APPENDIX F-7

Qualitative Analysis Paper

Gear Restrictions and Allocations

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ACRONYMS AND ABBREVIATIONS

AFA	American Fisheries Act
BSAI	Bering Sea and Aleutian Islands
CDQ	Community Development Quota
CVOA	catcher vessel operational area
EBS	eastern Bering Sea
EEZ	Economic Exclusion Zone
EFH	essential fish habitat
ESA	Endangered Species Act
FMPs	Fishery Management Plans
GOA	Gulf of Alaska
m	meter
MSA	Magnuson-Stevens Fishery Conservation and Management Act
N	North
nm^2	square nautical miles
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service or NMFS
NPFMC	North Pacific Fishery Management Council
PFMP	preliminary fishery management plan
PSC	prohibited species catch
TAC	total allowable catch
W	West

Gear Restrictions and Allocations

1.0 Introduction

This qualitative impact assessment discusses current and proposed gear restrictions and allocations in the Bering Sea-Aleutian Islands (BSAI) and Gulf of Alaska (GOA) groundfish fisheries. The introductory section is divided into three parts. First, we define the term "allocation" in the context of fishery management and describe the need for and rationale behind allocation measures. Second, we identify various types of management tools used to address allocation issues or implement allocation decisions. The tools of particular interest here are those measures that allocate fishing privileges among users of different gear types. Third, we describe recent trends in the application of such allocation measures in the Alaska groundfish fisheries.

1.1 Definition of Allocation and the Need for Allocation Measures

The National Marine Fisheries Service (NOAA [National Oceanic and Atmospheric Administration] Fisheries) defines an ‘‘allocation" or ‘‘assignment" of fishing privileges as a direct and deliberate distribution of the opportunity to participate in a fishery among identifiable, discrete user groups or individuals (61 FR 32552, June 24, 1996). Allocation measures have normally been implemented by fishery managers for one or more of the following reasons: 1) to maintain healthy fish stocks or rebuild depressed stocks; 2) to protect resources that are not directly associated with fishing; or 3) to protect the economic position of certain groups engaged in a fishery or in related fisheries.

If it becomes necessary to allocate fishing privileges among various U.S. fishermen, National Standard 4 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires that the allocation be 1) fair and equitable to all such fishermen; 2) reasonably calculated to promote conservation; and 3) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges (Sec. 301(a)(4)).

1.2 Types of Management Tools for Allocating Fishing Privileges

A fishery management plan (FMP) that merely perpetuates existing fishing practices may result in an allocation if those practices directly distribute the opportunity to participate in a fishery (61 FR 32552, June 24, 1996). Alternatively, an FMP may contain management measures specifically intended to allocate fishing privileges. A wide array of management tools can be used to intentionally allocate fishing privileges, and these privileges can be allocated among many different types of user groups. This analysis focuses on those management tools that allocate fishing privileges among users of various kinds of fishing gear. Such tools include quotas by gear type, different fishing seasons for gear types, prohibitions on the use of certain gear, and the assignment of ocean areas to different gear users.

1.3 Trends in Allocations among Gear Types in Alaska Groundfish Fisheries

U.S. foreign bilateral agreements were the main mechanism for managing groundfish fisheries off Alaska before 1976. Allocations among users of different gear types included time-area closures to protect domestic fishermen from fishing grounds preemption and gear conflicts caused by mobile foreign trawl gear.

Following the implementation of the MSA in 1976, foreign fishing could be conducted in the new 200 nautical miles (nm) U.S. Fishery Conservation Zone (later changed to the Exclusive Economic Zone [EEZ]) only pursuant to an international treaty or a governing international fishery agreement. The BSAI groundfish preliminary fishery management plan (PFMP) prohibited foreign fishing within 12 nm, except at certain times of the year in parts of the Aleutian Islands. Specifically to protect juvenile halibut, no trawling was allowed from December 1 through May 31 in a large area north of the Aleutian Islands and east of 170°West (W), which later would be called the Winter Halibut Savings Area, and in an area just south of the Pribilof Islands known as the Misty Moon Grounds. Further, the Bristol Bay Pot Sanctuary, north of the Alaska Peninsula running from the eastern boundary of the Winter Halibut Savings Area east to 160°W, was closed to trawling all year to prevent conflicts between foreign trawl gear and U.S. crab pots.

The GOA groundfish PFMP prohibited trawling within 12 nm (except at 169°-170°W) to prevent gear conflicts and catch of inshore species. Six Kodiak Island Gear Areas were closed to foreign fishing from August 10 through May 31 to prevent conflicts with U.S. crab pots and halibut setlines. To protect emergent domestic fisheries in Dutch Harbor and Sand Point, no trawling at all was allowed in the Davidson Bank area. Three additional areas were closed around Kodiak Island within five days of the halibut fishery so the grounds would be undisturbed and gear conflicts with U.S. fishermen would be reduced. A rule change to the FMP in April 1978 further restricted foreign fishing by limiting the cod fishery west of 157°W and inside the 500 meter (m) isobath to longlines to reduce bycatch of other species and prevent gear conflicts during the halibut season.

Under the sablefish PFMP there were no time area restrictions in the Bering Sea, but there were various year-round and temporary closures in the Aleutian Islands. In the GOA, the foreign setline fishery had to stay outside the 500-m depth contour to reduce gear conflicts with domestic fishermen.

A major task of the North Pacific Fishery Management Council (NPFMC), which first convened in October 1976, was to develop FMPs for the groundfish fisheries to replace the PFMPs (which applied only to foreign fisheries). The first FMP developed was for the GOA groundfish fisheries, implemented in January 1979: the BSAI groundfish FMP was implemented in 1982. Both plans carried forward most of the PFMP management measures. Some time-area closures were expanded, and depth restrictions were set on foreign longline fishing for Pacific cod in the Winter Halibut Savings Area in the eastern Bering Sea (EBS).

By the end of 1985, only minor foreign fisheries, directed on pollock and Pacific cod, were being allowed in the GOA. Foreign harvesting continued in the Bering Sea. Even there, foreign trawling had ended within 20 nm of the Aleutian Islands, and foreign longlining for cod was restricted to north of 55°North (N) and west of 170°W, depending on ice conditions. To protect halibut, southeast Alaska, east of 140°W, was closed to all foreign fishing in 1982. The Kodiak Island Gear Areas were expanded into one large area, bounded by the "Lechner Line," and its closure to all foreign trawling was designed to prevent gear conflicts between foreign trawlers and U.S. crab fishermen and to prevent preemption of crab grounds during the crab season by foreign trawlers. This closure remained in place while foreign trawlers still worked the grounds off Kodiak. Foreign trawling ceased in the GOA after 1985.

During the five years between 1986 and 1991, the groundfish fisheries became totally domestic. During this period, bycatch control in the domestic fisheries was a major policy emphasis. Extensive closures were imposed on domestic trawlers around Kodiak Island and in the EBS to protect red king crab. Some closures were complete and year round; others were for parts of the year and applied just to bottom trawling. By 1990,

prohibited species catch (PSC) restrictions were widely applied to the entire domestic fleet through a complex allocation of PSC limits by area, season, gear, and fishery sector, including both trawl and fixed gear. This PSC framework was first established for the GOA and later applied to the BSAI, although differences exist between the two areas in terms of prohibited species, method for setting the catch restrictions, and the fisheries/gear types to which the restrictions apply.

By 1992, a separate statistical subarea was created around Bogoslof Island to allow for the establishment of a separate total allowable catch (TAC) for pollock in this subarea, thereby providing regulatory protection of Aleutian Basin pollock during spawning to help rebuild the Aleutian Basin pollock stock. This stock was heavily fished in central Bering Sea international waters by foreign fleets displaced from the U.S. EEZ. Additionally, the Aleutian Islands management area was partitioned into three separate areas to manage Atka mackerel and later pollock.

By 1995, a large area (referred to as the Pribilof Islands Habitat Conservation Area) around the Pribilof Islands was closed to trawling to protect halibut and blue king crab and for other purposes. The Pribilof Islands trawling closure conferred benefits on local residents and also reduced the potential for disturbance and incidental mortality of marine mammals and seabirds that live in the area. In addition, more areas in Bristol Bay were closed to non-pelagic trawling to protect red king crab and their habitat, and the Chinook Salmon Savings Area was established to reduce bycatch of chinook salmon in the Bering Sea groundfish trawl fisheries. All trawling was prohibited in the area.

The rapid expansion of the domestic fleet during the 1980s also led to increased interactions among gear types. In the early 1980s, for example, domestic longliners had increased their harvests of sablefish rapidly as markets for this species developed. Two new gear types, pots and sunken gillnets, entered the sablefish fishery in 1984. In addition, trawling by foreign joint ventures in the central and western GOA also took sablefish. All these gears created an overcapacity problem in the domestic sablefish fishery, as well as gear conflicts between longline fishermen and pot fishermen. In 1985, in the first allocation of an Alaska groundfish species among domestic fishermen, 80 percent of the sablefish TAC in the western and central GOA was allocated to longline gear while trawl gear was allocated the remaining 20 percent, but only to cover incidental catches. In the eastern GOA 95 percent of the sablefish was allocated to longline gear and 5 percent to trawl gear to cover incidental catches. The use of pots in the sablefish fishery was phased out in the GOA. In the BSAI, gear allocations in the sablefish fishery were implemented in 1990. In the Aleutian Islands subarea, 25 percent was allocated to trawl gear and the remainder to fixed gear, while in the Bering Sea subarea 50 percent of the TAC was allocated to trawl gear.

In 1992, allocations of BSAI pollock were made between inshore and offshore sectors. In addition, a catcher vessel operational area (CVOA) was established in the Bering Sea in which catcher processors and motherships were prohibited from engaging in directed fishing for pollock during the B Season (September 1 to November 1). Inshore-offshore allocation of GOA pollock and Pacific cod were also approved in 1992–the inshore sector was allocated 90 percent of the pollock and 80 percent of the Pacific cod. The inshore-offshore allocations in the GOA remain in place as approved in 1992; however, the BSAI allocations were altered in 1995 and finally replaced with the American Fisheries Act (AFA) of 1998. The AFA modified the allocations of the BSAI pollock quota as follows: 10 percent to the western Alaska Community Development Quota (CDQ) program, with the remainder allocated 50 percent to the inshore sector, 40 percent to the offshore sector, and 10 percent to the mothership sector.

In the early 1990s, there were also concerns within the fishing industry regarding the need for stability in the trawl gear and fixed gear (longline, pot, and jig) fleets that targeted Pacific cod. In 1994, an allocation of the BSAI Pacific cod harvests among vessels using trawl, hook-and-line or pot gear, and jig gear was implemented. While the fixed and trawl gear fleet were allocated about their average catch, the 2 percent allocation to jig gear was larger than historical catches. This allocation to jig gear was intended to encourage participation of small, shore-based vessels. The BSAI Pacific Cod "gear split" was re-authorized in 1996 with changes in the allocation and an additional split between trawl catcher vessels and trawl catcher processors. In 2000, the fixed gear portion of the BSAI Pacific cod fishery was further subdivided between longline catcher processors, longline catcher vessels, and pot gear vessels. In 2001, a further split was deemed necessary between pot catcher processors and pot catcher vessels.

The 1990s also saw an increase in concern about fishery interactions with protected species. In 1990, NOAA Fisheries listed Steller sea lions as threatened under the Endangered Species Act (ESA). Subsequently, NOAA Fisheries closed areas year-round to trawling within 10 miles of 37 Steller sea lion rookeries, and to within 20 miles during the pollock A season (January 20–April 15) around five rookeries in the BSAI. There were comparable closures in the GOA. To reduce competition for prey and avoid localized depletion in sea lion foraging areas, the pollock TAC was spread over three areas, and the amount of excess pollock that could be taken in a quarter was limited.

2.0 Analysis of Alternatives

The following four policy alternatives are under consideration by the NPFMC:

Alternative 1 — Continue Under the Current Risk Averse Management Policy: Under this alternative, the NPFMC would continue to manage the groundfish fisheries based upon the present conservative and risk-averse policy. This policy assumes that fishing does result in some adverse impacts to the environment and that, as these impacts become known, mitigation measures will be developed and appropriate FMP amendments will be implemented.

Alternative 2 — Adopt a More Aggressive Management Policy: A less precautionary management policy (more aggressive harvest strategy) would be implemented based upon the concept that the present strategy is overly conservative and that higher harvests could be taken without threat of overfishing the target groundfish stocks. This strategy assumes that fishing at the recommended levels would have no adverse impact on the environment except in specific cases that are generally known.

Alternative 3 — Adopt a More Precautionary Management Policy: This policy would seek to accelerate the existing precautionary management measures through community or rights-based management, ecosystem-based management principles and, where appropriate and practicable, increase habitat protection and impose additional bycatch constraints. Under this approach, additional conservation management measures would be taken as necessary to respond to social, economic or conservation needs. Additional measures would be taken if scientific evidence indicated that the fishery was negatively impacting the "environment," not just a population of a given species.

Alternative 4 — Adopt a Highly Precautionary Management Policy: This policy would require that the user of the resource demonstrate that the intended use would not have a detrimental effect on the

environment before significant fishing could be allowed. The policy and its associated FMP framework would be to impose very restrictive conservation and management measures at minimum that would only be modified or relaxed when additional reliable scientific information became available. It would involve a strict interpretation of the precautionary principle. Management discussions would involve, and be responsive to, the public but decreased emphasis would be placed on industry and community concerns, and more emphasis would be placed on ecosystem concerns and principles, including the identification and incorporation of non-consumptive use values. The overall premise is that fishing does produce adverse impacts on the environment, but, due to a lack of information and uncertainty, we know little about these impacts. A goal of this alternative, as expressed through its FMP framework, is to include the use of explicit allocative or cooperative programs to reduce excess capacity and allocate fish to particular gear types and fisheries.

Each of the policy alternatives outlined above, with the exception of Alternative 1.0, contains two bookends to a range of management measures that illustrate how the framework of each policy could be implemented. These bookends provide a level of detail that allows the effects of the alternatives on the environment to be compared. They also provide a basis for the NPFMC to commit to the goals and principles of a particular policy alternative, while allowing it, under the MSA, to adaptively manage the fishery through FMP amendments using the best scientific information available.

3.0 Alternative 1: Continue under the Current Risk Averse Management Policy

3.1 Overview of Gear Restrictions and Allocations of Alternative 1.0

Alternative 1.0 would maintain current gear restrictions and allocations in the Alaska groundfish fisheries. Many of the management measures in the groundfish FMPs could be considered allocative and restrict gear in one way or another. This analysis focuses on the measures listed below.

No-trawl Zones

The no-trawl zones in effect at this time and their implementing FMP amendments are as follows:

GOA

- Amendment 15 - Kodiak bottom trawl closures (renewed by Amendment 18 and made permanent by Amendment 26)
- Amendment 41 - Southeast trawl closure (implemented as part of the Groundfish License Limitation Program in 1996)
- Amendment 59 - Sitka Pinnacles Marine Reserve
- Amendment 60 - Cook Inlet closed area

BSAI

- Amendment 10 - Trawl closure north of Alaska Peninsula
- Amendment 16a - Herring Savings Areas
- Amendment 18 - Catcher Vessel Operational Area (boundaries modified by Amendment 38)
- Amendment 21a - Pribilof Islands Habitat Conservation Area
- Amendment 21b - Chinook Salmon Savings Areas (revised by Amendment 58)
- Amendment 35 - Chum Salmon Savings Area
- Amendment 37
  - Bristol Bay Red King Crab Savings Area
  - Nearshore waters of Bristol Bay trawl closure
- Amendment 40 - C. opilio Bycatch Limitation Zone

Pollock bottom trawl gear prohibition in the BSAI

Pollock bottom trawling is banned in the BSAI under Amendment 57 to the BSAI FMP.

Sablefish pot gear prohibition in the GOA

The harvest of sablefish with pot gear is banned under Amendment 14 to the GOA FMP.

Sablefish and Pacific cod allocation

Sablefish TACs are allocated among gear types under Amendment 14 to the GOA FMP and Amendment 13 to the BSAI FMP. The BSAI Pacific cod TAC is allocated among gear types under Amendment 46 and Amendment 64 to the BSAI FMP. Amendment 24 to the BSAI FMP seasonally apportions the amount of Pacific cod TAC allocated to vessels using longline or pot gear.

Atka mackerel allocation

Amendment 34 allocates up to 2 percent of the Atka mackerel TAC specified for the eastern BSAI to vessels using jig gear.

Shortraker/rougheye rockfish allocation

After subtraction of reserves, Amendment 53 allocates 30 percent of the remaining shortraker/rougheye TAC to non-trawl gear and 70 percent of the remaining TAC to trawl gear.

While this analysis focuses on the measures listed above, it is recognized that other management measures may indirectly restrict gear or allocate harvest amounts among gear types. For example, the PSC management measures of Alternative 1.0 have the indirect effect of allocating between gear types and fishing sectors. Some of the management measures that may indirectly restrict gear or allocate harvest amounts among gear types are listed below.

GOA

- Amendment 18 - Halibut PSC allocations and Shelikof Strait management area
- Amendment 19 - Prohibit pollock roe stripping
- Amendment 21 - Apportion PSC limits by fishery and gear
- Amendment 22 - Experimental fishing permits
- Amendment 23 - Inshore/offshore allocation of pollock and Pacific cod (extended and/or modified by Amendments 40, 51 and 61).
- Amendment 24 - PSC control measures
- Amendment 25 - Steller sea lion buffer zones
- Amendment 27 - Trawl test areas

BSAI

- Amendment 9 - Directed fishing definition
- Amendment 12a - Revised halibut and crab PSC limits
- Amendment 14 - Prohibit pollock roe stripping
- Amendment 16 - Gear restrictions related to interim harvest levels and PSC management
- Amendment 17 - Experimental fishing permits
- Amendment 18 - Inshore/offshore allocation of pollock (extended and/or modified by Amendments 38, 51 and 61).
- Amendment 19 - Adjusted PSC categories
- Amendment 20 - Steller sea lion buffer zones
- Amendment 21 - Halibut bycatch mortality limits
- Amendment 41 - Reduced C. bairdi PSC limit
- Amendment 46 - Adjust halibut PSC for Pacific cod

3.2 Effects of Gear Restrictions and Allocations of Alternative 1.0

Effects on Marine Mammals

Three marine mammal species are of particular importance relative to both direct and indirect fishery interactions: Steller sea lions, Northern fur seals, and harbor seals. Interactions between the groundfish fisheries and other marine mammals are relatively low.

The incidental take of Steller sea lions under Alternative 1.0 is low. Based on NOAA Fisheries observer records from the BSAI and GOA trawl, longline, and pot fisheries during 1990 to 1999, the mean annual mortality rate was 9.6 animals per year from the western stock of Steller sea lions. The last recorded mortality of a Northern fur seal in any Alaskan groundfish fishery occurred in 1996. Observer records from 1990 to 1998 indicate that direct interactions of Northern fur seals with groundfish vessels occurred only in the BSAI trawl fishery, despite observer placement in pot, longline and trawl fisheries in both the BSAI and GOA. Incidental direct take of harbor seals by the groundfish fisheries operating in the GOA and BSAI are uncommon and collectively amounted to less than 0.2 percent of the GOA and southeast Alaska harbor seal management unit potential biological removals.

Sperm and killer whales are known to interact directly with longline gear. However, interactions that result in harm to any of the toothed whales, other than occasional incidental takes, have not been documented. Sperm whales in the GOA have been observed feeding off longline gear targeting sablefish and halibut. While sperm whales appear be attracted to these vessels, the interactions with boats employing commercial longline gear do not appear to have an adverse impact on sperm whales. Much to the contrary, the whales appear to have become more attracted to these vessels in recent years. (NMFS 2001).

Most information regarding killer whale consumption of commercially important groundfish results from observations of whales depredating longlines as they are retrieved in locations ranging from the south EBS to Prince William Sound. In the waters between Unimak Pass and the Pribilof Islands, killer whales regularly strip sablefish and Greenland turbot from longlines (NMFS 2001). Fishermen have testified at the NPFMC that increased interactions with killer whales have made the use of longline gear in areas of the BSAI difficult.

Steller sea lions may compete with groundfish fisheries for prey. Some toothed-whale species prey on the same species caught in groundfish fisheries. This is especially the case for killer whales and sperm whales. The impact of prey competition on these marine mammals is a function of both the amount of fishing activity and its concentration in space and time. In general, it does not appear that under Alternative 1.0 prey competition represents a concern for other marine mammals at current population levels (NMFS 2001). There may be localized effects based on spatial and temporal patterns of fishing (NMFS 2001). To the extent that no-trawl zones impose limits on fishing activity inside the critical habitat of marine mammals, it can be assumed that at least some protection is currently provided from these effects.

Effects on Seabirds

Several effects on seabirds related to gear restrictions and allocations can be summarized. Hook-and-line gear catches almost 90 percent of the seabirds taken in groundfish fisheries. This gear type, therefore, will dominate any direct effects of Alternative 1.0 on the incidental catch of most seabirds. The species most impacted by hook-and-line gear are northern fulmars, gulls, albatrosses (including endangered short-tailed albatross), and shearwaters in the BSAI and northern fulmars, albatrosses, and gulls in the GOA. Trawl gear is responsible for the remaining 10 percent of seabird incidental catch. Trawl gear takes mainly alcids, northern fulmars, and gulls.

Several factors are likely to affect the risk of seabird incidental catch including fishing effort (number of hooks set or trawl-hours per year), the distribution of effort by sub-area and season, the abundance and distribution of seabirds in the vicinity of fishing vessels, and the use of seabird deterrents in longline fisheries. The relative importance of these factors has not been fully studied.

In both the BSAI and GOA, northern fulmars are more likely to be taken with increased fishing effort than any of the other three seabird groups that are taken by longline gear. Differences in species-specific foraging behavior and behavior while around fishing vessels could be a factor in the different catch rates. The impact of hook-and-line fishing effort cannot be predicted in detail because of unknown factors such as the seasons and locations of fishing as it relates to the abundance and distribution of seabirds and the effectiveness of the deterrent measures being used.

To the extent that measures under Alternative 1.0 allocate more Pacific cod and sablefish to hook-and-line gear, there is an increased probability that more seabirds will be taken. Data indicate that allocations for hook-and-line gear in some fisheries have increased. In the BSAI, direct allocations of Pacific cod to hook-and-line and pots increased from 44 percent in 1994 to 51 percent in 1997. A specific allocation of 40.953 percent was made to hook-and-line gear in 2000. Sablefish allocations in the GOA have favored users of hook-and-line gear since 1985, when they received 95 percent of the sablefish in the eastern GOA and 80 percent of the sablefish in the central and western GOA. In the BSAI, beginning in 1990, they received a 50 percent allocation in the Bering Sea and a 75 percent allocation in the Aleutian Islands.

The establishment of the Pribilof Islands Habitat Conservation Area has had a positive effect on seabirds (NMFS 2001). Red-legged kittiwakes and black-legged kittiwakes, seabird species of special concern, appear to have remained at stable population numbers since 1989. Other seabird species, such as northern fulmars and common murres are increasing on the Pribilof Islands (NMFS 2001).

Effects on Target Species

The directed pollock fishery is conducted exclusively by pelagic trawl gear in the BSAI and primarily by this gear type in the GOA. Historically, large fractions of the total pollock harvest occurred in a relatively short time and in a fairly concentrated area. More recently, management measures have served to disperse the fishing effort over broader areas. Regional TACs are further allocated by season and there are limits to the amount of pollock catch that can be taken inside Steller sea lion critical habitat. The level of habitat disturbance and the temporal and spatial concentration of the catch under Alternative 1.0 does not appear to affect the stock's sustainability either through changes in the population's genetic structure or changes in reproductive success, as measured by the ability of the stock to maintain itself above its minimum stock size threshold.

The trawl fisheries targeting sablefish are often limited by PSC limits. Therefore, to the extent that more sablefish is allocated to trawl gear, the overall harvest of sablefish by trawl and fixed gear combined is expected to be lower. In 2001, the central GOA trawl and longline gear fully harvested their sablefish allocations. However, in the western GOA trawl gear only caught 35 percent of its allocation and longline gear caught 90 percent. Longliners harvested 78 percent of their sablefish allocation in the Bering Sea, while trawlers harvested only 53 percent. In the Aleutian Islands longliners harvested 64 percent of their allocation and trawlers harvested only 7 percent.

Under Alternative 1.0 and the existing FMP, trawl fishing is not permitted in the southeast/east Yakutat area, and the Pacific ocean perch acceptable biological catch or TAC normally allocated to that area is typically not caught. Pacific ocean perch stocks in all areas are fished at less than the overfishing level. The other slope rockfish category in the GOA includes sharpchin, harlequin, redstripe, silvergray, redbanded, and yellowmouth rockfish. Historically, almost all catch for these species has been as bycatch in other fisheries, although there was a small amount of directed fishing for silvergray and yellowmouth rockfish in the early 1990s. Trawl surveys show the biomass for all species of other slope rockfish is concentrated in the eastern GOA area (Heifetz *et al.* 1999). Since 1998, the prohibition on trawling in the eastern GOA east of 140°W has afforded a high level of protection to all species in the other slope rockfish group since most of these species are only taken in trawls.

Yellowfin sole catch rates have been lowered by the no-trawl zones along the northern side of the Alaska Peninsula. These area closures have forced vessels to shift their effort to areas in which PSC bycatch levels are higher. Consequently, the yellowfin sole TAC is not fully harvested due to PSC limits.

Effects on Non-target (Forage, Other, and Non-specified) Species

In deep water longline fisheries the catch of non-specified species in terms of volume or weight may nearly equal target species catch. This phenomenon is attributed to the bycatch of grenadiers, a large-size fish. Also, the longline fishery for Pacific cod catches a higher rate of skates than does the trawl fishery. Included in this longline bycatch is a disproportionately large amount of rarer skate species. To the extent that current allocations among gear types have favored users of longline gear, Alternative 1.0 has had a negative effect on these non-target species.

Effects on Prohibited Species

PSC limits and time and area closures have been specified for some prohibited species in the current FMP. The requirement that fisheries be closed (or moved) when PSC limits are attained has constrained some groundfish fisheries in recent years. Pacific halibut bycatch limits have affected bottom trawl fisheries, in particular; consequently, portions of fishing quotas annually specified for most flatfish species have remained unharvested (Witherell 1995). The majority of halibut bycatch in the BSAI is taken in trawl fisheries, specifically those targeting Pacific cod, yellowfin sole, and rock sole. Longline fisheries targeting Pacific cod take the next largest proportion of halibut bycatch. Overall, 80 percent of BSAI halibut bycatch is predicted in bottom trawl fisheries, 16 percent in longline fisheries, 4 percent in pelagic trawl fisheries, and less than 1 percent in all other gear types. The proportions are similar in the GOA with 86 percent in bottom trawl fisheries, 12 percent in longline fisheries, and less than 2 percent in all other gear types.

The bycatch of halibut is mostly juveniles and this juvenile mortality is taken into account within the halibut stock assessments and the International Pacific Halibut Commission quota setting process (NMFS 2001). While no significant impacts to halibut populations are predicted under Alternative 1.0, the bycatch mortality of juvenile halibut will continue to reduce yields in the directed halibut fishery.

PSC limits have led to technological innovation on the part of harvesters. For instance, careful release requirements in longline fisheries have been implemented to improve survival of halibut discards. Likewise, several trawlers voluntarily use bycatch reduction devices in their nets to release incidentally caught halibut with minimal harm.

Numerous areas are closed to non-pelagic trawling to protect king and Tanner crab stocks. These include the Bristol Bay Red King Crab Savings Area, the nearshore Bristol Bay no-trawl zone, the Pribilof Islands Habitat Conservation Area, and areas around Kodiak Island. Since the Bristol Bay measures were implemented, bycatch of red king crab has been greatly reduced, and the Bristol Bay red king crab stock has rebuilt to levels that supported directed crab fisheries in 1996-2001, but the stock is again declining due to a lack of recruitment. Since the establishment of the Pribilof Islands Habitat Conservation Area, the blue king crab population has continued to decline and is now considered overfished. With regard to the effects of the Kodiak Island area closures, surveys have detected signs of rebuilding for some crab stocks. In 2001, the C. bairdi Tanner crab fishery at Kodiak Island reopened after a seven-year closure. However, king crab stocks in the vicinity of Kodiak Island remain depressed.

About 94 percent of all BSAI herring catch occurs in the Bering Sea pelagic trawl fishery for pollock. Recently, bycatch of herring in groundfish fisheries has been very low compared to both herring biomass (1 percent or less in the BSAI and 0.05 percent in the GOA) and herring catch in directed fisheries (ADF&G 2000). Thus, bycatch of herring under Alternative 1.0 is unlikely to have significant impacts on herring populations.

Chinook salmon in the BSAI are taken primarily in pollock fisheries (about 92 percent of the total) and the Pacific cod bottom trawl fishery (7 percent). Amendment 58 to the BSAI FMP revised the boundaries of the chinook salmon savings areas and instituted bycatch levels that will trigger trawl closures in those areas. Amendment 35 to the BSAI FMP set chum salmon bycatch limits and a chum salmon savings area that prohibits all trawling.

Effects on Habitat, Including Essential Fish Habitat, and Ecosystems

A number of the no-trawl zones are designed, at least in part, to protect habitat and/or essential fish habitat. In addition, the prohibition on bottom trawling for pollock in the BSAI affords greater protection to habitat including essential fish habitat (EFH). Under Alternative 1.0, year-round closures to bottom trawling are 16 percent, 18 percent, and 21 percent of the benthic EFH in the Bering Sea, Aleutian Islands, and GOA, respectively. Although these percentages are near the 20 percent recommendation for marine reserves (Agardy 1994, Lauck *et al.* 1998, Allison *et al.* 1998), the primary focus of these area closures is to protect crab habitat. Because this habitat is generally relatively shallow and does not encompass a wide range of habitat types and depths, the closures do not protect a wide range of EFH for other species. The exception is the bottom trawl closure area in southeast Alaska, which encompasses a wide range of habitat types and depths. There are generally no area restrictions in the deeper waters that encompass the outer continental shelf and upper slope of the central and western GOA and BSAI. Within the areas currently open to bottom trawl fishing, specific areas or "hotspots" are repeatedly fished each year, while other areas are undisturbed or fished very lightly (Coon *et al.* 1999, Fritz *et al.* 1998). Presumably, an area is repeatedly trawled because there are high catches of target species and the bottom topography is suitable.

Fixed gear may also adversely impact benthic biota and habitat. Longline and pot gear can damage benthic biota by hooking, crushing, and plowing. In some cases, fixed gear may have a greater impact than trawl gear due to its ability to be more easily fished on a wider range of habitat types. Geographic areas with sensitive habitat (e.g., gorgonian corals) are probably the most susceptible to fixed gear impacts. The Sitka Pinnacles Marine Reserve and nearshore areas of some marine mammal protection zones are the only areas closed to fixed gear fisheries.

The existing no-trawl zones are likely to have ecosystem benefits in the EBS, as they comprise a relatively large portion of the continental shelf. The three Bering Sea area closures (Pribilof Islands Habitat Conservation Area, Bristol Bay and Red King Crab Savings Area) total about 30,000 square nautical miles (nm^2), which encompasses about 25 percent of the Bering Sea shelf. The GOA closures encompass about 47,000 nm^2, but a vast majority (about 80 percent) of this area is off the continental shelf (greater than 200 nm). Additional no-trawl zones include the Steller sea lion rookeries and haulouts. The 2.5 nm^2 Sitka Pinnacles Marine Reserve established in 2000 prohibits all groundfish and halibut fishing but allows recreational and commercial fishing for salmon.

Economic and Social Effects

Trawl closure areas were established with the expressed purpose of reducing bycatch of species valuable to certain non-groundfish commercial, recreational, or subsistence fisheries. Similarly, allocations of groundfish TACs among gear types were intended, at least in part, to protect the economic interests of participants in certain fisheries. There is insufficient economic data to determine the magnitude of the costs and benefits of these measures or how these costs and benefits are distributed across fishery participants.

The costs of prohibited species discards under Alternative 1.0 include 1) the cost imposed on participants in the groundfish fisheries by having to stay within the PSC limits; 2) the cost of prohibited species discards imposed on crab, halibut, herring, and salmon fishermen (including commercial, recreational, and subsistence fishermen) in terms of reduced catch and value; 3) the cost of any net adverse ecological effects associated with discarding prohibited species at sea; and 4) the management and enforcement costs associated with controlling this bycatch. The second type of costs is the opportunity costs of catching and discarding prohibited species. In the case of a PSC limit that is not utilized fully, this opportunity cost may be low. All but the first type of cost are external costs from the perspective of groundfish fishermen.

The imposition of compliance costs on the fishery participants reduces their potential profitability. This provides them economic incentives, at least in part, to comply in a less costly manner. Fishery participants have responded by developing gear modifications that selectively reduce bycatch of unwanted species (e.g., larger mesh in trawls, excluder devices) or increase survivability after being caught (e.g., grates on sorting decks). To the extent that these modifications are successful at reducing unwanted bycatch or PSC mortality, fishermen are able to catch more of their target species.

Effects on Management and Enforcement

NOAA Fisheries manages the fisheries off Alaska based on TAC amounts for target species and PSC limits for species that may not be retained. The TAC and PSC amounts are further subdivided by gear type, area, and season. The complexity of the management regime has increased substantially over the years. In 1995, for example, there were 40 TAC allocations and 38 PSC allocations in the BSAI. By 1999, there were 79 TAC allocations and 54 PSC allocations. Each allocation may require NOAA Fisheries to take a management action, such as close a fishery, reallocate bycatch amounts, or investigate an overage. When a directed fishery in one area is closed, the boats that participated in the fishery often move to another area or change to another target. This shift, in turn, often leads to the need for additional management actions. Though the number of allocations has increased, the quantity of fish available for these allocations has not, and NOAA Fisheries is required to manage increasingly small blocks of fish. To do this adequately requires the use of increasingly sophisticated catch-monitoring tools, such as observer coverage, electronic reporting, vessel monitoring systems, and the use of at-sea scales. Though these tools increase the quantity, quality, and timeliness of the data available to NOAA Fisheries, they also increase the demands on staff to effectively make use of a larger and more complex data system.

4.0 Alternative 2: Adopt a More Aggressive Management Policy

4.1 Overview of Gear Restrictions and Allocations of FMP 2.1

FMP 2.1 would eliminate all trawl closure areas and trawl and fixed gear restrictions. The only closed areas that will remain in effect are those specifically implemented to protect Steller sea lions.

4.2 Effects of Gear Restrictions and Allocations of FMP 2.1

Effects on Marine Mammals

Eliminating all trawl closure areas could increase the effects of fishing on marine mammals. The effects of fishing on marine mammals could occur as vessels harvest schools of fish that marine mammals also feed on. However, the scope and magnitude of such effects are unknown because little is known about interactions between fishing activities and marine mammal foraging. Steller sea lions would continue to receive some level of protection due to separate and continued findings of jeopardy. Protective measures instituted for Steller sea lions would also provide some protection for other species although the measures would not necessarily address these other marine mammals' specific habitat and activity patterns.

Effects on Seabirds

Some of the trawl closure areas that would be eliminated under FMP 2.1 are close to shore and adjacent to seabird rookeries such as the Pribilof Islands Habitat Conservation Area. To the extent that seabirds feed in proximity to their rookeries, opening fisheries near the rookeries could interfere with seabird foraging behavior. Localized depletion of prey species around seabird colonies could be particularly detrimental during the chick-rearing period for the breeding seabirds. For instance, the recent reductions in the populations of kittiwakes in the Pribilof Islands suggest that a decline in the abundance of prey (e.g., capelin) near these islands has had a negative impact on these seabirds. The cause of this decline in the abundance of prey is unknown.

Effects on Target Species

The elimination of trawl closure areas under FMP 2.1 would have little, if any, effect on target species, as the harvest of these species would continue to be governed by TACs.

Effects on Non-target (Forage, Other, and Non-specified) Species

The elimination of trawl closure areas under FMP 2.1 is expected to have little, if any, effect on non-target species.

Effects on Prohibited Species

Many of the areas closed to trawling under Alternative 1.0 were done so specifically to reduce the catch of prohibited species. This is the case in the Pribilof Islands Habitat Conservation Area, the Kodiak Island area closures, the Halibut Savings Area and the Salmon and Herring Savings Areas. Reopening these areas under

FMP 2.1 is expected to result in an overall increase in the catch of prohibited species. In some cases, however, the PSC associated with a target fishery may decrease by opening a closed area. For example, when the Bristol Bay area was closed to trawling the trawl fleet shifted its effort to other areas to harvest yellowfin sole. This shift resulted in a significant increase in PSC per metric ton of yellowfin sole harvested. A reopening of the Bristol Bay area to yellowfin sole trawling, therefore, may result in a decrease in the PSC associated with this target fishery.

Effects on Habitat, Including Essential Fish Habitat, and Ecosystems

If non-pelagic trawling resumes in the areas reopened under FMP 2.1, disturbance of benthic biota and habitat will occur. The extent of the disturbance will depend on the specific type of trawls used and the amount of fishing effort. The impact also varies with the habitat type. Because most of the areas have been closed to trawling for some time, the extent of change induced by a resumption of trawling will probably be substantial.

Economic and Social Effects

Trawl closure areas were established with the expressed purpose of reducing bycatch of species valuable to certain non-groundfish commercial, recreational, and subsistence fisheries, including those fisheries targeting crab, salmon, and herring. Therefore, reopening these areas under FMP 2.1 can be expected to have a negative economic impact on the participants in these fisheries. For instance, to the extent that the Kodiak Island area closures were successful in protecting C. bairdi Tanner crab stocks, opening those areas to trawling will have adverse economic effects on crabbers. These effects are associated with the taking of crab as bycatch (direct costs) or negatively affecting crab habitat or crab prey (indirect costs). On the other hand, reopening areas may reduce the operating costs of trawlers. Similar effects would be expected for subsistence and commercial salmon fisheries if the BSAI salmon savings areas were reopened. There is insufficient economic data to determine the magnitude of these costs and benefits.

Effects on Management and Enforcement

FMP 2.1 will result in decreased enforcement costs due to the elimination of closed areas. With fewer closed areas to monitor, enforcement agencies will have fewer obligations for resource deployment such as overflights and vessel patrols. However, these savings may not be substantial, as many of the patrols that monitor closed areas also monitor compliance with other management measures.

4.3 Overview and Effects of Gear Restrictions and Allocations of FMP 2.2

FMP 2.2 is identical to Alternative 1.0 in terms of gear restrictions and allocations. Consequently, the predicted effects on the environment are the same.

5.0 Alternative 3: Adopt a More Precautionary Management Policy

5.1 Overview and Effects of Gear Restrictions and Allocations of FMP 3.1

FMP 3.1 is identical to Alternative 1.0 in terms of gear restrictions and allocations. Consequently, the predicted effects on the human environment are the same.

5.2 Overview of Gear Restrictions and Allocations of FMP 3.2

This FMP would prohibit the use of bottom (non-pelagic) trawl gear to harvest pollock in the GOA and would restrict fishing to areas where fishing has previously been concentrated.

5.3 Effects of Gear Restrictions and Allocations of FMP 3.2

Effects on Marine Mammals

Prohibiting bottom trawling for pollock in the GOA will likely have little direct effect on marine mammals. The prohibition will lead to an increase in the use of pelagic trawls for pollock and an associated change in the size distribution of the catch and amount and type of bycatch species. Fisheries data suggest that switching to the use of pelagic trawls would result in a decrease in bycatch. The composition of the bycatch is uncertain. Some of the bycatch species of pelagic trawls may also be marine mammal prey.

Because FMP 3.2 would spatially concentrate fishing effort there will be more area available to marine mammals without direct fishing disturbance. However, the particular areas where fishing is open will determine if this concentration leads to fewer interactions. To the extent that the open areas are also used by marine mammals, interactions may increase since fishing effort will be redirected to those areas.

Effects on Seabirds

The effects of the gear restrictions and allocations of FMP 3.2 on seabirds are likely similar to those described for marine mammals. In particular, the effects depend on what fishing areas remain open (NMFS 2001).

Effects on Target Species

The gear restrictions and allocations of FMP 3.2 would have little, if any, impact on target species, as the harvest of these species would continue to be restricted by TACs.

Effects on Non-target (Forage, Other, and Non-specified) Species

The prohibition on bottom trawling for pollock in the GOA will lead to an increase in the use of pelagic trawls and an associated change in the amount and type of bycatch species. Fisheries data suggest that switching to pelagic trawling would result in a decrease in bycatch. The composition of the bycatch is uncertain. The effects on non-target species of spatially concentrating fishing effort are also uncertain, as the areas that will remain open have not yet been specified.

Effects on Prohibited Species

The prohibition on bottom trawling for pollock in the GOA will result in a decrease in the catch of some prohibited species in that fishery. Pelagic trawling for pollock has a lower mortality rate for halibut and takes fewer C. bairdi Tanner crab and chinook salmon. However, there could be a higher bycatch of other species of salmon, as pelagic trawling exhibits a higher bycatch rate for these salmon species.

Effects on Habitat, Including Essential Fish Habitat, and Ecosystems

The prohibition on bottom trawling for pollock in the GOA could lead to a substantial decrease in fishing impacts to benthic biota and habitat. The bycatch rate of benthic organisms in the GOA pollock fishery is considerably higher for bottom trawl gear than for pelagic trawl gear. For example, it is estimated that the catch rate is 1,000 times higher for coral, 20 times higher for anemones, and at least 900 times higher for sponges (NMFS 2001).

By limiting the groundfish fisheries to grounds where fishing has traditionally been concentrated, benthic biota and habitat in other areas would be protected from continuing impacts and be allowed to recover from past habitat disturbances. The potential benefits of such closures include protection of ecosystem structure and function and improved scientific understanding of the role of marine habitat (Murray *et al.* 1999). The effectiveness of these area closures is increased if the boundaries and locations of a network of closures is appropriately designed (Dugan and Davis 1993, Murray *et al.* 1999). Intuitively, concentrating even more fishing effort in areas already impacted by fishing gear would lead to increased disturbance of benthic ecosystems and substrates. These impacts would be less than on areas not already being impacted although it would no doubt vary by habitat and substrate type. The overall tradeoff between continued degradation of some areas and recovery of others is not determinable at this time.

A possible shortcoming of closing only those areas where fishing has previously been concentrated is that traditional fishing grounds would likely coincide with the preferred habitat for adult stages of many groundfish species. Consequently, this approach may not provide adequate protection or opportunity for restoration of affected habitat.

Economic and Social Effects

The prohibition on bottom trawling for pollock in the GOA would result in increased costs for those fishing vessels that switch to pelagic trawling. These vessels would have to purchase new gear and learn to use it.

Restricting fishing to areas where fishing has previously been concentrated could lead to increased operating costs and decreased revenues for some vessels if they have to travel further to harvest fish or fish in less productive areas. Catch rates for the fleet as a whole are likely to fall as vessels are forced into areas of greater fishing concentration.

Effects on Management and Enforcement

Restricting fishing to areas where fishing has previously been concentrated is expected to increase monitoring and enforcement costs. Closing areas to certain fisheries or to certain gear types may be more difficult to enforce than closing areas to all fishing by, say, establishing no-take marine reserves. For

example, the only means of determining if a vessel is towing a pelagic rather than a non-pelagic trawl or targeting flatfish instead of Pacific cod is by directly observing the gear and/or catch on deck. Therefore, the regulations specific to a restricted area will determine the level of monitoring and enforcement costs for this FMP component.

6.0 Alternative 4: Adopt a Highly Precautionary Management Policy

6.1 Overview of Gear Restrictions and Allocations of FMP 4.1

FMP 4.1 would prohibit trawling in all fisheries that can be prosecuted with other gear types (e.g., fisheries with greater than 25 percent incidental catch and bycatch). In effect, this measure represents an allocation of groundfish TAC to users of fixed gear. In addition, FMP 4.1 restricts bottom trawling for flatfish to specific areas and prohibits fishing in areas identified as no-take marine reserves.

Based on a preliminary review of fisheries data, the trawl fisheries that can be prosecuted with other gear types are: Pacific cod in the BSAI; Greenland turbot and sablefish in the BSAI; and, partially, rockfish fisheries in the GOA harvesting shortraker/rougheye and thornyhead. All of these fisheries can be prosecuted with fixed gear, primarily hook-and-line (i.e., longline) gear.

6.2 Effects of Gear Restrictions and Allocations of FMP 4.1

Effects on Marine Mammals

To the extent that trawling in BSAI Pacific cod fisheries has an adverse effect on the foraging success of marine mammals, there will be a positive impact on marine mammals from the elimination of such trawling. Closing nearshore portions of the GOA to bottom trawling could have a positive effect on harbor seals.

An increase in the use of longline gear may result in an increase in fishery interactions with killer whales and sperm whales. Killer whale depredation of sablefish and turbot off of longlines in the BSAI and as far east as Prince William Sound is well documented. Sperm whales in the GOA have been observed feeding off longline gear targeting sablefish.

Effects on Seabirds

An increase in the use of longline gear would result in an increase in fishery interactions with seabirds. Longline gear accounts for 90 percent of the seabird catch in the groundfish fisheries (NMFS 2001). The primary types of seabirds affected will be northern fulmars, gulls, albatrosses, and shearwaters.

Effects on Target Species

The elimination of trawling in some groundfish fisheries would have little, if any, effect on target species, as the harvest of these species would continue to be restricted by TACs. The overall amount of target species caught would not change provided the fixed gear fleet has sufficient fishing capacity to harvest the quota.

The elimination of trawling for Pacific cod in the BSAI would result in a decrease in the harvest of non-target species caught in the trawl Pacific cod fishery. These species include flatfish, rockfish and pollock. The elimination of trawling for turbot and sablefish in the BSAI would also result in a decrease in the harvest of flatfish. Also, the size of Pacific cod caught with trawl and fixed gear is different so there will be a change in age-class removals due to gear selectivity (NMFS 2001).

Thornyhead rockfish caught with longline gear tend to be older than those taken by trawl gear. Consequently, an increase in the harvest of thornyhead with longlines will cause a shift in size and age composition.

Effects on Non-target (Forage, Other, and Non-specified) Species

A decrease in the use of trawl gear is expected to result in decreased harvests of jellyfish and spiny dogfish in the GOA and forage fish in the BSAI (NMFS 2001). A concomitant increase in the use of longline gear will result in higher catches of grenadiers and skates. In addition, increased harvests are expected for forage fish, sculpin, octopus, and sleeper sharks in the GOA and octopus and spiny dogfish in the BSAI.

Effects on Prohibited Species

A shift from trawl to fixed gear in the BSAI Pacific cod fishery would result in a significant decrease in bycatch mortality of C. bairdi Tanner crab, red king crab, halibut, and chinook salmon (NPFMC 1996). A similar shift in the BSAI turbot/sablefish fishery would result in a slight increase in halibut and other salmon mortality and a decrease in C. bairdi crab mortality. The overall catch of prohibited species would not change if reductions in prohibited species bycatch are transferred to other fisheries and/or gears.

There will be a positive effect on the age structure of halibut as a result of shifting to fixed gear. Halibut caught as prohibited species by longline gear are typically older and larger than those taken by trawl gear.

Effects on Habitat, Including Essential Fish Habitat, and Ecosystems

A decrease in the use of trawl gear is expected to result in a net positive effect on benthic biota and habitat. Coral catch would be substantially reduced, and decreases in the catch of anemones, sponges, sea pens, and sea whips would also occur. Restricting bottom trawling for flatfish to specific areas is also likely to have a positive effect on benthic biota and habitat.

Economic and Social Effects

Redistributing fishing effort to fixed gear (pots and hook-and-line) may lead to grounds congestion, increased gear conflicts, increased fishing costs, and reduced revenues. For example, grounds crowding with pots and longline gear occurred in the halibut and sablefish fisheries prior to the implementation of the Individual Fishing Quota program. The result was increased gear loss, vessels racing to fish on the more productive grounds, and higher injury rates among crew.

Owners of vessels displaced from the affected trawl fisheries will have the choice of switching gears, switching fisheries, or tying up their boats. Given the entry constraints to the more lucrative fisheries such as pollock, sablefish, and crab, it is likely that many displaced vessels will have no viable economic options in the North Pacific fisheries.

The overall amount of target species delivered to processors would not change provided the fixed gear fleet has sufficient fishing capacity to harvest the quota. In some fisheries (e.g., sablefish longline fishery) this capacity may not be available, at least in the short term.

A shift from trawl to fixed gear will change the availability of certain processed products in U.S. markets. For instance, Pacific cod are typically processed into fillets by trawl catcher processors, while longline catcher processors are generally restricted to producing headed and gutted products. To the extent that the production of fillets in the Alaska groundfish fisheries is reduced significantly, the price of fillet products to U.S. consumers may increase.

Effects on Management and Enforcement

The gear restrictions and allocations implemented under FMP 4.1 are not expected to result in a significant change in management and enforcement costs.

6.3 Overview and Effects of Gear Restrictions and Allocations of FMP 4.2

Under FMP 4.2, the allocation of fishing privileges among gear types is not a possible management measure, as the FMP prohibits all fishing for groundfish in the EEZ off Alaska. These effects would prevail until each Alaska groundfish fishery was subjected to an environmental review and, based on the results of that review, permitted to operate under strict regulations. Only fisheries certified by NOAA Fisheries to have no significant adverse effects on the environment would be authorized to operate in the EEZ off Alaska. Such a review and certification process would likely take up to two years based on the length of a recent environmental review of the Alaska pollock fishery conducted by an international organization. Regulations accompanying each certified fishery may include specific gear restrictions, gear allocations, and closed areas.

7.0 Data Gaps and Information Needs

The following numerical data would support the analysis of the effects of the alternatives as they relate to gear restrictions and allocations in the Alaska groundfish fisheries:

- PSC estimates prior to implementation of current no-trawl zones;
- Current stock status of prohibited species in current no-trawl zones;
- Previous fishing activity in current no-trawl zones by season and target species;
- PSCs in yellowfin sole fishery before and after implementation of current no-trawl zones;
- Historical comparison of pollock fishing in the GOA with pelagic and non-pelagic trawls in terms of pollock catch, bycatch amount and composition, fishing areas, number and size of vessels, and ports of origin/landing; and
- Incidental catch and bycatch by gear group, area and target species.

8.0 Comparative Analysis of Alternatives

The following summarizes the effects of each policy alternative in terms of gear restrictions and allocations in the Alaska groundfish fisheries as determined by analyses of each alternative's associated FMP framework.

Alternative 1: This alternative would maintain current gear restrictions and allocations in the Alaska groundfish fisheries.

Alternative 2: FMP 2.1 would eliminate all trawl closure areas and trawl and fixed gear restrictions. The only closed areas that will remain in effect are those specifically implemented to protect Steller sea lions. FMP 2.2 is identical to Alternative 1 in terms of gear restrictions and allocations.

Alternative 3: FMP 3.1 is identical to Alternative 1.0 in terms of gear restrictions and allocations. FMP 3.2 would prohibit the use of bottom (non-pelagic) trawl gear to harvest pollock in the GOA and would restrict fishing to areas where fishing has previously been concentrated.

Alternative 4: FMP 4.1 would prohibit trawling in all fisheries that can be prosecuted with other gear types (e.g., fisheries with greater than 25 percent incidental catch and bycatch). In effect, this measure represents an allocation to users of fixed gear. In addition, FMP 4.1 restricts bottom trawling for flatfish to specific areas and prohibits trawling in areas identified as marine protected areas. FMP 4.2 prohibits all fishing for groundfish in the EEZ off Alaska

The following table summarizes the anticipated effects of different approaches toward implementing gear restrictions and allocations in the Alaska groundfish fisheries as described in the associated FMP bookends.

Summary of Anticipated Effects of FMP Bookends on Gear Restrictions and Allocations in the Alaska Groundfish Fisheries.

Alt. 1.0	Alt. 2.0		Alt. 3.0		Alt. 4.0	
FMP 1.0	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
Physical Environment						
NO EFFECT Fishing activities currently managed under the existing FMPs are not expected to greatly reduce the structural integrity and complexity of the benthic habitat.	**POSSIBLE ADVERSE EFFECT** Since areas presently closed to bottom trawling would be opened, there could be localized areas of disturbance as a result of concentrated fishing effort.	**NO EFFECT** Fishing activities currently managed under the existing FMPs are not expected to greatly reduce the structural integrity and complexity of the benthic habitat.	**NO EFFECT** Fishing activities currently managed under the existing FMPs are not expected to greatly reduce the structural integrity and complexity of the benthic habitat.	**BENEFICIAL EFFECT** Since more area will be closed to bottom trawling and a greater percentage of the fishable area will be designated as no-take marine reserves, fewer impacts on the substrate will be realized as compared to the current FMPs.	**BENEFICIAL EFFECT** This FMP closes additional deeper areas to trawling, and provides for a higher percentage of no-take marine reserves. Therefore these should be less impact on the physical environment across a wider range of depths and habitats	**POSSIBLE ADVERSE AND BENEFICIAL EFFECT** There would be no negative effects from fisheries on the physical environment while fishing is suspended. Only those fisheries that have no adverse effects on the environment will be allowed to resume. Displaced fishing effort could have indirect adverse effects.

Summary of Anticipated Effects of FMP Bookends on Gear Restrictions and Allocations in the Alaska Groundfish Fisheries. (Cont.)

Alt. 1.0	Alt. 2.0		Alt. 3.0		Alt. 4.0	
FMP 1.0	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
Biological Environment						
BENEFICIAL EFFECT No-trawl zones would continue to impose limits on fishing activity inside the critical habitat of marine mammals. Measures that allocate more Pacific cod and sablefish to longline gear may increase the probability that certain seabird species are taken and certain non-target species are caught. The Pribilof Islands Habitat Conservation Area will continue to have a positive effect on seabirds. Some no-trawl zones are designed to protect habitat and will contribute to the protection of certain target species and prohibited species.	**ADVERSE EFFECT** Eliminating all trawl closure areas would likely impact marine mammals through the disruption of prey behavior. Opening fisheries near rookeries could interfere with seabird foraging behavior. If non-pelagic trawling resumes in reopened areas, disturbance of benthic biota and habitat will occur.	Same effects as Alternative 1.0	Same effects as Alternative 1.0	**BENEFICIAL EFFECT** The prohibition on bottom trawling for pollock in GOA would lead to a substantial decrease in fishing impacts to benthic biota and habitat.	**BENEFICIAL EFFECT** Elimination of trawling in BSAI Pacific cod fisheries may have a positive effect on foraging success of marine mammals. Closing nearshore portions of the GOA to bottom trawling may have a positive effect on harbor seals. An increase in the use of longline gear may result in an increase in seabird takes and interactions with killer whales and sperm whales. A shift from trawl gear to longline gear will decrease the catch of some non-target species and increase the catch of others. A decrease in use of trawl gear will have a positive effect on benthic biota and habitat.	**POSSIBLE ADVERSE AND BENEFICIAL EFFECT** There would be no negative effects from fisheries on the biological environment while fishing is suspended. Only those fisheries that have no adverse effects on the environment will be allowed to resume. Displaced fishing effort could have indirect adverse effects.

Summary of Anticipated Effects of FMP Bookends on Gear Restrictions and Allocations in the Alaska Groundfish Fisheries. (Cont.)

Alt. 1.0	Alt. 2.0		Alt. 3.0		Alt. 4.0	
FMP 1.0	**FMP 2.1**	**FMP 2.2**	**FMP 3.1**	**FMP 3.2**	**FMP 4.1**	**FMP 4.2**
Economic and Social Effects						
BENEFICIAL EFFECT Trawl closure areas will continue to reduce bycatch of species valuable to certain non-groundfish commercial, recreational, or subsistence fisheries. Similarly, allocations of groundfish TACs among gear types will continue, at least in part, to protect economic interests of participants in certain fisheries	**ADVERSE AND BENEFICIAL EFFECT** A reopening of no-trawl zones will have a positive economic effect on trawling operations but a negative economic effect on participants in fisheries that target prohibited species.	Same effects as Alternative 1.0	Same effects as Alternative 1.0	**POSSIBLE ADVERSE EFFECT** The prohibition on bottom trawling for pollock in the GOA would result in increased costs for those fishing vessels that switch to pelagic trawling. Restricting fishing to areas where fishing has previously been concentrated could lead to increased operating costs or decreased revenues for some vessels. Catch rates for the fleet as a whole are likely to fall as vessels are forced into areas of greater fishing concentration and congestion.	**POSSIBLE ADVERSE EFFECT** Shifting from trawl to fixed gear will concentrate fishing effort in some fixed gear fisheries. Concentration of fishing effort may lead to grounds congestion, increased gear conflicts, increased fishing costs, and reduced revenues. Owners of vessels displaced from affected trawl fisheries will have the choice of switching gears, switching fisheries, or tying up their boats. A shift from trawl to fixed gear will change the availability of certain processed products in U.S. markets.	**ADVERSE EFFECT** If the people and equipment that are displaced shift to some underutilized fishery, or into an entirely different segment of the economy, society will not lose part of its productive capacity. However, some of the displaced effort may be transferred into a fishery already suffering from overexploitation or overcapacity.

9.0 References

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