory impact review to evaluate the costs and benefits of intended regulations.	Yes. RIRs are routinely prepared for all regulatory packages as part of the NEPA analysis and IRFA.	Yes. RIRs will continue to be included in all regulatory packages as part of the NEPA analysis and IRFA.	Yes. RIRs will continue to be included in all regulatory packages as part of the NEPA analysis and IRFA.	Yes. RIRs will continue to be included in all regulatory packages as part of the NEPA analysis and IRFA.
EO 13084 Government to Government Coordination	Federal agencies must establish a process to permit Indian tribal governments to provide meaningful and timely input in the development of regulatory practices that affect their communities.	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decisionmaking process. Agency does consult with Alaska tribal governments on fishery issues that are found to adversely affect their communities. [O-21]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decisionmaking process. [O-11, O-12]	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decisionmaking process. [O-25, O-26, O-27] **PPA [O-32, O-33, O-34]**	Yes. Updated policy explicitly recognizes that Alaska Native consultation is an important part of the decisionmaking process. [O-23]

Table 4.11-1 (cont.). Comparison of alternatives to federal requirements.

Federal Law	Requirement	Alternative 1	Alternative 2	Alternative 3 (PPA is Bolded)	Alternative 4
EO 13158 MPAs	Strengthen the management, protection, and conservation of existing MPAs; develop a scientifically based, comprehensive national system of MPAs; develop new or expanded MPAs, and avoid causing harm to MPAs through federal actions.	Yes. EFH explicitly incorporated into policy with a commitment to research and the development of mitigations measures as determined necessary. [MA, O-15, O-16, O-17]	Yes. Research would continue on the effects of fishing on EFH and mitigation measures taken as appropriate. [MA, O-8, O-9]	Yes. Policy seeks to maintain and protect EFH and will consider implementation of a MPA program to mitigate adverse effects and protect important HAPC. MPA program would review and certify existing areas and consider additional use of MPAs and No-Take Reserves [MA, O-17, O-18, O-19, O-20] **PPA [MA, O-24, O-25, O-26, O-27, O-28]**	Yes. Policy seeks to protect EFH and HAPC through implementation of MPA program that greatly expands use of No-Take Reserves. [MA, O-15, O-16, O-17, O-18, O-19]

Notes: Brackets [ ] cite back to the alternatives.
CDQ - community development quota
EFH - essential fish habitat
EO - Executive Order
FMP - fishery management plan
HAPC - habitat area of particular concern
IFQ - individual fishing quota
IRFA - Initial Regulatory Flexibility Analysis
LLP - License Limitation Program
MMPA - Marine Mammal Protection Act
MSST - minimum stock size threshold
MPA - marine protected area TAC - total allowable catch
MSA - Magnuson-Stevens Fishery Conservation Management Act
NEPA - National Environmental Policy Act
NPFMC - North Pacific Fishery Management Council
OFL - overfishing level
OY - optimum yield
PSC - prohibited species catch
PSEIS - Programmatic Supplemental Environmental Impact Statement
RIR - regulatory impact review
SAFE - Stock Assessment and Fishery Evaluation

Table 4.11-2. Comparison of policy-level impacts of the alternatives.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA	KEY:
	NOTE: The implication of a split color rating is that major components within the category will undergo a different impact under the alternative in question. To the extent possible, the rationale is explained in the bullets beneath.					
What is the impact of the policy on the sustainability of target stocks (preventing overfishing)?	• successful at preventing overfishing of target stocks, ensures sustainable fishery • no incentive to research those stocks on which impacts of fishing are unknown; possible to overharvest a vulnerable member of a stock complex	• maximizes economic yield while preventing overfishing of target stocks, but not effective at preventing stocks from becoming overfished • increases the chance of unintentionally overfishing a stock	• prevents overfishing of target stocks through precautionary harvest policies • acceleration of efforts to identify methods for reducing the number of stocks where the status relative to an overfished condition is unknown	• establishes a very conservative harvest policy which is likely to prevent stocks from becoming overfished • protects most vulnerable species of a complex, but the resulting management would be difficult to implement	• prevents overfishing of target stocks through precautionary harvest policies • acceleration of efforts to improve the current harvest strategy	**adverse impact; may include adverse conclusions that are based on assumptions**
What is the impact of the policy on the sustainability of fisheries and communities?	• continues to provide economic and community stability within the current system while adapting management programs when the need arises • some fisheries and communities are stressed due to negative effects of the race for fish	• long-term sustainability of fisheries and communities may be problematic if scenarios depicted in 2.1 are implemented; in the short-run fisheries and communities will likely see improved economic conditions • if less aggressive actions are pursued, likely to be no better or worse than Alternative 1	• rationalization of fisheries holds the promise of improved fishery and community sustainability • extensive area closures associated with more aggressive ecosystem-based management may reduce small-boat and Alaska community involvement in fisheries	• extensive TAC reductions and area closures reduce viability of fisheries and fishery dependent communities • some fisheries may survive if assumptions of impacts are correct	• rationalization of fisheries holds the promise of improved fishery and community sustainability • incorporation of community protection elements into rationalization and ecosystem-based management programs are likely to ensure coastal community stability	**no adverse impact if assumptions are correct; no room for uncertainty**

Table 4.11-2 (cont.). Comparison of policy-level impacts of the alternatives.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA	KEY:
What is the impact of the policy on the stability of the food web and community structures (preserving the food web)?	• likely effective in protecting food web components that are more well-studied than others and those that are at critical population thresholds • uncertain whether sufficient protection is provided to others for which less-complete information is available	• high potential to create adverse food web impacts through its lack of precaution for many food web components, which leaves no room for uncertainty	• many improvements provide additional protection against uncertainty in order to achieve the goal of preserving the food web • if implemented, this strategy is likely to provide protection to a broad range of food web components	• very successful in meeting the goal of preserving the food web, by providing large buffers against scientific uncertainty about ecosystem impacts • achieves protection of virtually all food web components and thus ecosystem function	• many improvements provide additional protection against uncertainty in order to achieve the goal of preserving the food web • if implemented, this strategy is likely to provide protection to a broad range of food web components	**no adverse impact if assumptions are correct; accounts for some level of uncertainty**
What is the impact of the policy on bycatch (discards) and incidental catch?	• effective at limiting incidental catch of non-target species and reducing of bycatch • insufficient reporting of individual species catch, and catch in shallow water environments	• may not be consistent with the goal of reducing and avoiding bycatch through developing practical measures that minimize bycatch	• likely successful at reducing prohibited species catch • reductions likely to be achieved through incentives for more efficient use of fishery resources under cooperatives, comprehensive rationalization of fisheries or other bycatch incentive programs	• bycatch and incidental catch reduction policies are effective • achieved through extreme reductions in target groundfish catch and strong bycatch and incidental catch limits	• likely successful at reducing prohibited species catch • reductions likely to be achieved through incentives for more efficient use of fishery resources under cooperatives, comprehensive rationalization of fisheries or other bycatch incentive programs	**beneficial impact if assumptions are correct; accounts for large level of uncertainty**

Table 4.11-2 (cont.). Comparison of policy-level impacts of the alternatives.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA	KEY:
What is the impact of the policy on seabird and marine mammal interactions?	• effective at providing protection to ESA-listed seabirds and marine mammals • no objectives for protecting non-listed species	• retains protection measures for ESA-listed species, but does not go beyond ESA-required measures • high potential to increase fishery interactions with seabirds and marine mammals which may result in adverse impacts to those species	• goal of minimizing human-caused threats to protected species is largely met • likely to provide increased protection to marine mammals and seabirds	• very successful at avoiding impacts to seabirds and marine mammals • specific objectives to protect all seabirds from fishing interactions, and extend protection measures for Steller sea lion critical habitat and prey base	• effective at providing protection to ESA-listed seabirds and marine mammals • may provide increased protection to seabirds • no objectives for protecting non-listed marine mammal species	
What is the impact of the policy on protecting marine habitat, including benthic essential fish habitat?	• likely effective in protecting habitat components that are more well studied than others; uncertain whether sufficient protection provided to habitat components for which there is less complete information • continued reduction of long-lived slow growing benthic habitat species; continuation of reduced levels of benthic organisms in areas of high fishing intensity	• increased impacts to habitat because of less precautionary management measures • potential changes may result in adverse impacts that may be hard to reverse, especially for long-lived, slow recovering living habitats	• potential to reduce and avoid future impacts to habitat by careful placement of closures • a careful strategy can minimize geographic redistribution and increases in effort, and thus reduce chances of unintended consequences. • historical impacts could have caused long-term and possibly irreversible loss of long-lived, slow growing benthic habitat species	• combination of highly precautionary measures associated with increasing marine reserves and other closure areas will likely achieve protection of, and avoidance of impacts to, habitat • although benefits to habitat accrue due to reduced effort and high use of no-take reserves, uncertain whether they can mitigate the adverse historical impacts affecting the baseline condition	• potential to reduce and avoid future impacts to habitat by careful placement of closures • a careful strategy can minimize geographic redistribution and increases in effort, and thus reduce chances of unintended consequences. • historical impacts could have caused long-term and possibly irreversible loss of long-lived, slow growing benthic habitat species	

Table 4.11-2 (cont.). Comparison of policy-level impacts of the alternatives.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA	KEY:
What is the impact of the policy on the value of marine resources (commercial and non-commercial)?	• continues to generate substantial producer and consumer benefits in the US, while adapting management programs when the need arises • continues policies that have generated environmental concerns tending to keep recreation, tourism and non-market values low	• potential to increase allowable catches is expected to significantly increase revenues, but would also increase operating costs • non-market, recreational, and tourism values are expected to decline because of the reduced emphasis on these benefits	• increased social and economic benefits through the elimination of the race-for-fish while also emphasizing the long-term economic value of the fishery • promotes ecosystem based management and is likely to increase non-commercial values assigned to the ecosystem	• results in substantial reductions in allowable catches and could also result in the closure of large portions of traditional fishing areas, could jeopardize the continued viability of coastal communities • goals of incorporating and enhancing non-consumptive use values are met	• increased social and economic benefits through the elimination of the race-for-fish while also emphasizing the long-term economic value of the fishery • considers ecosystem-based management and is unlikely to decrease non-commercial values assigned to the ecosystem	
What is the impact of the policy on Alaska Native participation in fishery management, and their traditional ways of life?	• Alaska Native consultation and participation in fishery management, and subsistence, would continue to comply with federal law	• Alaska Native consultation and participation in fishery management, and subsistence, would continue to comply with federal law • increased fishing effort would result in increased economic benefits to fishery participants (particularly CDQ), but potentially increased salmon bycatch	• increase current participation and consultation in fishery management by expanding informal and formal consultation and TK data collection • rationalization and additional area closures may benefit subsistence by reducing salmon bycatch	• directly involves Alaska Natives in fishery management through the development of co-management or cooperative research programs • other goals, that greatly reduce or eliminate commercial fishing, would adversely impact Native communities	• increase current participation and consultation in fishery management by expanding informal and formal consultation and TK data collection • rationalization and additional area closures may benefit subsistence by reducing salmon bycatch	

Table 4.11-2 (cont.). Comparison of policy-level impacts of the alternatives.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA	KEY:
What is the impact of the policy on data quality, monitoring, research, and enforcement requirements?	• data collection program will continue to meet minimum acceptable standards • aspects of the program, such as non-random coverage in the 30% component of the fleet, could be improved	• maintains a minimum level of data collection to meet conservation requirements • consideration to repeal the Observer Program may compromise management on the best science available	• likely to be effective at reducing uncertainty through data collection measures, such as improved observer catch monitoring data of target and non-target species, and expanded economic reporting data	• expands research and monitoring programs to fill critical data gaps that may result in the modification of restrictive conservation and management measures • expansion of observer program coverage would result in more complete fishery data, particularly on vessels <125 ft LOA	• likely to be effective at reducing uncertainty through improved data collection and monitoring, promotes research to fill data gaps • explicitly promotes enforceability	

Notes: CDQ - community development quota
ESA - Endangered Species Act
LOA - length overall
PPA - preliminary preferred alternative
TAC - total allowable catch
TK - traditional knowledge

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Chapter 5
Tables

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Table 5.2-1. Changes in the specific management measures in the alternatives.

Comparative Baseline	Suggested Management Measure Changes in Alternatives 1, 2, 3, 4, and the Preliminary Preferred Alternative					
		Alt 1	Alt 2	Alt 3	Alt 4	PPA
Control the harvest level by setting TACs	- reduce TACs			✓	✓	✓
	- specify TACs for different areas or seasons than currently specified				✓	
	- establish TACs for new species groups			✓	✓	✓
	- set all TACs equal to OFLs		✓			
	- adjust BSAI OY cap		✓	✓	✓	
	- remove groundfish bycatch and incidental catch restrictions		✓			
PSC limits in the BSAI and GOA	- remove all PSC limits		✓			
	- reduce PSC limits			✓	✓	✓
	- establish additional PSC limits in the GOA			✓	✓	✓
Time or area closures to protect marine mammals, groundfish target species, non-target species, or habitat	- repeal closures		✓			
	- more time or area closures			✓	✓	✓
Bycatch (discard) management program	- reduce bycatch rates			✓	✓	✓
	- initiate bycatch incentive programs			✓		✓
	- more rigorous retention and utilization standards	✓			✓	✓
Gear restrictions and gear modifications	- relaxing of gear modifications		✓			
	- more gear modification requirements	✓		✓	✓	✓
	- increase in gear restrictions			✓		✓
Rights-based management in certain fisheries	- increased use of rights-based fishing systems			✓		✓
North Pacific Groundfish Observer Program	- revise coverage levels			✓	✓	✓
	- collect new data, develop uncertainty estimates			✓	✓	✓
	- repeal the observer program except for monitoring AFA		✓			
Data and Reporting Requirements	- collect new data			✓		✓
	- improve access to existing data			✓		✓
Require use of monitoring equipment	- extend mandatory use of VMS			✓	✓	
	- require motion-compensated scales in all fisheries				✓	
	- repeal at-sea weighing of catch		✓			

Table 5.2-1 (cont.). **Changes in the specific management measures in the alternatives.**

Notes: AFA - American Fisheries Act
Alt - alternative
BSAI - Bering Sea and Aleutian Islands
GOA - Gulf of Alaska
OFL - overfishing level
OY - optimum yield
PPA - preliminary preferred alternative
PSC - prohibited species catch
TAC - total allowable catch
VMS - vessel monitoring system

Table 5.2-2. Significance of the alternatives.

Management and Enforcement Complexity	Alternative 1	Alternative 2	Alternative 3	Alternative 4	PPA
Managing harvest within specified catch limits (TAC & PSC)	**SAME**	**INC**	**INC**	**INC**	**INC**
Monitoring and enforcing compliance with area closures (including seasonal, gear, directed fishery)	**SAME**	**DEC**	**INC**	**INC**	**INC**
Monitoring and enforcing compliance with bycatch (discard) reduction standards	**SAME**	**DEC**	**INC**	**INC**	**INC**
Managing and enforcing gear modifications requirements and gear restrictions	**SAME**	**SAME**	**SAME**	**INC**	**INC**
Management complexity due to rights-based management programs	**SAME**	**DEC**	**INC**	**SAME**	**INC**
Managing observer programs and data collection	**SAME**	**DEC**	**INC**	**INC**	**INC**
SIGNIFICANCE EVALUATION:** Does the alternative significantly affect management and enforcement complexity? (adverse = more complex beneficial = less complex)	**I**	**S+**	**S-**	**S-**	**S-**

Notes: CS+ - conditionally significant beneficial
CS- - conditionally significant adverse
DEC - alternative would tend to decrease management and enforcement complexity
I - insignificant
INC - alternative would tend to increase management and enforcement complexity
S+ - significant beneficial
S- - significant adverse
SAME - alternative would not be likely to affect the degree of management and enforcement complexity
**See Section 5.2.3 for definitions of significance.