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FINAL

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

AND

REGULATORY IMPACT REVIEW/INITIAL REGULATORY FLEXIBILITY ANALYSIS

OF PROPOSED INSHORE/OFFSHORE ALLOCATION ALTERNATIVES

(Amendment 18/23)

TO THE FISHERY MANAGEMENT PLANS FOR THE

GROUNDFISH FISHERY OF THE BERING SEA AND ALEUTIAN ISLANDS

AND THE GULF OF ALASKA

Prepared by the Inshore/Offshore Analytical Team
of the
North Pacific Fishery Management Council

MARCH 5, 1992

COVER SHEET

RESPONSIBLE AGENCIES:

National Marine Fisheries Service
National Oceanic and Atmospheric Admin.
U.S. Department of Commerce
Washington, D.C. 20235

North Pacific Fishery Management Council
P.O. Box 103136
Anchorage, Alaska 99510

PROPOSED ACTION:

Approval and implementation of a inshore/offshore allocation alternative.

FOR FURTHER INFORMATION CONTACT:

Steven Pennoyer
Director, Alaska Region
National Marine Fisheries Service, NOAA
P.O. Box 21668
Juneau, Alaska 99802-1668
Telephone: (907) 586-7221

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ABSTRACT:

This supplemental environmental impact statement, combined with a regulatory impact review/initial regulatory flexibility analysis, evaluates environmental, economic, and social impacts of proposed inshore/offshore allocations of pollock in the Bering Sea/Aleutian Islands area, and pollock and Pacific cod in the Gulf of Alaska. These proposed allocations constitute amendments to the Fishery Management Plans for the Groundfish Fishery in the Bering Sea/Aleutian Islands and the Gulf of Alaska. The Council has defined as a problem the risk of resource preemption by one industry sector upon another. Several management alternatives have been proposed by the industry and refined by the Council to address this problem. This analysis is designed to provide the public and the decisionmakers with an understanding of the trade-offs; the costs and benefits of each alternative in addressing the problem. The effectiveness of these alternatives in successfully solving the preemption problem is presented in the analysis.

COMMENTS:

Comments on this final are invited until April 20, 1992. Send written comments to Steven Pennoyer, Director of the Alaska Region, National Marine Fisheries Service, at the address above.

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Prior to the 1980s, the groundfish fisheries off Alaska were dominated by foreign fleets. With passage of the Magnuson Fishery Conservation and Management Act in 1977, and by direction of the North Pacific Fishery Management Council, foreign fisheries were gradually phased out as the domestic fishing industry expanded to harvest and process the quotas. By 1988, there were no longer any directed foreign fisheries off Alaska, and significant joint venture operations ended in 1990.

During this period of "Americanization", the Council became increasingly aware of the allocative effects of decisions on domestic users, as one fishery after another became fully U.S.-utilized. A major issue arose in 1989 when offshore factory trawler vessels moved into the Gulf of Alaska and harvested a significant part of the pollock quota that the shorebased industry had planned to use during the year. Fishermen and processors from Kodiak, Alaska requested Council consideration of inshore/offshore allocations of fishery stocks as a way to prevent future preemption of resource use by one industry sector over another. This shorebased component of the Alaska groundfish industry asserted that while harvesting and processing pollock over a short period (while the fish are schooling) may have certain advantages, the social and economic importance of a steady supply of fish to coastal communities necessary to maintain the community's economic base should not be ignored. Even though no apparent preemption occurred in the Bering Sea in 1989, the Council included the Bering Sea/Aleutian Islands as a study area, noting that rapid expansion of inshore and offshore processing activity might soon lead to similar resource use conflicts.

Both the inshore and offshore sectors of the Alaska groundfish industry have experienced rapid growth in the last few years; estimates of processing capacity indicate that this industry is capable of utilizing more than twice the current pollock and Pacific cod quota. This overcapitalization is increasing the competitive pressures on industry participants to obtain the volume of fish necessary to supply their processing capacity. In proposed Amendment 18/23, the Council has defined the underlying problem to be one of resource allocation, where one industry sector faces preemption by another. With extensive advice from industry, the Council developed several alternatives to address the preemption problem. Ultimately, eight management alternatives were considered in the analysis of the proposed amendment. This analysis examines the potential effectiveness of these proposed alternatives in resolving the preemption problem from a biological, economic, and social perspective.

Alternative 1, the status quo alternative, evaluates potential impacts on inshore and offshore sectors if no action is taken to resolve the preemption problem. This alternative also provides a "baseline" for comparisons with the other alternatives. Alternative 2 examines the use of traditional management measures, like trip limits or exclusive registration areas, as a solution to the preemption problem. Alternative 3 proposes the establishment of percentage allocations of pollock and Pacific cod stocks to defined inshore and offshore processing sectors. Alternative 4 evaluates the allocation of these resources in set percentages to fishing vessels, based on vessel length. Alternative 5 proposes a series of pollock management measures such as a prohibition on roe-stripping, seasonal allocations, and establishment of smaller management areas, many of which have already been implemented. Alternative 6 suggests allocating TAC to fishing vessels based on those that catch and process and those that only catch fish and deliver to at-sea processors or shore plants. Alternative 7 expands on an option raised in Alternative 3 where, following a decision to allocate pollock TAC to the inshore sector, a percentage of that allocation is reserved for processing by shore-based plants located in Western Alaska communities along portions of the Bering Sea.

The preferred alternative (Alternative 8) was adopted by the Council during their June 1991 meeting. This action prescribes a direct allocation of BSAI pollock, and GOA pollock and Pacific cod TACs, to the respective inshore and offshore components of the industry specific to each of the fishery management areas involved. The percentage shares apportioned to each component incorporate the Council's consideration of historical and anticipated resource utilization patterns, community, industry, and national economic stability, as well as conscientious management of the fishery resources affected. Generally, the preferred alternative stabilizes or moderately increases the percentage share of the BSAI pollock and GOA pollock and Pacific cod TACs available to the inshore sector, relative to the 1989 baseline. Specific provisions were added to address community development opportunities and local access by the inshore fleet to fishery stocks in the BSAI. In addition, the preferred alternative places a finite expiration date (December 31, 1995) on the prescribed regulatory actions, initiates a research plan for additional long range analysis of problems in the fishery, and directs expedited action on a vessel moratorium. These latter three actions serve as a bridge linking timely action on the immediate preemption problem to a more comprehensive, long term management regime.

Allocating the TAC between inshore and offshore users is expected to provide the inshore sector with some relief from the adverse consequences of preemption by the offshore sector. Benefits of a preferential allocation primarily accrue to the shore-based catchers and processors, along with the affected local port communities. The economic and social benefits to inshore operations arise from increased or stabilized incomes, employment, and related economic activity. Benefits may also derive simply from reductions in the uncertainty, or threat of preemption that accompanies a set allocation. Generally, the percentage allocations of the TACs to the inshore category will necessitate a lowering of the share of the TACs currently being utilized by the offshore fleet. The reduction in tonnage available to the offshore component will result in economic losses to these operations, their supporting service industries, and communities.

The analysis recognizes that the risk of one industry sector preempting another is a direct result of overcapitalization within these fisheries. The remedy established by the preferred alternative provides relief from preemption *between* the inshore and offshore sectors, but does not address adverse competitive consequences arising *within* these defined sectors. The overcapitalization problem is not resolved by any of the proposed alternatives. As a result, the preferred alternative does not necessarily assure the financial stability of the industry or the inshore component over the long term. The ever-changing operational and economic conditions that have characterized the Alaska groundfish industry during the past five years cloud the estimation of precise impacts under the management alternatives proposed. These conditions inject some variability into the analysis, and preclude highly definitive measurement of many key issues. Where feasible, sensitivity analyses, or qualitative assessments of impacts are included to provide insight into such matters.

The biological analysis indicates that as long as the fisheries are managed within their respective quotas, the proposed alternatives will have only minor impact on the pollock and Pacific cod resources. Less certain are the potential impacts upon the related marine ecosystem, including mammals, seabirds, and coastal environment, although such impacts are perceived to be minimal, or manageable within the existing regulatory procedures. Changes in fishing areas and intensity as a result of direct allocations are possible and shifts in fishing or processing activity could influence bycatch of other species. It is beyond the capability of this analysis to accurately forecast fishermen's behavior and thus predict how the Council's bycatch management program will be affected. Qualitative assessment indicates that in the absence of any explicit short term provision to apportion bycatch between the inshore and offshore sectors, bycatch complications might limit the ability of Amendment 18/23 to contain the preemptive pressures between these two industry components. However, the existing mechanism for apportioning PSC limits among various industry segments might be used to address this problem. That is, existing bycatch regulatory measures can be applied to problems arising from the inshore offshore allocation.

The economic analysis presents a description of the relative impacts of the eight alternatives under consideration, when compared to the 1989 base year, and with each other. Estimates developed using economic models of the affected industry indicate that in almost every case, the inshore industry and Alaska coastal communities benefit from an increase in their share of the TACs, while preventing or limiting the preemptive threat from the offshore sector. Much of the economic gain received by the inshore sector under the direct allocations (Alternatives 3, 6, and 8) or small vessels (Alternative 4) would be offset by an economic loss to the offshore sector. An economic trade-off between gains in direct income to local Alaska ports, and losses in Pacific Northwest employment was found for each of the preferential allocations of the TAC to the inshore sector. The percentage allocations in the preferred alternative attempt to balance a preemptive remedy for the inshore component against economic losses likely to be incurred by the offshore industry. The analysis suggests that in certain cases the net income effects to the nation may be positive, although such conclusions rest on several simplifying assumptions. Slight changes in these assumptions regarding the underlying price or cost variables generate impacts leading to the opposite conclusion. While the net dollar impacts of reallocating the fishery resources may be neutral on consumers or the direct catching and processing operations involved, there are national benefits associated with maintaining a balance in the social and economic opportunities inherent in these fisheries. Restricting or managing preemption helps insure that the fishery resources are available to provide benefits to all parties, without unduly obstructing the competitive element of the marketplace. The assignment of set harvest shares or allocations is expected to reduce the uncertainty and operational instability caused by actual or threatened preemption.

The economic analysis illustrates the narrow margin of financial solvency held by both inshore and offshore processors. Processors in both industry categories face ominous financial futures if resource shares continue to decline as new operations enter these fisheries. Shrinking harvest or processing shares will likely cause some operations to pursue other alternatives, with uncertain consequence. To the extent that the excess capacity can be productively channeled into other fisheries or modes of operations, the adverse consequences of preemption, or the proposed alternatives, may be reduced.

The social impact analysis indicates that all Alaska communities considered would derive positive effects from an inshore allocation, both in terms of economic development and social stability, and all are experiencing negative impacts under the conditions of the status quo. The greater the inshore allocation, within the options considered, the greater these benefits will be. It is recognized, however, that other factors following an inshore allocation, such as continuing competition, stock reductions, and price fluctuation may undermine the gains received via an inshore allocation. All communities studied in Alaska have the capacity to absorb the social consequences of all of the allocation options associated with community development. The direct economic benefits will result in increased community stability and general long-term viability. While additional growth may exacerbate some infrastructure problems experienced by the communities now, such growth will also provide the means for the solution of existing problems through an increase in the economic base of the communities.

The Pacific Northwest as a region would experience a net economic loss under any of the allocation alternatives, and the greatest loss under the most extreme. The major effects however, would be confined to a reallocation of resources and jobs from the offshore to the inshore sector of Ballard/Seattle's economy, and virtually no negative social impacts are anticipated for either Bellingham, Washington or Newport, Oregon, the communities specifically analyzed. The social consequences of these economic dislocations in Ballard/Seattle could be minimal. Ballard/Seattle is much more diverse and provides access to many more resources than does any of the Alaskan study communities by several orders of magnitude.

The preferred alternative was developed following consideration of the SEIS/RIR/IRFA prepared for the proposed amendment, written and oral input from industry, as well as lengthy discussion by the Council, the Advisory Panel, and the Scientific and Statistical Committee. The Council has chosen the preferred alternative from those under consideration given its ability to most effectively resolve the preemption problem, based on a considered analysis of biological, economic, and social variables involved. The direct allocation of pollock and Pacific cod TACs to defined inshore and offshore components of the industry appears more effective in providing a timely and succinct response to the preemption problem than do those alternatives offering indirect remedies, and/or requiring subsequent iterative adjustments by the

Council. The preferred alternative provides for inshore/offshore allocations that are a moderation of features suggested in the original alternatives 3, 4, and 6, recognizing that the relief from preemptive conditions provided to the inshore sector results in some adverse economic impacts for the offshore component of this industry. While elements of the Alaska groundfish industry involve dynamic relationships that inject uncertainty into future projections, the analysis concludes that the biological, economic, and social benefits arising from the preferred alternative are consistent with the mandates of the Magnuson Act, and the fishery plans and goals established by the Council for the BSAI and GOA. In this context, the proposed actions to rectify the economic and social problems arising from preemption are expected to create positive social gains, while maintaining or furthering conscientious management of the fishery resources involved.

CHAPTER 1

INTRODUCTION

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1.0 INTRODUCTION

Domestic and foreign groundfish fisheries in the Exclusive Economic Zone (EEZ) of the United States (3-200 miles offshore) in the Bering Sea and around the Aleutian Islands are managed under the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands (FMP). The FMP was developed by the North Pacific Fishery Management Council under authority of the Magnuson Fishery Conservation and Management Act (Magnuson Act). The FMP was approved by the Assistant Administrator for Fisheries of the National Oceanic and Atmospheric Administration (NOAA), became effective on January 1, 1982 (46 FR 63295, December 31, 1981), and is implemented by Federal regulations appearing at 50 CFR 611.93 and Part 675. Fourteen of nineteen amendments to the FMP have been implemented.

Groundfish fisheries in the EEZ in the Gulf of Alaska are managed by a separate FMP. The Gulf of Alaska Groundfish FMP was developed by the Council, approved by the Assistant Administrator, and became effective on December 11, 1978 (43 FR 52709, November 14, 1978), and is implemented by Federal regulations appearing at 50 CFR Parts 611, 620, and 672. Twenty amendments to the FMP have been implemented with several other amendments in progress.

This supplemental environmental impact statement, combined with a regulatory impact review/initial regulatory flexibility analysis, evaluates environmental, economic, and social impacts of measures proposed to address inshore/offshore issues in the Bering Sea/Aleutian Islands and Gulf of Alaska. These proposed measures constitute amendments 18/23 to the Bering Sea/Aleutian Islands Groundfish FMP and Gulf of Alaska Groundfish FMP, respectively. The Council has defined as a problem the risk of resource preemption by one industry sector upon another. Several management alternatives have been proposed by the industry and refined by the Council to address this problem. This analysis is designed to provide the public and the decisionmakers with an understanding of the trade-offs of each alternative (e.g. the relative costs and benefits of each alternative in addressing the problem), and the ability of these alternatives to successfully solve the preemption problem.

The Council solicits public recommendations for amending the FMPs on an annual basis. Amendment proposals are then reviewed by the Council's Bering Sea Plan Team (PT), Plan Amendment Advisory Group (PAAG), Advisory Panel (AP), and Scientific and Statistical Committee (SSC). These advisory bodies make recommendations to the Council on which proposals merit consideration for plan amendment. Amendment proposals and appropriate alternatives accepted by the Council are then usually analyzed by the PT for their efficacy and for their potential biological and socioeconomic impacts. In this case, a special analytical team was established to prepare the analysis because of the complexity of the issue and the need for additional manpower.

Draft Amendment 18/23 was reviewed initially by the Council and its advisory bodies at their April 22-26, 1991 meetings and approved for public distribution and comment. The public comment period ran from May 10 to June 24, 1991. After receiving advice from the public and its advisory bodies, the Council adopted a preferred alternative (Alternative 8) at their June 24, 1991 meeting. The Council has recommended that this preferred alternative go forward to Secretarial review in accordance with provisions of the Magnuson Act. It is the Council's intent that this preferred alternative be implemented by the Secretary as soon in 1992 as possible.

After reviewing this analysis, the AP and SSC will recommend whether the amendment alternatives should be rejected or changed in any way, whether and how the analysis should be refined, and whether to release the analysis for general public review and comment. If the amendment package is released for public view, then the AP, SSC, and the Council will consider subsequent public comments before deciding whether or not to submit the proposal to the Secretary of Commerce for approval and implementation.

1.1 Purpose and Structure of the Document

This document provides background information and assessments necessary for the Secretary of Commerce to determine that the FMP amendment is consistent with the Magnuson Act and other applicable law. Other principal statutory requirements that this document is intended to satisfy are the National Environmental Policy Act (NEPA), the Regulatory Flexibility Act (RFA), and Executive Order 12291 (E.O. 12291); other applicable law addressed by this document include the Coastal Zone Management Act, the Endangered Species Act, and the Marine Mammal Protection Act. Specifically, this document is a combined supplemental environmental impact statement (SEIS) and regulatory impact review/initial regulatory flexibility analysis (RIR/IRFA).

1.1.1 Supplemental Environmental Impact Statement (SEIS)

In order to analyze the potential impacts of the proposed action on the quality of the human environment, compliance with NEPA requires that an environmental assessment or impact statement be prepared. According to NOAA directive, an EIS must be prepared if the proposed action may reasonably be expected:

(a) To jeopardize the productive capability of the target resource species or any related stocks that may be affected by the action.

(b) To allow substantial damage to the ocean or coastal habitats.

(c) To have a substantial adverse impact on public health or safety.

(d) To affect adversely an endangered or threatened species or a marine mammal population.

(e) To result in cumulative effects that could have a substantial adverse effect on the target resource species or any related stocks that may be affected by the action.

Moreover, two factors to be considered in any determination of significance are controversy and socioeconomic effects.

During the course of several Council meetings preceding the noticed scoping period of November 1 - December 8, 1989, and during the scoping period, it was apparent that this issue was very controversial and that it would likely have significant socioeconomic impacts. As a result, the Regional Director of the National Marine Fisheries Service determined that a supplement to the original EIS produced for the FMPs, rather than an initial Environmental Assessment, would be required.

The determination requiring an SEIS was not intended to prejudice any decision by the Council or the Secretary of Commerce, but instead was designed to provide the best information on which to base any inshore/offshore decision.

1.1.2 Regulatory Impact Review/Initial Regulatory Flexibility Analysis (RIR/IRFA)

Other portions of this document constitute a RIR/IRFA that is required by NOAA for all regulatory actions or for significant policy changes that are of public interest. The RIR/IRFA:

(a) Provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action.

(b) Provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problems.

(c) Ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective manner.

This analysis also serves as the basis for determining whether any proposed regulations are major under criteria provided by E.O. 12291 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the RFA. The primary purpose of the RFA is to relieve small businesses, small organizations, and small governmental jurisdictions (collectively "small entities") of burdensome regulatory and recordkeeping requirements.

1.1.3 Scope of the Proposed Regulatory Change

Executive Order 12291 provides broad criteria for determining whether a proposed regulation is "major." Three criteria are provided for this determination. A regulation is deemed a major rule if it is likely to result in:

1. an annual effect on the economy of $100 million or more;

2. a major increase in costs or prices for consumers, individual industries, Federal, State, or local government agencies, or geographic regions; or

3. a significant adverse effect on competition, employment, investment, productivity, innovation, or on the ability of United States-based enterprise to compete with foreign-based enterprises in domestic or export markets.

NOAA clarifies the first criterion to mean that a regulation is major if it has an annual *incremental* effect on the economy of $100 million or more in direct or indirect enforcement and compliance costs. The incremental economic impacts estimated under the alternatives considered, including the preferred alternative, do not reach $100 million. Upper bounds on the net change in direct income under the most dramatic allocation proposal (Alternative 3.2) were roughly $17 million. The projected net change in direct income under the preferred alternative ranges from $5 to $15 million between the first and third year of the phased-in allocation. These quantitative projections must be viewed cautiously, however. Judgement offered the Council by the SSC recommended that the estimates of net economic impacts be regarded as not significantly different than zero based on the estimation procedure used.

The second criterion requires a subjective interpretation of the term "*major increase* in costs or prices." The allocation specified in the preferred alternative, by placing some restriction on the share of the pollock and Pacific cod TACs available to the offshore component, may lead to higher operating costs by this segment. The proposed amendment does not directly affect the technical efficiency of processing operations, but it does establish the availability of resource inputs to the broad inshore and offshore segments. However, the operating costs of catchers and processors are subject to increase, under any of the alternatives including status quo, in the sense that reduced resource shares to individual operations are a consequence of overcapitalization in this industry. To the extent that the prescribed inshore/offshore allocations of the TAC alter the resulting product mix from the respecting processing sectors, consumer prices may adjust to changes in available supplies, but are unlikely to result in major price changes, given that overall supply from the affected pollock and Pacific cod fisheries is not explicitly changed.

Criterion three also relies upon a subjective interpretation, in this case the judgement as to what constitutes a "*significant* adverse effect." Analysis of the preferred alternative suggests that the prescribed allocations would create changes in the distribution of economic impacts such as employment and direct income, but the overall level of these variables is not expected to change significantly. The major impact of this redistribution is projected to be a net increase in direct income associated with the proportional gains to the inshore sector, offset by a net decline in employment due to job losses in the offshore sector. While a concern, the proposed allocation of resource shares is not expected to lead to significant changes in the overall competitiveness or innovative capabilities of the industry, in either the domestic or international market. The allocative split between the inshore and offshore sectors does not create an excessive or disproportionate market share for either segment that would encourage price fixing or restraint of trade.

The overall determination as to whether or not the proposed Amendment 18/23 constitutes a "major" rule change is questionable, given the subjective nature of the definitional criteria. There does not appear to be a definitive finding that would establish this proposed amendment as "major" based on the guidelines provided for this determination. In the absence of conclusive evidence to the contrary, it is suggested that the proposed amendment does not constitute a major rule.

1.2 Purpose of and Need for the Action

The groundfish fisheries off Alaska were dominated by foreign fleets through the 1970s and early 1980s. After passage of the Magnuson Fishery Conservation and Management Act in 1976 foreign fisheries were gradually displaced as the domestic fishing industry expanded to harvest and process the quotas. By 1988, there were no longer any directed foreign fisheries off Alaska.

As one fishery after another became fully U.S.-utilized, increasingly the Council was faced with highly controversial allocative decisions concerning domestic users. Economic issues were raised to the forefront of the Council's decisionmaking process. Little attention was spent on social impacts until 1989 when, following a short season on pollock in the Bering Sea, several factory trawlers (e.g. catcher/processor vessels) moved into the Gulf of Alaska, taking part of the pollock total allowable catch (TAC) which the shorebased catching and processing industry was planning to use during the year.

That April, fishermen and processors from Kodiak came to the Council requesting consideration of inshore/offshore allocations to prevent future preemption of resources by one industry sector over another. They also claimed that although harvesting and processing pollock quickly while the fish are schooling may have economic advantages, the social and economic importance of a steady supply of fish to coastal communities should not be ignored.

As a result, the Council requested an analysis of the potential biological, economic, and social impacts of management alternatives to address the inshore-offshore preemption issue, especially as it relates to pollock and Pacific-cod in the Gulf of Alaska, and pollock in the Bering Sea/Aleutian Islands.

Specifically, the Council, through a series of refinements in 1989 and early 1990, adopted in April 1990, the following statement of the problem to be resolved in the groundfish fisheries of the Gulf of Alaska and the Bering Sea and Aleutian Islands:

Problem Statement

> The finite availability of fishery resources, combined with current and projected levels of harvesting and processing capacity and the differing capabilities of the inshore and offshore components of the industry, has generated concern for the future ecological, social and economic health of the resource and the industry. These concerns include, but are not limited to, localized depletion of stocks or other behavioral impacts to stocks, shortened seasons, increased waste, harvests which exceed the TAC, and possible pre-emption of one industry component by another with the attendant social and economic disruption.
>
> Domestic harvesting and processing capacity currently exceeds available fish for all species in the Gulf of Alaska and most species in the Bering Sea. The seafood industry is composed of different geographic, social, and economic components which have differing needs and capabilities, including but not limited to the inshore and offshore components of the industry.
>
> The Council defines the problem as a resource allocation problem where one industry sector faces the risk of preemption by another. The analysis will evaluate each of the alternatives as to their ability to solve the problem within the context of harvesting/ processing capacity exceeding available resources.
>
> The Council will address these problems through the adoption of appropriate management measures to advance the conservation needs of the fishery resources in the North Pacific and to further the economic and social goals of the Act.

1.3 The Proposed Action, Alternatives, and Assumptions

Development of Alternatives. The Council took considerable time, with significant consultation with industry, in developing the array of alternatives analyzed in this document. It is important to view this development of alternatives against the backdrop of other issues before the Council when the inshore-offshore preemption problem arose. The following discussion is intended to provide insight into why the Council chose to examine certain alternatives in detail, others in less detail, and still others, such as a moratorium and limited access on a separate schedule.

As noted in Section 1.2, the pollock fishery off Kodiak in the Gulf of Alaska closed unexpectedly early in 1989. The closure was in March, just ahead of the Council's scheduled meeting in April. As will be described below, the Council was then involved in consideration of a moratorium on entry to all fisheries, and in limited access for all fisheries. Though the issue of protection for shoreside processors was not formally on the agenda for the April meeting, the concern was raised at that meeting numerous of times in public testimony on limited access and in relation to pollock roe-stripping. The concern had also been raised in various scoping sessions on limited access earlier in the year. Though one Council member requested that the issues of coastal community development and shoreside preference be discussed at the April meeting, the Council decided it would be more expedient to consider those issues outside the discussion of limited access, and placed them on the agenda for the June 1989 meeting. The Council also asked industry to submit proposals for Council review then.

Proposals received from industry fell into three categories: quota allocations, limited access, and differential regulations. In June 1989 the Council assigned a working group, the Fishery Planning Committee (FPC), to work with the staff from the Council and other appropriate agencies to review the various alternatives for an allocation of fishery resources between at-sea and non at-sea components of the industry. NOAA-GC was requested to advise on the legal viability of the various alternatives. The working group also was directed to assess traditional management tools such as changing seasons, trimestral releases and trip limits, and to report their recommendations in September 1989.

The FPC met on September 6, 1989, and identified several general alternatives, including status quo, priority access for shore-based deliveries, inshore-offshore allocations with or without special operational areas, a prohibition on catcher-processors in the Gulf of Alaska combined with special areas in the Bering Sea and Aleutians reserved for harvesters delivering onshore, and traditional tools to extend the seasons and preserve product flow to all sectors of the industry. The Committee recommended that proposals dealing with limited entry and a prohibition on roe-stripping be considered with other such programs then being reviewed by the Council. This recommendation was based on general guidance from NOAA GCAK on September 5, 1989[1]. The FPC also recommended sending a special notice to the public explaining that groundfish proposals being submitted for the annual cycle that concerned inshore-offshore be received no later than September 27, 1989 so they could be reviewed by the Council at the September meeting.

In September the Council reviewed all proposals received and generally accepted the alternatives of the FPC as revised by the Advisory Panel, including a provision to provide for future management options for disadvantaged communities. The proposal for priority access for shore-based processors was deleted in favor of a proposed direct allocation. A motion to add limited access to the list was defeated because the Council was addressing that issue on another schedule already adopted and, though it was conceivable that some form of regional license limitation system might address the issue, the Council concluded that such management probably would not address specifically the nearshore and offshore conflicts being addressed with the then current package of proposals. Limited access consideration also was on a longer schedule for analysis and implementation that would have precluded it from addressing the immediacy of the inshore-offshore issue that arose in early 1989.

Also in September, the Council was informed that a Supplemental Environmental Impact Statement would be required. A 45-day scoping process was held between October 13 and December 8, 1989, and additional proposals and concerns were submitted. The FPC met on November 15, 1989 to review proposals. The Committee added to their earlier list of alternatives an allocation of TAC on the basis of vessel length and the use of a combination of measures including a ban on pollock roe-stripping and other measures, hereinafter referred to as pollock management measures. Many of these pollock measures were already being examined in a proposed amendment 14/19. The Committee remained firm in its earlier opinion that the moratorium and limited access proposals should be considered in the ongoing effort on limited access for sablefish, halibut, groundfish and crab, rather than as part of the inshore-offshore package. They did note, however, that there was a continuing and new interest in the issue of limiting access.

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[1]Letter dated September 5, 1989 from NOAA CGAK to Fishing Planning Committee.

In December 1989 the Council adopted the FPC's suggested alternatives and added a seventh one concerning establishment of an immediate moratorium. In general, by the end of 1989, the seven alternatives were as follows, and all reference to TAC was intended to include all groundfish species.

1. Status quo.

2. Use traditional management tools.

3. Allocate TAC between inshore and offshore components of industry, with or without specific operational areas.

4. Prohibit some or all of the offshore components of the industry from the Gulf of Alaska, and in the Bering Sea and Aleutians, allocate a portion of the TAC between inshore and offshore components of the industry and define operational areas.

In addition to the above, at the discretion of the Council, provide for future management options for disadvantaged communities.

5. Allocate TAC on the basis of species and vessel length.

6. Use a combination of pollock management measures, including a ban on roe-stripping, roe and non-roe seasons, etc.

7. Establish an immediate moratorium and cut-off date.

In January 1990 the FPC and Council met and further revised the alternatives. The Council's Scientific and Statistical Committee (SSC), reporting in January, noted that the alternatives needed to be further tailored to address the issue of preemption. They noted that Alternative 2, traditional management tools, was too general and it was not clear how those traditional tools would ensure that fish would be delivered to onshore processors. The SSC went on to note that Alternative 3 needed to specify how the TAC would be allocated between onshore and offshore segments of the industry and Alternative 4 needed to specify percentages for the distribution in the Bering Sea and Aleutians. Alternative 5 created the possibility that fish would be made available for onshore processing, though there was no assurance of specific quantities. Alternative 6 would not ensure that fish were processed onshore. Finally, the SSC noted that although Alternative 7 would cap the harvesting and processing capacity, which would lessen pressures that would intensify inshore-offshore conflicts, preemption could still occur.

The FPC noted in their report of their January 15, 1990 meeting that several of the alternatives presented management concepts rather than specific measures and would need further definition to be properly analyzed. For example, Alternative 2, on traditional measures, was broad and clearly a conceptual approach to solving the problem. The FPC recommended leaving the alternative in the amendment package so the Council could have this approach available when considering future management actions. Further development of this alternative could take the form of a Council policy implemented through a framework where traditional management tools are used.

The FPC recommended merging Alternatives 3 and 4 because both proposed allocating portions of TAC to inshore/offshore components of the industry. The FPC recommended focusing this alternative just on pollock, rockfish, flatfish, and Pacific cod fisheries in the Gulf of Alaska and on pollock, flatfish, and Pacific cod in the Bering Sea/Aleutians. The Committee also established percentage allocations and recommended that any allocative scheme include some provision for community development. For

Alternative 5, the FPC recommended using the 150' cut-off suggested by industry to separate vessels that normally process their catch from those that deliver onshore. The FPC recommended that this alternative stay in the package and be analyzed using the same allocation percentages described under Alternative 3. They also recommended that analysts examine domestic catch histories (1979-present) for information which might suggest other allocation percentages.

The FPC recommended leaving Alternative 6 in the package even though it was being addressed in another Council amendment. The FPC recommended leaving Alternative 7 in the amendment package so it could remain a discussion topic as a way to address the inshore-offshore issue. The FPC was asked specifically if other measures to address excess capacity should be included and declined to include any. As will be noted below, the Council was already in process of making a final decision on sablefish limited access at the January 1990 meeting, and analysis and decision on limited access for halibut and groundfish and crab was to follow thereafter.

After considering the advice of the FPC, SSC, AP, and industry, the Council, in January 1990, adopted Alternatives 1 and 2 as recommended by the FPC. The Council adopted the FPC's alternative 2, which was also recommended by the AP, but added the phrase, "and define inshore-offshore operational areas for pollock in the Bering Sea." The Council also agreed to examine the percentages recommended by the FPC as follows:

Onshore	Offshore	
100%	0%	(GOA pollock only)
80	20	(GOA only)
50	50	(both GOA and BS)
20	80	(BS only)

For Alternative 4 the Council adopted the AP's recommendation to partition the TAC by species and vessel length (split BSAI TAC equally between vessels over 150' and those less than 150', threshold in GOA might be 125'). Species to be analyzed included pollock, flatfish and Pacific cod.

The Council adopted the AP's recommendation for Alternative 5, a combination of measures for pollock management including a ban on roe-stripping, etc. It was recognized that the Council had already taken emergency action to ban roe-stripping in 1990, and was in the process of acting on a permanent ban for 1991 and beyond, and therefore, some additional analysis would probably not take much additional time.

Alternative 6 was deleted in favor of analyzing alternatives 3,4 and 5 with or without a moratorium, described as being an immediate four-year moratorium on new harvesting vessels and processing capacity, and exempting vessels under 40' in the Bering Sea. The intent was not to include carrier or support vessels in this definition. Regarding the moratorium as it applied to processors, a motion was defeated that otherwise would have applied the moratorium just to at-sea processors.

On March 16, 1990, the FPC developed a new list of percentages for the alternatives with allocations between inshore and offshore. NOAA GCAK advised that Council selection of a percentage within the range or within 1-5% of the endpoints would be considered by the Secretary as within the scope of the analysis. The FPC also recommended limiting the analysis to pollock and Pacific cod, in both the Gulf of Alaska and Bering Sea/Aleutian Islands, and defined the operational area north of the Alaska Peninsula.

In April 1990, the Council received inshore-offshore recommendations from the FPC which included a problem statement focused on the risk of preemption. The FPC recommended using the sablefish community development quota concept for analytical purposes. The Council adopted assumptions for analysis and various rules for operations of the fleets and the alternatives with percentages recommended by the FPC.

In September 1990 the Council accepted a recommendation from its FPC to delete BSAI Pacific cod from the inshore-offshore study because there was no immediate allocation issue, and doing so would expedite the analysis.

The FPC met on February 19-20, 1991 and revised several percentage allocations to correct unintentional errors.

In April 1991, the Council added alternatives 6 and 7, but rejected a motion to table the inshore/offshore effort until the moratorium issue was resolved, an individual fishing quota system based on historical participation in the fisheries was in effect, and an exclusive registration area for pollock was established for the Central Gulf of Alaska. This was defeated because the Council felt that such a limited access program could not be implemented until 1994 and that the preemption problem should be addressed earlier, in 1992.

Final Alternatives. Alternatives 1-7, summarized below, were submitted to public review in May and June 1991 and were the basis for final Council action at their June 24-28, 1991 meeting. Alternative 8, the preferred alternative, was chosen by the Council in June and draws upon elements of the other alternatives. The analysis of the all eight alternatives is presented in this document. A description of the alternatives follows.

1.3.1 Alternative 1: Status quo with no change in regulations to address the problem (This alternative is required by law to be included in the analysis).

1.3.2 Alternative 2: Use traditional management tools including but not limited to: trip limits, periodic allocations, super-exclusive registration areas, and gear sizes.

1.3.3 Alternative 3: Allocate the Total Allowable Catch (TAC) between inshore and offshore components of the industry. Specifically this alternative examines the Gulf of Alaska pollock and Pacific cod fisheries, and the Bering Sea pollock fishery, under various allocation percentages, and defines operational areas for pollock in the Bering Sea.

Council requested the following percentages be used as parameters for analysis of Alternative 3:[2]

Allocative Percentage Alternatives

Alternative 3.1 Snapshot of 1989 fisheries, with 1989 BSAI JVP catch being distributed 80/20 to inshore/offshore categories respectively.

[2]Certain percentage allocations specified in Alternative 3 were modified at February 1991 FPC meeting to correct for errors in the original calculations.

In GOA:

	Inshore	Offshore
Pollock	46%	54%
Pacific cod	93%	7%

In BSAI:

	Inshore	Offshore
Pollock	33%	67%

<u>Alternative 3.2</u> Historical inshore/offshore average with 80% of JVP and 20% of JVP historical catch be apportioned to inshore and offshore, respectively. (1986-1989; for GOA pollock, 1986-1988 are examined also).

In GOA:	Inshore		Offshore	
Pollock	69.2%	(77.4%)	30.8%	(22.6%)
Pacific cod	82.9%		17.1%	
In BSAI:				
Pollock	59.2%		40.8%	

<u>Alternative 3.3</u> In GOA:

	Inshore	Offshore
Pollock	100%	0%
Pacific cod	80%	20%
In BSAI:		
Pollock	50%	50%

An option considered by the Council under Alternative 3 was the designation of an inshore operational area described below:

> For pollock harvesting and processing activities, an inshore operational area shall be defined as those waters inside 168 through 163 W longitude, and 56 N latitude south to the Aleutian Islands. Any pollock harvested in a directed pollock fishery in this area and delivered in the U.S. must be processed by the inshore component of the DAP industry.

For purposes of analysis and public review, the following definitions and assumptions have been prepared for proposals being considered under Alternative 3:

Inshore/Offshore Definitions
(Approved by the Council on April 26, 1990)

<u>Offshore</u>: The term "offshore" includes all trawl catcher/processors and all motherships and floating processing vessels, regardless of length, which process groundfish at any time during the calendar year in the Exclusive Economic Zone.

Inshore: The term "inshore" includes shorebased processing plants, all fixed gear catcher/processors, and all motherships and floating processing vessels which process groundfish at any time during the calendar year in the Territorial Sea.

Inshore/Offshore Assumptions for Analysis
(Approved by the Council on April 26, 1990)

1. Each year, prior to the commencement of groundfish processing operations, each mothership and floating processing vessel will declare whether it will operate in the inshore or offshore component of the industry. The mothership or floating processing vessel may not participate in both, and once processing operations have commenced, may not switch for the remainder of the calendar year. For the purpose of this rule, the Gulf of Alaska and the Bering Sea are viewed as one area, and groundfish applies to all of the species combined which have been allocated to one component or the other.

2. (a) A mothership or floating processing vessel which participates in the inshore component of the industry shall be limited to conducting processing operations on pollock and Pacific cod, respectively, to one location inside the base line. (Note bycatch provisions will be allowed.)

   (b) A mothership or floating processing vessel which participates in the inshore component of the industry shall be allowed to conduct processing operations on pollock and Pacific cod in any inshore area.

3. On an annual basis, the NMFS will conduct a survey of the inshore and offshore components of the industry to determine the extent to which they will fully utilize their respective allocations. If the results of the survey show that one or the other will not take its entire allocation, or if during the course of the fishing year it becomes apparent that a component will not take the full amount of its allocation, the amount which will not be taken shall be released to the other component for that year via the harvesters. This shall have no impact upon the allocation formula.

4. Harvesting vessels can choose to deliver their catch to either or both markets (e.g. inshore and offshore processors). However, once an allocation of the TAC has been reached, the applicable processing operators will be closed for the remainder of the year unless a surplus reapportionment is made.

1.3.4 Alternative 4. Allocate TAC on basis of species (as specified in Alternative 3) and vessel length (for example, partition the BSAI TAC 50-50 between vessels over 150' and those less than 150'. A threshold for the GOA might be 125').

1.3.5 Alternative 5. Use a combination of the following measures: ban pollock roe-stripping everywhere, delay opening of GOA pollock season until after roe season, split pollock into roe, non-roe seasonal quotas, and divide GOA pollock area into separate districts.

Management Alternatives 3, 4 and 5 will be analyzed to determine the effects of the option with and without a moratorium.[3] Assumption 3 also applies to Alternative 4.

At its April 23-26, 1991 meeting, the Council approved the following additional alternatives for analysis and public review:

1.3.6 Alternative 6. The allocation of pollock and Pacific cod will be at the vessel level, categorized by vessels that catch and process on board, and vessels that catch and deliver at sea or to shoreside processors. A reserve is set aside with first priority for catchers that deliver shoreside.

1.3.7 Alternative 7. Ten percent of the shoreside allocation available in the Bering Sea would be available for delivery to shorebased plants north of 56 N. Latitude and west of 164 W. Longitude.

As with Alternatives 3 and 4, Assumption 3 is available as an option under Alternatives 6 and 7. Whenever the Council selects an alternative which makes a specific allocation, it is understood that regulatory flexibility will be provided to allow redistribution of any surplus amounts between industry sectors. Alternatives 6 and 7 are described and analyzed in greater detail in Sections 3.3.7 and 3.3.8, respectively.

The North Pacific Fishery Management Council developed an eighth alternative during their June 24-29, 1991 Council meeting in Anchorage. This alternative was proposed following consideration of the SEIS/RIR/RFA prepared for the proposed amendment, written and oral comment submitted by the public, as well as lengthy discussion by the Council, the Advisory Panel, and the Scientific and Statistical Committee. Ultimately adopted by the Council as the Preferred Alternative, Alternative 8 consists of five components, incorporating features drawn from several of the proposals under consideration.

1.3.8 Alternative 8. (Preferred Alternative) A Comprehensive Fishery Rationalization Program for the Groundfish and Crab Resources of the Gulf of Alaska and the Bering Sea and Aleutian Islands:

1. **Moratorium.** The Council reiterates its intention to develop and implement as expeditiously as possible a moratorium, including implementation by emergency action at the soonest possible date.

2. **Definitions, Rules, and Allocation.** Relative to definitions, rules and allocations for inshore and offshore components of the Gulf of Alaska (GOA) pollock and Pacific cod fisheries and the Bering Sea and Aleutian Islands (BSAI) pollock fisheries:

A. Definitions

The following definitions shall apply:

Offshore: The term "offshore" includes all catcher/processors not included in the inshore processing category and all motherships and floating processing vessels which process groundfish [pollock in the

[3] Subsequently, the Council determined that the magnitude of consideration called for in designing and implementing a moratorium was beyond the scope of a simplistic appraisal. As a result, the moratorium is still under consideration by the Council, but on a separate schedule.

BSAI or pollock and/or Pacific cod in the GOA] at any time during the calendar year in the Exclusive Economic Zone.

Inshore: The term "inshore" includes all shorebased processing plants, all trawl catcher/processors and fixed gear catcher/processors whose product is the equivalent of less than 18 metric tons round weight per day, and are less than 125 feet in length, and all motherships and floating processing vessels, which process pollock in the BSAI or pollock and/or Pacific cod in the GOA at any time during the calendar year in the territorial sea of Alaska.

Trawl Catcher/Processor: The term "trawl catcher/processor" includes any trawl vessel which has the capability to both harvest and process its catch, regardless of whether the vessel engages in both activities or not.

Mothership/Floating Processing Vessel: The term "mothership" or "floating processing vessel" includes any vessel which engages in the processing of groundfish, but which does not exercise the physical capability to harvest groundfish.

Harvesting Vessel: The term "harvesting vessel" includes any vessel which has the capability to harvest, but does not exercise the capability to process, its catch on a calendar year basis.

Groundfish: The term "groundfish" means pollock and/or Pacific cod in the GOA and pollock in the BSAI.

B. Rules

The following rules shall apply to both the Gulf of Alaska, and the Bering Sea and Aleutian Islands:

1. Each year, prior to the commencement of groundfish processing operations, each mothership, floating processing vessel, and catcher-processor vessel will declare whether it will operate in the inshore or offshore component of the industry. A mothership or floating processing vessel may not participate in both, and once processing operations have commenced, may not switch for the remainder of the calendar year. For the purpose of this rule, the Gulf of Alaska, the Bering Sea and the Aleutian Islands are viewed as one area, and groundfish applies to all of the species combined which have been allocated to one component or the other.

2. A mothership or floating processing vessel which participates in the inshore component of the industry shall be limited to conducting processing operations on pollock and Pacific cod, respectively, to one location inside the territorial sea, but shall be allowed to process other species at locations of their choice.

3. If during the course of the fishing year it becomes apparent that a component will not process the entire amount, the amount which will not be processed shall be released to the other components for that year. This shall have no impact upon the allocation formula.

4. Harvesting vessels can choose to deliver their catch to either or both markets (e.g. inshore and offshore processors); however, once an allocation of the total allowable catch (TAC) has been reached, the applicable processing operations will be closed for the remainder of the year unless a surplus reapportionment is made.

5. Allocations between the inshore and offshore components of the industry shall not impact the United Sates obligations under the General Agreement on Tariffs and Trade.

6. Processing of reasonable amounts of bycatch shall be allowed.

7. The Secretary of Commerce would be authorized to suspend the definitions of catcher/processor and shoreside to allow for full implementation of the Community Development Quota program as outlined in the main motion.

C. Allocations

The following allocations shall apply:

a. Gulf of Alaska

Pollock: One hundred percent of the pollock TAC is allocated to harvesting vessels which deliver their catch to the inshore component. Trawl catcher/processors will be able to take pollock incidentally as bycatch.

Pacific cod: Ninety percent of the TAC is allocated to harvesting vessels which deliver to the inshore component and to inshore catcher/processors; the remaining ten percent is allocated to offshore catcher/processors and harvesting vessels which deliver to the offshore component. The percentage allocations are made subarea by subarea.

b. Bering Sea/Aleutian Islands

Pollock: The Bering Sea/Aleutian Islands pollock TAC shall be allocated as follows:

A phase-in period for the BSAI with an allocation of the pollock TAC in the BSAI as follows:

	Inshore	Offshore
Year 1	35%	65%
Year 2	40%	60%
Year 3	45%	55%

Bering Sea Harvesting Vessel Operational Area: For pollock harvesting and processing activities, a harvesting vessel operational area shall be defined as inside 168 through 163 West longitude, and 56 North latitude south to the Aleutian Islands. Any pollock taken in this area in the directed pollock fishery must be taken by harvesting vessels only, with the exception that 65% of the at-sea "A" season pollock allocation available to the offshore segment may be taken by the offshore segment in the operational area.

3. **Western Alaska Community Quota**. For a Western Alaska Community Quota, the Council instructs the NMFS Regional Director to hold 50% of the BSAI pollock reserve as identified in the BSAI Groundfish Fishery Management Plan (FMP) until the end of the third quarter annually. This held reserve shall be released to communities on the Bering Sea Coast who submit a plan, approved by the Governor of Alaska, for the wise and appropriate use of the released reserve. Any of the held reserve not released by the end of the third quarter shall be released according to the inshore and offshore formula established in the BSAI FMP. Criteria for Community Development Plans shall be submitted to the Secretary of Commerce for approval as recommended by the State of Alaska after review by the NPFMC.

The Western Alaska Community Quota program will be structured such that the Governor of Alaska is authorized to recommend to the Secretary that a Bering Sea Rim community be designated as an eligible fishing community to receive a portion of the reserve. To be eligible a community must meet the specified criteria and have developed a fisheries development plan approved by the Governor of the requesting State. The Governor shall develop such recommendations in consultation with the NPFMC. The Governor shall forward any such recommendations to the Secretary, following consultation with the NPFMC. Upon receipt of such recommendations, the Secretary may designate a community as an eligible fishing community and, under the plan, may release appropriate portions of the reserve.

4. **Other Alternatives to be Considered.** Commencing immediately, the Council instructs its staff and the GOA and BSAI plan teams, with the assistance of the Alaska Fisheries Science Center, the Alaska Regional Office of the National Marine Fisheries Service, the Scientific and Statistical Committee and Advisory Panel, to undertake the development of alternatives for the Council to consider to rationalize the GOA and BSAI groundfish and crab fisheries under the respective FMPs. The following alternatives shall be included but not limited to:

1. ITQs
2. License Limitation
3. Auction
4. Traditional Management Tools
   a. Trip Limits
   b. Area Registration
   c. Quarterly; Semi Annual or Tri-annual allocations
   d. Gear Quotas (hook and line, pots etc.)
   e. Time and area closures
   f. Seasons
   g. Daylight only fishing
5. Continuation of inshore/offshore allocation
6. Implementation of Community Development Quotas
7. No Action

The Executive Director of the Council, on behalf of the Council, shall immediately solicit from the Council family and other interested parties ideas in addition to those identified above for rationalization of these fisheries. This request should ask for ideas to be submitted by September 30, 1991.

5. **Duration.** If by December 31, 1995, the Secretary of Commerce has not approved the FMP amendments developed under item IV above, the inshore/offshore and Western Alaska Community Development Quotas shall cease to be a part of the FMPs and the fisheries shall revert to the Olympic System.

1.4 Relationship of Proposed Action to Existing Council Procedures

The FMP currently embodies a procedure for setting of annual harvest levels whereby the Council receives recommendations for acceptable biological catch (ABC) from the PT and the SSC and, based upon these recommendations, votes to set ABCs for each species group. The Council also solicits recommendations from the AP regarding economic and social concerns in order to derive total allowable catches (TACs) for each species group. These proposed ABCs and TACs are then released for public review. At a subsequent meeting the Council entertains refined recommendations on ABCs from the PT and SSC, refined recommendations on economic and social concerns from the AP, and any public comment before deriving final ABCs and TACs. The Council's final recommendations for TACs are then forwarded to the Secretary of Commerce for federal review, approval, and implementation. Approved TACs constitute harvest limits for each species.

Although the Council is not obligated to restrict species' TACs to values equal to or less than their ABCs, in practice it has rarely set TACs that exceed ABC for any species. This reflects the Council's primary concern for conservation of groundfish resources. In those few cases when TAC has exceeded ABC, the Council's intent was to maintain some stability in harvest regimes while recognizing potential conservation concerns. Extensive opportunities for public comment and final federal review and approval further assure that the conservation of stocks is adequately accommodated.

The proposed action in no way contemplates altering established procedures for derivation of individual species' ABCs and subsequent setting of individual species' TACs. The proposal deals only with the amounts of pollock and Pacific cod TACs which may be delivered to inshore and offshore processors. Fishermen (e.g. harvesters) will be free to deliver their catch to either markets.

1.5 Scope of Analysis for Individual Alternatives

This SEIS document presents an overview of the inshore/offshore issue and evaluates the relative impacts of several proposed alternatives in a biological, economic, and social context. Alternatives are analyzed according to scope and specificity of the proposals designated by the Council.

Alternative 1 is the status quo, or "do nothing" alternative. For purposes of comparative analysis, the status quo is defined as the 1989 fishery, recognizing that the industry has continued to change in 1990 and 1991. The 1989 fishery was identified as the base case scenario in this analysis since it was the most recent year for which complete data sets could be obtained at the time the study was undertaken.

Alternative 2 proposes the use of "traditional" management measures as methods to address the inshore/offshore preemption problem. These measures include trip limits, periodic allocations/distributions of quota, exclusive registration areas, and gear limitations or restrictions. The Council has included this alternative in the document to indicate that more traditional management measures may be used in the future if the preferred alternative fails to accomplish the amendment objective. Past experience with these tools serves as the main basis for evaluation of their ability to solve the preemption problem.

Alternatives 3 and 4 allocate fishery resources to specified industry components, with shares apportioned based on several criteria. Alternative 3 directly allocates shares to defined inshore and offshore sectors, while Alternative 4 allocates TAC shares based on vessel length. Relatively detailed models of the affected Alaska groundfish industry are developed in order to assess the economic impacts arising from the specified changes in fishery allocations. These models and the accompanying analysis were subsequently expanded and adapted to examine the impacts of Alternatives 6, 7, and 8.

Alternative 5 proposes implementing pollock-specific management measures as methods of addressing the preemption problem. These measures include a prohibition on roe-stripping, delaying the opening of the Gulf pollock season until after the pollock spawning period, dividing the pollock TAC into specific roe and non-roe quotas, and subdividing the Gulf of Alaska Regulatory Areas into smaller districts. To a certain extent, several of the regulatory actions listed under this alternative have already been analyzed and implemented by the Secretary in prior amendments to the FMPs. These measures, for example, periodic allocation, might also be considered as an application of traditional management tools, as referenced in Alternative 2.

Alternative 6 is a modification of Alternatives 3 and 4 that allocates specifically to catcher vessels based on processing capability, with designated inshore and offshore processor apportionments, as well as a portion that is available via the marketplace from catcher vessels to either inshore or offshore processors.

Alternative 7 addresses a specific component of the Alaska groundfish industry--Bering Sea coastal communities. This alternative specifies that a ten percent share of the eventual BSAI "inshore" TAC allocation be made available for economic development to communities in a designated area of the Bering Sea. St. Paul, Pribilof Islands, is used in the analysis as a proxy for estimating likely economic impacts.

Alternative 8 (Preferred Alternative) is a further refinement of Alternative 3, allocating the TAC between inshore and offshore components, but with specific criteria and provisions added to remedy ambiguities in existing proposals. These features include a modification of the preferential inshore allocation of TAC prescribed in Alternative 3, a three year phase-in of allocative shares in the BSAI, the creation of a Bering Sea Harvest Vessel Operational Area, and the creating of a Western Alaska Community Quota program to enhance development of economic communities along the Bering Sea. The Preferred Alternative would be effective only through 1995, specifying that a thorough examination of all fishery management alternatives be undertaken in order to develop a more comprehensive, long term solution to the preemption problem.

1.6 Limited Access as an Alternative

As noted in Section 1.3, concerning the development of alternatives, several limited access measures were advanced in the spring of 1989 to address the inshore-offshore issue analyzed in this document. It is instructive to review the Council and industry's involvement with limited access to understand why this approach is under intensive consideration, but on a separate schedule.

The Council has been involved in consideration of limited access programs since 1983 when it recommended a moratorium on the halibut fisheries to the Secretary of Commerce. The moratorium was disapproved by the Office of Management and Budget, but fishermen asked the Council to ensure that the sablefish longline fishery did not turn into a derby as had the halibut fishery. Some requested limited access be implemented in the fishery and others requested that the fishery be made longline only.

Through 1986, the Council considered cut-off dates and alternatives to the open access fishery for sablefish, and finally in September 1987, because of pressures building in the sablefish longline fisheries, the Council adopted a statement of commitment to develop alternative management strategies for sablefish and for other groundfish fisheries off Alaska by 1990. The Council established a special workgroup, the Future of Groundfish Committee to consider the need for and the impacts of limited access measures, and report by June 1988.

The Committee reported in June 1988 and among other things, recommended a cut-off date for consideration for entry to the fishery of June 30, 1988, and that the Council develop management alternatives for groundfish. The Council adopted the Committee's recommendations in June 1988, but did not appoint a new committee to take up where the Future of Groundfish Committee had left off.

Proposals for alternative management measures were developed by the Council staff during the summer and reviewed by the Council in January 1989. The Council then stated its intent to take public comment at the April 1989 meeting on all aspects of a proposal for a moratorium cut-off date of January 16, 1989 for all fisheries under Council jurisdiction including halibut and crab. The Council voted to expand the terms of reference for its original sablefish management committee to include all groundfish, halibut and crab species under the Council's jurisdiction in the Bering Sea and Aleutian Islands and the Gulf of Alaska. This committee, renamed the Fishery Planning Committee (FPC), along with Council staff and appropriate contracted organizations, was to develop a management scenario for each of three alternatives --status quo, license limitation and individual fishing quotas--which would address the major factors which must be considered in implementing any management plan. If the Council were to adopt a cut-off date at the April meeting, this action would be part of any management regime brought before the public for further comment. The Council deferred action on the January 16, 1989 cut-off date in the interest of allowing more public comment and advice from the Advisory Panel.

The FPC met on March 28-29, 1989 to discuss the cut-off date and pipeline definitions. NOAA Fisheries and Council staff recommended the use of a specified cut-off date and NOAA GC pointed out that the use of a clear and prospective cut-off date could weaken the claims of many participants who might be excluded. NOAA GC cautioned that the Council's tentative cut-off date of January 16, 1989, and definition had not been promulgated as regulatory standards and had not been justified in terms of the Magnuson Act. The definitions were vague and lacked predictability in terms of application. The Committee was unable to reach agreement on any single cut-off date but agreed to recommend two alternatives, January 16, 1989, and present and future cut-off dates.

In April 1989 the Council's Advisory Panel recommended that the Council maintain the open access system and discontinue development of limited access systems for all species currently under Council jurisdiction. The Council received public testimony indicating little support for limited access. The preponderance of testimony from all segments of the industry was against limited access. The Council decided after much discussion and several motions to proceed with the work schedule for sablefish, halibut groundfish and crab options as previously approved. It was clarified for the record that the January 16, 1989 cut-off date had been abandoned. As noted in Section 1.3, inshore-offshore events also began to unfold at the April 1989 meeting, during a period when many in the industry were vehemently opposed to limited entry.

The FPC met May 17-18, 1989 and again on June 19, 1989 and prepared a schedule for considering limited access systems. The Council accepted the FPC's schedule and adopted specific times in the work schedule to review the schedule, revise it or possibly abandon it completely. Specific review dates for all species were September 1989, January 1990, and June 1990.

In September 1989, the Council's Advisory Panel (AP) reiterated its advice from April 1989 that the Council maintain open access in all fisheries within the Council jurisdiction, except salmon. However, the Council approved the sablefish limited access package to go to public review, and scheduled the final decision on sablefish limited entry for January 1990. They also scheduled public workshops on the limited access alternatives for sablefish.

In January 1990, the Council was scheduled to take final action on sablefish limited entry. After over 25 hours of debate and consideration, the Council accepted the advice of the AP to further develop just the IFQ alternative and schedule a final decision for April 1990 with public review in the interim. For halibut, the Council recognized staff obligations on other items and delayed until April consideration of halibut limited access systems. It was pointed out that a final decision on a preferred alternative for sablefish in April would allow the scope of the halibut analysis to be more focused and save staff time.

For groundfish and crab, the AP had recommended that it was important to address the question of future management schemes in other fisheries and recommended that the Council begin the process of establishing a moratorium or nontransferable license system for all fisheries under Council jurisdiction. This was recommended as a high priority. A minority report was submitted against this action.

The Council, concerned that there was insufficient staff available to conduct a full analysis of a moratorium, passed a motion putting the fishing community on notice that the Council would consider taking action at the April 1990 meeting to establish a moratorium for all fisheries under Council jurisdiction and would consider a cut-off date as early as January 19, 1990.

On March 16, 1990 the FPC discussed further approaches to the moratorium and the difference between a statutory moratorium and notice of a control date. The statutory moratorium would require extensive analysis and require amendments to the Council's FMPs. The FPC agreed that all groundfish, halibut and crab fisheries be considered under a moratorium and that a community development system must be included in any moratorium.

At the April 1990 Council meeting, the AP advised moving forward with developing a moratorium. The Council heard from the FPC and moved to instruct the staff to undertake a process of plan amendments for all plans to include a moratorium and that the Council adopt a proposed moratorium submitted by industry in January. The motion was withdrawn after consultation from NOAA GCAK that the Council was acting prematurely in devising an actual moratorium. NOAA GCAK recommended that the Council announce a proposed date for a moratorium to the public and have staff develop an options paper around the moratorium. The Council then instructed the staff to prepare a Federal Register notice with a January 19, 1990 cut-off date, to be implemented by January 1, 1992 for 4 years. The Federal Register notice was to be available for Council approval at the June 1990 meeting. For sablefish limited entry, the Council responded to requests for a longer review period and deferred final action until June. The Council sent the document out for public review with changes suggested during discussion. The Council postponed further work on halibut and groundfish limited entry until at least June 1990 when the final decision on sablefish was to be made.

In June and August 1990 the Council could not come to consensus on a particular IFQ system for sablefish and the motion was placed on the table. The AP recommended that the Council proceed with the moratorium. NOAA GC indicated that the control date should be either the date of announcement or later, rather than a date preceding the announcement of the intent to limit entry to fisheries. The Council approved a notice of intent of a control date of August 1990 and initiated a process to develop amendments and regulation to implement a moratorium. Final Council action was tentatively scheduled for June 1991 to take effect in January 1992. The Council initiated a scoping period on its intent to develop limited entry systems, but deferred action on work schedules for groundfish, halibut and crab.

In September 1990 , the Council reviewed comments from the scoping period and instructed the FPC to develop options for a moratorium and report back in April 1991 so they could define a moratorium schedule. Sablefish limited entry was retabled until December 1990.

In December 1990 the Council referred the sablefish system to the FPC for further development. The FPC reviewed proposed sablefish IFQ systems in January 1991 and instructed staff to provide a revised analysis in April for public review. The FPC noted there would be no staff available to perform analysis of limited access for other fisheries until 1992.

In April 1991, the Council approved sablefish alternatives for public review and instructed staff to complete analysis of halibut alternatives. Council requested NMFS to analyze the procedures and requirements necessary to accomplish the task of analyzing and implementing a moratorium and proceeded with development of an IFQ system for all fisheries under Council jurisdiction. A final decision on sablefish IFQs was scheduled for June 1991 and a decision on halibut for September 1991.

This history with limited access is recounted to illustrate the difficulty the Council, its advisory bodies, and industry, have had in making a public policy decision on limiting access for North Pacific fisheries. All-in-all, for sablefish limited entry alone, the Council has considered the issue at 23 meetings starting in December 1985 and public testimony on the issue was received at all meetings. Many in industry through the years have expressed the deeply held concern that limited access is one of those threshold, irreversible decisions that will seriously reduce the opportunity for many individuals to participate in the fisheries. The decision has sweeping economic and social ramifications and can not be made quickly or easily by a public body such as the Council.

A final decision on sablefish and halibut limited access is scheduled for September 1991. After that decision is made, NMFS projects that the new systems to implement the program will not be in place until sometime in 1993, more than a year away and even that may be optimistic. Similarly, if the Council were to act on groundfish limited entry, NMFS documented at the June 1991 Council meeting that it would likely take until January 1995 to implement the program. A moratorium alone could not be implemented until January 1993, according to projections by NMFS in June 1991.

In conclusion, though the Council remains intensely involved in its consideration of limited access and a moratorium, and such approaches may be viable long term alternatives to address the inshore-offshore system, such solutions cannot address the immediacy of the preemption problem, and as the SSC indicated in their report of January 1990, a moratorium may cap the harvesting and processing capacity, which would lessen pressures that would intensify inshore-offshore conflicts, but preemption could still occur. The only limited access system which could directly address the inshore-offshore issue is some form of individual fishing quotas, and such a system will take an extraordinary amount of consideration by the Council over the next few years. The Council recognizes the need to examine such a system and has made that one of the alternatives to be considered in its comprehensive development of alternatives to rationalize the groundfish and crab fisheries by December 31, 1995, as approved in inshore/offshore Alternative 8, the preferred alternative chosen at the June 1991 Council meeting. The Council also reiterated its intention to develop and implement as expeditiously as possible a moratorium, including implementation by emergency action as soon as possible.

CHAPTER 2

DESCRIPTION OF THE PHYSICAL AND BIOLOGICAL ENVIRONMENT

CHAPTER 2

2.0 DESCRIPTION OF THE PHYSICAL AND BIOLOGICAL ENVIRONMENT

The Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) FMPs apply to waters of the EEZ (3-200 miles offshore) in the eastern Bering Sea, north and south of the Aleutian Islands westward of 170 west longitude, and Gulf of Alaska waters eastward of 170 west longitude to Dixon Entrance in Southeast Alaska at 132 40'west longitude (Fig. 2.1). These waters support a complex ecosystem driven by physical impacts on primary producers (phytoplankton), secondary producers (mainly zooplankton), and consumers. Consumers include forage fishes, groundfish species managed by the FMP, other commercial finfishes (including salmon, herring and halibut), benthic invertebrates (including commercially important stocks of king and Tanner crab as well as mollusks), and large populations of seabirds and marine mammals.

This chapter describes those portions of the physical and biological environment that may be affected by the proposed action, and also the potential physical and biological impacts of the alternatives.

2.1 Physical Environment

The physical environment consists of waters that lie over the continental slope, and over portions of the deeper Aleutian Basin. Northern portions of the eastern Bering Sea area are seasonally covered by sea ice.

Bering Sea

The area of the Bering Sea is about 2.3 million square kilometers (km). Of this area, 44% consists of continental shelf; 13% of continental slope; and 43% of deepwater basin. The continental shelf of the northeastern Bering Sea is one of the largest in the world. It is extremely smooth and has a gentle, uniform gradient. The continental slope bordering this shelf is abrupt and very steep, and is scored with valleys and large submarine canyons. On the south, the Aleutian/Commander Islands Arc forms a partial barrier between the Bering Sea and the Pacific Ocean. This chain consists of more than 150 islands, and is about 2,260 kilometers long. The continental shelf of the Aleutians is narrow and discontinuous, with a breadth ranging between 4 and 46 kilometers. The broader parts of this shelf are in the eastern Aleutians. The Aleutian Trench, a large canyon stretching from the central Gulf of Alaska to the Kamchatka Peninsula, adjoins the Aleutian/Commander chain on the south.

Bowers Bank is a submerged ridge extending to the northwest from the west central Aleutians into the Bering Sea. It is about 550 kilometers long and 75 to 110 kilometers wide, increasing in width as it approaches the continental shelf of the Aleutians. The summit of the ridge is 150 to 200 meters deep in the south, 600 to 700 meters deep in the center, and 800 to 1,000 meters deep in the north.

Aside from the Aleutians and Commanders, the Bering Sea has relatively few islands. The small Pribilof and St. Matthew Island groups lie adjacent to the continental slope of the northeastern Bering Sea. Nunivak Island lies just off the Alaska mainland between the Yukon and Kuskokwim deltas. St. Lawrence Island lies in the northern part of the Bering Sea, between Norton Sound and the Chukchi Peninsula.

Water flows into the Bering Sea from the Pacific Ocean and from the rivers and surface of the adjoining land areas. Water moves from the Bering Sea into the Arctic Ocean through the Bering Strait. Thus, there is a net movement of water northward throughout the Bering Sea. On the eastern Bering Sea continental shelf, the dominant movement of water involves water entering the Bering Sea from the Pacific

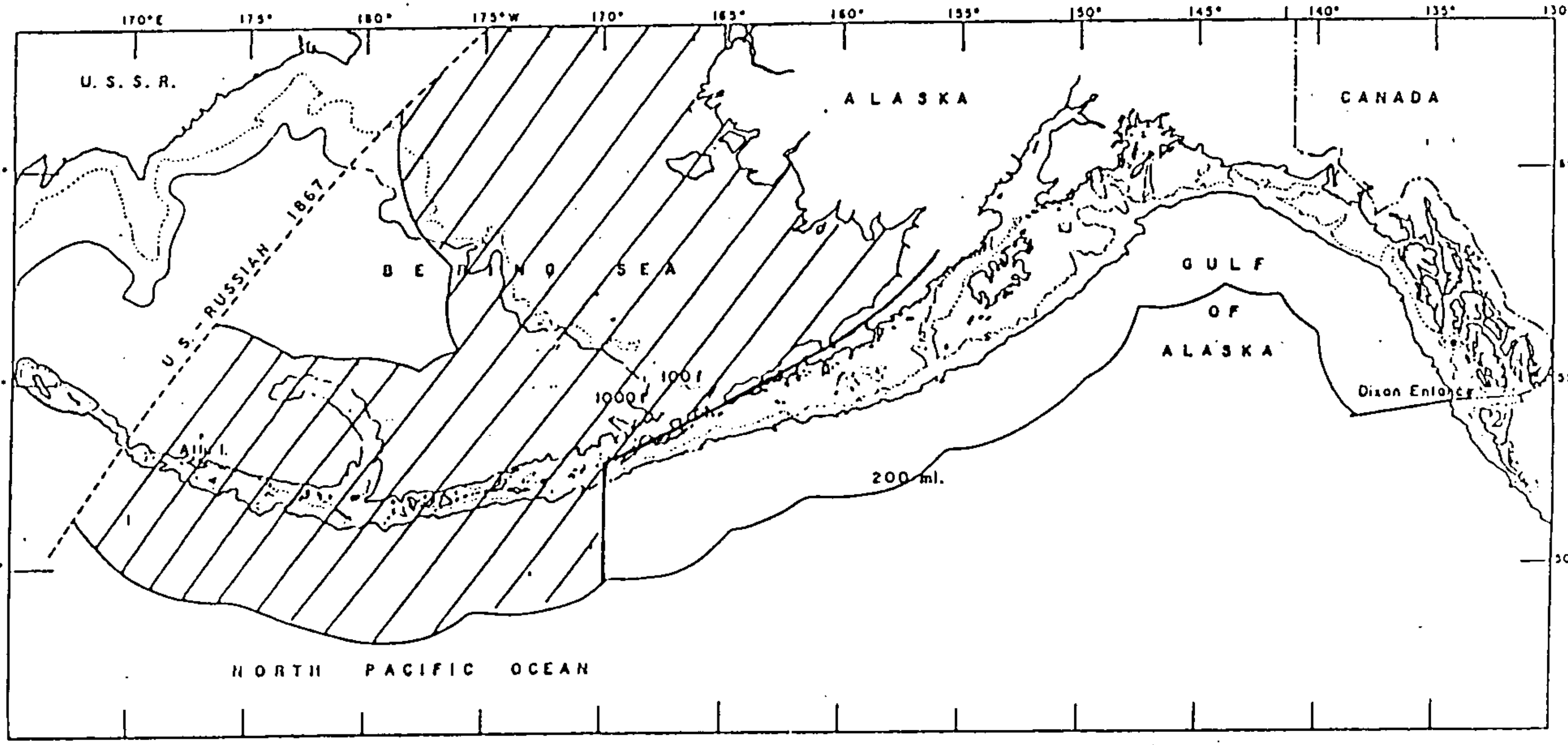


Figure 2.1. Bering Sea/Aleutian Islands and Gulf of Alaska Management Areas.

in the area of Unimak Pass. This water moves northward to St. Matthew Island and eastward toward Bristol Bay. Dividing near St. Matthew Island, the northward stream reunites and passes through the Bering Strait.

Gulf of Alaska

Total area of the continental shelf in the Gulf of Alaska is about 160,000 square km, which is more than the shelf area in the Washington-California region but less than 25% of the eastern Bering Sea shelf. Between Canada and Cape Spencer in the Gulf of Alaska the continental shelf is narrow and rough. North and west of Cape Spencer it is broader and more suitable for trawling. As it curves westerly from Cape Spencer towards Kodiak Island it extends some 50 miles seaward, making it the most extensive shelf area south of the Bering Sea. West of Kodiak Island and proceeding along the Alaska Peninsula toward the Aleutian Islands, the shelf gradually becomes narrow and rough again.

The western Gulf is characterized by steep rugged mountains, highly irregular coastline, and several islands and island groups. This area includes Unimak Pass and the Shumagin Islands. The continental shelf south of the Alaska Peninsula is about 250 km wide, and breaks rapidly to the Aleutian Trench and abyssal plain (Hood 1987).

The central Gulf encompasses the Kodiak Archipelago, Shelikof Strait, Cook Inlet, and Prince William Sound. Cook Inlet is separated from Prince William Sound by the Kenai Peninsula. The southern portion of Cook Inlet, which is highly productive, is bounded by Kachemak Bay on the east and Kamishak Bay on the west, and Shelikof Strait to the south. The continental shelf in this region is 220 km wide, extending to the 600 m depth contour and eastwardly towards the Aleutian Trench. In this area, the Alaska Current sweeps westward along the continental shelf parallel to the Alaska Coastal Current which intensifies as it flows toward Shelikof Strait past the Kenai Peninsula and becomes the Kenai Current (Reed and Schumacher, 1987).

The southeastern Gulf of Alaska consists mainly of the Alexander Archipelago. This area contains numerous inlets, passages, and fjords. Currents offshore are northerly along a continental shelf that is less than 100 km wide.

Runoff from the snow and ice of the Alaska coastal ranges causes salinity gradients which drive the Alaska Coastal current, which extends from British Columbia, Canada to Unimak Pass in the Aleutian Islands. The Alaska Current lies offshore from the Alaska Coastal Current and is the dominant transport system of surface waters of the Gulf. This current moves in a northwesterly direction in the eastern Gulf and swings to the west and southwest off Kodiak Island and westward to Unimak Pass. In contrast to the upwelling situations off the west coast of the western United States, downwelling occurs in the Gulf of Alaska.

2.1.1 Continental Shelf

Between nearshore waters and deeper portions of the ocean lies a relatively shallow region over the continental shelf. The outer limit of the shelf occurs at the shelf break, at a depth of approximately 180-200 meters. Three physical domains have been identified across the shelf (Coachman 1986).

Waters out to a depth of approximately 50 meters are well mixed by a combination of winds and tidal action (Schumacher et al. 1979) and exhibit small mean current flow. This area hosts a nearshore zooplankton community (Cooney 1981) and forage fish populations including herring, capelin, and sand lance. Seaward of the coastal domain lies an inner front--strong gradients of temperature and salinity that separate this water mass from the middle shelf domain.

The middle shelf (50-100 meters) is a vertically stratified system exhibiting almost no mean current (Coachman 1986). During summer these waters experience high rates of primary production due to occasional mixing of nutrient-rich bottom waters into the surface layer, but large grazing zooplankton are absent so much of this production sinks to the bottom supporting high abundances of benthic animals including crabs and flounders (Haflinger 1981, Cooney and Coyle 1982). The middle shelf domain is separated from outer shelf waters by another area of high physical gradients, the middle front.

Outer shelf waters (100-200 meters) are vertically stratified, with shelf water overlying a layer of fine structure which itself overlies intruding oceanic waters (Coachman 1986). Due to occasional mixing of nutrient-rich oceanic waters into surface layers, this area also exhibits high rates of primary production, but vertically migrating oceanic zooplankton effectively graze these plants to divert energy into a pelagic ecosystem (Cooney and Coyle 1982). Pollock and Pacific cod are predominant species in outer shelf waters.

2.1.2 Continental Slope and the Aleutian Basin

An outer shelf front separates these waters from the oceanic domain over the continental slope and Aleutian Basin. These oceanic waters are typically poor in nutrients and support less productivity than waters on the shelf and slope. However, localized areas, particularly close to the bottom in areas of topographic irregularity, support concentrations of rockfish and sablefish. Waters particularly along the shelf break exhibit moderate mean current flow parallel to the bathymetry.

2.1.3 Seasonal Sea Ice

Except for the southernmost part, which is in the temperate zone, the Bering Sea has a subarctic climate. It experiences moderate to strong atmospheric pressure gradients, and is subject to numerous storms. The distribution of sea ice in the Bering Sea is subject to great seasonal variation. Ice begins to form along south-facing shorelines during the early fall, and, in October and November, extends to northern sections of Bristol Bay. The ice edge advances southward under the influence of prevailing winds with more ice formed behind it, in a conveyer belt fashion. Sometime in March or April the sea ice reaches its maximum southern extent, and then begins a rapid retreat due to melting and shifts in prevailing winds (Overland and Pease 1981, Niebauer 1981, Webster 1981).

2.2 Biological Environment

The biological environment consists of various trophic levels that translate energy from producers to consumers. Major groups discussed in this document include lower trophic levels consisting of phytoplankton and zooplankton, commercially important groundfish species, other finfish and shellfish, and apex consumers such as seabirds, marine mammals and man.

2.2.1 Lower Trophic Levels

The flora and fauna that comprise the lower trophic levels of the Bering Sea and Gulf of Alaska can be separated into three communities: (1) epontic or organisms associated with the undersurface of sea ice; (2) pelagic or organisms living in the water column; and (3) benthic or organisms living on or in the sea bottom. In this section, the primary and secondary producers are described and interactions among trophic levels are discussed.

Epontic Community

From November through June, portions of the Bering Sea are covered by sea ice. Such ice serves as a substrate for algae, small invertebrates, and cryopelagic fish. Alexander and Chapman (1981) identified over 20 species of epontic phytoplankton in the Bering Sea--almost exclusively diatoms. More than half of the ice algae species also occurred in water-column samples. Vertical distribution of epontic algae is confined to the bottom few centimeters of the ice pack. Chlorophyll a (a measure of phytoplankton abundance) at concentrations as high as 70 milligrams per square meter of sea ice has been observed (Alexander and Chapman, 1981), but these dense concentrations are patchily distributed within the ice pack.

Epontic algae are adapted to low-light conditions and grow from the onset of adequate light conditions until ice breakup. McRoy and Goering (1974) found that the highest production and standing stock of epontic algae occurred just as the ice breaks up. Although ice algae initiate the annual cycle of primary production, ice algae contribute less than 1.5 grams of carbon per square meter annually (Alexander and Chapman, 1981).

Within the Bering Sea, primary production by ice algae is more important in its timing rather than in its contribution to the total primary productivity (Tamm and Jarvela, 1984). Alexander and Chapman (1981) estimated that ice algae contribute less than 1% of the annual primary production of the southeastern Bering Sea. However, production by ice algae precedes phytoplankton blooms in the water column by at least 1 month. The ice-algae bloom serves primarily as an early source of concentrated food for amphipods, copepods, ciliates and fishes, and secondarily, as a spring inoculum of algae cells that seeds the water column (Niebauer et al., 1981). Alexander and Chapman (1978) estimated the influx of ice-algae cells into the water column as 105 to 106 cells per liter.

Pelagic Community

Phytoplankton, zooplankton, and micro-nekton comprise the lower-trophic levels of the pelagic community. Planktonic organisms are principally found in the upper-water column and are subject to wind and tidal currents that control their distribution. Micronekton also inhabit pelagic waters but are capable of swimming effectively. The system of hydrographic fronts and domains of the Bering Sea and Gulf of Alaska play an integral part in the patterns of distribution and abundance of these organisms.

Phytoplankton:

Bering Sea: Alexander and Cooney (1979) found that 65% of the primary production in the Bering Sea occurs from April through June. Three phytoplankton blooms encompass this period: An ice-algae bloom (discussed earlier), followed by a bloom at the ice edge, and then the typical spring bloom in open water. Similar to the ice algae, phytoplankton in the water column are primarily diatoms. At least 90 species of diatoms occur in the Bering Sea (Alexander and Chapman, 1978).

During winter, the abundance and productivity of phytoplankton is low due to low-light intensities. As the ice separates into smaller floes, light penetration into the sea increases significantly, resulting in an extremely intense bloom at the ice edge. The bloom usually begins in April and follows the receding ice pack northward.

Productivities as high as 725 milligrams of carbon per square meter per hour have been measured at the ice edge (Niebauer et al., 1981). The bloom extends to depths of 30 to 60 meters and distances of 50 to

100 kilometers away from the ice edge. As the ice edge melts, the upper layer of the water column stabilizes because of decreased salinity and dampened wind mixing, thus permitting such an intense bloom. The ice-edge bloom persists for 2 to 3 weeks until nutrients are depleted. Because the bloom develops so rapidly, the phytoplankton cannot be completely grazed, so much of the organic matter sinks to the bottom. Primary species of the ice-edge bloom include Thalassiosira sp., Nitzschia sp., Achnanthes sp., Navicula pelagica, Navicula vanhoffeni, Chaetoceros sp., and Detonula sp. (Schandelmeier and Alexander, 1981).

In ice-free waters, a spring bloom occurs after formation of the seasonal thermocline. The open-water bloom occurs in spring in the Aleutian Islands and in summer in the Bering Strait (Alexander and Niebauer, 1981). Diatoms in the warmer, open waters of the Bering Sea are considerably larger than those found at the ice front (Alexander and Cooney, 1979). Species associated with the spring bloom include Chaetoceros convolutus, C. socialis, C. compressus, C. radicans, and Thalassiosira nordenskioldii (Schandelmeier and Alexander, 1981). Compared to the ice-edge bloom, the spring bloom is less intense but of longer duration throughout a greater depth of the water column.

Iverson and Goering (1979) estimated primary production for the hydrographic domains in the Bering Sea. Annual production was 400 grams of carbon per square meter in the middle-shelf domain, 200 grams of carbon per square meter over the outer shelf and 90 grams of carbon per square meter in the oceanic domain. Thus, the ice-edge and spring blooms produce the highest carbon input over the middle shelf (50-100 m isobaths).

Gulf of Alaska: Most of the production in the Gulf of Alaska comes from relatively brief blooms in the spring, followed by a peak of secondary production in the fall. Studies of primary production in various Gulf shelf areas indicate that these regions are very productive. Upwelling associated with the Alaska Coastal Current appears to play an important role in maintaining large daily production throughout the summer. Water movement through the Aleutian passes also produces local upwelling.

The Gulf of Alaska shelf is extremely productive, particularly the areas on the Kenai shelf and lower Cook Inlet, where annual production is approximately 300 grams of Carbon per square meter (Sambrotto and Lorenzen, 1987). Estimates of annual production in coastal areas of the Gulf range from 140 to over 200 grams of Carbon per square meter.

In the oceanic regions of the Gulf, productivity increases in the spring are not accompanied by increases in the phytoplankton standing crop. Diatom cells are not particularly numerous, and the phytoplankton community is numerically dominated by microflagellates. It is difficult to describe the composition of the phytoplankton community as it is quite varied geographically and temporally. In the oceanic Gulf it has been suggested that the diatom Denticulopsis seminae is ubiquitous to this area. Other abundant oceanic species of phytoplankton include: Nitzchia pseudonana, Rhizosolenia alata f. inermis, Corethron hystrix, and Cylindrotheca closterium.

Similarly, generalizations regarding the composition of the phytoplankton community of the coastal Gulf areas are difficult to make due to the heterogenous nature of growing conditions that are encountered in the coastal Gulf. Dominant groups of phytoplankton identified in lower Cook Inlet and adjacent areas include: Melosira sulcata, Chaetoceros spp., Thalassiosira spp., and microflagellates (Larrance et al, 1977).

Zooplankton

Bering Sea: Zooplankton are the major grazers of the phytoplankton, and the grazing stress exerted upon phytoplankton ultimately determines whether the food web leading to higher trophic levels is pelagic or benthic. In the Bering Sea, copepods are the dominant zooplankton, both in terms of abundance and diversity. Cooney (1981) identified 22 numerically common species of copepods in the Bering Sea. Approximately 80% of the zooplankton standing stock occurs in the upper 80 meters of the water column (Motoda and Minoda, 1974), corresponding to the vertical distribution of phytoplankton.

In the southeastern Bering Sea, two distinct copepod communities occur, segregated by the middle-shelf front at approximately the 100 m isobath. Seaward of the front, the oceanic species Calanus plumchrus, C. cristatus, Eucalanus bungii and Metridia pacifica are dominant members of the oceanic/outer-shelf communities (Cooney and Coyle, 1982). The cold water of the midshelf front blocks penetration of these large, oceanic species into the middle-shelf waters (Alexander, 1981). The middle shelf is seasonally dominated by smaller copepods: Pseudocalanus sp., Acartia longiremis, and Oithona simulus (Cooney and Coyle, 1982). Calanus glacialis and C. marshallae may also be abundant in midshelf waters (Zenkevitch, 1963; Cooney, 1981).

The reproductive strategies of midshelf and oceanic zooplankton result in differential grazing on the phytoplankton blooms. Oceanic copepods reproduce in winter, and hence, large numbers of both mature and immature copepods inhabit pelagic waters before the spring bloom. Midshelf copepods must first feed before reproducing, and therefore do not attain peak densities until after the spring bloom. Cooney (1981) estimated grazing efficiencies of 2% and 15% for the midshelf and oceanic/outer-shelf copepods, respectively. Thus, the phytoplankton/zooplankton link is much more tightly coupled seaward of the middle front, leading to a pelagic food web rich in nekton, pelagic fishes (e.g., pollock), marine mammals, and birds. In the midshelf domain as much as 90% of the phytoplankton sinks to the sea bottom ungrazed (Goering and Iverson, 1981), leading to a rich benthic food web of infauna, epifauna, demersal fishes (e.g., yellowfin sole), and marine mammals.

Gulf of Alaska: The composition of zooplankton communities in the Gulf of Alaska displays a homogeneity of species across the oceanic, shelf, and coastal and inside waters. Copepods are the dominant taxa observed in samples taken from all marine environments in the Gulf of Alaska. In the oceanic domain, more than 70% of the biomass is associated with three species: Neocalanus cristatus, N. plumchrus, and Eucalanus bungii. Their complex life history characteristics such as migratory behaviors and reproduction at depth, places a mixture of these large copepods in the upper 150 m for at least 10 months of the year. Recent studies seem to confirm the hypothesis that grazing by oceanic herbivores controls both the stock and the production of phytoplankton in the open ocean.

Shelf and coastal zooplankton stocks vary in abundance and species composition according to season. Winter and early spring populations are augmented by oceanic species that are transported into shallower waters. During the summer and fall months the numerical abundance of the oceanic species declines and is replaced by a more neritic assemblage. Common species during this time include the copepods: Pseudocalanus spp., Acartia longiremis, A. tumida, Calanus marshallae, Metridia spp., and Centropages abdominalis. The marine cladocerans Podon and Evadne, and larvaceans, Oikopleura spp. are also observed during the summer. The shelf and coastal zooplankton stocks exhibit growth cycles corresponding to phytoplankton production. Zooplankton production is lowest in the winter and early spring, followed by substantial increases in the summer and fall.

Zooplankton serve as forage for fishes, shellfishes, marine birds, and marine mammals. Copepod nauplii are vitally important in the diets of most larval fishes. Therefore, the prolific small copepods

Pseudocalanus spp. and Oithona spp. may be extremely important in the life cycles of most pelagic and demersal fishes. The larger copepods and euphausiids are critical food items, particularly for marine birds, whales, and juvenile and adult pelagic fishes.

Micronekton

Small invertebrates that graze phytoplankton and zooplankton comprise the micronekton, of which amphipods and euphausiids are the most important components. Similar to zooplankton, micronekton are geographically separated by the middle-shelf front. Seaward of the front, the amphipod Parathemisto pacifica and euphausiids Thysanoessa longipes and T. inermis are most abundant (Lewbel, 1983). Parathemisto libellula and Thysanoessa raschii predominate in the middle-shelf domain.

Although micronekton are much less abundant than zooplankton, micronekton form dense swarms approaching 100 per square meter and are abundant throughout the summer (English, 1979). Amphipods and euphausiids are significant in the diets of many seabirds (Hunt et al., 1981; Hunt, 1981b), finfish (Cooney et al., 1980; Lowry and Frost, 1981a), seals (Lowry and Frost, 1981b), and baleen whales (Frost and Lowry, 1981).

Benthic Community

The benthic food web is primarily composed of invertebrates and demersal fishes. The invertebrate benthic community can be further divided into infauna (organisms living in the sediments) and epifauna (organisms living on the sediment surface). This section discusses the invertebrate infauna and slow-moving epifauna. Benthic fishes and macro-epifauna (e.g., crabs) are discussed in the next section.

Invertebrate infauna form a vital link between accumulated flora and fauna in the bottom sediments (e.g., detritus) and epifauna, fishes, and marine mammals. The benthic invertebrate community of the Bering Sea is abundant and diverse. At least 472 species of invertebrates comprise the macroinfauna, including 143 species of polychaete worms, 76 species of amphipods, 76 species of gastropods, and 54 species of bivalves (Stoker, 1981).

Two trends characterize the distribution of infauna within the Bering Sea: (1) density and biomass increase from south to north (Stoker, 1981; Alton, 1974; Feder and Jewett, 1981), and (2) infaunal biomass is highest in the middle shelf waters (Haflinger, 1981; Nagai and Suda, 1976; Stoker, 1981). The inefficient link between phytoplankton and zooplankton in midshelf waters results in rich standing stocks of infauna, epifauna and demersal fish between the 50- and 100-meter isobaths. Although infaunal biomass is higher in the northeastern Bering Sea, reduced numbers of demersal fishes occur, presumably due to the low bottom water temperatures normally present.

2.2.2 Principal Groundfish Stocks

This group of fishes comprises the major harvest in both numbers and value from the eastern Bering Sea and Gulf of Alaska at this time. The group is also called bottomfish. For management purposes involving catch statistics and in determination of economic value, this fish complex is subdivided into the following categories for the Bering Sea/Aleutian Islands: pollock, Pacific cod, yellowfin sole, Greenland turbot, rock sole, arrowtooth flounder, other flatfish, sablefish, Pacific ocean perch, a group comprising shortraker, rougheye, sharpchin and northern rockfish, other rockfish, Atka mackerel, squid, and other species. In the Gulf of Alaska, the management categories are: pollock, Pacific cod, deep flatfish, shallow flatfish, flathead sole, arrowtooth flounder, sablefish, Pacific ocean perch, shortraker and rougheye rockfish, other slope rockfish, pelagic shelf rockfish, demersal shelf rockfish, thornyhead rockfish, and other species.

Walleye Pollock (Theragra chalcogramma)

Bering Sea: This species is the most abundant demersal fish on the continental shelf in the Bering Sea and is estimated to comprise approximately 85% of the total biomass of all demersal fish in the Bering Sea (Bakkala et al., 1987). Large schools of pollock occur on the outer continental shelf and upper slope, from the surface to 500 meters in depth.

Pollock undergo seasonal and diurnal migrations associated with spawning and feeding in the eastern Bering Sea. Seasonal distribution appears to be related to water temperature (Smith, 1981). Overwintering occurs along the outer shelf and upper slope at depths of 150 to 300 meters, where bottom temperatures are warmer. As water temperatures rise in the spring, pollock move to more shallow waters (90 to 140 m), where they spawn. From February through July, spawning occurs along the outer shelf, with major concentrations of spawning fish between the Pribilof Islands and Unimak Island (Lewbel, 1983). Pollock also move vertically in the water column. Adults tend to aggregate near the bottom during the day and rise at night to feed.

Most spawning takes place from February to March off the shelf edge into approximately 90-meter water depths along the outer shelf. Some incidents of spawning have been observed during June and July in areas further north along break (Hinckley 1987). The eggs are pelagic and abundant in surface waters until they hatch in 2 to 3 weeks, depending on the water temperature (Walline, 1985). The larvae are also pelagic and remain in surface waters until they are 35 to 50 millimeters long, when they begin a demersal existence (Pereyra et al., 1976). Larvae are most abundant between Unimak Pass and the Pribilof Islands along the continental slope (Waldron, 1981). In the summer, they show a more widespread distribution from the Aleutian Islands to 60 30'N latitude, and from well up on the continental shelf in Bristol Bay across the central basin to 177 E longitude (Waldron, 1981). Larvae may take 2 or 3 months to develop into juveniles, depending on water temperature. Juvenile pollock are found in near-surface waters. Groundfish trawl surveys have found 2- to 4-month-old pollock over a large area of the northwestern outer shelf, with highest concentrations of 0-age juveniles directly west of the Pribilof Islands (Smith, 1981). Following spawning along the southeastern outer continental shelf, the northwest drift apparently carries larvae and metamorphosing juveniles to the vicinity of the Pribilofs.

By one year of age pollock are distributed broadly over the entire central and outer continental shelf, completely overlapping the adult range, but also extending inshore beyond the adult range (Smith, 1981). By 2 years of age, pollock are more restricted to deep water. As they mature at age 3 to 4, juveniles join the adult demersal population on the outer continental shelf.

There are apparent annual variations in the distribution of juvenile pollock, based mostly upon water temperature. Since spawning adult pollock do not penetrate continental shelf waters colder than 1 to 2 degrees, larval pollock are more concentrated near the shelf break during colder years but more widely dispersed across the shelf in warmer years (Nishiyama, 1982; Chen, 1983; Bakkala and Alton, 1986). Juveniles aged 1 and 2 also tend to be constrained by cold water temperatures (Chen, 1983) and tend to be concentrated near the shelf break and outer shelf waters during colder years (Bakkala and Alton, 1986).

Larval pollock feed on copepod eggs and nauplii after their yolk reserves have been exhausted (Cooney et al., 1980). Juvenile pollock prey on larger copepods, euphausiids, and amphipods. Adults feed on copepods, euphausiids, and fish (a majority of which are juvenile pollock) (Morris, 1981).

Feder and Jewett (1981) show a food web which depicts the major flows of energy to adult walleye pollock in the eastern Bering Sea. Juvenile walleye pollock and euphausiids serve as the main sources of energy for adult pollock. In addition, copepods, mysids, amphipods, sand lance, smelt, and herring form minor portions of the diet. Livingston et al.(1986) and Dwyer et al. (1988) show the seasonal change in pollock diet and the total amount of juvenile pollock consumed by adults. Adult pollock are cannibalistic mostly during autumn and winter and they consume mainly age 0 juveniles.

Many other fish predators rely on juvenile walleye pollock for food (Livingston and Dwyer 1986; Livingston et al. 1986; Brodeur and Livingston 1988): including Pacific cod, sablefish, flathead sole, Pacific halibut, Greenland turbot, arrowtooth flounder, Atka mackerel and great sculpins.

Pollock populations peaked in the early 1970s, and declined thereafter because of overharvesting by foreign fisheries, then slowly increased to a standing stock biomass of approximately 10 million tons by 1982. Recent assessments (NPFMC 1990b) indicate that 1991 exploitable biomass in the Bering Sea is 6.667 million mt, and 340,000 mt for the Aleutian Islands. The Bering Sea stock is currently supported by the strong 1982 and 1984 year classes. Future recruitment appears to be lower, and the biomass is expected to decline in the near future.

Gulf of Alaska: Walleye pollock are a pelagic species in all life stages. They are found throughout the water column from shallow to deep water, frequently forming large schools at depths of 100-400 m along the outer continental shelf and slope. Eggs have been found at depths of 0-1,000 m. Young-of-the-year occur in the upper 40 m and older juveniles are found in depths of 10-400 m in the water column. Adult are usually found at 50-300 m, but occasionally to 975 m. Seasonal movements between inshore-offshore habitats have been observed, with adult fish moving in the spring from deep water to shallower depths where they remain throughout the summer. In the fall they return to deep water. In addition to seasonal movements, there may be vertical movements in the water column associated with time of day and feeding patterns.

Several subpopulations of pollock may exist but the evidence is inconclusive. There are two groups in the Bering Sea which can be distinguished by different growth rates, and perhaps five discrete spawning groups which exist from the Aleutians to Puget Sound.

Spawning is seasonal and occurs during the late winter/early spring period. The species is a mass spawner that forms large mid-water concentrations during the spawning season. The greatest spawning biomass has been observed in Shelikof Strait, with spawning also occurring off the east coast of Kodiak Island and off Prince William Sound. Both male and female pollock begin to attain sexual maturity at about 25 cm fork length and 50% are mature by 30-34 cm (3-4 years of age). Estimated fecundity of females 30-34 cm of length is about 100,000 eggs.

Walleye pollock are opportunistic feeders, feeding on free-swimming pelagic animals. Juveniles feed on copepods, euphausiids, amphipods, and isopods. Small adults feed primarily on euphausiids while large adults may concentrate on juvenile pollock. Walleye pollock are preyed upon by pinnipeds, cetaceans, diving birds, and larger fishes. They are also cannibalistic.

The latest assessment of pollock (NPFMC 1990c) estimated the 1991 exploitable biomass at approximately 1.3 million mt. The stock is considered to be at an average level and in a decreasing trend.

Pacific Cod (Gadus macrocephalus)

Bering Sea: In the Bering Sea, schools of this demersal species are most abundant on the continental shelf and upper slope. Pacific cod are similar to pollock in distribution, but occur in more shallow waters, commonly at depths of 80 to 260 meters (Pereyra et al., 1976). The greatest concentrations of adult cod are at depths of 100 to 200 meters (Wespestad et al., 1982).

Adult cod are abundant along the northern side of the Alaska Peninsula throughout the area from Cape Seniavin to Cape Sarichef (Thorsteinson, 1984). Pacific cod migrate seasonally between the continental slope and shelf in the Bering Sea. Cod overwinter and spawn in deeper waters in the canyons across the shelf and along the shelf edge and upper slope at depths of 100 to 400 meters, and move to more shallow waters (30-75 m) in the summer. Cod disperse to feeding areas in more inshore areas following spawning. Because the location and concentration of spawning aggregations are poorly known, the magnitude of any migration between spawning and feeding grounds is also unknown.

This species spawn from January to May, with the bulk of spawning occurring in February and March (Wespestad et al., 1982). The demersal eggs hatch within 10 to 20 days and the pelagic larvae are found at water depths from 25 to 150 meters, with concentrations at 75 to 100 meters (Lewbel, 1983). Larvae have been caught in ichthyoplankton surveys in the Aleutian Islands and on the continental shelf south of Nunivak Island (Waldron, 1981). Some larvae have been caught in nearshore waters (less than 50 m deep) in northern Bristol Bay, and others within the 50- to 100-meter contours (Waldron, 1981). Coastal areas with rocky bottoms are used by juveniles before they move offshore into deeper waters. The North Aleutian Shelf area is important as a nursery area for Pacific cod (USDOC, NMFS, 1980).

Pacific cod feed on benthic and planktonic organisms. They also prey on fish such as herring and sand eels, and on invertebrates including polychaetes, clams, snails, and shrimp (Morris et al., 1983; Thorsteinson, 1984). Cod are a major predator on juvenile crabs.

The food web of energy flow to Pacific cod (Feder and Jewett 1981) shows Tanner crab, pandalid shrimp and walleye pollock as the main sources of food for adults. Cod also consume flatfish, herring, capelin, sand lance, and other shrimp and crabs. Livingston et al.(1986) and Shimada et al.(1988) show that cod become increasingly piscivorous with increasing size. In particular, cod larger than 60 cm consume mostly fish, which consists mainly of walleye pollock 10-30 cm long or about 1-3 years of age. During spring when female red king crab are molting, cod will consume soft-shell king crabs. Preliminary analysis shows that the number of red king female crabs eaten by Pacific cod is directly proportional to the number of female crab present.

As a result of an extremely strong year-class in 1977 and good recruitment in 1978 and 1979, the biomass of Pacific cod increased significantly in the mid-to-late 80s. Recent assessments (NPFMC 1990b) indicate that the exploitable biomass for 1991 in the Bering Sea/Aleutian Islands is about 1 million mt. Stocks are characterized as high in abundance, but appear to be declining from the relatively high levels of the 1980s.

Gulf of Alaska: Pacific cod are a widespread demersal species found along the continental shelf of the Gulf of Alaska from inshore waters to the upper slope. Adult cod are commonly found at depths of 50-200 m. In the Gulf of Alaska Pacific cod are most abundant in the western Gulf, where large schools may be encountered at varying depths depending upon the season of the year. During the winter and spring cod appear to concentrate in the canyons that cut across the shelf and along the shelf edge and upper slope between depths of 100-200 m where they overwinter and spawn. In the summer they shift to shallower depths, usually less than 100 m.

There is some evidence to suggest that there are subpopulations of Pacific cod. A study of meristic characters indicated that northern and western Bering Sea Pacific cod represent a stock distinct from that in the eastern Gulf of Alaska. The sample sizes,.however, were not large enough to precisely delineate the population.

Spawning occurs in the winter/early spring period. Spawning in the Gulf of Alaska has been observed from February-July, with most spawning occurring in March at depths of 150-200 m. Spawners have been observed mostly along the outer continental shelf off Kodiak Island but also in Shelikof Strait and off Prince William Sound. Female cod begin to attain maturity at about 50 cm in length and 50% reach maturity at 55-62 cm (4-6 years). Estimated fecundity of females 55-62 cm in length ranges from 860,000-1,300,000 eggs.

Pacific cod are benthopelagivores. Juveniles feed on benthic amphipods and worms. Small adults feed primarily on benthic crabs, shrimps, and fishes. Large adults feed mainly on pelagic fishes and on some benthic fishes and shrimp. Pacific cod are preyed upon by Pacific halibut, fur seals, and some cetaceans.

The latest assessment of Pacific cod for the Gulf of Alaska (NPFMC 1990c) estimated exploitable biomass at 424,100 mt. The stock is considered to be at a high level of abundance, and it is characterized as decreasing.

Bering Sea Flatfish

Yellowfin Sole (Limanda aspera)

This flatfish is found in continental shelf waters at depths of 5 to 360 meters in the North Pacific Ocean, the Bering Sea, and the Chukchi Sea. The largest portion of the population is found in the eastern Bering Sea (Pereyra et al., 1976).

Yellowfin sole have complex seasonal movements in the eastern Bering Sea. During winter (September-March), adults are concentrated in dense schools on the outer shelf and upper slope at depths of 100 to 360 meters, with the largest trawl catches at depths of 100 to 200 meters (Fadeev, 1970; Salveson and Alton, 1976; Bakkala, 1981). One of the primary winter concentrations of adult yellowfin sole is located north of Unimak Island. Smaller concentrations are found in Bristol Bay (Bakkala, 1981). Winter concentrations generally do not feed until April, although exceptions have been reported (Fadeev, 1970). In the spring, yellowfin sole move inshore to more shallow waters (100 m) along the Alaska Peninsula, where feeding intensity remains low (Skalkin, 1963; Smith et al., 1978). In April and May, the fish migrate northward into outer Bristol Bay where, at depths of 40 to 100 meters, spawning and intensive feeding occur (Bakkala, 1981). It is believed that the water temperature and the extent of winter ice cover in the Bering Sea affect the rate of these summer migrations and the summer distributional patterns (Bakkala, 1981). With the advent of winter, adult yellowfin sole migrate back to deeper waters, probably in response to the advance of pack ice that covers portions of the Bering Sea in winter (Bakkala et al., 1983). In warmer years, the fish may remain in more shallow, central-shelf areas throughout winter (Bakkala et al., 1983). Young yellowfin sole (less than 8 years old) are found year-round in the inner-shelf region, including Bristol Bay (Fadeev, 1970). Large numbers of juvenile yellowfin sole have been found along the southern shore of Bristol Bay and on the northern side of the Alaska Peninsula and Unimak Island (Morris, 1981) during International Halibut Commission surveys. During the winter, adult yellowfin sole also move up vertically in the water column (Fadeev, 1965).

Yellowfin sole spawning begins in early July and continues into September in the Bering Sea (Musienko, 1970), in waters up to 75 meters deep (Thorsteinson, 1984). Spawning is concentrated southeast and northwest of Nunivak Island (Bakkala, 1981; Thorsteinson, 1984), but also has been observed in Bristol Bay (Fadeev, 1965; Bakkala, 1981). Females release millions of pelagic eggs that hatch in approximately 4 days (Thorsteinson, 1984); 3 days later yolk sacs are absorbed (Bakkala, 1981). The pelagic larvae are found in nearshore areas of the continental shelf at depths of less than 50 meters (Thorsteinson, 1984). After 4 or 5 months as pelagic larvae, they metamorphose into juvenile sole that settle to the bottom along the inner shelf (Morris, 1981), including Bristol Bay, which they occupy year-round (Fadeev, 1970). Bristol Bay is an important nursery area for yellowfin sole (Thorsteinson, 1984). Large numbers of juvenile yellowfin sole have been found along the southern shore of Bristol Bay and on the northern side of the Alaska Peninsula and Unimak Island during International Pacific Halibut Commission surveys (Morris, 1981). After spending their first few years in nearshore waters, the juveniles gradually disperse to deeper offshore waters (Thorsteinson, 1984).

The diet of the yellowfin sole in the Bering Sea varies with both depth and location (Skalkin, 1963). The food web for yellowfin sole does not show any one item as a dominant food source (Feder and Jewett 1981). Yellowfin sole are mostly benthic feeders as evidenced by their consumption of clams, shrimp, mysids, and worms. Occasionally, yellowfin sole also swim up in the water column and consume pelagic prey such as euphausiids, crab larvae, and juvenile pollock or cod (Livingston et al. 1986). Fadeev (1965) suggested that yellowfin growth in the Bering Sea is limited by food abundance. Concentrations of plankton in rearing areas are probably important for yellowfin larvae (Cooney et al., 1979).

Yellowfin sole populations had been depleted significantly due to intense fishing pressure by foreign trawlers. Populations were significantly reduced by 1963 (Lewbel, 1983), when fishing efforts switched to pollock. In the mid-1960s, the population showed signs of recovery but again declined in 1970 (Bakkala, 1981). The yellowfin sole population has recovered since 1970, and its current biomass is estimated to be at an all time high. Recent assessments (NPFMC 1990b) indicate that exploitable biomass in the Bering Sea/Aleutian Islands for 1991 is approximately 1.8 million mt. Stocks are characterized as very high in abundance and stable.

Greenland Turbot (Reinhardtius hippoglossoides)

This flatfish is widely distributed over the continental shelf and slope of the eastern Bering Sea with a depth range of 70 to 760 meters (Pereyra et al., 1976). Greenland turbot are concentrated in an area located between Unimak Island and the Pribilofs, and in an area west of St. Matthew Island (Morris, 1981). Turbot also inhabit areas south of the Alaska Peninsula.

This species has complex seasonal movements that are not well understood. Greenland turbot generally are found at more shallow depths in the summer than in the winter (Morris, 1981).

Spawning occurs from October to December on the continental shelf and slope at water depths greater than 100 meters (Lewbel, 1983). The eggs are bathypelagic, developing in deep water. The larvae are pelagic, rising to more shallow waters (30-130 m). When they reach a length of approximately 80 millimeters, the larvae become demersal (Pereyra et al., 1976). Generally, juveniles are found in shelf waters at depths of less than 200 meters, and adults inhabit slope waters at depths of 200 meters or greater. They feed on a variety of pelagic and demersal fish and crustaceans (Lewbel, 1983).

Greenland turbot become almost exclusively piscivorous at a fairly small size (Livingston et al. 1986; Yang and Livingston 1988). Beyond sizes of about 20 cm, turbot consume mostly walleye pollock. Turbot less than 50 cm eat mostly age 0-1 pollock while turbot larger than 50 cm eat pollock 20-45 cm in length. Other fish consumed include zoarcids, and deep-water fish such as bathylagids and myctophids. Cephalopods (mostly squid) are also an important dietary component. Young turbot (<20 cm) eat mostly euphausiids.

Continuous poor recruitment has been observed throughout the 1980s which indicates that the biomass of the adult population is expected to decline well into the 1990s. Current exploitable biomass is estimated at 325,500 mt (NPFMC, 1990b). This stock is characterized as low in abundance and declining.

Arrowtooth Flounder (Atheresthes stomias)

This species is abundant on the continental slope in the southeastern, central, and northwestern Bering Sea at depths of 200 to 500 meters (Pereyra et al., 1976; Morris, 1981). During winter, arrowtooth flounder occupy deeper waters (300-500 m), and they migrate to more shallow waters (200-400 m) in the summer. These migrations are believed to be associated with changes in water temperature (Pereyra et al., 1976).

Arrowtooth flounder spawn from December to February. They release up to 500,000 eggs, which are bathypelagic (Pereyra et al., 1976). Larvae occupy shallow, nearshore shelf waters for several months prior to settling to the bottom (Morris, 1981). Juvenile fish gradually migrate to deeper waters. Their prey include crustaceans (euphausiids, shrimps, and crabs) and fish (pollock and other flatfish) (Lewbel, 1983).

Arrowtooth flounder have diets very similar to Greenland turbot: they are piscivorous from sizes less than 20 cm and their diet is composed mainly of walleye pollock (Livingston et al. 1986). Euphausiids, shrimp and other fish such as zoarcids and flatfish are minor dietary components. Arrowtooth flounder consume mostly age 0-1 walleye pollock. These studies indicate that arrowtooth flounder feed in the water column using sight to locate their prey.

This resource is in excellent condition and biomass continues to be high and increasing. Current exploitable biomass is estimated at 590,400 mt (NPFMC, 1990b).

Rock Sole (Lepidopsetta bilineata)

This species of flatfish is most abundant in the southeastern portion of the Bering Sea, where it inhabits shelf areas to depths of 300 meters (Pereyra et al., 1976). This species is also present south of the Alaska Peninsula.

Seasonal movements of this species are not well understood, but they are believed to be similar to those of other flounders. Adults are believed to inhabit more shallow waters during the spring, summer, and fall.

Rock sole spawn from February to June at depths near 100 meters. Their eggs are demersal and adhesive. Larvae are pelagic and are believed to spend their first year near the spawning areas or in slightly more shallow waters.

Adult rock sole prey on benthic invertebrates, including mollusks, polychaetes, and crustaceans (Lewbel, 1983). They occasionally feed on other fish.

The rock sole biomass is estimated to be at a very high level and increasing. The 1991 estimate of exploitable biomass was 1.4 million mt (NPFMC, 1990b)

Other Flatfish

This group of miscellaneous flatfish is predominately comprised of flathead sole (Hippoglossoides elassodon) and Alaska plaice (Pleuronectes quadrituberculatus). Included in this group are also rex sole (Glyptocephalus zachirus), Dover sole (Microstomus pacificus), starry flounder (Platichthys stellatus), longhead dab (Limanda proboscidea), and butter sole (Isopsetta isolepis).

Flathead Sole (Hippoglossoides elassodon): This flatfish is most abundant in the eastern Bering Sea. The species inhabits shelf and slope waters ranging from the surface to 550 meters (Lewbel, 1983). Flathead sole also are present south of the Alaska Peninsula.

Seasonal distributions of flathead sole change as the fish migrate from deeper waters inhabited in the winter to more shallow waters, where they spend the spring and summer. Adult fish overwinter on the outer shelf and upper slope at depths of 70 to 400 meters, and then migrate eastward to more shallow shelf waters of 20 to 180 meters (Pereyra et al., 1976). During the summer, flathead sole are widely distributed over the outer shelf from Unimak Island northwest to the central Bering Sea. These fish rise toward the surface at night, possibly to feed on pelagic organisms.

Flathead sole spawn from February to May within the shelf boundaries of the Bering Sea at depths of 50 to 150 meters (Lewbel, 1983). The eggs are pelagic and become widely distributed at depths ranging from 30 to 500 meters (Pereyra et al., 1976). The larvae are pelagic and float near the surface until they metamorphose and descend to the bottom. The area north of the Alaska Peninsula is an important nursery area (USDOC, NMFS, 1980).

Adults prey on benthic crustaceans and echinoderms in deeper waters (Lewbel, 1983). In shallow waters, adults feed on planktonic crustaceans and chaetognaths (Lewbel, 1983).

Flathead sole less than 25 cm consume mostly small crustaceans such as mysids, gammarid amphipods, and crangonid shrimp (Livingston et al. 1986). Other invertebrates consumed are polychaetes and brittle stars. Small amounts of pandalid shrimp and Tanner crab are also eaten. Walleye pollock (age 0) may comprise about 20% by weight of the diet of both large (>25cm) and smaller (<25cm) flathead sole.

Alaska Plaice (Pleuronectes quadrituberculatus): Alaska plaice are found in the waters of the continental shelf in the Gulf of Alaska, Bering Sea, and Chukchi Sea. The eastern Bering Sea population of plaice appears to be restricted to shelf areas south of St. Matthew Island (Lewbel, 1983).

Alaska plaice make seasonal migrations from deeper shelf waters (130 m) to more shallow waters (30 m) during the summer and fall. During the winter and spring, they inhabit the deeper waters and spawn during the spring (late April to mid-June) at depths of 75 to 150 meters. The eggs are pelagic and widely distributed in the water column for up to 2 months prior to hatching. Larvae also are pelagic, but occur near the surface (Lewbel, 1983). Plaice prey upon benthic polychaetes, mollusks, and crustaceans (Lewbel, 1983).

Recent assessments (NPFMC 1990b) indicate that exploitable biomass of the other flatfish category for 1991 is 1.2 million mt. Stocks are characterized as very high in abundance and stable.

Gulf of Alaska Flatfish

In the Gulf of Alaska the flatfish assemblage is divided into four categories: deep flatfish, shallow flatfish, flathead sole (Hippoglossoides elassodon), and arrowtooth flounder (Atheresthes stomias). Deep water species include rex sole (Glyptocephalus zachiris), Greenland turbot (Reinhardtius hippoglossoides), and Dover sole (Microstomus pacificus). The principal shallow water species are rock sole (Lepidopsetta bilineata), butter sole (Isopsetta isolepis), starry flounder (Platichthys stellatus), yellowfin sole (Limanda aspera) and lemon sole (Paraphrys vetulus). All are demersal but have varying depth ranges.

Arrowtooth flounder are abundant over a depth range of 100-500 m. During the winter months they aggregate in the deeper portion of their range. High densities of arrowtooth flounder, as indicated from resource assessment surveys, have also been found in waters off southeastern Alaska at depths of 200-400 m. Starry flounder have been taken in rivers 120 km upstream and in the ocean to depths of 375 m. Most marine occurrences of starry flounder in the trawl surveys have occurred at depths less than 150 m. Flathead sole are most abundant at depths less than 250 m. Rock sole are most abundant in the Kodiak and Shumagin areas. They are a shallow water species, preferring depths less than 100 m. Dover sole and rex sole are closely associated with the soft bottom community of benthic animals that occur in the deep water portions of submarine canyons. They are found throughout the northeastern Pacific and in the Bering Sea at depths usually less than 275 m. There is a population of yellowfin sole in outer Cook Inlet. Although yellowfin sole are only an incidentally caught species in the Gulf of Alaska, they are the second most abundant demersal fish (after pollock) in Cook Inlet and are also found in Prince William Sound.

Flatfish all spawn on or near the bottom at various depths, but their spawning seasons vary by species. Arrowtooth flounder spawn during December-February at depths of 100-360 m. Spawning of arrowtooth flounder occurs in the Gulf of Alaska from Kodiak Island to Yakutat Bay. Starry flounder may spawn in late winter/early summer. Flathead sole spawn from February-April at depths of 50-300 m. Rock sole spawn during the spring. Dover sole spawn from January to August in the Gulf of Alaska.

The fecundities and size at age at 50% maturity also varies by species. Arrowtooth flounder are 50% mature at 55-60 cm (5 years) for females and 32-35 cm (6 years) for males. The fecundity of this species is unknown. Starry flounder mature at 22-36 cm (2-3 years) for males and 24-45 cm (3-4 years) for females. Fecundity ranges from 900,000 to 11 million eggs. Flathead sole reach 50% maturity at 3 years for males and 7 years for females. Fecundity ranges from 70,000-600,000 eggs. Rock sole attain 50% maturity at 5 years for males and 6 years for females. Dover sole reach 50% maturity at 5 years for both sexes. The size at 50% maturity is 32 cm for males and 35-38 cm for females. Fecundity ranges from 37,000-250,000 eggs.

Among the commercially important flatfish, the soles (Dover, rex, and rock) feed on small invertebrates that live on or in the seafloor sediments. Dover and rex sole, the small-mouthed soles, are especially adapted to feeding on small detrital-consuming invertebrates that live within the sediment (polychaete worms and clams) or at the sediment surface (amphipods and other small crustaceans, shrimp, snails, and brittlestars). Small crustaceans that swim close to the seabed may also be consumed by these soles. Flathead sole are also bottom feeders but will feed on small nektonic animals such as shrimp, krill, herring, and smelt when the opportunity arises. Arrowtooth flounder feed predominantly on nektonic prey.

According to the latest assessments on flatfish, the deep flatfish exploitable biomass is estimated at 201,500 mt, shallow flatfish biomass at 333,900 mt, flathead sole at 251,800 mt, and arrowtooth flounder at 2 million mt. All flatfish categories are considered to be at high levels and in stable condition.

Sablefish (Anoplopoma fimbria)

Bering Sea: In the Bering Sea, the sablefish (or black cod) is most abundant on the continental slope (200-600 m), where approximately 13% of the total species biomass is found (Pereyra et al., 1976). Although present in the Bering Sea, the greatest abundance of sablefish is in the Gulf of Alaska (Morris et al., 1983). This species occupies a wide range of depths from 0 to 1,200 meters (Pereyra et al., 1976). A small fraction of sablefish undergo extensive migrations in the North Pacific, but most undergo more localized movements (Pereyra et al., 1976; Wespestad et al., 1983).

Sablefish spawn during the winter at depths of 250 to 750 meters (Morris et al., 1983). Their pelagic eggs are buoyant and develop near the surface (Pereyra et al., 1976; Morris, 1981). Larvae also are planktonic and are common in surface waters of the shelf and in shallow bays and inlets during the late spring and early summer (Morris et al., 1983). One-year-old juveniles are found in shallow coastal waters (Morris, 1981). These shallow areas in and adjacent to the North Alaska Peninsula are important as a nursery area for sablefish (USDOC, NMFS, 1980). Gradually, the juveniles move into deeper waters and assume a demersal existence.

Sablefish are omnivorous and feed on both pelagic and benthic prey, depending on the season, location, and age of fish (Pereyra et al., 1976). Sablefish prey include squid, capelin, pollock, sand lance, herring, euphausiids, polychaetes, and crustaceans (Morris, 1981; Morris et al., 1983).

Recent assessments (NPFMC 1990b) indicate that exploitable biomass for 1991 is 26,400 mt in the Bering Sea, 27,700 mt in the Aleutian Islands. Stocks have declined dramatically in recent years, and there has not been significant recruitment since the strong 1977 year class.

Gulf of Alaska: Sablefish are an important demersal species of the slope region (200-1,200 m). Sablefish occur over a wide range of depths that include the outer shelf, slope, and abyssal habitats. The center of abundance of adult sablefish appears to lie at 400-1,000 m along the continental slope, especially within or near submarine canyons and gullies. Eggs are spawned at depths greater than 300 m and most are mesopelagic at depths greater than 400-500 m. Larvae and young-of-the-year juveniles are neritic-epipelagic and occur near the surface. Juveniles undergo a change in depth distribution during their first year as they transform from a pelagic to demersal existence at depths of 100-200 m. Their depth distribution increases with age and some fish reach depths of 300 m by their third summer.

As the fish continue to grow there are indications from tagging studies of westward and northward movement until fish reach maturity. Bracken (1982) and Dark (1983) found that some large, mature fish exhibited eastward or southward movements. Other evidence suggests that most sablefish remain in the same general bottom area where they settle as subadults (Wespestad et al., 1983). Independent tagging studies conducted by scientists from Canada, Japan, and the United States have revealed that some sablefish undertake migrations that cover vast distances, but there is disagreement as to the degree of interchange of fish by regions.

Sablefish are thought to belong to a single population. There has been some evidence to suggest subpopulations based on genetic, meristic, and tagging studies. Samples for genetic studies have not been taken from spawning stocks so the determination of discrete stocks is not conclusive.

Sablefish spawn during late winter to early spring along the continental slope at depths exceeding 400 m. It is not known where significant spawning success occurs in the Gulf, although larvae have been reported throughout the Gulf as well as the Aleutian Islands and the southeastern Bering Sea (Sasaki 1985). Sizes at maturity are 52-61 cm (5 years) for males and 58-71 cm (5-7 years) for females. Estimated fecundity of females ranges from 56,000 eggs for a 50 cm fish to 1 million eggs for a 102 cm fish. Based on a fecundity relationship established by Bracken and Eastwood (1984), fecundity of females 58-71 cm in length ranges from 200,000 to 400,000 eggs.

Sablefish feed on pelagic and benthic prey. Larvae probably feed on pelagic copepods. Epipelagic juveniles feed on copepods, amphipods, euphausiids, larvaceans, fish eggs and larvae, and pelagic fishes. Older juveniles and adults feed primarily on fishes, crustaceans, and cephalopods. Juvenile sablefish are eaten by spiny dogfish, salmon, Pacific cod, rockfishes, lingcod, albacore, Pacific halibut, sea birds, and pinnipeds. Predators of adults include hagfishes, sharks, Pacific cod, lingcod, Pacific halibut, sea lions, and sperm whales.

The estimate of 1991 exploitable biomass of Gulf sablefish is 194,000 mt. Gulf sablefish are estimated to be at a high level, but in a decreasing trend (NPFMC 1990c).

Rockfish

Bering Sea: In the Bering Sea rockfish are managed by four categories: Pacific Ocean perch, shortraker and rougheye, sharpchin and northern, and other rockfish. Eleven known species of rockfish occur in the Bering Sea (Quast and Hall, 1972). Rockfish species are primarily demersal, but are distributed from the surface to depths of up to 2,800 meters (Hart, 1973). Because little is known about Bering Sea distributions of other rockfish species, only the Pacific Ocean perch will be discussed. Other rockfish are believed to have similar life histories.

Pacific Ocean perch (Sebastes alutus): This rockfish is present in the Bering Sea in offshore waters at depths of 0 to 600 meters (Hart, 1973) and is commonly found in and along canyons and depressions on the upper continental slope (Pereyra et al., 1976). Two main stocks have been identified in the Bering Sea: an Aleutian stock (probably the most abundant), and a stock along the continental slope in the eastern Bering Sea with large concentrations from the Pribilofs to Unimak Island. Pacific Ocean perch (POP) also are known to be present along the southern side of the Alaska Peninsula.

Pacific Ocean perch mate during the fall and winter (October-February), and their live young are released in the following spring (March-June). The larvae are believed to be planktonic for approximately 1 year (Morris, 1981), after which the young become demersal at depths of 125 to 150 meters. Rocky areas and pinnacles are used as nursery areas for juveniles (Carlson and Straty, 1981). As the juveniles mature, they move into deeper waters.

Juvenile POP prey primarily on copepods. Adults feed on copepods, euphausiids, fish, and squid (Pereyra et al., 1976; Morris, 1981).

Recent assessments (SSC minutes, Dec. 1990) indicate that 1991 exploitable biomass for POP in the Bering Sea is 91,400 mt, and 215,500 mt in the Aleutian Islands; combined exploitable biomass for shortraker, rougheye, sharpchin, and northern rockfish in the Bering Sea is 36,500 mt. In the Aleutians, exploitable biomass of shortraker and rougheye rockfish is estimated at 49,800 mt, and the biomass of sharpchin and northern biomass is estimated at 68,800 mt. The biomass of the "other rockfish" category for the Bering Sea is estimated at 8,000 mt and 18,500 mt in the Aleutians. POP are characterized as average in abundance, but slowly increasing. All other rockfish stocks are characterized as average in abundance and stable.

Gulf of Alaska: The rockfish group of the Gulf of Alaska includes six assemblages separated on the basis of habitat and behavioral characteristics, or for protection against over-exploitation: shelf demersal, shelf pelagic, Pacific Ocean perch, shortraker and rougheye rockfish, other slope rockfish, and thornyhead rockfish. Life history information and distribution patterns of the demersal and pelagic shelf assemblages are sparse. Little information also exists for the slope assemblage, except for the species Sebastes alutus, commonly known as Pacific Ocean perch (POP).

Sebastes alutus are found over a wide range of depths. The overall depth range of POP is 0-800 m but 95% of its occurrences in trawl survey catches have been at depths of 100-450 m. Adult POP perform seasonal bathymetric migrations associated with reproduction and feeding. They apparently migrate into deep water during fall and winter to spawn and then move to shallower depths to feed during spring and summer. Separate schools of males and females have been observed migrating from feeding grounds at depths of 150-185 m in the Unimak Pass region to spawning areas at depths of 350-400 m off Prince

William Sound to Yakutat Bay. Adults also perform diel migrations off the sea bottom that are associated with feeding.

The Gulf of Alaska POP stock is considered to be separate from those of the eastern Bering Sea, Aleutian, and British Columbia-California stocks. Within the Gulf POP may exist in several subpopulations. There is no commonality in year class strengths between the eastern Bering Sea POP and those of the Gulf of Alaska, which suggests little or no exchange of fish between these regions.

Pacific Ocean perch are ovoviviparous. Mating occurs in September-November. Fertilization is internal and the eggs are retained by the female and released as larvae. Release of larvae varies by region. In the Gulf of Alaska it occurs during March-June. Known spawning areas are southeast of the Pribilof Islands in the Bering Sea and in the Yakutat region of the Gulf of Alaska. Males mature at 4-13 years and females mature at 5-15 years. Most maturation occurs when POP are 5-9 years of age and 50% maturity occurs at about 7 years at a size of about 28 cm. Estimated fecundity of females ranges from 10,000 eggs at 23 cm to 300,000 eggs at 45 cm. Fecundity at 28 cm length is about 11,000 eggs.

Pacific Ocean perch are pelagivores. Small juveniles feed on calanoid copepods; large juveniles and adults feed on euphausiids. Large adults may feed on pandalid shrimps and squids. Major feeding areas are found off Unimak Island west of the Shumagin Island and offshore of Kodiak Island. Immature fish feed throughout the year but feeding by adults is seasonal. Adults do not feed during the spawning season. Predators of POP include albacore, sablefish, Pacific halibut, and sperm whales.

The most recent estimate of biomass for Gulf POP is 231,900 mt, 72,600 mt for rougheye and shortraker, 223,900 mt for other slope rockfish, and 96,330 mt for pelagic shelf rockfish. There is no biomass estimate for the demersal shelf assemblage.

Thornyheads (Sebastolobus sp.)

The thornyhead rockfish assemblage consists of two species: shortspine thornyheads (Sebastolobus alascanus) and longspine thornyheads (Sebastolobus altivelis). They inhabit the outer shelf and slope region throughout the northeastern Pacific and Bering Sea. Thornyheads are benthic and seldom swim far off the bottom. Unlike rockfish of the genus Sebastes, they do not generally form large schools. Shortspine thornyheads inhabit depths of 90-1,460 m and the longspine thornyheads inhabit depths of 370-1,600 m. Shortspine thornyheads are the most abundant of the two species. In the Gulf of Alaska longspine thornyheads have rarely occurred in resource assessment survey catches.

Female thornyheads release a mass of eggs that are held together by a gelatinous material. This gelatinous mass rises to the surface where it becomes free-floating. It is not known if fertilization occurs internally or at the time the eggs are released.

The estimated exploitable biomass of Gulf of Alaska thornyheads is 25,700 mt. They are considered to be at a depressed level and declining. The biomass of Bering Sea thornyheads is included in the other rockfish category.

Atka Mackerel (Pleurogrammus monopterygius)

Large schools of this species inhabit the upper water layers of the outer continental shelf; and they are found throughout the Bering Sea to its northern boundary, the Bering Strait (Andriyashev, 1954). Atka mackerel also are found south of the Alaska Peninsula, particularly near the Shumagin Islands.

Atka mackerel are pelagic during much of the year, but they migrate annually to moderately shallow waters where they become demersal during spawning (Morris et al., 1983). While spawning, they are distributed in dense aggregations near the bottom. Larvae are found north of the Alaska Peninsula from Port Moller southwest to Umnak Island, (Lewbel, 1983).

Spawning occurs from June through September (Musienko, 1970; Morris, 1981). Atka mackerel generally deposit their eggs on rocky substrates at 10 to 17 meters (Gorbunova, 1962), but also may deposit them on kelp (Andriyashev, 1954). The adhesive eggs hatch in 40 to 45 days (Musienko, 1970). The larvae are planktonic and are dispersed at distances of 320 to 800 kilometers from shore. The life history of young mackerel is not known.

Larvae feed on plankton soon after hatching (Gorbunova, 1962). Adults consume a variety of prey including plankton, microcrustaceans, euphausiids, and small fish (Andriyashev, 1954; Gorbunova, 1962; Rutenberg, 1962).

Recent assessments (NPFMC 1990b) have had difficulty in estimating a specific figure for exploitable biomass, primarily due to the disjunct distribution of Atka mackerel, and their dense schooling behavior which makes them difficult to survey. The actual abundance and trend are unknown.

Squid

Two species, Berryteuthis magister and Onychoteuthis borealijaponicus, predominate in commercial catches in the Bering Sea and Aleutian Islands, respectively. In the Gulf of Alaska, the squid species which are taken as bycatch include Berryteuthis magister, B. anonychus, and Gonatus spp. Little is known of their life history and population dynamics, therefore the abundance of these stocks are characterized as unknown.

Other Species

Other species in the groundfish complex include those for which there is only slight economic value at this time but for which there may be demand in the future. Because there is insufficient data to manage each of these species separately, they are considered collectively. The species include: skates, sharks, sculpins, octopuses, and smelts. Recent assessments (NPFMC 1990b) indicate that exploitable biomass in the eastern Bering Sea is on the order of 827,400 mt; stocks are considered to be high in abundance and increasing. The other species category for the Gulf of Alaska is not assessed; the total allowable catch (TAC) is equal to 5% of the sum of the groundfish TACs

2.2.3 Other Finfish and Shellfish Species

Pacific Halibut (Hippoglossus stenolepis)

Bering Sea: Halibut is a flatfish species that is widespread on the shelf and slope to depths of up to 700 meters in the Bering Sea (Pereyra et al., 1976; Morris, 1981). Although more numerous in the Gulf of Alaska, halibut also are distributed throughout the eastern Bering Sea, from the Alaska Peninsula to as far north as Norton Sound and St. Lawrence Island. Substantial numbers of juvenile halibut are found distributed along the southern shore of the southeastern Bering Sea from Unimak Island into Bristol Bay (Thorsteinson, 1984).

During the winter months, ice covers much of the Bering Sea and water temperatures near the bottom drop to 0 C or lower, which forces the halibut to concentrate in the deeper, warmer waters along the continental edge. During this time, the major portion of the halibut population of the eastern Bering Sea occupies outer continental shelf and slope areas from Unimak Island to west of the Pribilof Islands. With the retreat of the ice and rising water temperatures in April and May, halibut migrate eastward along the northern side of the Alaska Peninsula into the more shallow (30-140 m) spring feeding areas of the inner shelf (Morris, 1981). Throughout the summer and fall, halibut are found scattered over the shelf in shallow waters. With declining bottom-water temperatures in the late fall, halibut migrate back to the deeper waters of the continental slope (250 to 550 m) where they overwinter and spawn (Morris, 1981).

Spawning occurs from October to March (Novikov, 1964; Lewbel, 1983) along the continental shelf at depths from 200 to 500 meters (Bell, 1981) between Unimak Island and the Pribilofs (Best, 1981). Females release up to 2 million pelagic eggs (Lewbel, 1983), which hatch after approximately 15 days, depending on water temperature (Forrester and Alderice, 1973). Larvae are planktonic for 6 to 7 months prior to metamorphosis (Morris et al., 1983). Larvae have been caught over the continental slope and in deeper water, and a few have been caught on the edge of the continental shelf, distributed in a narrow band extending from the vicinity of Unimak Pass to northwest of the Pribilofs (Waldron, 1981). Later larval developmental stages tend to rise in the water column, where they are moved by winds into more shallow shelf waters (Gusey, 1978).

Juveniles settle to the bottom in shallow, nearshore nursery areas (Best, 1981). Juveniles also undergo seasonal movements related to water temperatures as described by Best (1981). During winter months, ice cover and cold water temperatures force them to concentrate in deeper waters (330 to 370 m) between Unimak Pass and the Pribilof Islands. As the ice retreats and the water warms in the spring, juveniles disperse over the shallow flats, which provide suitable habitat for a nursery for young halibut. In April, halibut have been found concentrated near the northern entrance of Unimak Pass at depths of 80 and 104 meters. As warming continues, juveniles move eastward along the northern side of the Alaska Peninsula and are found throughout Bristol Bay in June. Large numbers of juveniles have been caught in the eastern Bering Sea from Unimak Island to Bristol Bay (Thorsteinson, 1984).

Halibut are omnivorous and consume a variety of prey, which vary with age and location. Halibut of up to 30 cm feed primarily on crustaceans, such as shrimp and small crabs (Novikov, 1964; Morris et al., 1983). Adult fish consume a wide variety of crustaceans and fish including flatfishes, smelt, capelin, pollock, sand lance, and particularly yellowfin sole (Novikov, 1964). Halibut prey heavily on yellowfin sole, and the summer distribution of halibut in the Bering Sea is believed to be determined largely by the movements of yellowfin sole (Novikov, 1964).

The most recent International Pacific Halibut Commission (IPHC) assessment (IPHC, 1990) indicates that the exploitable biomass of Pacific halibut available for 1990 was 232.9 million pounds (for the Bering Sea and Gulf of Alaska combined). This represents a 6% decline compared to the previous year, and is consistent with the 5-6% annual decline observed in recent years. A substantial drop in recruitment (abundance of 8 year-olds) was indicated in all areas for 1990. This observation is apparently consistent with cyclical patterns of recruitment noted over the last 50 years. Lower recent recruitment combined with higher exploitation rates, indicates that the stock will continue to decline.

Gulf of Alaska: Pacific halibut inhabit the continental shelf and slope of the Gulf of Alaska. They are a relatively abundant offshore/demersal species, having a wide bathymetric range depending on season and age of fish. They are intensively fished in the Gulf of Alaska at depths of 25 to 300 m. Highest abundances are often in submarine canyons at depths less than 150 m.

Extensive along-shelf migrations are observed mainly from west to east, especially of juveniles and, to a lesser extent, of adult halibut. Adult halibut 8 years and older also perform annual migrations from shallow feeding grounds in the summer to deeper spawning grounds in the winter. Spawning occurs in concentrated areas off the shelf edge from November to March at depths of 180 to 450 m. Major spawning areas in the Gulf of Alaska are off Yakutat, from Cape Suckling to Cape Yakataga, Cape Spencer, Cape St. Elias, Portlock Bank, Chirikof Bank, and Trinity Island.

The eggs are buoyant; larvae are planktonic in near-surface waters for up to seven months. During this time the eggs and larvae may drift hundreds of miles along the coast. Juveniles descend to the bottom in May and June in shallow near-shore nursery areas, where they reside for one to three years. Important nursery habitats for juveniles have been identified in Yakutat Bay, on the Fairweather Grounds, and near Kodiak Island. Subadults shift farther offshore where they eventually enter the fishery at about age 8 to 10.

Pacific halibut are carnivorous and opportunistic feeders, preying on a variety of organisms. They are apex predators in the demersal animal community. As their size increases, the frequency and size of fish in their diet increases.

King Crab

Red King Crab (Paralithodes camtschatica)

Red king crab (Paralithodes camtschatica) is the most abundant of the five species of this genus, and is broadly distributed on the continental shelf and upper slope of both the Bering Sea and Gulf of Alaska. They have been identified as the most prominent members of the epifaunal community of the southeastern Bering Sea (Lewbel, 1983). They inhabit the continental shelf at depths up to 400 meters. Red king crab are concentrated immediately north of the Alaska Peninsula and around Bristol Bay. The major fisheries in the Bering Sea are in Bristol Bay, Norton Sound, and along the Aleutian Islands. In the Gulf, fisheries have occurred in Prince William Sound, Cook Inlet, around Kodiak Island, and along the south side of the Alaska Peninsula (Hood and Zimmerman, 1987).

The life cycle of the red king crab is characterized by a spring spawning migration and a summer-fall feeding migration. Beginning in January, females move from deep, offshore waters into more shallow, coastal waters (70 m or less). Males are more abundant in the deeper waters farther offshore in the winter, and they migrate into the more shallow waters a month later than the females to mate. Pereyra et al. (1976) identified spawning areas near Amak Island and in the Black Hills-Port Moller areas. Studies have indicated that spawning occurs in nearshore waters between Unimak Island and Cape Seniavin (Armstrong et al., 1983; McMurray et al., 1984). After mating, the males and the ovigerous females feed in coastal areas before returning to deeper waters in the late summer or fall. Eggs are carried by the females for approximately 11 months before hatching after the females have returned to nearshore waters. Hatching generally occurs from April 1-20, although the timing can vary up to a month (Weber, 1967; Haynes, 1974).

Red king crab larvae are present in nearshore areas from April to August. It is suggested that inshore spawning of king crab assures that their planktonic larvae are not carried out to sea by currents. Important larval release areas are the Port Moller area and off the Black Hills area of the Alaska Peninsula (Lewbel, 1983). Larvae develop at depths of 40 to 70 meters (Armstrong et al., 1981). The highest known densities of red king crab larvae occur from western Unimak Island to Port Moller, but the extent and abundance of larvae from Cape Seniavin into Bristol Bay remain unknown (McMurray et al., 1984). The larvae are planktonic and tend to drift northeastward with the prevailing water currents along the Alaska Peninsula toward Bristol Bay, and may be carried quite some distance before adopting a benthic existence (Haynes, 1974; Hebard, 1979). Data on development time and current speeds (Kinder and Schumacher, 1981b) suggest that larvae could be transported more than 200 kilometers during the time from hatch to metamorphosis. By August, inshore areas contain very low densities of larvae. Relatively heavy pelagic larval distributions have been found from the Black Hills area to Port Heiden, with largest concentrations found 200 km offshore between Cape Seniavin and Port Heiden (Armstrong et al., 1983), which correlates with high concentrations of phytoplankton. Red king crab larvae also exhibit a diel vertical migration, which probably is influenced by tidal action. The larvae pass through several molts before finally settling to the bottom as juveniles.

The juveniles migrate into shallow waters and, starting at age 3, form dense pods (thousands to hundreds of thousands of individuals) that inhabit the intertidal and shallow subtidal zones. Smaller juvenile crabs (to 60 mm carapace length) have not been caught by nets in the NMFS survey area, and are consequently presumed to be concentrated in nearshore areas. Larger juveniles (to 110 mm) are found on the coastal, middle, and outer shelf around the 50-100 meter isobaths (Kinder and Schumacher, 1981a). Age 3 to 5 juveniles appear to form pods in the Port Moller area at water depths of 40 to 60 meters. The nearshore area along the northern side of the Alaska Peninsula also has extensive gravel and rocky substrates necessary for the survival of the early benthic lifestages of this species (Sharma, 1979). This substrate also supports the invertebrate fauna that are food for juvenile red king crab (Armstrong et al., 1983). It is hypothesized that postlarval survival is related to settlement onto this refuge habitat that is thought to consist of gravel or larger-sized rocky substrates inhabited by several attached epifaunal invertebrates, which are food for juvenile crab and the vegetation that provides protective cover for these juveniles. King crab mature sexually at 5 or 6 years of age, at which time podding behavior ceases and they join the seasonal feeding and breeding migrations of adults.

Planktonic larval crabs feed on phyto- and zooplankton. Juveniles feed on diatoms, protozoa, algae, echinoderms, small mollusks, and other benthic species. Adult king crab are omnivorous and feed on small benthic invertebrates, including bivalves, gastropods, polychaetes, brittle stars, and Tanner crab. They also feed on small fish and dead organisms.

Historically, the abundance of the red king crab populations have been cyclic on 7- to 14-year intervals influenced primarily by environmental conditions (Thorsteinson, 1984). Cycles of abundance suggest that year-class failure or success may be based on survival of critical lifestages (i.e., larvae and young juveniles) in nearshore areas (Armstrong et al., 1983). Instantaneous mortality rates of juvenile and sublegal, sexually mature crab are estimated to be low, approximately 10% per year, until entering the fishery (Balsiger, 1976; Reeves and Marasco, 1980). Consequently, the size of a future fisheries cohort is determined predominantly by reproductive success and survival of larvae and young of the year (0+ crab) in nursery areas.

Larval survival is influenced strongly by water temperature (Kurata, 1960; McMurray et al., 1983), and also by food supply and predation (Armstrong et al., 1983). Lethal temperatures are those greater than 15 C or lower than 0.5 to 1.8 C (Kurata, 1960) and survival of zoeae is greater between 5 to 10 C (McMurray et al., 1984). In addition, the number and location of spawning females may significantly influence larval survival and location of megalopae relative to optimal substrates at metamorphosis (Armstrong et al., 1983).

Although the magnitude of initial larval hatch and numbers surviving to metamorphosis may be important determinants of year-class strength, the geographic location of survivors at metamorphosis may be more important if refuge habitat is scarce and/or patchy. If optimal bottom type does not uniformly occur, the location of spawning female populations and the interplay of oceanographic factors and influences (i.e., currents and direction, windspeed and direction) during development time, could be the major determinants of placement and survival rates of larvae over optimal bottom types at metamorphosis (Armstrong et al., 1983).

Any source of mortality that substantially reduces numbers of large males could threaten the breeding potential of the red king crab population. Insemination of larger females by smaller males results in reduced clutch size. A male-female weight ratio of 1:7 is required for 100% copulation (Reeves and Marasco, 1980); below this weight, smaller males have less success breeding mature females. This may have been the case in the 1982 National Marine Fisheries Service observations, which found an unusually large number of barren female crabs (i.e., which had not extruded eggs) in a year of very low male abundance. It is not clear whether or not there is a relationship between spawners and eventual recruits for this species (Reeves and Marasco, 1980).

Declines in the red king crab stocks occurred in virtually all major stocks in Alaskan waters. Catches in both the Kodiak and Chignik-South Peninsula areas declined very sharply after the 1981-82 season (Hood and Zimmerman, 1987). The abundance of male red king crabs in the southeastern Bering Sea decreased from 1981 through 1985, but the population is now increasing. As summarized in Reeves (1985), the precipitous decline in this stock may have resulted from the occurrence of weak year classes recruiting to the fishery and increased mortality among adult, and especially sublegal crabs, of these weaker year classes (Reeves, 1985). The occurrence of weak year-classes is related to conditions that affect survival during the immature lifestages. Increased mortality of adult crabs appears to be related to a number of factors, including predation by halibut, Pacific cod, and yellowfin sole; competition; fishery effects (handling mortality); disease; and temperature. Apparently, many factors may influence the declines in this population. Recent assessments (Stevens et al. 1987) indicate that numbers of legal male crabs are increasing and that recruitment is improving.

Blue King Crab (Paralithodes platypus)

This king crab species is lesser in both abundance and distribution than the red king crab, with some populations along the Asian coast and the eastern Bering Sea, near the Pribilof, Saint Lawrence, and St. Matthew islands. There are also some numbers of this crab in Herenden Bay on the North Alaska Peninsula, and in Prince William Sound.

The life history of the blue king crab is similar to that of the red king crab excepting that reproduction in this species may be only biennial with a later spawning period during the spring. Habitat components may also be more specific as juvenile blue king crab seem to be concentrated over limited areas of "shell wash" substrate near the Pribilofs during a part of their life cycle. This substrate affords protection from predators and also harbors the food organisms on which these crab subsist.

Recent assessments (Stevens et al. 1987) indicate that although numbers of legal male crabs may be increasing, the fishery is stable but poor. Future recruitment is difficult to characterize due to inadequate data.

Tanner Crabs (Chionoecetes opilio and C. bairdi)

Two species of commercial importance are distributed widely throughout the southeastern Bering Sea and Gulf of Alaska. These species generally occur at depths of 40 to 100 meters and greater (Lewbel, 1983). Adult Tanner crab are intolerant to and restricted in their densities by low salinities and high temperatures.

The major Tanner crab fisheries occurred off Kodiak Island and in the Bering Sea. In the Gulf, C. bairdi has been the principal target. Significant fisheries in the Gulf also occurred in Cook Inlet and southeastern Alaska. In the Bering Sea, C. bairdi is concentrated in two areas: around the Pribilof Islands and immediately north of the Alaska Peninsula (Jewett and Feder, 1981). In the southeastern Bering Sea, this species is common only at depths below 100 meters. Chionoecetes opilio is common throughout the southeastern Bering Sea.

Tanner crab make seasonal movements related to spawning. During the fall and winter, they inhabit deeper waters, then move into more shallow waters (less than 100 m) in the spring and summer for spawning. Tanner crabs breed in shallow shelf waters from January to May. Eggs are carried by females on their abdomens for approximately 11 months. Hatching is temperature-dependent. Chionoecetes bairdi eggs have a prehatching mortality of approximately 20% (Thorsteinson and Thorsteinson, 1982). The larvae are pelagic and concentrated in nearshore areas in the upper 60 meters of water (Thorsteinson, 1984) for approximately 3 months, depending on the availability of food and on water temperatures. Juveniles are bottom dwellers. The area north of the Alaska Peninsula is a nursery area for Tanner crab. There is a higher abundance of C. bairdi larvae and juveniles in the outer Bristol Bay, although larvae of both species are present from April through October (Thorsteinson, 1984).

Tanner crab larvae feed on phyto- and zooplankton. As demersal juveniles, they feed on benthic diatoms, hydroids, and detritus. Adults consume dead mollusks and crustaceans and prey on shrimp, polychaetes, clams, hermit crabs, and brittle stars.

Recent assessments (Stevens et al. 1987) indicate that both populations and fisheries are improving, with significant increases in juvenile abundance and recruitment.

Dungeness Crab (Cancer magister)

This species is found in shallow, nearshore waters of the Gulf of Alaska. Areas north and south of the Alaska Peninsula are the northern limit of this species. They inhabit bays, estuaries, and open-ocean, nearshore areas from the intertidal zone to depths of 90 meters. There is a seasonal movement to more shallow waters associated with breeding.

Dungeness crab mate from July to September. The females carry the eggs for 7 to 10 months before the eggs hatch in April and May. The larvae are planktonic for 3 to 4 months before molting to juveniles. Juveniles generally are associated with stands of eelgrass or, in the absence of eelgrass, with masses of detached algae that are believed to provide them protection from predation.

Korean Hair Crab (Erimacrus isenbeckii)

The Korean hair crab occurs in water depths of 10 to 360 meters. The largest concentrations of this species are found in the shallow waters along the northern shore of the Alaska Peninsula and around the Pribilof Islands. Hair crabs hatch in the spring, and the larval stage lasts approximately 5 months (Armstrong et al., 1983).

Recent assessments (Stevens et al. 1987) indicate that the fishery is declining although juvenile production is apparently improving.

Shrimp

Two commercially important species of shrimp are common throughout the Bering Sea, pink shrimp (Pandalus borealis) and humpy shrimp (P. goniurus). Several species of shrimp have been identified as commercially important in the Gulf of Alaska: pink shrimp, dock shrimp (P. danae), humpy shrimp, coonstripe shrimp (P. hypsinotus), ocean pink shrimp (P. jordani), spot shrimp (P. platyceros), and sidestripe shrimp (P. dispar) (Ronholt et al. 1978). Pink shrimp represent the largest portion of the commercial catch in the Gulf, although humpy shrimp and sidestripe shrimp may dominate in some areas (Hood and Zimmerman, 1987).

The pink shrimp inhabits depths of 20 to 1,450 meters in zones of deep, warm waters. They are found along the outer shelf and slope. Concentrations have been found near Nome and northwest of St. Paul Island (Lewbel, 1983). Pink shrimp in the Gulf supported an extensive historical fishery in the Kodiak area and westward to the Unalaska area. The humpy shrimp is found at similar depths, but in cooler waters, with a concentration between the Pribilof Islands and Bristol Bay.

Pandalid shrimp spawn in September and October. Eggs are carried on females during the winter and hatch the following spring. The larvae spend 2 to 3 months in the nearshore plankton, feeding and molting before they metamorphose to juveniles and assume the semidemersal habit of adults. Juveniles inhabit waters less than 40 meters deep in the winter and deeper waters in the summer (University of Alaska, AEIDC, 1974).

The larvae feed on diatoms and plankton. Adults feed on benthic organisms, including polychaetes, and small crustaceans. Pandalid shrimp make diurnal feeding migrations, rising in the water column at night to feed (Thorsteinson, 1984).

Bivalve Mollusks

Bivalves are widely distributed on the shelf of the Gulf of Alaska and Bering Sea. Concentrations have been noted in the midshelf region of the Bering Sea (Lewbel, 1983). Some species are found in the nearshore surf zones. The Pacific razor clam (Siliqua patula) is found on sand beaches of the Alaska Peninsula, including Izembek Bay and Bechevin Bay (Nickerson, 1975). Other clams inhabiting the Alaska Peninsula include the surf clam (Spisula polynyma), distributed between Port Moller and Ugashik Bay; the Great Alaskan Tellin (Tellina lutea); two species of cockle (Serripes groenlandicus and S. laperousii); and other less frequently taken species.

Clams generally spawn in the summer during periods of warmer water temperatures. The eggs and/or larvae may be planktonic before metamorphosing into sedentary juvenile stages.

Large Gastropods

These snails are concentrated along the outer shelf at depths from 40 to 100 meters. Neptunea heros and N. ventricosa are the dominant species. From May to October, they produce eggs that hatch after about 3 months. Neptuniids prey on polychaetes, bivalves, barnacles, crustaceans, and fish.

Pacific Salmon (Onchorynchus sp.)

Five species of Pacific salmon inhabit the waters of the eastern Bering Sea and Gulf of Alaska: chinook (king), sockeye (red), coho (silver), pink (humpback), and chum (dog). The Gulf of Alaska is the main oceanic nursery for most North American salmon, at least for a significant part of their ocean life (Rogers, 1987). Their feeding migrations in the North Pacific and the Bering Sea are extensive, and salmon migrate long distances to their spawning streams. Salmon runs fluctuate greatly from year to year, largely dependent on climatic factors during egg development and during early fry stages.

The life history of the Pacific salmon has been separated into three phases (Thorsteinson, 1984): (1) seaward migration of juveniles through the area; (2) temporary residence of immatures in and adjacent to the area; and (3) return spawning migrations of adults through the area. In general, the life histories of the five species in the Bering Sea area are similar. Adults migrate through the eastern Bering Sea area to their natal streams for spawning. Chinook are the first to enter coastal areas, followed in order by sockeye, chum, pink, and coho (Thorsteinson, 1984). Migration rates from the shelf edge to the Kvichak River in Bristol Bay were estimated by Straty (1981) as ranging from 45 to 60 kilometers per day. Along the southeastern Bering Sea coast, salmon migrate in a band that extends to 162 kilometers offshore, with a center of abundance 50 to 100 kilometers from shore (Straty, 1981).

In the Gulf of Alaska, the abundance, distribution, and size of salmon varies both seasonally and interannually. The life history of all five species is characterized by juvenile salmon that usually migrate to sea in the spring, coincident with increasing temperatures and daylight hours. Since spring comes earlier in the southern portion of their range than it does in the northern portion, the southern stocks migrate to sea about two months earlier than northern stocks. Most northern stocks migrate to sea from mid-May to mid-July.

In the Gulf, nearly all of the salmon that originate in the area from central Alaska to southern British Columbia spend their oceanic life in the Gulf of Alaska. Stocks from southeastern Alaska and northern British Columbia tend to occupy the eastern and central Gulf, and those from central Alaska occupy the central and western Gulf (except chinook salmon which migrate into the central Pacific) (Rogers, 1987).

Adult salmon then return from sea for their fall spawning period. Chinook salmon usually return first during the month of June, and coho salmon usually return last (August-September). The timing of the returns for other species varies and can range from mid-June to August. The maximum biomass of salmon in the Gulf therefore probably occurs in late May to early June before the mature fish begin returning to the freshwater spawning streams.

Once they reach their spawning grounds, salmon deposit their eggs in the gravel beds of streams, rivers, or lakes (depending on the species and its origin). Alevins hatch in the winter and remain in the gravel substrate until they have absorbed their yolk sacs in the spring. They emerge from the gravel as fry, some of which stay in fresh water for a period ranging from a few weeks to 1 or more years, while others migrate immediately to the sea. Outmigration of juvenile salmon is species- and stock-specific and varies with annual differences in environmental conditions (i.e., ice breakup on lakes and streams, over-winter stream-water temperatures).

Only sockeye salmon in Bristol Bay have been studied sufficiently to describe their seaward migration in some detail; however, general information on outmigration of all five species is known. After entering the Bering Sea, juvenile salmon remain in nearshore waters for varying lengths of time and grow rapidly during the initial few months of seaward migration (Straty, 1974; Barton, 1979a). Observations from other ocean waters off Alaska indicate that coastal movement during the first few months of seaward migration is typical behavior for Pacific salmon throughout their range (Straty, 1981). Juveniles move along the coastline of the southeastern side of Bristol Bay and the northern side of the Alaska Peninsula. The migratory route apparently is determined by salinity gradients and water temperatures (Favorite et al., 1977; Straty and Jaenicke, 1980). Speed of migration is determined in large part by water temperatures and consequent growth and energy rates (Straty and Jaenicke, 1980). With increased growth in these nearshore areas from early summer to late fall, the fish move offshore to more pelagic regions (Straty, 1974; Barton, 1979a). This offshore migration is species specific and variable according to annual differences in time of entry into the Bering Sea. Information on shelf distribution of juvenile salmon after leaving coastal waters is only fragmentary (Straty, 1981).

Offshore, adults are epipelagic, usually found in the upper 10 to 30 meters of water. Adults spend 1 to 4 years at sea (depending on the species), return to their natal streams to spawn, and subsequently die. Maturing salmon are most abundant in the southeastern Bering Sea shelf region from mid-May to early September and are concentrated in the upper 5 meters of water (Hokkaido University, 1965, 1968).

Sockeye Salmon (Oncorhynchus nerka)

Sockeye salmon are associated with lakes where they spawn near beaches or in tributary streams and rivers (Rogers, 1987). They are more dependent on freshwater than any other species of Pacific salmon. Large concentrations are found in both the large lake systems that drain into Bristol Bay, and also the lakes of the Fraser River system. Important production areas in the Gulf are the Chignik, Karluk, and Copper rivers and streams which empty into Cook Inlet (Fredin et al. 1977).

This species is the most important commercial salmon of the Bering Sea. Sockeye spawning runs are widespread throughout Bristol Bay and along the northern side of the Alaska Peninsula; sockeye also extend northward through the Yukon-Kuskokokwim delta and Norton Sound and westward along the Aleutian Islands. Bristol Bay produces more sockeye than any other area in the world. Major Bristol Bay runs are in the Kvichak, Naknek, and Nushagak Rivers. Bristol Bay sockeye runs peak every 5 years. On the northern side of the Alaska Peninsula, nearly every drainage supports a run of sockeye. Major runs occur in the area from the Bear River to north of Port Moller, and in the Nelson, Sandy, and Ilnik Rivers. The Yukon, Kuskokwim and smaller drainages in western Alaska also support substantial populations.

Mature sockeye have been captured in many places throughout the Bering Sea during their spawning migrations. In May and early June, stocks from the northern portions of the Bering Sea and stocks from the Gulf of Alaska which have migrated through the Aleutian passes begin to move into Bristol Bay. These prespawning adults concentrate in two bands offshore (one north and one south of the Pribilof Islands), and traverse Bristol Bay as they migrate to rivers around Bristol Bay, along the northern side of the Alaska Peninsula and in Kuskokwim Bay. Spawning runs occur from July to September (Musienko, 1970; Barton, 1979a; Morrow, 1980), with sockeye most abundant on the southeastern Bering Sea shelf between mid-June and late July as they migrate to their natal streams (Thorsteinson, 1984). Following spawning, fry emerge in the spring, generally between April and June (Morrow, 1980). A few sockeye populations have individuals that migrate immediately to the sea, but most sockeye spend 1 to 2 years in fresh water before migrating to the ocean (Lewbel, 1983).

Juveniles are abundant in the eastern Bering Sea from mid-May through at least September (Thorsteinson, 1984). Juveniles originating in rivers along Bristol Bay and along the northern side of the Alaska Peninsula enter the Bering Sea at different times during late spring and early summer, depending on environmental conditions. Young sockeye leave Bristol Bay from mid-May to August, with a peak around June. Juveniles leave the northern side of the Alaska Peninsula during the same period, but peak migration occurs later. Young sockeye entering the sea are segregated during the first weeks of seaward migration by age, class, and origin, so they are distributed throughout most of the migration-route area from late May through late July. From late May to early August, the greatest biomass of juveniles occurs along the coast of Bristol Bay to northeast of Port Heiden (Straty, 1974). Food is less abundant in inner Bristol Bay than farther seaward, so juveniles move rapidly to the Port Heiden area, which has a more abundant food supply (Thorsteinson, 1984). After early August, the majority of the sockeye occur west (seaward) of Port Heiden. The young move westward along the northern shore of the Alaska Peninsula, and eventually turn north or move south through the Aleutian passes. From late May to late September, the juveniles travel in a belt between the coast and 48 kilometers offshore, avoiding the colder offshore waters (Thorsteinson, 1984). These seaward-migrating juveniles are most abundant in the upper 2 meters of the water column during the day and in the uppermost meter at night (Straty, 1974). Sockeye usually spend 1 to 3 years in the sea before returning to their natal streams to spawn.

Juveniles feed on euphausiids, copepods, cladocerans, and sand lance. Adults prey on copepods, euphausiids, amphipods, and small fish (Hart, 1973; Nishiyama, 1977; Morrow, 1980).

Chinook Salmon (Oncorhynchus tschawytscha)

Chinook are the largest and oldest at maturity, but they are the least abundant of the 5 species of Pacific salmon. They are relatively high in value. This salmon species comprises approximately 2.2% of the commercial catch for the Bering Sea (Straty, 1981). Bristol Bay supports approximately 40% of the total annual chinook production (Straty, 1981).

Chinook salmon enter the Bering Sea through Unimak Pass and migrate some distance offshore through the Bering Sea toward their natal streams along the Alaska Peninsula, Bristol Bay, and further north. This species is more abundant farther offshore of the northern side of the Alaska Peninsula than sockeye (Thorsteinson, 1984). The Nushagak River supports the largest run of chinook into Bristol Bay, but the Togiak, Alagnak, Naknek, and Mulchatna River systems all support major runs. Streams and rivers on the northern side of the Alaska Peninsula also support significant numbers of spawning salmon, particularly the Sapsuk River system (Nelson Lagoon), the Meshik River system (Port Heiden), and the Cinder River. The Yukon, Kuskokwim, Copper, and Nushagak river systems of the Gulf of Alaska also support substantial populations

The period of time over which Chinook salmon migrate to the spawning grounds is very prolonged; they enter North American streams nearly year-round (Major et al., 1978). Chinook spawning migrations into Bristol Bay occur from mid-June to July. Eggs hatch in 7 to 12 weeks, and alevins generally emerge in 2 to 3 weeks. Chinook fry live in fresh water for 1 to 2 years before migrating to the sea. Juveniles are most abundant along the southeastern coast of the Bering Sea; few have been caught in Bristol Bay, perhaps because sampling has not been conducted during periods of assumed peak abundance (late April-May) or because, for some unexplained reason, they have been missed by fishing gear (Thorsteinson, 1984). After migrating to the sea, smolts remain in coastal waters during their initial months (Straty, 1981). Juveniles move out of coastal waters, migrating seaward during May and early June, earlier than the offshore migration of other salmon species (Thorsteinson, 1984). Immatures spend 1 to 6 years in the ocean before returning to spawn. Thorsteinson (1984) reported that 2% of the immatures had spent 1 year at sea; 77% had spent 2 years; 19% had spent 3 years; and 2% had spent 4 to 6 years. Maturing chinook have been captured throughout the Bering Sea during their spawning migrations, but the route of this migration has not been established in detail. Straty (1981) hypothesized that chinook follow the same migration route as other salmon species in responding to the same environmental clues.

Scott and Crossman (1973) reported that 97% of the chinook diet consists of herring, sand lance, capelin, and smelt. Although chinook are highly piscivorous, they also consume some squid, amphipods, euphausiids, and crustaceans.

Pink Salmon (Oncorhynchus gorbuscha)

Pink salmon are associated with small to intermediate sized coastal rivers, with large concentrations occurring in southeastern Alaska, Prince William Sound, Kodiak, and a few large rivers such as the Nushagak and the Fraser. Historically, pink salmon have been more abundant in Asia than in North America. Within the Bering Sea, 92% of the pink salmon production is from Bristol Bay (Lewbel, 1983), where the primary system is the Nuyakuk River, a tributary to the Nushagak River. On the northern side of the Alaska Peninsula, pink salmon are not abundant, but they occur in limited numbers in several systems in Bechevin Bay. Pink salmon also occur northward through Norton Sound. The main production areas for pink salmon are southeastern and central Alaska.

Pink salmon usually have only one seasonal run that enters fresh water over a relatively short time period usually peaking in July. (Fredin et al, 1977). Pink salmon have been captured throughout offshore areas of the Bering Sea during their spawning migrations. The heaviest concentrations are in two bands north and south of the Pribilof Islands. The band south of the Pribilofs, which migrates through Bristol Bay, heads primarily for rivers entering Bristol and Kuskokwim Bays and a few streams along the northern side of the Alaska Peninsula. Spawning runs occur from July to October. Pink salmon rarely migrate more than 160 kilometers upstream, and some spawn in intertidal areas (Lewbel, 1983). The young hatch from December to February and remain in the gravel as yolk-sac larvae until spring.

After emerging, fry immediately migrate seaward, where they form large schools in estuaries and remain nearshore for their first summer. Juveniles captured in Bristol Bay after late June are primarily in coastal areas of inner Bristol Bay east of 159 degrees W longitude, where they increase in abundance from late June through mid-August (Thorsteinson, 1984). Pink salmon do not reach the outer coastal areas of inner Bristol Bay until late August and September, (Thorsteinson, 1984). Once in the sea, fry remain on the continental shelf in areas with estuarine salinities (Straty, 1981). Adult pink salmon are widely distributed during their ocean period. With few exceptions, they return to spawn after 2 years. Prey of adult pink salmon are believed to be similar to that of other salmon species, including euphausiids, squid, amphipods, and small fish.

Chum Salmon (Oncorhynchus keta)

Chum salmon are widely distributed throughout the Bering Sea and Gulf of Alaska. Large concentrations occur in all large northern rivers as well as in many of the same small to intermediate sized rivers used by pink salmon (Rogers, 1987). During their spawning migrations, chum are more extensively distributed throughout the Bering Sea than are sockeye (Thorsteinson, 1984). In Bristol Bay, chum salmon are produced largely in the Nushagak, Togiak, and Naknek-Kvichak River systems. On the northern side of the Alaska Peninsula, major systems used by this species include: Izembek-Moffet Bay, Bechevin Bay, the Sapsuk River (Nelson Lagoon), Herendeen-Moller Bay, and Frank's Lagoon.

Chum salmon use areas in and adjacent to the North Alaska Peninsula for their spawning migrations and their seaward migrations as juveniles. During their spawning migrations, chum concentrate in two bands north and south of the Pribilofs. The southern band traverses Bristol Bay and includes fish returning to rivers in Bristol and Kuskokwim Bays and on the northern side of the Alaska Peninsula. While migrating through outer Bristol Bay, these salmon begin to segregate according to the location of their spawning streams. By mid-June and late July, they are most abundant on the southeastern Bering Sea shelf, with largest numbers found in estuaries and at the mouths of streams. Most populations of chum salmon are fall spawners (August-November) (Lewbel, 1983). Chum salmon sometimes spawn in intertidal areas.

Following emergence, fry migrate to the sea. Small numbers of young have been captured in the coastal waters of Bristol Bay as early as mid-June, but they generally are not abundant until after mid-July (Thorsteinson, 1984). Once they reach the sea, juveniles remain in nearshore areas for several months before migrating offshore in the early fall. Young fish follow estuarine salinities as they feed and migrate along the continental shelf (Straty, 1981). Juveniles have been found to remain abundant along the southwest coast of Bristol Bay (seaward of 159 degrees W longitude) through August and until at least mid-September (USDOC, NOAA, NMFS, 1966-72). Chum generally spend three to four years at sea before returning to fresh water to spawn. Adults feed on euphausiids, amphipods, squid, and planktonic crab larvae (Hart, 1973).

Coho Salmon (Oncorhynchus kisutch)

The center of coho abundance is between Oregon and southeast Alaska (Hart, 1973). The most abundant populations of maturing coho in the Bering Sea (in decreasing order) are in Kuskokwim Bay, Bristol Bay, and along the northern side of the Alaska Peninsula (Straty, 1981). Coho are found in streams throughout Bristol Bay, but are harvested primarily in the Nushagak and Togiak Rivers. On the northern side of the Alaska Peninsula, coho are harvested at Nelson and Swanson Lagoons, and at the Ilnik River, Port Heiden, and the Cinder River.

Mature coho salmon enter coastal areas in mid- to late July on their spawning migrations and begin to congregate at river mouths in late summer. Spawning runs generally occur from September to October. Fry emerge from the gravel from March to July, depending on water temperatures (Hart, 1973; Scott and Crossman, 1973). Juveniles remain in fresh water for one to three years before entering the ocean.

Coho is the salmon species whose juveniles are the largest and the latest each year on their seaward migrations. Although they have been captured along the southeast coast of Bristol Bay as early as mid-June, coho are not abundant until late June or early July (USDOC, NOAA, NMFS, 1962-66); they remain abundant throughout July and August. Smolt remain nearshore and near-surface for several months, feeding before moving farther offshore.

Juveniles feed on small fish and planktonic crustaceans. Adults feed on squid, euphausiids, and small fish. Herring and sand lance may make up to 80% of the adult coho diet (Scott and Crossman, 1973).

Forage Fishes

This is a broad term for generic classification purposes which encompasses the generally smaller pelagic and some demersal fishes on which larger fishes and other marine animals prey. Of the group, Pacific herring may be a major portion of the diet of many of the larger pelagic fishes, marine birds, and mammals although, in itself, it is of commercial value. Forage fishes may also be characterized by their schooling behavior.

Pacific Herring (Clupea harengus pallasi)

This pelagic species is abundant and widespread in the Bering Sea, where it is important both commercially and as a forage fish. Herring are much less abundant in the Gulf of Alaska, with the major concentrations occurring in Prince William Sound and southeastern Alaska. Gulf of Alaska concentrations fall into three groups: 1)southeastern-Chatham Strait, Stephens Passage, and the west coast of Baranof Island, 2)central-Yakutat Bay, Prince William Sound, Kachemak Bay, northern and eastern Kodiak Island, and 3)western-Chignik and the Shumagin Islands.

Since the largest herring fisheries occur in the Bering Sea, the following discussion focuses on this area. The life history characteristics of Bering Sea and Gulf of Alaska herring are considered to be fairly similar, the differences being that Gulf stocks are more nearshore, tend to have higher mortality rates and be shorter lived than the Bering Sea stocks (V. Wespestad, pers. comm., AFSC).

Herring have a seasonal distribution in the Bering Sea. This species over-winters in offshore waters near the edge of the continental shelf. Identified overwintering grounds include an area between St. Matthew Island and the Pribilofs (Warner and Shafford, 1981; Wespestad and Barton, 1981), and the Navarin Basin (Morris, 1981; Wespestad and Barton, 1981). The major wintering ground of eastern Bering Sea herring is northwest of the Pribilofs, between approximately 57 and 59 N latitude, and encompasses an area of 1,600 to 3,000 square kilometers (Shaboneev, 1965) which shifts in relation to the severity of the winter. In mild winters, herring concentrate farther north and west, and in severe winters, further south and east. Dense schools are found during the day a few meters off the bottom at depths of 105 to 137 meters, at water temperatures of 2 to 3.5 C (Dudnik and Usol'tsev, 1964). Very few are found in more shallow areas on the continental shelf, where lower temperatures prevail. Distinct diurnal, vertical migrations occur in early winter; however, as the season progresses, diel movements diminish and herring remain on-bottom during the day and slightly off-bottom at night (Shaboneev, 1965).

In the spring, adults migrate from their overwintering grounds to nearshore spawning areas. Gulf stocks also spawn only in spring, sometimes beginning in March and sometimes as late as June (Hood and Zimmeraman, 1987).

In the summer, only a small number of herring are believed to remain offshore; most inhabit coastal waters. Herring are believed to remain in coastal waters in the summer because of heavy phytoplankton blooms (1-3 gC/m2) in nearshore waters and poor feeding conditions on the outer shelf (Rumyantsev and Darda, 1970). In late summer, herring migrate along the coast and concentrations begin reappearing in offshore waters in the areas of Nunivak and Unimak Islands in August (Rumyantsev and Darda, 1970). Migrations to the winter grounds continue through September, with the herring progressively moving to deeper water and concentrating in the 2 to 4 C temperature stratum (Wespestad and Barton, 1981). Mature fish arrive at the wintering grounds before the immature fish arrive (Rumyantsev and Darda, 1970), with concentration in wintering grounds beginning in October (Wespestad and Barton, 1981).

Herring migrate along the Alaska Peninsula as they move from their shallow, coastal spawning areas to offshore overwintering grounds. The nearshore areas used for spawning in the southeastern Bering Sea are generally from Togiak in Bristol Bay northward to Nelson Island although some spawning also occurs along the north Alaska Peninsula. Spawning also occurs in nearshore areas adjacent to the Yukon-Kuskokwim delta and in Norton Sound.

Pacific herring spawn in two types of habitats along: (1) rocky headlands and (2) intertidal or shallow subtidal bays and lagoons (Barton, 1978; Hameedi, 1982). The preferred spawning substrate is vegetation, usually rockweed kelp (Fucus) or eelgrass (Zostera) (Barton, 1979b; Morris, 1981; Warner and Shafford, 1981). During dense spawning, other substrates may be used, including bare rock, pilings, and submerged tree branches (Hart, 1973). South of Norton Sound, most spawning occurs on Fucus in the intertidal zone (Wespestad and Barton, 1981).

The relative abundance of spawning herring along the northern side of the Alaska Peninsula (Port Moller and Port Heiden) is low compared to other areas (i.e., Togiak, Cape Newenham) (Wespestad and Barton, 1981). Spawning time varies with latitude, beginning earlier in the south (i.e., late May at Port Moller) (Rumyantsev and Darda, 1970; Barton, 1979b). Some herring spawn for the first time at age 2, but the majority do not spawn until ages 3 (50% mature) and 4 (78% mature) (Wespestad and Barton, 1981). By age 5, 95% of the population has matured (Rumyantsev and Darda, 1970). In the Gulf herring mature at an earlier age, approximately 90% are mature at age 3 (V. Wespestad, pers. comm., AFSC). Sexual maturity of eastern Bering Sea herring coincides with recruitment into the fishery, primarily at ages 3 and 4 (Wespestad and Barton, 1981).

Herring eggs hatch in 10 to 23 days (Musienko, 1970; Hart, 1973) depending on water temperature. Hatching success is usually low due to failure of fertilization, desiccation during low tides, uprooting of substrate, or predation. A hatching rate of 50% is considered high, but hatching success may be as low as 1% (Morris et al., 1983). Larvae are pelagic drifters during their 6- to 8-week planktonic stage. Concentrations of larval herring occur in nearshore areas. Larvae generally remain within the vicinity of their hatching locations (Checkley, 1983). The distribution and abundance of herring larvae are related to the presence of abundant prey (copepod, nauplii, and microzooplankton) (Checkley, 1983). In ichthyoplankton surveys, herring larvae have been collected in shallow waters in Bristol Bay and Norton Sound, and are scarce in offshore areas (outside the intertidal areas, where spawning occurs) (Waldron, 1981). Larval mortality is also high and has been attributed to larvae being caught in offshore currents and presumably perishing at sea (Morrow, 1980).

After larval metamorphosis, free-swimming juvenile herring inhabit kelp beds for protection during their first summer. By fall, they form dense schools and start to move offshore (Taylor, 1964). The movements of juveniles in the Bering Sea from the time they leave the coast following their first summer until they are recruited into the adult population are not documented specifically, but their general seasonal movements are known. Juveniles feed in coastal waters in the summer, and move to deeper waters in the winter (Rumyantsev and Darda, 1970). Significant numbers of age 1 herring have been observed in June in nearshore waters of Hagemeister Strait in northern Bristol Bay (Barton, 1979b). In October, after migrating along the Alaska Peninsula, immature herring are found from St. Matthew Island almost to the shelf break (Wespestad and Barton, 1981) and they overwinter in this area to the northwest of the Pribilof Islands (Hameedi, 1982).

Herring fry feed on immobile prey, such as diatoms. Adult herring feed on copepods, amphipods, euphausiids, and fish fry (Hart, 1973; Barton, 1979b; Morrow, 1980).

Herring stocks are shown to be declining in all areas of the Bering Sea except Norton Sound (NPFMC, 1990). The very strong 1977-78 year classes have been sustaining most eastern Bering Sea stocks through the 1980s. However, these fish which are now 13 and 14 years old in 1991 are rapidly senescing out of the population. No strong year classes have recruited to the fishery since the 1977-78 year classes. Therefore, the stocks are declining and projected to continue to decline unless bolstered by substantial recruitment. In the Gulf, herring biomass appears to be quite cyclic. Current level of biomass are at low levels compared to historical estimates of biomass. However, good recruitment was noted from the 1984 year class, and there are reports of significant numbers of 3-year-olds from the 1988 year class (V. Wespestad, pers. comm., AFSC).

Capelin (Mallotus villosus)

This forage fish is distributed throughout the Bering Sea and Gulf of Alaska, including most coastal areas, and extending offshore to the continental shelf break (Lewbel, 1983). Capelin are found in large bathypelagic schools, often long distances from shore, during much of the year (Macy et al., 1978). Nearshore waters of the North Alaska Peninsula are traversed by large schools of capelin that have been encountered during the herring fishery in April and May. Capelin are believed to be the most abundant forage species in the spring and summer (Thorsteinson, 1984).

In the spring mature adults migrate toward the shore and rise to the surface on the way to the spawning grounds from May through July (Musienko, 1970; Warner and Shafford, 1981). Capelin usually begin to spawn at 2 years of age. Specific spawning locations along the northern shore of the Alaska Peninsula are not well-defined. Capelin are believed to use the area between Moffet Point and Port Heiden (Jackson and Warner, 1976) and north to Cape Menshikof (Barton, 1979b). They may spawn over a broader area from Urilia Bay into Bristol Bay. Spawning areas around Port Moller (Herendeen Bay) and Port Heiden have been observed (Hale, 1983). Capelin also spawn on beaches in Norton Sound. In the Gulf, spawning has been reported in southeastern Alaska (Marsh and Cobb 1908).

Capelin are reported to prefer a particular type of substrate for spawning. Rocky areas are avoided and beaches having very specific grain sizes (0.5- to 1.5-mm diameter pebbles) are preferred (Warner and Shafford, 1981). Salinity also seems to be an important factor in the local distribution of spawning areas, with capelin appearing to choose areas of high salinity. Spawning takes place at night during high tides; eggs can be found at or below the high-tide mark (Warner and Shafford, 1981). In some years, capelin reproduce en masse along open beaches to the extent that windrows of trapped capelin may be observed for miles.

The cohesive eggs form small masses that adhere to the gravel substrate (Musienko, 1970). Depending on temperature, eggs hatch in 1 to 4 weeks (Musienko, 1970; Macy et al., 1978; Warner and Shafford, 1981). Distribution of capelin larvae in the Bristol Bay area is only generally known. Since capelin spawn on beaches from Moffet Point to Point Heiden, the larval distribution is assumed to include the coastal nearshore waters adjacent to the beaches between these points. Larvae drift in the nearshore zone during the summer months, until winter temperatures force them into deeper waters (Warner and Shafford, 1981). There also are indications, however, that larval distributions extend beyond coastal waters. Capelin larvae have been caught in ichthyoplankton surveys in the Bering Sea, generally south of 60 N latitude, almost exclusively over the continental shelf and extending into the easternmost part of Bristol Bay (Waldron, 1981). In the Gulf, capelin larvae have been reported in Shelikof Strait.

Capelin prey primarily on small crustaceans, including euphausiids, amphipods, decapod larvae, and copepods, and on small fish (Hart, 1973; Macy et al., 1978; Vesin et al., 1981).

Pacific Sand Lance (Ammodytes hexapterus)

Pacific sand lance are distributed throughout Alaska and the Bering Sea (Hart, 1973). In the Bering Sea, sand lance are present in much of Bristol Bay, along the Aleutian Chain, south of St. Lawrence Island, and along the coast near the Yukon and Kuskokwim deltas (Waldron, 1981) and northward beyond Norton Sound. They were also found to be abundant though highly variable in local distribution, in a 1979 study along the eastern side of the Kodiak Island group (Dick and Warner, 1982). Trumble (1973) reported sand lance among the stomach contents of fur seals captured in the Gulf, with a high frequency of occurrence from seals taken near Kodiak Island. Their distribution and abundance appear to be related to temperature (Lewbel, 1983), with sand lance showing an affinity for warmer waters.

Sand lance distribution and abundance along the Alaska Peninsula is described in Houghton (1984). Of the fish captured in a 1984 sampling, sand lance was the dominant species, comprising 62.6% of all fish captured, which indicates that sand lance is one of the most important species of forage fish in the southeastern Bering Sea. From late June to mid-August, densities appeared greater in the inshore waters. They were widely, but irregularly, distributed throughout the area. Concentrations were found in and outside Port Moller during late June to mid-July and in Izembek Lagoon from mid-August to mid-

September. After mid-July, there was a progressive, significant decline in catches and a shift from the inshore waters into midbay by midsummer. By late summer, there was a strong offshore movement.

There is some uncertainty as to the time of year during which sand lance spawn. Members of the sand lance family have been reported to spawn in summer, fall, or winter depending on the particular species and their location (Trumble, 1973). In the Bering Sea, it is believed that sand lance spawn in the winter in areas with sandy substrates (Lewbel, 1983). The demersal, adhesive eggs usually hatch within a month, depending on the temperature (Macy et al., 1978). Yolk-sac larvae bury themselves in the sandy substrate until their yolks have been absorbed. Once they emerge, the larvae are pelagic. Sand lance larvae have been captured near the Pribilofs from July to September (Musienko, 1963).

Sand lance larvae feed on phytoplankton (Macy et al., 1978). Adults prey on crustaceans, barnacle larvae, copepods, and chaetognaths (Clemens and Wilby, 1949; Hart, 1973; Macy et al., 1978). Sand lance are important as forage fish for numerous other species including halibut, coho, and chinook salmon, seabirds, and marine mammals.

Rainbow Smelt (Osmerus mordax)

This smelt is distributed along the entire coastline of the Bering Sea. It is also reported to be found in southeast Alaska (Hart, 1973). They generally occur in the continental shelf area to depths of 120 meters (Macy et al., 1978). Rainbow smelt are a schooling pelagic fish.

Rainbow smelt migrate upstream to spawn in the spring to early summer, returning to the marine environment after spawning. Spawning takes place at night, with the older and larger individuals spawning first (McKenzie, 1964). The eggs are adhesive and attach to the substrate. Eggs incubate for 19 to 29 days (McKenzie, 1964), depending on temperature. Larvae drift downstream to lakes or estuaries after hatching. Juveniles are found offshore in the same area as the adults (Belyanina, 1969).

Larval smelt feed on copepods, amphipods, cladocerans, and aquatic insects (Scott and Crossman, 1973). As they grow, smelt feed on mysids and amphipods, and as adults they become piscivorous, feeding on cod and other small marine and anadromous fish (Macy et al., 1978).

Eulachon (Thaleichthys pacificus)

Eulachon is distributed throughout the Gulf of Alaska and Bering Sea. The Bering Sea distribution of this smelt includes both coastal and oceanic areas. They inhabit waters around the Aleutian Chain and the Pribilof Islands and in most of Bristol Bay (Hart, 1973; Scott and Crossman, 1973; Carl et al., 1977). These anadromous fish are especially abundant in the Meshik-Port Heiden area from mid-April through July (Thorsteinson, 1984).

These fish spend most of the year in marine or estuarine waters before returning to spawn from March to May in deep rivers with coarse-sand or gravel substrates (Scott and Crossman, 1973). Eulachon spawn en masse. No nest is built and the eggs are simply abandoned (Scott and Crossman, 1973). Most eulachon die after spawning, but a few survive and return the following year to spawn again (Barraclough, 1964). The demersal, adhesive eggs hatch in 3 to 6 weeks, depending on the temperature. Because the larvae are weak swimmers, many are carried out to estuarine areas (Hart, 1973), but some remain in backwater areas.

Young eulachon feed on larval and adult copepods, mysids, ostracods, and cladocerans (Hart, 1973). Adults feed on euphausiids (Barraclough, 1964; Hart, 1973) and small fish (McPhail and Lindsey, 1970).

2.2.4 Seabirds

Over 75 species of seabirds, as well as waterfowl and shorebirds--many of which represent major segments of their world, North American or regional populations--breed, migrate or overwinter in the Bering Sea and Gulf of Alaska. Of particular importance are the Procellariiforms (shearwaters, fulmar, and storm petrels), Alcids (murres, auklets, puffins), and Larids (gulls and kittiwakes) many of which have their centers of abundance in the region. The Bering Sea contains a majority of Alaska's largest seabird colonies (100,000+ individuals) as well as hundreds of lesser concentrations (Sowls et al., 1978; Trapp, 1980). Seabird abundance in the Gulf is greatest to the west of Cape St. Elias, and particularly to the west of Kodiak Island in the Semidi and Shumagin Islands. Critical staging areas, migration routes, and northern summering areas for southern hemisphere species occur in the region. These seabird concentrations ultimately depends upon the extensive and productive food base of the Bering Sea and Gulf of Alaska (Hunt et al. 1981a, 1981b; Springer and Roseneau, 1985; Springer et al. 1984, 1986, 1987; Springer and Byrd 1989).

Pelagic Distribution and Abundance of Seabirds

Pelagic distribution of seabirds varies considerably between species and seasons. Typically, a variable pattern of distribution is evident with scattered, highly mobile flock or single individuals coalescing into larger assemblages for short intervals and then dispersing (Hunt et al. 1981a). This results in a "patchy" pattern of high and low densities, determined to a great extent by the distribution of prey concentrations and proximity to nesting areas.

The greatest pelagic bird densities are observed in spring and summer over the outer continental shelf and shelf break (Gould et al. 1982) where plankton and forage fish diversity and abundance are greater than in surrounding waters (Schneider et al. 1984). This probably is due to enhanced biological productivity where nutrient upwelling and mixing takes place at boundaries between several Bering Sea water masses as well as in the vicinity of the shelf break. Presumably because of the favorable foraging conditions, surface-feeding species such as fulmars, storm-petrels and kittiwakes are associated especially with outer shelf waters. Densities are also influenced by the presence of suitable nesting areas and the occurrence of enormous numbers of southern hemisphere shearwaters (estimates range from 9-20 million in the Bering Sea and up yo 26 million in the Gulf) which frequently concentrate in huge flocks. Thus, densities also are especially high in summer in the inner shelf zone (within the 50 meter depth contour) and in certain coastal areas, in the vicinity of large colonies and preferred shearwater foraging habitat. Likewise, major kittiwake, murre, puffin, and auklet nesting areas near the outer shelf (e.g., Pribilof, Shumagin, and Semidi Islands) considerably increase bird densities in this zone. The presence of St. Matthew Island in the middle shelf zone (between 50 and 100 meter isobaths) results in much higher bird densities than would otherwise be expected in this relatively depauperate zone.

Bering Sea: During winter and early spring months (December-April), most pelagic birds, including some waterfowl species, typically are restricted to areas south of the consolidated pack ice, although substantial numbers also occupy open leads in the ice front or polynyas on the lee sides of islands or peninsulas. These latter habitats are of obvious importance to overwintering birds, which tend to concentrate along the ice edge where foraging conditions may be improved by concentration of prey species attracted to favorable nutrient conditions and spring algal blooms in the ice-edge habitat (Niebauer and Alexander 1985). Comparing density in open-water habitat with that in the ice front, Divoky (1979) recorded 99 and 561 birds/km^2, respectively. Densities of up to 10,000 birds/km^2 have been observed and 1000 birds/km^2 are not uncommon (Divoky 1981). Murres are the most abundant species associated with ice. In open water near St. Matthew Island, flocks of harlequin duck, oldsquaw, king eider, common eider, murres, several gull species, and other seabirds have been observed (McRoy et al. 1971), Polynyas south of St.

Lawrence Island support large concentrations of oldsquaw and eiders (Fay and Cade 1959). Open-water areas within the pack ice also provide early access to breeding sites for birds returning to their colonies in spring (Brown and Nettleship 1981).

For many species breeding in the northern Bering Sea, numbers peak in spring prior to breakup of the pack ice, when overwintering individuals and migrants are concentrated in the vicinity of the ice front. Decomposition of the ice in late spring (April-June) proceeds throughout much of the pack ice simultaneously, and leads which open soon after melting and breakup facilitate the northward migration of seabirds and waterfowl. By April or May, many birds are moving to the vicinity of nesting colonies or breeding grounds where they are concentrated in leads or other open water. In general, birds breeding in more southern localities, such as the Pribilof or Aleutian Islands, are freed from the constraint of surrounding pack ice. At this time, average pelagic shelf densities have declined to about 40 birds/km^2 while densities of 100 birds/km^2 or greater have been found near nesting colonies. The most abundant species recorded during pelagic cruises by Eppley and Hunt (1984) were fulmar, storm petrel, least auklet, and murres. Densities observed by these investigators over deeper water, and in the area west of St. Matthew Island in late spring 1982, were 6 and 16 birds/km^2, respectively. More extensive data sets indicate average shelf (including coastal embayments) density of 67.3 birds/km^2 in this season, somewhat lower mean density (54.2/km^2) along the shelfbreak, and outer shelf densities as high as 1048 birds/km^2 (Gould et al. 1982).

Summer densities reflect the concentration of birds at nesting areas and their associated patterns of foraging in the region. In the northern Bering, average density on the outer shelf, where many of the birds associated with the regionally important St. Matthew Island colony complex forage, more than doubles to 97 birds/km^2. Near St. Matthew, where most of the summer residents forage, density increases to 193 birds/km^2 (Eppley and Hunt 1984). Murres and auklets are the most abundant species. Critical foraging areas for most species probably lie within 50 kilometers of the island. Density over the middle shelf (50-100 meter depth), away from St. Matthew, declines to 19 birds/km^2 in summer after overwintering birds have dispersed. North of St. Matthew, summer density in the vicinity of St. Lawrence Island exceeds most other areas (343 birds/km^2) because of large numbers of auklets (the most abundant species group) foraging near the island. Apparently a majority of both auklets and murres from this area forage north and west of the island (Bedard 1969a, 1969 b; Searing 1977; Divoky 1979; Roseneau et al. 1982). By comparison, Hunt et al. (1981b) found breeding period densities near the Pribilof Islands varying from 431 birds/km^2 southwest of St. George Island to 530/km^2 northeastward. A large proportion of the murres and auklets at the Pribilof Islands forage within 50 kilometers of the colonies while fulmars and kittiwakes forage along the shelfbreak. Mean density over the shelf in summer exceeds 200 birds/km^2. These densities suggest that about 600,000 birds are present over the water in this area at any given moment.

Postbreeding season dispersal of birds over large areas of the Bering Sea apparently results in the relatively low average densities (7-22 birds/km^2) in all pelagic habitats sampled by Eppley and Hunt (1984). Densities in the vicinity of St. Matthew Island ranged from 30-75 birds/km^2. Elsewhere, in late summer and fall, shelf densities also decline and shelfbreak densities increase as many shearwaters move further offshore and other common species (e.g., alcids) disperse from their summer foraging areas. Shearwater densities of 354 birds/km^2 have been recorded during this season, equivalent to about 1.1 million individuals over the area surveyed (Gould 1981).

High bird densities also occur in Unimak Pass. In particular, shearwaters forage here in summer and large numbers move between the North Pacific and Bering Sea. Flocks of over a million individuals have been observed in the pass in July and August, and movements in excess of 25,000 birds/hour for extended periods have been recorded in April and May (Gill et al. 1978). Other species are especially abundant in migration. For example, in late March, April and May, murres move through the pass typically at about

500 birds/hour with as many as 12,000/hour recorded (Gill et al. 1978). Mean density of all species in Unimak Pass in summer, including fulmars, storm petrels, gulls, and murres and other alcids, is 224 birds/km^2, or about 720,000 birds at any given moment (Strauch and Hunt 1982).

Gulf of Alaska: Winter seabird populations are the least numerous and least diverse for the year. Overall densities for nearshore, shelf, shelf break, and oceanic regions averaged 18.2, 13.7, 22.0, and 3.2 birds/km^2, respectively (Gould et al. 1982). The shelf break appears most important at this time of the year for northern fulmars, fork-tailed storm petrels, and black-legged kittiwakes. Common murres remain in the nearshore and make up a major part of the seabird fauna in the Kodiak area in winter, while thick-billed murres disperse to oceanic regions. As in the Bering Sea, shearwaters, albatrosses, Leach's storm petrels, and some glaucous-winged gulls have migrated southward by winter.

Dramatic increases in abundance and diversity occur in the spring due to returning breeders and summer visitors. This is most noticeable on the outer shelf and at the shelf break where densities increase in spring to 158.2 and 57.2 birds/km^2, respectively. Increases also occur in the inner shelf (29.0 birds/km^2) and (43.8 birds/km^2) oceanic regions (Gould et al. 1982). Bird abundance is at yearly peak in all regions other than the nearshore. Most of this increase is due to the influx of shearwaters from the southern hemisphere breeding areas.

By midsummer there are over 40 million seabirds in the Gulf of Alaska. Birds move further inshore to the breeding colonies in summer, with nearshore densities peaking at 56.7 birds/km^2. Some nesting species (cormorants, guillemots, and marbled murrelets) remain nearshore, contributing to the increases in abundance there. Others, such as kittiwakes, puffins, fulmars, and storm petrels, forage further at sea. Highest densities are still observed at the shelf (134.1 birds/km^2), with shearwaters making up the majority of birds there. This includes an estimated 26 million shearwaters, 68% of which are sooty shearwaters. High densities are also observed at the shelf break (55.8 birds/km^2) due to the concentration of albatrosses, fulmars and fork-tailed storm petrels, as well as shearwaters there. Lowest densities are found in the oceanic region (14.7 birds/km^2), with most of this composed of shearwaters, juvenile puffins, and Leach's storm petrel. Tufted puffins are most commonly observed in the nearshore and shelf areas, while horned puffins are usually associated with the shelf break.

Bird densities decline rapidly in all regions in the post breeding period, particularly on the outer shelf (59.9 birds/km^2). As noted, a number of the more common species (e.g., shearwaters) depart for southern waters. Others simply disperse farther offshore (e.g., kittiwakes and puffins). Fall numbers are still relatively high in the inner shelf (35.6 birds/km^2), but are much lower in the shelf break (22.4 birds/km^2) and oceanic (6.7 birds/km^2) regions (Gould et al. 1982).

Seabird Breeding Colonies

Bering Sea - Aleutian Islands: Thirty-three seabird species are known to breed in the Bering Sea. Major seabird colonies exist on St. Lawrence, King, St. Matthew, Hall, Pinnacle, Nunivak, and Pribilof Islands, as well as at Capes Newenham and Pierce and the Walrus Islands in Bristol Bay. There are an additional eight major sites in the eastern Aleutian Islands and four in the western Aleutians. Substantial numbers of lesser colonies are found throughout the Aleutians, northern Bristol Bay and in Norton Sound (Sowls et al. 1978).

On the Pribilof Islands, the most abundant species occupying the extensive nesting cliffs are fulmars, red and black-legged kittiwakes, and murres. Talus-nesting least and crested auklets also are abundant. About 88% of the world population of red-legged kittiwakes and 92% of the Alaskan thick-billed murre population breed on the Pribilofs. Certain species (e.g., kittiwakes and murres) have exhibited poor reproductive success in recent years and apparently have undergone population declines (Springer and Byrd 1989). Similarly poor reproductive success has been observed recently for kittiwakes and murres on St. Matthew Island (Murphy et al. 1987).

Burrow-nesting species, such as storm petrels, ancient murrelets and tufted puffins are abundant in the Aleutian Islands, while kittiwakes and auklets are generally less common than in the Pribilofs (Sowls et al. 1978). The Fox Islands (eastern Aleutians) support about 50% of the Alaskan population of endemic whiskered auklet and about 45% of Alaskan tufted puffins.

Gulf of Alaska: Twenty-seven seabird species nest throughout the Gulf of Alaska, and the largest numbers of birds and colonies are found from the Barren and Kodiak Islands to the west. The northeast Gulf and southeast Alaska are conspicuous in the general absence of large breeding colonies, probably due to an absence of suitable nesting habitat. The only large colonies in southeast Alaska are found at St. Lazaria and Forrester Islands. Tubenose species, such as fulmars and storm petrels nest mostly in the Barren, Semidi, and Shumagin Islands, and most colonies are relatively small. An estimated 440 thousand fulmars, 1 million fork tailed storm petrels, and 1.2 million Leach's storm petrels are estimated to nest in these areas (DeGange and Sanger 1987). Northern fulmars in the Semidi Islands appear to be increasing in abundance (Hatch, pers. commun. 1990).

Four species of gulls (mew, herring, glaucous wing, and black-legged kittiwake) nest in the area to the west of Cape St. Elias. Only glaucous wing gulls and kittiwakes are present in significant numbers, >200 thousand and 700 thousand, respectively. As in the Bering Sea (but unlike the North Atlantic), Gulf of Alaska kittiwakes have highly variable reproductive success (Baird and Gould 1985). Middleton Island black legged kittiwake populations appear to be in decline, but the same species appears to be increasing at Chiniak Bay at Kodiak Island.

Alcids are by far the most common nesting seabird. Approximately 2 million (of an Alaska total of 10 million) murres nest in the area, mostly from the Barren Islands to the west. Common murres are much more common than thick-billed murres (Sowls et al. 1978; DeGange and Sanger 1987). Seven species of small alcids (three murrelets and four auklets) probably nest in the area. Little is known about nesting areas of two of the murrelets (marbled and Kittlitz's; Day et al. 1983). Twenty-seven colonies of the ancient murrelet have been identified, most of which are in western Gulf of Alaska in the Shumagin and Semidi Islands, and at Forrester Island in southeast Alaska (Sowls et al. 1978). Colonies of the four auklet species (least, crested, Cassin's, and parakeet) are concentrated in the western Gulf of Alaska. Least and crested auklets, however, are basically Aleutian Island and Bering Sea species, with relatively few birds found in the Gulf (Sowls et al. 1978). Nearly 2.5 million puffins nest in the Gulf of Alaska, mostly to the west of Prince William Sound. Tufted puffins have been found at 382 colonies and include nearly 1.5 million birds. The western Gulf of Alaska and Aleutian Islands are their center of abundance. An additional 1 million horned puffins nest in the Gulf, with the western Gulf also their center of abundance (DeGange and Sanger 1987).

<u>Food Habits and Trophic Relations of Seabirds</u>

Breeding success of seabirds has been correlated with consumption of preferred prey in Alaska and elsewhere (Belopol'skii 1957; Harris 1980, Murphy et al. 1984; Baird and Gould 1986). Short-term fluctuations in fish prey or in their availability occur naturally due to environmental variations (Furness 1982, 1984; Murphy et al. 1984; Lloyd 1985) and populations of birds can apparently follow and recover from such non-extreme fluctuations. However, population declines of 60 to 90% have been observed in association with steep reductions in stocks of commercial fish in areas other than Alaska (Furness 1982, 1984; Nettleship and Birkhead 1985). When compared with seabird declines due to environmental fluctuations alone, these types of reductions are generally more severe and recovery is much slower.

The proportion of fish and invertebrates in the diet of seabirds varies between species, however the diets of several major species in the Bering Sea are approximately 50% juvenile groundfish of commercial importance. The proportion of walleye pollock in diets of northern fulmars on the Pribilof Islands is estimated at 61%, black-legged kittiwakes 25-60%, red-legged kittiwakes 2-24%, common murres 5 to more than 50%, thick-billed murres 25-50%, and for tufted puffins 40% (Hunt et al. 1981a; Schneider and Hunt 1984). Other birds sampled in the Pribilofs eat negligible amounts of groundfish. In contrast to the larger piscivorous seabirds, abundant auklets feed upon zooplankton, particularly copepods, and may compete with juvenile groundfish for food (Springer and Roseneau 1985, Springer et al. 1986).

Very few studies have been completed in the Aleutian Islands, but tufted puffins on Aiktak Island near Unimak Pass consumed 76% pollock; those on Tangagm Island near Dutch Harbor 59% pollock and 8% Atka mackerel; and those on Buldir Island in the western Aleutians 6.3% Atka mackerel. These data on seabird diet are not standardized among studies and are extremely sparse compared with those for seabird communities in other parts of the world.

The biomass of pollock needed to sustain seabird populations in the eastern Bering Sea has been estimated at 150,000 mt (Hunt et al. 1981a) to 272,000 mt (Kajimura and Fowler 1984). However, these estimates are only approximate, given that only rudimentary data and models are available for prediction of seabird consumption in northern latitudes.

Groundfish are generally unimportant in the diet of most Gulf of Alaska seabird species. Only common murres appear to consume significant amounts of walleye pollock (11.3% of their diet; Sanger 1983). Piscivorous seabirds largely consume only Pacific herring, eulachon, sand lance, and capelin. This is true for surface feeding birds (e.g., gulls), as well as shallow to deep divers (e.g., murres and puffins; Sanger 1983). However, these data were not necessarily collected at times when small groundfish would be available as prey.

2.2.5 Marine Mammals

Pinnipeds and sea otters

Eight pinniped species and the sea otter occupy a variety of Bering Sea and Gulf of Alaska habitats on either an annual or seasonal basis:

- Northern sea lions (Eumetopias jubatus)
- Northern fur seals (Callorhinus ursinus)
- Pacific harbor seal (Phoca vitulina)
- Spotted seal (Phoca largha)
- Ringed seal (Phoca hispida)
- Ribbon seal (Phoca fasciata)
- Bearded seal (Erignathus barbatus)
- Pacific walrus (Odobenus rosmarus)
- Sea otter (Enhydra lutris)

Nor for the same area, or a decline of about 50%. Surveys conducted in 1989 indicated the numbers in southwestern Alaska had declined to around 25,000 nonpups, a decline of 63% from the 1985 numbers and 82% from the pre1970's numbers. The largest decline was in the eastern Aleutian Islands. The six major rookeries in this area contained 41,220 adult and juvenile northern sea lions in 1960. In 29 years, sea lion numbers declined 93% to 2,873 in 1989 (8.6% annual decline). The timing and magnitude of declines at major rookeries in all areas from 1985 to 1989 is unprecedented for unexploited marine mammal populations in the North Pacific Ocean (Merrick et al. 1987; Loughlin et al. 1989; Merrick et al. 1990). In light of these declines in abundance, northern sea lions have been listed as threatened under the Endangered Species Act and depleted under the Marine Mammal Protection Act (MMPA). The reason(s) for these declines have not been determined; however, the major candidates are changes in the availability or quality of prey, disease, and direct interactions with fisheries (e.g., shooting).

The geographic range of the northern sea lion extends from Hokkaido, Japan, through the Kuril Islands and Okhotsk Sea, Aleutian Islands and central Bering Sea, Gulf of Alaska, Southeastern Alaska, and south to central California. The Aleutian Islands and Gulf of Alaska are the centers of distribution and abundance, respectively, for the species. At least 38 rookeries are located in the Aleutians Islands, Bering Sea, coastal Gulf of Alaska, and southeastern Alaska. Haul outs are rare north of the Pribilof Islands.

Sea lions do not migrate; however, there is a definite dispersal from rookeries following the summer breeding season. At least some adult females (those with dependent offspring and some others as well) remain associated with the summer rookery sites throughout the year, while others may disperse away. The large concentrations of animals found at seasonal haul outs (e.g., Puale Bay in the spring) were probably due to animals moving to those haul outs because of seasonal prey availability nearby. One major difference between summer and winter movements is that females appear to be at sea longer in the winter.

Adult males are completely absent from rookery sites during the nonbreeding season. In late summer and early fall, Aleutian Island and Bering Sea animals reach St. Lawrence Island and the Bering Strait (Kenyon and Rice 1961). Matthew and Hall Islands in summer. Movement of males to the ice edge apparently occurs in winter. In spring (March-April) some sea lions utilize the ice front prior to the disintegration of ice in the central Bering Sea, especially in the vicinity of the shelfbreak (Burns et al. 1980; NMFS unpub. data 1983). Seasonal movements of Gulf of Alaska male sea lions are unknown.

Sighting data indicates that many sea lions forage from the continental slope shoreward; however, they have been observed in excess of 150 km offshore (Kajimura and Loughlin 1988). Data from one satellite radio tagged female from Marmot Island indicated that this animal typically foraged 100 km east of the island (on the south edge of Portlock Bank). The destination of one trip, however, was over 200 km offshore (Merrick unpub. data 1990).

Recent food habits studies indicate that walleye pollock is the major prey of northern sea lions in Alaska (Lowry et al. 1989). Their diet also includes squid, octopus, and a variety of forage fish such as Pacific herring, capelin, and sand lance (Lowry et al. 1982). Studies in 1985-86 in the Gulf of Alaska found that sea lions consumed a greater proportion of walleye pollock than in the past, though octopus and flatfish were also important (Calkins and Goodwin 1988). Size of pollock consumed by sea lions ranges from age 1 fish to adults greater than age 10, however most of the pollock consumed are ages 1 to 3 and the average size is under 30 cm (Lowry et al. 1989).

Northern Fur Seal: The world population of the northern fur seal is estimated to be about 1.2 million adults and juveniles (Fowler 1985a). Of these, between 800,000 and 830,000 comprise the Pribilof Islands population. From 1975 to 1981 the Pribilof population declined at a rate of 4-8% per year (Fowler 1985b) as indicated by decreasing numbers of pups born and adult males present. Entanglement in nets, net fragments and other debris may have been an important contributing factor in this decline (Fowler 1985b

1987). The downward population trend has been arrested since 1981, however, their numbers are sufficiently low to be listed as depleted under the MMPA.

Although the fur seal's geographic range is throughout the North Pacific Ocean, they only breed at a few sites - Commander, Bogoslof, and Pribilof Islands in the Bering Sea, Robben and Kuril Islands in the Sea of Okhotsk, and San Miguel Island in southern California. Fur seals are highly migratory and lead a pelagic existence in the nonbreeding season from November to May or June (Kajimura et al. 1980; Kajimura 1984). Most fur seals begin their southward migration in late October-early November and the majority have departed the Pribilof Islands by mid-December. During this period, they are widely dispersed in offshore waters of the North Pacific (70-130 km offshore), with various age- and sex-class segments of the population found from the southern Bering Sea south to the California/Mexico border in the west and to Japan in the east. Females of all ages (and young males 1-4 yr old) are found in the Gulf of Alaska and the eastern North Pacific Ocean during winter and spring. Only the younger immature males (ages 1-5 yr) migrate south of Alaskan waters with few exceptions. Nearly all of the older males winter in Alaskan waters primarily in the Gulf of Alaska, north and south of the eastern Aleutian Islands and the Bering Sea (Kajimura 1984). Breeding males typically arrive in late April/May followed progressively by older pregnant females.
Habitats of major importance to fur seals include: (1) rookeries and haul out areas on the Pribilof Islands; (2) outer shelf and shelf break areas where fur seals forage; (3) a broad corridor including the shelf break between the Pribilofs and eastern Aleutian passes; and (4) eastern Aleutian passes, primarily Unimak Pass, utilized as migratory routes in spring and fall.

Fur seals typically forage over the outer shelf and shelf break as far as 400 km away from the Pribilof Islands (Loughlin et al. 1987). Fur seals forage mainly at night and early morning on various schooling fishes which congregate in areas of nutrient upwelling. Approximately 400,000 individuals, including foraging females and nonbreeding individuals, may be foraging in the Bering Sea at any given time from June to November.

Extensive studies of the diet of northern fur seals indicate variation by season and location. Important prey include pollock, capelin, squid, and other pelagic fishes (Perez and Bigg 1986). Much of the pollock eaten by fur seals is from younger age classes (Frost and Lowry 1986).

Pacific Harbor Seal: The Alaskan harbor seal population was estimated at 270,000 animals prior to 1973 (Pitcher and Calkins 1977). Subsequently, numbers at haul outs declined by more than 50% since 1973 on the Alaska Peninsula, by more than 85% Since 1976 at Tugidak Island, and by more than 30% since 1983 in Prince William Sound (Pitcher 1989; Pitcher unpub. data). Numbers appear to have increased in southeast Alaska. However, there are insufficient data at the present to determine the harbor seal's status throughout Alaska. The cause of these declines is unknown; however, a linkage with the northern sea lion declines is possible because the declines have occurred in generally the same spatial and temporal frames. Both species also feed on the same prey.

Harbor seals range throughout the subarctic waters of the northern hemisphere. A number of subspecies have been identified, with the subspecies in Alaska identified as Phoca vitulina richardsi). Harbor seals are common residents of coastal areas throughout southeast Alaska, coastal Gulf of Alaska, Aleutian Islands, Alaska Peninsula, and north through Kuskokwim Bay and the Pribilof Islands (Pitcher and Calkins 1977; Everitt and Braham 1980).

Harbor seals are generally a sedentary species, making local movements in response to food availability, tides and breeding activities. However, radio-tagged individuals in the Gulf of Alaska moved up to 194 km from the Tugidak tagging site (Pitcher and McAllister 1981). Large-scale emigration of seals occurs from northern Bristol Bay in winter when the area usually is ice-covered. Apparently, some individuals also disperse to ice floes in winter, especially when the pack ice advances further into the southern Bering Sea than usual. While generally a coastal species (water depths less than 55m), harbor seals have been observed up to 80 km offshore.

Harbor seals feed primarily on schooling fishes and cephalopods (Lowry et al. 1982; Pitcher 1980). In the Bering Sea, major fish prey include sand lance, smelt, sculpins, pollock, and Pacific cod (Lowry et al. 1982). Most pollock consumed apparently are ages 1 to 3, although some larger pollock are taken (Frost and Lowry 1986).

Pacific Walrus: The Pacific walrus comprises about 80% of the world's walrus population. Three subspecies are recognized, and the Pacific walrus is the only one with a population approaching historical levels. However, the population has undergone several episodes of reduction and recovery since the late 1880's. The most recent survey (1985) indicated the population was stable at approximately 234,000 animals (Gilbert 1989). However, there are some indications that the population may be beginning to decline due partly to their overharvesting of their prey (Fay et al. 1989).

The Pacific walrus ranges from the Chukchi and Beaufort Seas to the southeastern Bering Sea and northern Kamchatka Peninsula (Fay 1982). Most of the animals migrate north in summer and south in winter in association with seasonal movements of the pack ice. Herds of migrant walrus moving south from the Chukchi Sea appear in the St. Lawrence-Punuk Islands area in fall (October-December). During winter months (January - March) walrus may be found wherever openings are numerous in the drifting pack ice; most animals occur in the relatively thin ice west and as much as 300 kilometers southwest of St. Lawrence Island (including St. Matthew Island), and in the Bristol Bay area. Smaller concentrations occur east of the Pribilof Islands and southwest of Cape Navarin. Mating occurs during this period, primarily in the St. Lawrence Island and Bristol Bay areas (Fay et al. 1984).

As the seasonal pack ice melts and the ice edge recedes northward in spring, pregnant females and those with young move north with it. Adult and subadult males then move to coastal haul outs, mostly in Bristol Bay and the Bering Strait. In early spring, densities of 13.0 individuals/nm2 between St. Lawrence and St. Matthew Islands and 4.2/nm2 west of this area have been recorded (Burns et al. 1980). Calves are born on the ice in the northern Bering Sea from April to June (peak in early May) during the northward migration. Some haul outs along the Chukchi Peninsula and on St. Lawrence Island are used primarily during the full migration.

Walrus are bottom feeders, feeding mainly on bivalve mollusks at depths of 80 meters or less (Fay 1982). Other prey include gastropods, polychaetes, echiuroids and other benthic invertebrates (Lowry et al. 1982).

Other species: Sea otters, spotted, ringed, seals also occasionally interact with the Bering Sea commercial trawl fisheries. Abundance of each of these species appears to be high; however, there have been no new estimates of ice seal abundance since the mid-1970s.
All are rarely caught in commercial nets (1-2 animals are reported a year, NMFS unpub. data 1976-1989). The seals also occasionally forage on groundfish (Lowry et al. 1989); however other prey appear to be more important on an annual basis. Distribution of the ice seals is closely associated with ice, and sea otters with land. Thus, the potential for direct interaction with trawl fisheries is relatively low.

Cetaceans

There are at least 10 cetacean species which occur in the Alaskan waters which have a potential for interaction with groundfish fisheries. Four of these species are listed as endangered species:

Fin whale (Balaenoptera physalus)
Sei whale (Balaenoptera borealis)
Humpback whale (Megaptera novaeangliae)
Sperm whale (Physeter macrocephalus)

The remaining six species are nonendangered small to medium sized cetaceans:

Minke whale (Balaenoptera acutorostrata)
Beluga (Delphinapterus leucas)
Killer whale (Orcinus orca)
Dall's porpoise (Phocoenoides dalli)
Harbor porpoise (Phocoena phocoena)
Pacific white-sided dolphin (Lagenorhynchus obliquidens)

These species interact with trawl fisheries either through a common prey such as walleye pollock (Lowry et al. 1989) or are occasionally caught in trawl nets (NMFS unpublished data). The former includes all ten species while the latter includes only the six small to medium sized cetacean species.

Fin Whales: Fin whales range from the North Pacific Ocean to the Bering Sea and, rarely, the Chukchi Sea. The North Pacific population has been estimated from 14,620 to 18,360 individuals (Braham 1984); it is estimated that about 5,000 enter the Bering Sea during summer (Morris 1981).

Fin whales generally winter off southern California and Baja California, although a few whales overwinter in the Gulf of Alaska and near the Commander Islands (Berzin and Rovnin 1966). Fin whales entering the Bering Sea are generally separated into two groups (Nasu 1974). A group consisting mostly of mature males and females without calves migrate along the shelf break to Cape Navarin and more northern waters. A group of lactating females and immature whales summer along the shelf break between the Pribilof Islands and Unimak Pass. Other summer concentrations occur in the Gulf of Alaska and along the Aleutian Chain. Historically, a summer concentration was located between St. Matthew and Nunivak Islands (Berzin and Rovnin 1966). Although the fall migration may begin in September, some fin whales may remain in the Aleutians and the Gulf of Alaska until November and possibly overwinter in these areas.

Observations by Brueggeman, Grotefendt, and Erickson (1984) during four seasonal surveys in the Navarin Basin, found fin whales to be the most abundant whale. Fin whales were observed in the area throughout the year and may be classified as a resident species. From spring throughout fall, fin whales were observed only in the shallow-shelf areas (200 meter). During the winter, they were observed along the marginal-ice front on the shallow side of the shelf break.

Fin whales feed by engulfing large concentrations of euphausiids, anchovies, capelin, herring, and juvenile walleye pollock.

Sei Whales: Sei whales occur in all the world's oceans. The North Pacific population is estimated at between 22,000 and 37,000 individuals (Braham 1984).

They are most commonly found in the Gulf of Alaska and southeast of the Aleutian Chain area during the summer months (May and June) and migrate to southern latitudes during winter. Migration periods and routes are similar to those of the fin whales. Sei whales are rarely seen north of the Aleutian Islands (Rice 1974). Braham et al. (1977) reported one sighting in the Fox Islands and one sighting east of the Pribilof Islands.

The principal food source is copepods, which the sei whale catches by skimming. Other food sources include euphausiids, herring, sand lance, and walleye pollock.

Humpback Whale: In the North Pacific, humpback whales are distributed from the tropics north to 70 N latitude in the Chukchi Sea. In the North Pacific, the humpback population is estimated at <1,200 individuals (Braham 1984), and Morris (1981) estimated that up to 200 humpbacks were distributed throughout the Bering Sea in the summer.

Summer range extends from the coast of California northward to the southern portion of the Chukchi Sea. The whales migrate from wintering grounds off Hawaii and Mexico north to the Gulf of Alaska (early April), the eastern Aleutian Islands (late June), and northward to the Bering and Chukchi Seas (July through September). The whales are found in the Bering Sea from May through November; the autumn migration begins in September. Photo-identification of humpbacks indicates that migratory routes exist between Hawaii and Prince William Sound and southeastern Alaska, and between Mexico and California and southeastern Alaska. Soviet and Japanese tagging and whaling records indicate that humpbacks heading for the St. George Basin area migrate between Japan and the southeastern Bering Sea (Hameedi 1981). Berzin and Rovnin (1966) postulated that the summering humpbacks along the Soviet coast overwinter off Japan but that some mingling occurs with whales that overwinter around Hawaii and Mexico.

Humpbacks feed on euphausiids and small schooling fish that they capture through lunging or a modified skim-feeding action. Specifically, euphausiids, arctic cod, herring, capelin, saffron cod, walleye pollock, mysids, pelagic amphipods, and shrimp comprise the most important humpback food (Tomilin 1957).

Sperm Whales: Sperm whales are the most abundant large cetaceans in the North Pacific and the only toothed whale listed as endangered. Their North Pacific population is estimated at approximately 472,100 individuals with approximately 15,000 distributed in the Bering Sea during the summer months (Morris 1981; Braham 1984).

Sperm whales are distributed in the Pacific from the equator north to Cape Navarin in the Bering Sea (Berzin and Rovnin 1966). Whales entering the Bering Sea are mostly males because females and juveniles seldom migrate north of the 10 C isotherm (approximately 50 N lat.). They enter the Bering Sea primarily through Unimak Pass and migrate along the shelf break between the Pribilof Islands and Cape Navarin. They are found in pelagic waters near the continental shelf edge. Sperm whales have been captured in the region centered at 56 N, 170 W just south of the Pribilof Islands. Sperm whales are likely to be in the Bering Sea from March through November.

They feed largely on squid, although deepwater bottom fish are common on their diet (Caldwell et al. 1966).

Minke Whale: Minke whales are one of the smaller baleen whales, and inhabit all oceans of the world except equatorial regions. The North Pacific population is classified as abundant.

The species occurs broadly over the North Pacific and into the southern Chukchi Sea during the summer months and migrates to lower latitudes during the winter. Minke whales apparently occur in the Bering Sea on a year-round basis, with concentrations near the Aleutian Islands and the Pribilof Islands during the summer. Over 95% of minke whale sightings in the NMFS data base were within the 200-meter isobath, and most were in shallow coastal waters (Morris 1981).

Minke whales feed locally on abundant fish, euphausiids, and copepods. Euphausiids are the preferred prey in the North Pacific, followed by schooling fish, and copepods. From March through December, minke whales are seen feeding most frequently in the lagoons and coastal waters along the northern shore of the Alaska Peninsula (i.e., Port Moller and Nelson Lagoon).

Beluga: Belugas are circumpolar in arctic and subarctic waters, numbering at least 30,000 in the North American Arctic (Sergeant and Brodie 1975). Belugas are abundant in Alaska waters, especially above 60° N latitude. At least two stocks are generally recognized--one in the Cook Inlet/Gulf of Alaska region and the other larger population in the Bering, Chukchi, and Beaufort Seas. The Cook Inlet population has been estimated to number 400-500, while a minimum of 13,500-18,000 belugas are estimated to occur in coastal waters of western and northern Alaska (Burns et al. 1985). Belugas occur in Bristol Bay year round and are found in association with the seasonal pack ice in the winter and early spring. The summer Bristol Bay population is estimated between 1,000 and 1,500 individuals (Frost et al. 1984).

Gurevich (1980) reported movements twice a day of belugas (50 to over 500 whales) foraging for red salmon and smelt up and down the Kvichak River during May and June. There have also been reports of concentrations north of Port Heiden (300 individuals) along the coast during the summer (Gurevich 1980). Although belugas have been observed near the Pribilof Islands, they are generally characterized as a nearshore and estuarine species, where they feed and calve during the summer months.

Belugas feed from midwater to the bottom, primarily on fish (such as salmon, smelt, herring, cods and flatfish) usually in shallow waters of the continental shelf and at the mouths of major rivers (Seaman et al. 1982).

Killer Whale: Killer whales are observed in all major oceans and seas of the world and appear to increase in abundance shoreward and toward the poles of both hemispheres (Mitchell 1975). Population levels of Alaskan killer whales are unknown.

Killer whales have been observed as far north as the Chukchi and Beaufort Seas (Braham and Dahlheim 1982; Lowry et al. 1987). Year-round occurrence may occur within Alaskan waters; however, their movements are poorly understood (Braham and Dahlheim 1982). Whales are forced southward from the Chukchi and northern Bering Seas with the advancing pack ice and, under such circumstances, long-range movements may occur. In ice-free waters, more restricted movements may occur. Killer whale concentrations have been noted in coastal waters, continental shelf waters, and neritic zones. These areas of killer whale abundance are of particular interest as they overlap areas of high abundance of prey.

Killer whales are top-level carnivores of the marine ecosystem with diets that vary regionally (Heyning and Dahlheim 1988). Although primarily fish eaters, killer whales are known to prey on other cetaceans, pinnipeds, and seabirds (Dahlheim 1981). Killer whales may feed upon fish when locally abundant and then switch to marine mammals when fish are less available.

Killer whales have been documented to take significant numbers of fish off longlines in the Aleutian Island and Gulf of Alaska black cod fisheries.

Dall's Porpoise: This species ranges from Northern Baja California, along the western coast of North America, and across the North Pacific Ocean to the coastal waters of Japan. The estimated size of the North Pacific Dall's porpoise population (not including coastal waters from California to Washington) north of 40° N to the Aleutian Islands is approximately 1,349,000 animals (Turnock 1987; and Bouchet et al. 1986). In the Bering Sea the population is estimated as 212,000 (Turnock 1987).

The northern limit of the species is generally Cape Navarin in the Bering Sea, although they have been observed as far north as 66° N latitude (Morris et al. 1983). Dall's porpoise are sighted in Bristol Bay through the year and in the Navarin Basin area from spring through fall (Brueggeman et al. 1984). They can occur in shallow waters but have been most frequently sighted in waters over 100 meters deep. Concentrations occur from June through November along the shelf break from the Pribilof Islands to Cape Navarin. Migratory movements are not well understood, but available information suggests local migrations along the coast and seasonal onshore/offshore movements. However, data from throughout the North Pacific and Bering Sea show that Dall's porpoise reproduce annually and seasonally, starting in late July or early August to September (Jones et al. 1985).

Dall's porpoise feed predominantly on squid and mesopelagic fish.

Harbor Porpoise: The harbor porpoise is a boreal-temperate species along the North Pacific coast from Point Barrow, Alaska, to central California. Numbers of harbor porpoise in Alaskan waters are unknown.

Harbor porpoise are generally sighted singly or in pairs. Sightings in the Bering sea are reported in Frost et al. (1982). Neave and Wright (1969) reported that harbor porpoise in the western North Atlantic move north in late May and south in early October. Harbor porpoise are generally seen in coastal environments such as harbors, bays, and the mouths of rivers. Mating probably occurs from June or July through October, with peak calving in May and June.

They feed primarily on small gadoid and clupeoid fish, such as cod, herring, and also on mackerel.

Pacific White-Sided Dolphin: This species ranges from Baja California to the Aleutian Islands, as well as off the coast of Japan. The numbers of this dolphin found in Alaska is unknown.

Pacific white-sided dolphin are observed north of the Aleutian Islands, primarily in waters 100 to 200 meters deep. Most abundant in the summer months, this species concentrates in areas of high fish abundance, such as along the shelf break. Presumably, the dolphins shift their distribution farther north during the summer season and also may move offshore (Morris et al. 1983). They are frequently observed in groups exceeding 100 individuals; groups of between 500 and 2,000 individuals have been sighted.

They are opportunistic feeders that eat a variety of fish and squid.

2.3 Physical and Biological Impacts of the Alternatives

2.3.1 Distribution of Stocks and Harvests

Pollock (*Theragra chalcogramma*)

The location of the historic foreign pollock fisheries reflect in part, the seasonal movements of the fish, but also the restrictions placed on the foreigners. Of primary importance were gear restrictions, catch quotas for target species and the exclusion of foreign vessels from areas designed for protection. Foreign nations, in receiving allocations for major target species, often received allocations for other species only sufficient to allow for a low bycatch. Therefore, the distribution of fishing effort by these nations was also guided by the need to maximize the catch of target species, while minimizing the bycatch of other species. Appendix 2-A shows the locations of the foreign reported trawl pollock catches in the Bering

Sea, by quarter for the years 1980 through 1985. After 1985 the foreign allocation of pollock sharply decreased (Table 2.1). The catches shown on the charts of the appendices are in hundreds of metric tons, with catches greater than or equal to 500 mt encircled.

The proposed Bering Sea inshore operational area between 168° W longitude and 163° W longitude, and 56° N latitude south to the Aleutian Islands, encompasses Dutch Harbor and Akutan. This special area was an option considered under Alternatives 3 and 8 (Preferred Alternative), with the boundaries remaining the same under both alternatives, but the operational rules being different. Under Alternative 3, any pollock harvested in a directed pollock fishery in this area and delivered in the U.S. must be processed by the inshore component of the DAP industry. Under Alternative 8, the area is reserved for harvesting vessels only, with the exception that 65% of the at-sea "A" season pollock allocation may be taken by the offshore sector in that area.

It is notable that this area falls within two restricted zones closed to foreign trawlers at certain times of the year. The Bristol Bay pot sanctuary was closed to trawling year-round (See Fig. 2.2). This was to prevent conflicts between foreign trawl gear and U.S. crab pots, and to prevent the incidental catch of juvenile halibut which are known to concentrate in this area. The Winter Halibut Savings Area was closed to trawling from December 1 to May 31 to protect winter concentrations of juvenile halibut, and to protect spawning concentrations of pollock and flounders (NPFMC 1986).

A significant proportion of the Bering Sea pollock catches have come from this area in the third and fourth quarters. Table 2.2 shows the Bering Sea catches and corresponding catch proportions from the operational area. Most of this area covers depths greater than 100 m, which is consistent with depths where pollock are found in the winter months. Foreign trawlers were prohibited from trawling in this area for the first quarter and most of the second quarter.

The bulk of the catches were taken in the third quarter of the year. This is more a reflection of when the bulk of the effort was deployed, coincident with better weather and long daylight hours, rather than availability of the fish. In the first quarter the ice edge and fishing restrictions prevented fishing east of 170° W. In the second quarter the fishery expanded, and was at its peak in the third quarter. Catches generally decreased in the fourth quarter compared to the previous quarter.

A bi-modal distribution of fishing effort is particularly evident in the third quarter fishery. This does seem to be reflective of the distribution of the stock. There has always been a natural break in the catch distribution around the Pribilof Islands (V. G. Wespestad, AFSC, pers. comm). The foreign effort was distributed south and east of the Pribilofs, and to the north and west of the Islands. Table 2.3 shows the percentage of catch each quarter taken east and west of 170° in the Bering Sea. In the first quarter, most of the catch came from the west. Trawling was prohibited in most of the southeastern Bering Sea during the first quarter. In the second quarter, the majority of the catch came from the east during 1981-82. In 1983 the catches were about evenly split between the two areas. After 1983, the bulk of the catch came from the west. During the third quarter, it appears that in the early 80s most of the catch came from the east. In 1984 and 1985 the bulk of the catch came from the west. During quarter four the catch seemed to be more evenly split between the east and west.

Fishing in the Aleutians is also noted in some years in the area from the Islands of Four Mountains to Seguam Pass (approximately 170-173° W). The 1990 domestic pollock fishery is also reported to be fishing this area (P. Dawson, pers. comm., AFSC).

Table 2.1. Bering Sea/Aleutian Islands foreign and joint venture allocations for pollock.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Foreign	1,072,950	1,043,450	1,055,450	967,000	994,635	864,230	396,402	5,000	0	0
Joint Venture	21,550	54,050	34,050	114,000	289,750	407,550	813,804	1,089,803	826,678	93,415

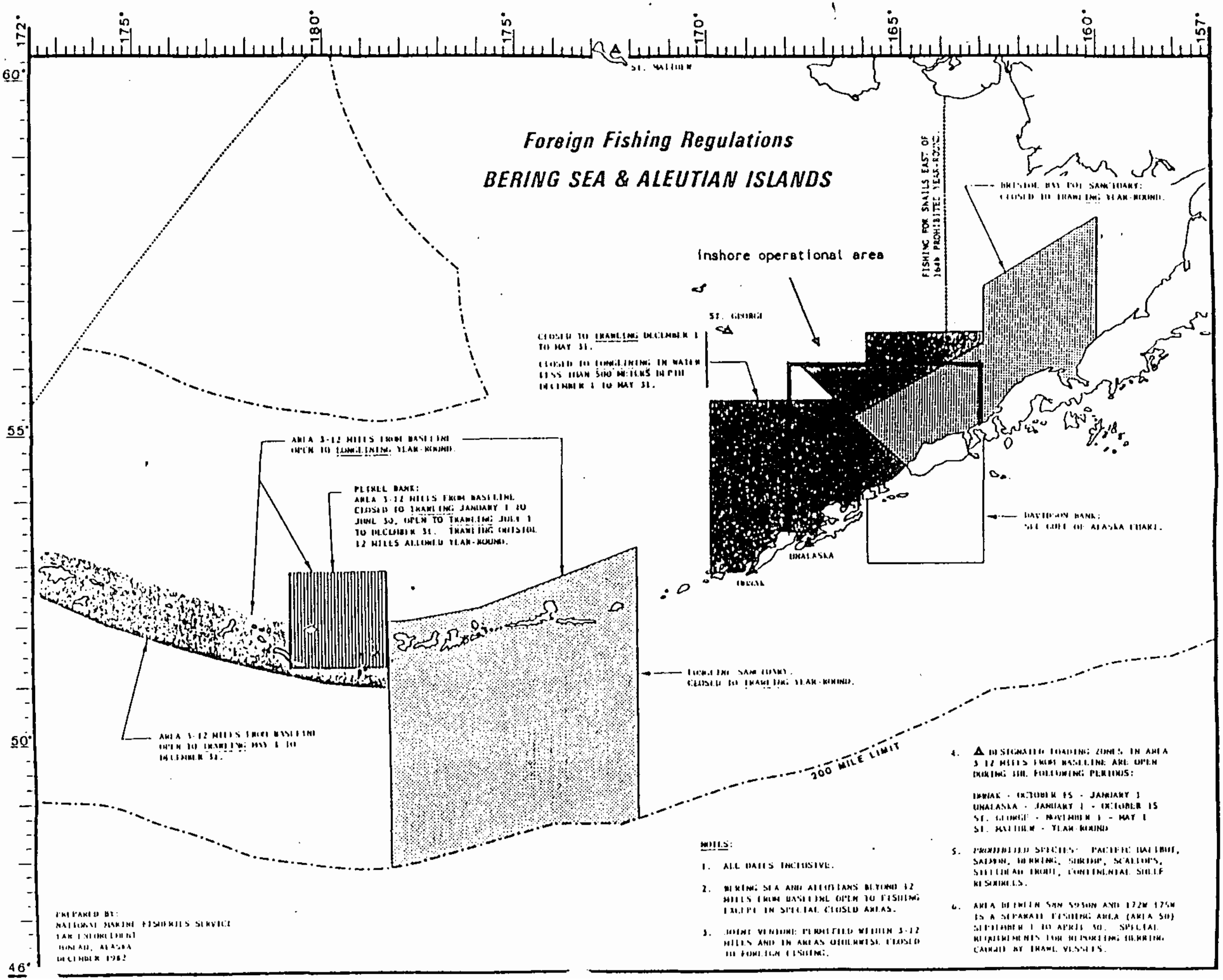

Foreign Fishing Regulations
BERING SEA & ALEUTIAN ISLANDS
172°
175°
180°
175°
170°
165°
160°
157°
60°
55°
50°
46°
ST. MATTHEW
ST. GEORGE
UNALASKA
UNIMAK
Inshore operational area
FISHING FOR SNAILS EAST OF 164W PROHIBITED YEAR-ROUND.
BRISTOL BAY POT SANCTUARY: CLOSED TO TRAWLING YEAR-ROUND.
DAVIDSON BANK: SEE GULF OF ALASKA CHART.
CLOSED TO TRAWLING DECEMBER 1 TO MAY 31.
CLOSED TO LONGLINING IN WATER LESS THAN 500 METERS DEPTH DECEMBER 1 TO MAY 31.
AREA 3-12 MILES FROM BASELINE OPEN TO LONGLINING YEAR-ROUND.
PETREL BANK: AREA 3-12 MILES FROM BASELINE CLOSED TO TRAWLING JANUARY 1 TO JUNE 30, OPEN TO TRAWLING JULY 1 TO DECEMBER 31. TRAWLING OUTSIDE 12 MILES ALLOWED YEAR-ROUND.
LONGLINE SANCTUARY. CLOSED TO TRAWLING YEAR-ROUND.
AREA 3-12 MILES FROM BASELINE OPEN TO TRAWLING MAY 1 TO DECEMBER 31.
200 MILE LIMIT
NOTES:
1. ALL DATES INCLUSIVE.
2. BERING SEA AND ALEUTIANS BEYOND 12 MILES FROM BASELINE OPEN TO FISHING EXCEPT IN SPECIAL CLOSED AREAS.
3. JOINT VENTURE PERMITTED WITHIN 3-12 MILES AND IN AREAS OTHERWISE CLOSED TO FOREIGN FISHING.
4. DESIGNATED LOADING ZONES IN AREA 3-12 MILES FROM BASELINE ARE OPEN DURING THE FOLLOWING PERIODS:
UNIMAK - OCTOBER 15 - JANUARY 1
UNALASKA - JANUARY 1 - OCTOBER 15
ST. GEORGE - NOVEMBER 1 - MAY 1
ST. MATTHEW - YEAR-ROUND
5. PROHIBITED SPECIES: PACIFIC HALIBUT, SALMON, HERRING, SHRIMP, SCALLOPS, STEELHEAD TROUT, CONTINENTAL SHELF RESOURCES.
6. AREA BETWEEN 54N 5930N AND 172W 175W IS A SEPARATE FISHING AREA (AREA 50) SEPTEMBER 1 TO APRIL 30. SPECIAL REQUIREMENTS FOR REPORTING HERRING CAUGHT BY TRAWL VESSELS.
PREPARED BY:
NATIONAL MARINE FISHERIES SERVICE
LAW ENFORCEMENT
JUNEAU, ALASKA
DECEMBER 1982

Table 2.2. Foreign reported pollock trawl catches by quarter for the Eastern Bering Sea (mt). Percent of catch in that quarter from inshore operational area are in parentheses.

Year	1st QTR	2nd QTR	3rd QTR	4th QTR	Total
1980	142,714	200,992	482,630	212,485	1,038,821
	(0)	(3)	(29)	(35)	
1981	154,263	220,673	452,399	154,263	981,598
	(0)	(7)	(52)	(65)	
1982	127,034	142,274	477,461	204,722	951,491
	(0)	(8)	(27)	(45)	
1983	97,446	184,865	435,533	149,428	867,272
	(0)	(6)	(27)	(49)	
1984	92,683	108,365	443,540	269,787	914,375
	(0)	(3)	(8)	(31)	
1985	51,423	52,083	419,895	310,471	833,872
	(0)	(0)	(1)	(37)	

Table 2.3. Percent of foreign reported pollock trawl catches east and west of 170 degrees west in the Eastern Bering Sea.

Year		1st QTR	2nd QTR	3rd QTR	4th QTR
1980	E	3.6	30.5	58.3	49.6
	W	96.4	69.5	41.7	50.4
1981	E	16.5	60.0	89.0	71.8
	W	83.5	40.0	11.0	28.2
1982	E	1.6	66.1	90.3	57.6
	W	98.4	33.9	9.7	42.4
1983	E	1.5	54.8	74.6	69.3
	W	98.5	45.2	25.4	30.7
1984	E	1.5	27.6	17.8	52.0
	W	98.5	72.4	82.2	48.0
1985	E	16.8	30.8	18.9	48.7
	W	83.2	69.2	81.1	51.3

Appendix 2-B shows the locations of the joint venture (JV) pollock catches in the Eastern Bering Sea from 1984-1989. Pollock catches by the joint venture fleet were not significant until the mid-1980s. In contrastto the location of the foreign effort, the JV fleet fished more inshore. Most of the catches were taken during the first through third quarters (Table 2.4). The joint venture fleet was not prohibited from fishing in areas restricted to foreign vessels during the first and most of the second quarter.

The inshore operational area is marked on the charts, and the percentage of catch taken from this area each quarter is given in Table 2.4. During the first quarter, the bulk of the pollock catch has been taken from the inshore operational area. The amount of fish coming from this area in other quarters has varied over the years. Fishing generally appears to take place along the shelf edge. The JV fishery is also noted to have fished the area from the Islands of Four Mountains to Seguam Pass in the Aleutians.

Catch data from the 1990 domestic fishery are available by large statistical areas. Areas 515 and 517 in the Eastern Bering Sea are approximately equivalent to the inshore operational area. Table 2.5 gives domestic catches by quarter and the percentage of catch each quarter taken from Areas 515 and 517. Ninety percent of the catch delivered to shoreside processors in the eastern Bering Sea were taken from the inshore operational area. Twenty two percent of the catches taken by offshore processors came from the inshore operational area.

Appendix 2-C shows the locations of the foreign reported trawl pollock catches in the Gulf of Alaska by quarter for the years 1980 through 1985. After 1985 the foreign allocation of pollock sharply decreased as in the Bering Sea (Table 2.6). Charts showing only the western and central Gulf (147°-170° W) are provided as catches of pollock from the eastern Gulf were minimal. The bulk of the Gulf pollock population resides in the western Gulf, and also, in 1982 the area east of 140° W was closed to foreign fishing year-round.

Again, it is noted that the geographical and seasonal distributions of foreign fishing effort were not only affected by the distributions of the target species, but also the various restrictions placed on these fisheries. The only gear restrictions pertaining to foreign trawling in Gulf waters during 1980-85 was the requirement for the use of pelagic trawls from Dec. 1 to May 31. This was to minimize the incidental catch of halibut. During 1980-88 the area from 147° W to 157° W was closed to foreign trawling from Feb. 16 to May 31. This was to minimize the incidental catch of halibut and to allow grounds to remain undisturbed before the halibut season.

In the Kodiak region in 1980 there were 6 crab "gear areas" which were closed to foreign trawling from Aug. 10-June 1 (See Fig. 2.3) There were also 3 "halibut areas" which were closed from 5 days before to 5 days after the time period open for the U.S. domestic longline fishery for halibut. The "halibut areas" have remained in effect. In 1981 Amendment 9 to the GOA FMP established the "Kodiak Gear Area" (See Fig. 2.4) for foreign trawlers during the king crab season. This was for the purpose of reducing conflicts between the domestic fixed and crab gear and foreign trawls. The closure was in effect 2 days before the opening of the Kodiak king crab season through Feb. 15.

The "Davidson Bank" area between 163°04' W and 166°W north of 53° N was been closed year-round. This area was designated for developing U.S. fisheries in an area with healthy concentrations of several groundfish species which is in the range of already established cold storage and processing facilities at Dutch Harbor and Sand Point (NPFMC 1984).

Foreign trawlers were prohibited from fishing within 12 nautical miles of land in the Bering Sea and Gulf year-round. This precluded foreign fisheries in Shelikof Strait.

Table 2.4. Joint venture pollock trawl catches by quarter for the Eastern Bering Sea (mt). Percent of catch in each quarter from inshore operational area is in parentheses.

Year	1st QTR	2nd QTR	3rd QTR	4th QTR	Total
1984	29,372	76,475	130,104	372	236,323
	(94)	(83)	(48)	(39)	
1985	47,176	90,406	232,098	7,635	377,315
	(73)	(63)	(76)	(77)	
1986	220,410	170,172	374,032	69,254	833,868
	(50)	(36)	(11)	(88)	
1987	585,267	402,708	55,254	1,248	1,044,477
	(67)	(4)	(90)	(0)	
1988	328,535	362,683	87,879	46,497	825,594
	(78)	(7)	(86)	(80)	
1989	67,463	0	87,530	132,794	287,787
	(78)	(0)	(24)	(44)	

Table 2.5. Pollock trawl catches by quarter for the Eastern Bering Sea delivered to a) shoreside processors and b) offshore processors in metric tons (mt). Percent of catch in each quarter from inshore operational area is in parentheses.

(a).

Year	1st QTR	2nd QTR	3rd QTR	4th QTR	Total
1990	60,237	41,733	90,934	26,048	218,952
	(94)	(75)	(97)	(85)	

(b). 1/

Year	1st QTR	2nd QTR	3rd QTR	4th QTR	Total
1990	278,103	339,446	419,906	134,484	1,171,939
	(65)	(13)	(8)	(3)	

1/Offshore includes catcher processors and catch delivered to domestic motherships or floaters operating in the EEZ.

Table 2.6. Gulf of Alaska foreign and joint venture allocations for pollock and Pacific cod.

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Pollock	Foreign	157,923	162,640	135,070	117,730	197,000	35,000	140	0	0	0
	Joint Venture	6,879	27,176	28,230	133,370	210,300	235,629	69,439	25,800	500	0
Pacific cod	Foreign	53442	59634	51688	50936	32518	10200	15520	0	7600	0
	Joint Venture	2,500	2,199	1,410	3,752	18,162	7,640	9,480	2,000	11,050	0

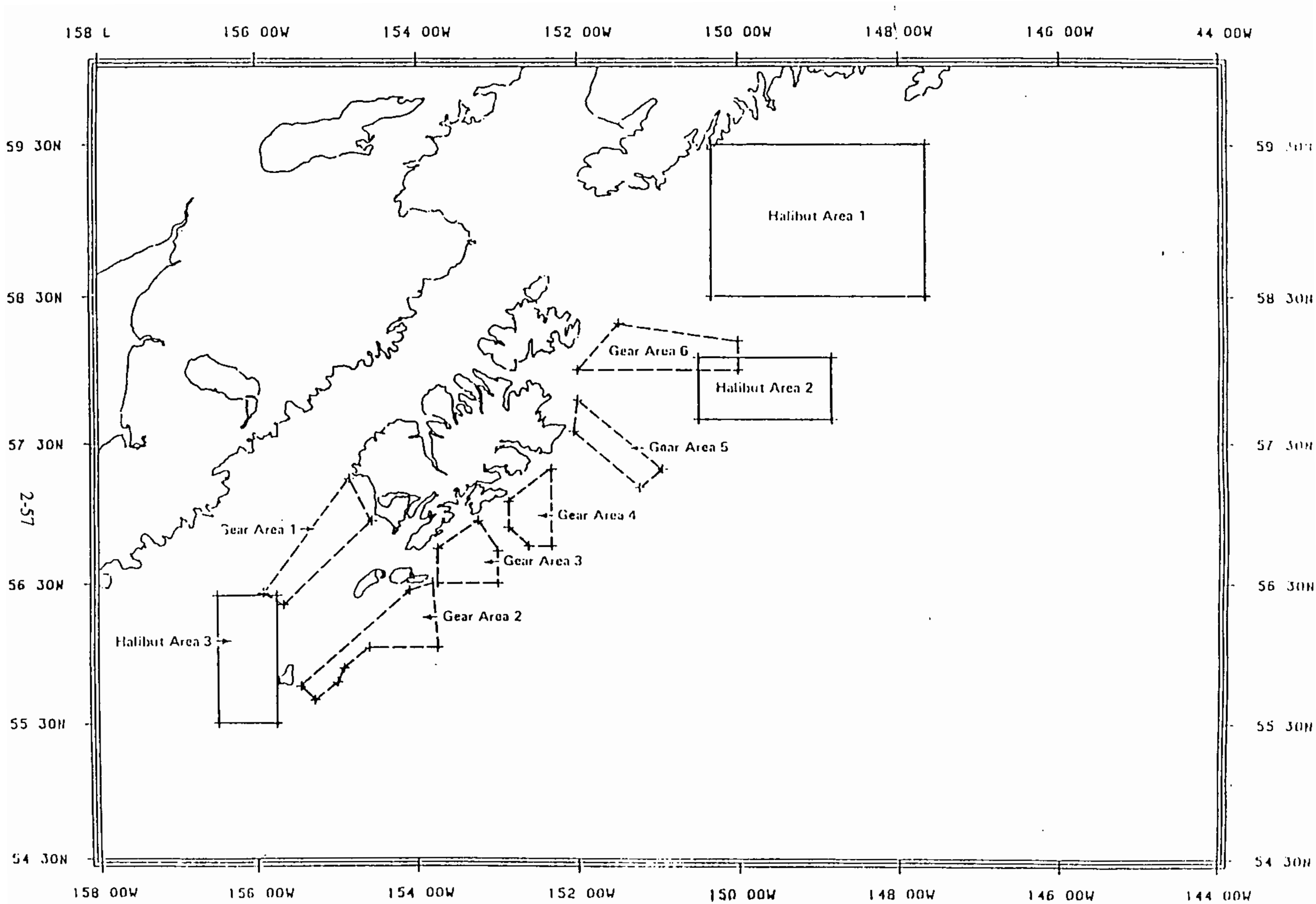
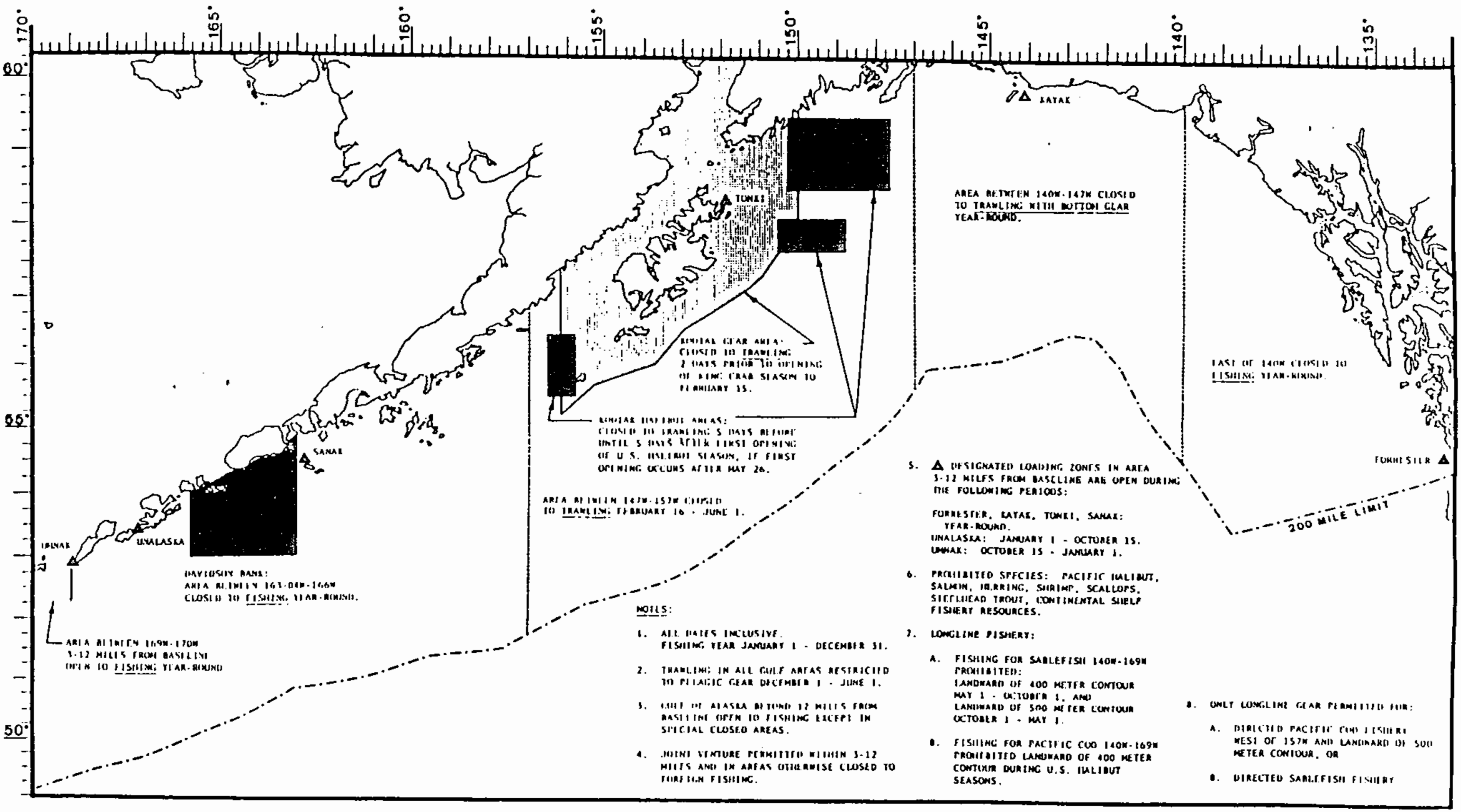


Figure 2.3. Areas in the central and eastern Gulf of Alaska where foreign trawling was restricted.

1982 Foreign Fishing Regulations

GULF OF ALASKA



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MAY 1982

Figure 2.4.

Most of the foreign fishing occurred during the third and fourth quarters, although a catch of 30,334 mt was taken during the second quarter of 1980 (Table 2.7, Appendix 2-C). It appears that there were three areas where fishing occurred - the east side of Kodiak, off the Shumagin Islands, and off Unalaska Island. Alaska Fisheries Science Center triennial bottom trawl surveys have also shown these areas to be quite productive for pollock. Figures 2.5 and 2.6 show CPUE of pollock from the 1987 and 1990 surveys, respectively. Catches of pollock came from gully areas nearshore. The foreign catches seem to show this same pattern although they fished the shelf break, since they were prohibited from fishing near shore.

Pacific cod (Gadus macrocephalus)

Appendix 2-D shows the fishing locations of the foreign longline fleet targeting on Pacific cod for the years 1980-1986. As with the charts in the other appendices, catches shown are in hundreds of metric tons, with catches greater than or equal to 500 mt encircled. Foreign longliners were required to fish beyond 12 miles year-round between 140 and 169° W. They were not permitted to target on Pacific cod between 140 and 169° W, landward of the 400 m contour during U.S halibut seasons. West of 157° W only longline gear could be used to target cod landward of 500 m. These restrictions were to prevent the take of juvenile sablefish which are generally distributed shallower than adults, and to prevent hooking mortality on juvenile halibut (NPFMC 1984).

Fishing took place from the area off the Kenai Peninsula to the Shumagin Islands, with most of the catches coming from off Kodiak to the Shumagin Islands (approximately 153-160° W). After 1983, most of the catches came from the Shumagin Islands area. The catches did not appear to show any definite pattern of seasonality. Although in 1982-1984, most of the catches were taken during the first and fourth quarters (Table 2.8). During the summer, cod can be found in shallow nearshore waters which may have prohibited some foreign effort.

2.3.2 Effects of fishing on aggregated stocks

Concentrated fishing effort on aggregated stocks may be attractive to fishermen due to substantially higher catches per unit effort. Additionally, roe taken from pre-spawning fish often has a significant market premium over the flesh of the fish. Concentration of effort on aggregated stocks raises concerns of overharvesting - if the rates of harvest exceed the accounting abilities of managers - and possible disruption of the spawning process.

Pollock

The EA/RIR/IRFA document for Amendment 19 to the Gulf of Alaska Groundfish Fishery Management Plan and Amendment 14 to the Bering Sea/Aleutian Islands Groundfish Fishery Management Plan addresses possible impacts on sustainable catch of roe-season pollock fisheries concentrated in time and space (NPFMC 1990a). Specifically, the effects of timing of harvest, fishing mortality occurring over a short time period, fishing during the spawning season, targeting on females, and localized depletion were discussed.

Pollock harvests concentrated early in the fishing year were not shown to negatively impact the productivity of pollock due to foregone opportunities for feeding and growth. While biomass gained due to growth is greater than biomass lost due to natural mortality up to age 5, biomass lost due to natural mortality exceeds biomass gained from growth after age 5. Since pollock recruit into a fishery at ages 3 - 4, and may remain in the fishery through ages 9 - 10, no gain in productivity was shown to result from fishing later in the year, or spreading the harvest more widely over a fishing year.

Table 2.7. Foreign reported pollock trawl catches by quarter for the Gulf of Alaska (mt).

Year	1st QTR	2nd QTR	3rd QTR	4th QTR	Total
1980	11,351	30,334	36,321	27,783	105,789
1981	17,753	7,124	48,707	54,216	127,800
1982	2,088	13,652	35,403	33,044	84,187
1983	139	5,189	24,678	45,379	75,385
1984	291	4,855	51,147	42,748	99,041
1985	0	0	5,762	17,904	23,666

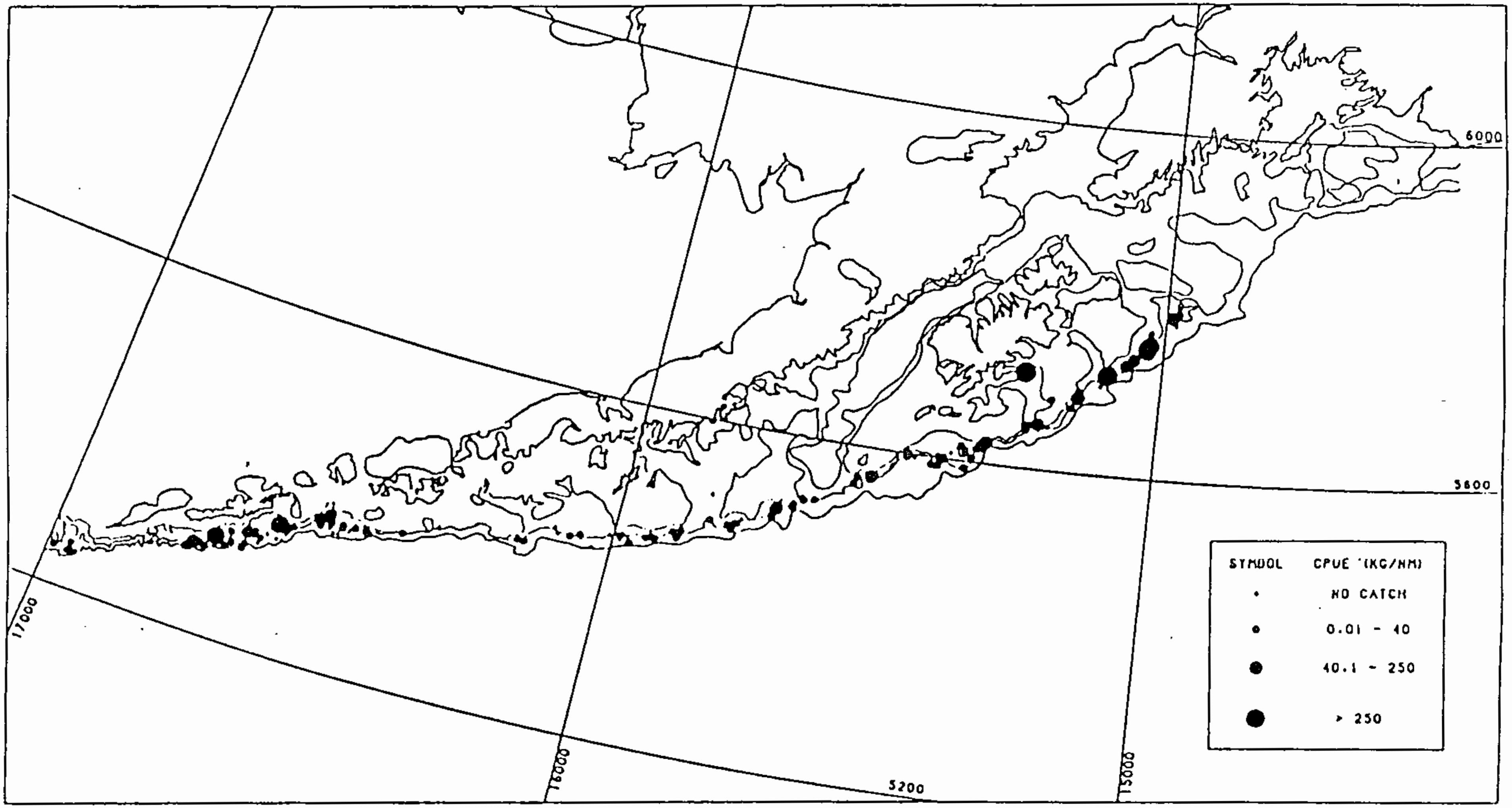
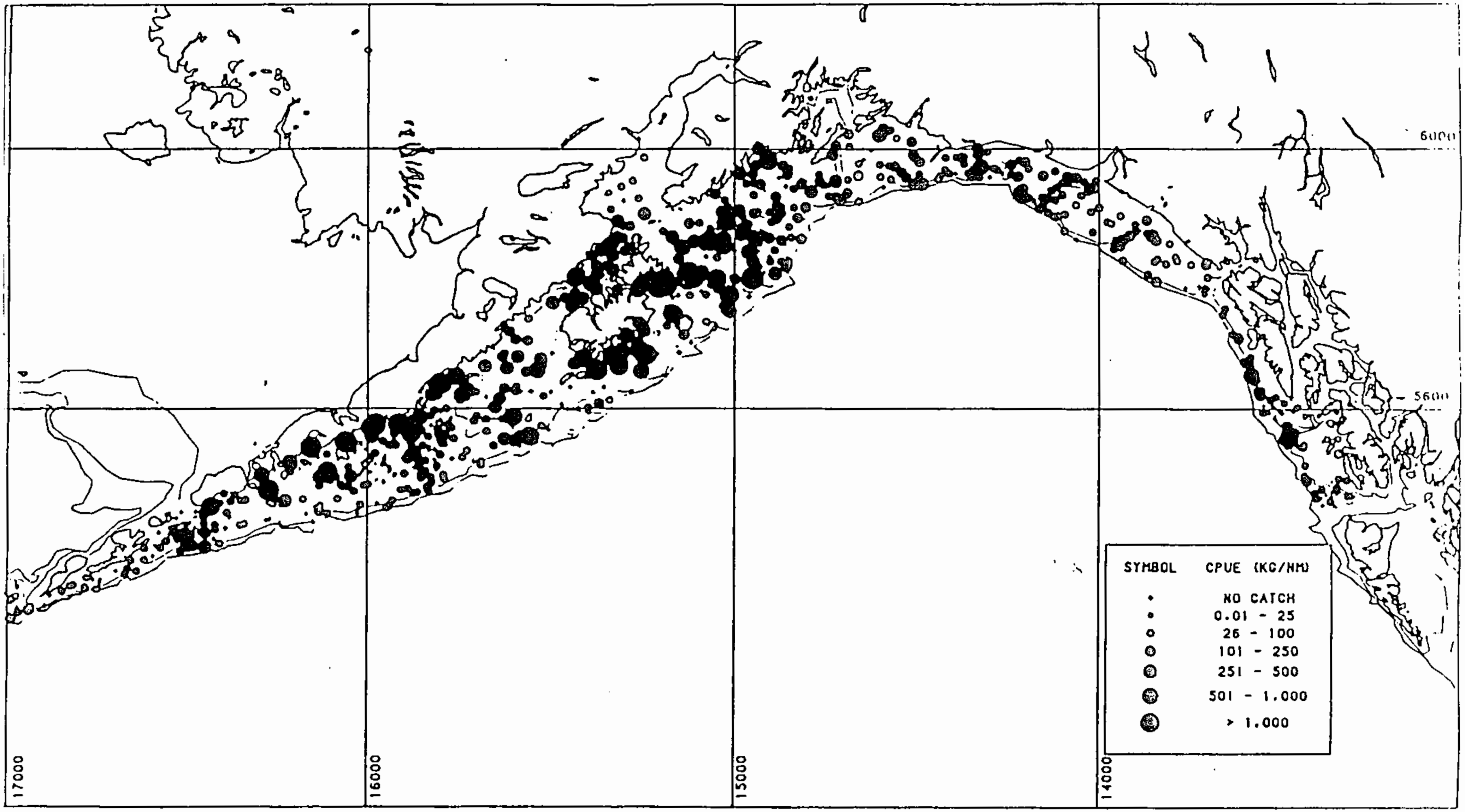


Figure 2.5.--Catch per unit effort (kilograms/nautical mile) of walleye pollock, during the 1987 U.S.-U.S.S.R. cooperative bottom trawl survey of the central and western Gulf of Alaska.



/ALLEYE POLLOCK CPUE (KG/NM) .DURING THE 1990 GOA TRIENNIAL SVY.

Figure 2.6

Table 2.8. Foreign reported Pacific cod longline catches by quarter for the Gulf of Alaska (mt).

Year	1st QTR	2nd QTR	3rd QTR	4th QTR	Total
1980	8,356	7,035	5,813	4,807	26,011
1981	7,680	2,911	6,482	6,037	23,110
1982	7,285	3,249	2,733	8,827	22,094
1983	8,863	3,771	3,082	9,692	25,408
1984	10,524	907	268	2,318	14,017
1985	8,377	533	0	150	9,060
1986	14,868	268	0	0	15,136

Fishing mortality concentrated in short time periods could lead to over-harvesting total allowable catch (TAC) levels, resulting in a reduction in stock productivity through excessive fishing mortality. This would be less a consequence of fishing mortality concentrated in time than a result of accounting and management measures not keeping pace with the rate of harvest. The potential for this to occur has been diminished by the North Pacific Council's domestic observer program and expanded reporting requirements. It has been further reduced by the Council's division of the pollock TAC into equal quarterly allowances in the Gulf of Alaska, and into roe and non-roe seasonal allowances in the Bering Sea/Aleutian Islands under Amendments 19/14. For 1991, the Bering Sea roe season allowance is approximately 34% of the total Bering Sea subarea TAC. No seasonal division was made for the Aleutian Islands subarea TAC of 85,000 mt.

The effects of fishing during the spawning season, and of targeting on females, on stock productivity depends upon the stock-recruit relationship, and specifically on the identity and magnitude of density dependent factors which may influence the number of recruits. The stock-recruit relationship for pollock is poorly understood in both the Gulf of Alaska and the Bering Sea/Aleutian Islands. The existence of a stock-recruit relationship is suggested by the fact that maximum recruitment is observed at intermediate stock sizes. However, the relative importance of density dependent and density independent mechanisms in influencing recruitment are unknown.

Table 2.9 presents recent historical exploitation patterns of pollock generally, and during the spawning months. Harvest during the spawning months has ranged from 7% to 87% of the overall harvest, and from 0.4% to 14.7% of the total exploitable biomass in any given year since 1984.

Localized depletion of discrete stocks or sub-stocks is also a possible consequence of fisheries concentrated in time and space. Available evidence suggests that Gulf of Alaska pollock and eastern Bering Sea pollock are of different stocks (Grant and Utter 1980, Iwata 1975a, 1975b, Johnson 1977). There are indications that two, and possibly three, pollock stocks are present in the Bering Sea (Dawson 1988, Lloyd and Davis 1989, Wespestad et al. 1990), and there may be distinct stocks in the Gulf of Alaska as well (Hollowed and Megrey 1989). At present, there is insufficient information to define discrete localized stocks or their boundaries.

Pacific Cod

Much less is known about spawning aggregations, and related seasonal movements, of cod than of pollock. However, the general biology of the two species is similar. Consequently, the biological issues and points of concern would be expected to be the same for both species. At this point, insufficient information exists to suggest that concentrated fishing effort on spawning aggregations of cod, if it occurs, has a deleterious impact on stocks.

Table 2.10 reviews recent historical harvesting impacts on cod during the spawning months. Since 1984, harvests during the spawning months have ranged from 22.9% to 78.6% of the total harvest, and from 1.4% to 10.4% of the total exploitable biomass.

Harris (1990) reviewed the status of the northern cod stock in the northwest Atlantic. The present depressed state of this stock is attributed to high overall fishing mortality, rather than concentration of fishing mortality during particular times and in particular places, such as during the cod's inshore feeding migrations. Harris found no recorded evidence that fishing during spawning periods is deleterious to cod stocks. However, Harris correctly presented the cautionary note that

> "our state of current knowledge is such that we cannot easily answer the question whether intense fishing on spawning cod populations disturbs either the mating behavior or the spawning process

Table 2.9. Seasonal Exploitation of Walleye Pollock

Area	Year	Biomass (million mt)	Harvest (thousand mt)	Exploitation Fraction (C/B)	Harvest Jan - March (thousand mt)	% Harvest Jan - March	%B Jan - March
GoA	1980	1.148	115	0.10			
	1981	1.97	148	0.08			
	1982	2.28	169	0.07			
	1983	2.129	216	0.10			
	1984	1.853	307	0.17	178	57.98%	9.61%
	1985	1.42	291	0.20	209	71.82%	14.72%
	1986	1.22	84	0.07	57	67.86%	4.67%
	1987	1.613	62	0.04	7	11.29%	0.43%
	1988	1.982	56	0.03	17	30.36%	0.86%
	1989	1.854	67	0.04	58	86.57%	3.13%
	1990	1.625	81	0.05	20	24.69%	1.23%
EBS	1980	4	958	0.24			
	1981	7.54	974	0.13			
	1982	8.36	956	0.11			
	1983	8.51	982	0.12			
	1984	8.35	1,102	0.13	83	7.53%	0.99%
	1985	9.42	1,180	0.13	79	6.69%	0.84%
	1986	8.68	1,199	0.14	227	18.93%	2.62%
	1987	8.83	1,225	0.14	621	50.69%	7.03%
	1988	8.53	1,316	0.15	395	30.02%	4.63%
	1989	7.87	1,277	0.16	303	23.73%	3.85%
	1990	7.7	1,339	0.17	389	29.05%	5.05%

Sources: Bering Sea/Aleutian Islands and Gulf of Alaska 1990 SAFE Documents, PacFIN Reports (1984-1989 monthly landings), NMFS Weekly Production Reports (1990 landings)

Table 2.10. Seasonal Exploitation of Pacific Cod

Area	Year	Biomass (million mt)	Harvest (thousand mt)	Exploitation Fraction (C/B)	Harvest Jan - March (thousand mt)	% Harvest Jan - March	%B Jan - March
GoA	1980	0.618	35	0.06			
	1981	0.589	36	0.06			
	1982	0.57	29	0.05			
	1983	0.552	36	0.07			
	1984	0.528	23	0.04	14	60.87%	2.65%
	1985	0.519	14	0.03	11	78.57%	2.12%
	1986	0.522	25	0.05	18	72.00%	3.45%
	1987	0.514	31	0.06	7	22.58%	1.36%
	1988	0.501	32	0.06	14	43.75%	2.79%
	1989	0.488	42	0.09	16	38.10%	3.28%
	1990	0.467	68	0.15	30	44.12%	6.42%
EBS	1980	0.905	46	0.05			
	1981	0.905	52	0.06			
	1982	1.02	55	0.05			
	1983	1.276	83	0.07			
	1984	1.002	112	0.11	28	25.00%	2.79%
	1985	0.961	133	0.14	37	27.82%	3.85%
	1986	1.134	131	0.12	38	29.01%	3.35%
	1987	1.142	143	0.13	60	41.96%	5.25%
	1988	0.96	193	0.20	94	48.70%	9.79%
	1989	0.96	165	0.17	68	41.21%	7.08%
	1990	0.714	175	0.25	74	42.29%	10.36%

Sources: Bering Sea/Aleutian Islands and Gulf of Alaska 1990 SAFE Documents, PacFIN Reports (1984-1989 monthly landings), NMFS Weekly Production Reports (1990 landings) of the aggregate. Nor can we be sure that fishing on large spawning aggregates will not lead to localized depletions so that overfishing of particular spawning groups may lead directly, in the short term, to shortages of fish in particular inshore areas...That is to say, we cannot give anything like a definitive answer until we know a great deal more about the nature of the spawning subgroups, their aggregational patterns from year to year, the manner in which recruitment to such groups is affected, and the nature of their feeding and spawning migrations."

This admonition is equally appropriate to the evaluation of concentrated fishing on aggregations of pollock and cod of the Bering Sea/Aleutian Islands and Gulf of Alaska.

2.3.3 Analysis of the Alternatives

The alternatives being considered by the Council were described in Sections 1.3.1 through 1.3.8. Total removals of cod or pollock are controlled by the Council's annual process for setting TACs for the groundfish species of the Gulf of Alaska and the Bering Sea and Aleutians. None of the alternatives to the status quo would alter that process. To the contrary, it may be argued that subdividing the pollock and cod quotas between industry sectors, as called for in several of the alternatives, may enhance the ability of NMFS to control overruns of the TAC. The more segmented the TAC, the less probability there is for a gross overrun of the total annual TAC, and the more potential there is for emergency adjustment of fishing patterns to ensure that the resource will not be overfished. Accuracy of quota monitoring is also expected to increase as better estimates of discards are obtained through the domestic observer program and revised product recovery rates lead to improved estimates of the round weight of retained catch.

Of particular interest is the first quarter harvest on aggregated spawning stocks. The Council already has sought to control fishing on spawning stocks in previous amendments to the Bering Sea and Aleutian groundfish plan by establishing a roe pollock TAC for January 1 to April 15, and a non-roe season thereafter commencing June 1. Additional measures to control harvest of Bogoslof pollock stocks have been implemented for 1991 and beyond. None of the alternatives considered in this analysis of inshore-offshore allocations would change the total removals that may come from the spawning stocks.

The provisions for an inshore operational area in the BSAI in Alternative 8 (Preferred Alternative) will impact which sector receives the fish, but not necessarily the total amount taken in the inshore operational area during the critical first quarter spawning period. The following table compares the combined DAP and JV first quarter harvests during 1987-1990 from the operational area with prospective shares of harvest under Alternative 8 (all in metric tons and rounded for comparative purposes):

	Inshore	Offshore	JV	Total
1987	10,000	7,000	392,000	409,000
1988	35,000	37,000	256,000	328,000
1989	47,000	133,000	53,000	233,000
1990	60,000	278,000		338,000
Year 1	146,000	187,000		333,000
Year 2	166,000	172,000		338,000
Year 3	187,000	158,000		345,000

The joint venture catches in the operational area in 1987 and 1988 provide benchmarks for the range of highest harvest from that area (refer to Table 2.4). Previous foreign harvests were precluded from that area (refer to Table 2.2). The DAP harvest in 1990 in the inshore area in the first quarter was within that range. The projected catches under Alternative 8 also fall within that range and are very close to the 1990 DAP catch. The projections--considered upper limits to removals based on recent TACs--are calculated assuming the following: (1) roe season pollock quota is 441,500 mt as in 1991; (2) inshore operators will continue to take about 94% of their roe quota in the zone as shown in Table 2.5; and (3) offshore operators will take 65% of their roe season quota in the inshore operational area as allowed under Alternative 8.

These projections indicate that total removals from pollock spawning stocks in the inshore area will remain generally unchanged and well within the range of catches in recent years. Without the ceiling imposed by Alternative 8 on the amount available to inshore operators, harvest in that area could intensify as fishing operations affiliated with the inshore sector developed in the coming years. They have been shown to rely much more heavily on the inshore operational area than the offshore fleet during all quarters of the year.

2.3.4 Bycatch

Bycatch of halibut, red king crab, and C. bairdi Tanner crab in the BSAI groundfish bottom trawl fisheries are limited by caps, portions of which are allocated to specific directed fisheries. In the Gulf of Alaska, crab are protected by closed areas in the vicinity of Kodiak Island, and halibut bycatch caps set by the Council apply to bottom trawl and longline groundfish fisheries. It is anticipated that the total removals of prohibited species would not be exceeded under any of the alternatives due to the bycatch caps. However, the rates at which these caps are attained would likely change if fishing patterns are altered. Briefly, if any of the alternatives lead to increased effort in certain areas or during certain times, it can be expected that bycatch caps would be reached in shorter time periods. This could severely constrain or even shut down fisheries, thereby preventing the attainment of the intended allocations, and effectively reapportioning the initial allocations of directed quota between inshore and offshore sectors.

The current groundfish fisheries are already constrained by bycatch. During 1990, Gulf fixed and trawl fisheries were closed on May 29 and November 21, respectively, after reaching their halibut caps. In the 1991 Bering Sea fishery, the first quarter primary halibut allowance was reached for the DAP "other fishery". As a result, directed fishing for pollock and Pacific cod was prohibited by vessels using non-pelagic trawl gear in Zones 1 and 2H as of February 17. Zone 2H (equal to reporting area 517) is approximately equivalent to the top half of the proposed Bering Sea inshore operational area. The secondary first quarter halibut allowance was reached on March 8, which then closed down the entire Bering Sea and Aleutian Islands to the DAP "other fishery".

Fixed gear is not constrained by bycatch caps in the BSAI groundfish fishery. Consequently, any allocation decision made by the Council which has the effect of increasing the proportion of cod taken by fixed gear may lead to an increase in total halibut bycatch (in longline fisheries) and total crab bycatch (in pot fisheries).

The Bering Sea inshore operational area proposed by the Council overlaps slightly with the region of high red king crab concentrations in Bristol Bay (Stevens and MacIntosh 1989). If an inshore operational area is adopted, and if such a measure displaces bottom trawl effort by the offshore processing sector further to the north and west, this sector may have diminished need for red king crab bycatch allowances and increased need for C. bairdi Tanner crab bycatch allowances. Without adequate and species specific bycatch allowances, initial directed fishery allocations may not be attainable.

During the 1991 mid-water pollock fishery in the Bering Sea, very high bycatches of chinook salmon occurred in area 517. There are currently no PSC limits for salmon in the Bering Sea. It is noted that salmon bycatch problems tend to occur intermittently. In the foreign groundfish fishery, there was no consistent pattern to where and when salmon bycatch occurred (pers. comm., Russell Nelson, AFSC).

Herring bycatch may also be a concern in future fisheries in the BSAI. For 1991, annual herring PSC limits are proposed. Two Summer Herring Savings Areas and one Winter Herring Savings Area (Fig. 2.7.) would be closed to specified fisheries when a fishery attains its herring bycatch allowance. The Summer Herring Savings Areas fall almost entirely within the proposed inshore operational area. Summer Herring Savings Area 1 would be closed from June 15 to July 15 of a fishing year, and Summer Herring Savings Area 2 would be closed from July 1 through August 15 of a fishing year.

In the Gulf of Alaska, bycatch caps do not apply to pot gear fisheries targeting Pacific cod. No impacts to the crab or halibut populations are foreseen under any allocational alternative under consideration unless the Council's decision stimulates substantial additional effort by fishermen using pot gear for Pacific cod. However, the rates at which the bycatch caps are reached could be greatly altered under any of the alternatives, and due to other regulations in place for 1991.

In the summer, pollock and cod are found at the same shallow water depths as halibut. Increased bottom trawl effort during this time would likely encounter halibut bycatch. During the winter, Pacific cod are found in shallower water than halibut, but the directed cod fishery still encounters some halibut bycatch. The Council has recommended that a proportionally larger halibut PSC be available to support trawl fishing during the first and second quarters of 1991. During this time, substantial trawl effort is expected to be directed at Pacific cod after the pollock trawl fishery is closed. The Council has also recommended that the second quarter pollock fishery in the Gulf of Alaska be delayed until June 1, when the Bering Sea pollock fishery will reopen. Should the Secretary implement the Council's recommendation, trawl fishing effort would likely be directed at Pacific cod, flatfish, and rockfish before June 1. Halibut bycatch mortality while trawling for deep-water species of flatfish and rockfish could be higher and require a larger proportion of the halibut seasonal allocation during this time period.

Impacts of the Alternatives on fleet operations and bycatch are discussed further in Section 3.4.5.

2.3.5 Marine Mammals

Types of interactions between marine mammals and commercial groundfish fisheries in the Bering Sea/Aleutian Islands have been divided into direct and indirect effects:

(a) Direct effects on marine mammals from shooting, harassment, disturbance, incidental entanglement during fishing operations, and/or entanglement in lost or discarded fishing gear.

(b) Indirect effects on marine mammals caused by fisheries reducing the quantity or quality of prey species available to marine mammals.

Direct effects on marine mammals: Loughlin and Jones (1984) characterized and ranked direct interactions between marine mammals and groundfish fisheries. They identified problems with incidental take, catch loss, and gear damage between groundfish trawl fisheries and northern fur seals, northern sea lions, and harbor seals. There has also been great concern about the entanglement of northern fur seals in derelict net fragments from the trawl fishery (Fowler, 1987). Loughlin and Jones (1984) and Steiner (1987) further described problems with catch loss, gear damage, and harassment or killing of northern sea lions

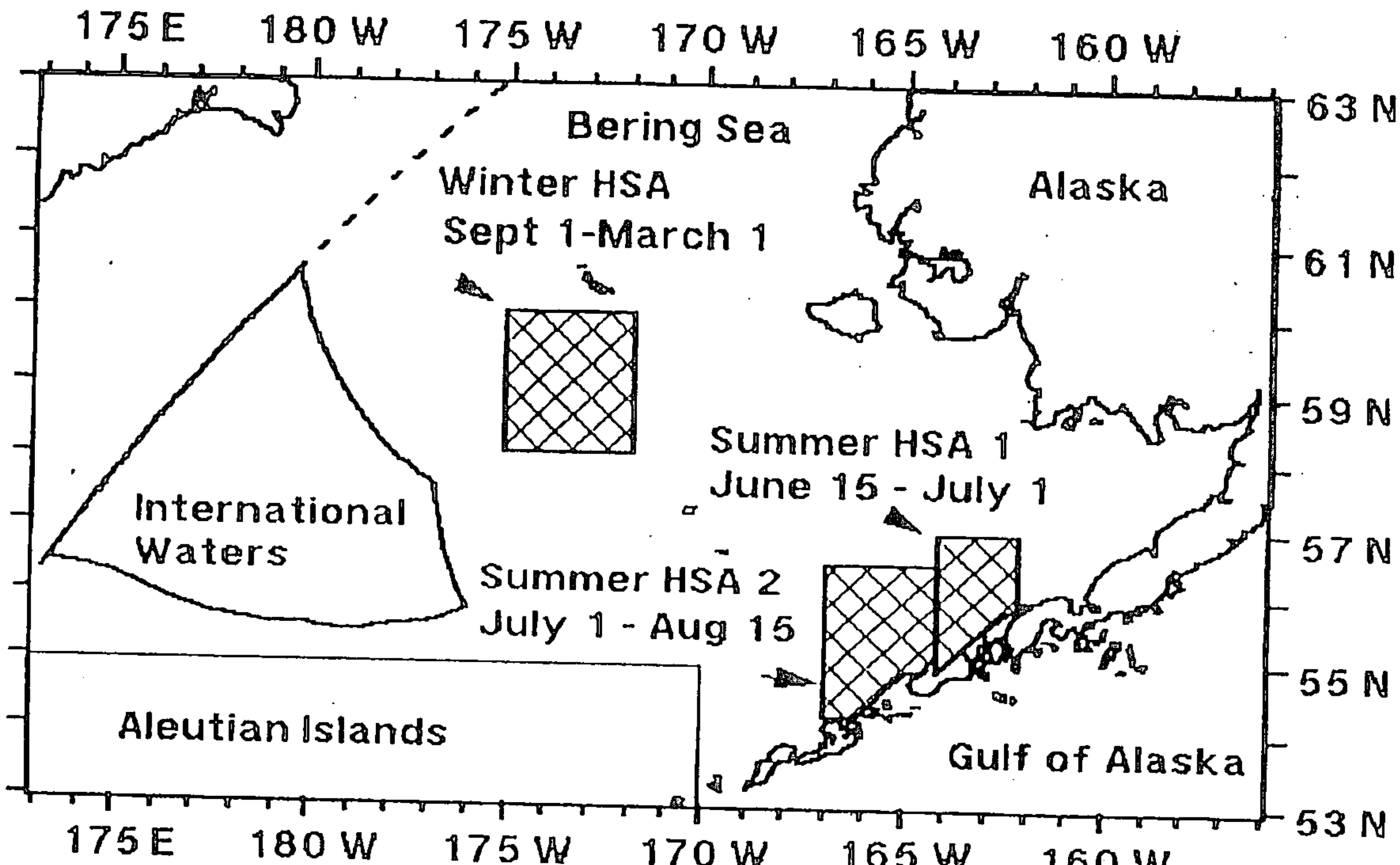


Figure 2.7. Herring Savings Areas (HSAs) in the Bering Sea and Aleutian Islands Area.

and killer whales in longline fisheries. There also have been reports of walrus caught in trawls in Bristol Bay and concern about walrus being displaced by air and water borne noise, both problems associated with the yellowfin sole/other flatfish fishery.

Under the Marine Mammal Protection Act of 1972,incidental taking of some marine mammals in the groundfish fisheries has been allowed by issuance of Certificates of Inclusion to fishermen covered under a general permit. Marine mammals, particularly northern sea lions, have been caught incidentally in foreign commercial trawl fisheries in the Bering Sea and Gulf of Alaska since about 1954 when those fisheries expanded. Northern sea lions are the predominant species incidentally caught in commercial trawl fisheries (Loughlin et al., 1983; Loughlin and Nelson, 1986). Many northern sea lions incidentally caught during fishing operations are alive when brought aboard vessels (up to 34% in 1979); however joint venture fisheries composed of U.S. trawlers catching and selling fish to foreign processors experience nearly 100% mortality of caught sea lions (Loughlin and Nelson, 1986). During the period 1978-81 the estimated average annual take of northern sea lions by foreign vessels was 724 animals (Loughlin et al., 1983). In a walleye pollock joint venture fishery in Shelikof Strait, Alaska, the estimated number of mortalities resulting from incidental catch ranged from 216 to 1,436 during January to April 1982 to 1984 (Loughlin and Nelson, 1986).

Information on the abundance of net fragments in both the pelagic waters of the Pacific Ocean and Bering Sea, and on beaches, as well as on the incidence of fur seal entanglement in such debris has been collected. Data for fur seal entanglement has been collected since the mid 1960's. A comparison of this information with recent trends in population levels of northern fur seals (Fowler, 1982, 1987) suggests that entanglement-induced mortality of young seals may largely account for recent population declines. Such a conclusion has been contested, however, by York and Kozloff (1987) since pupping rates stabilized on St. Paul Island from 1981 to 1986 even though entanglement rates had presumably remained the same; if entanglement were the source of population decline, then pupping rates on St. Paul would be expected to have continued their decline.

Entanglement of northern sea lions is less evident and appears to be insufficient to account for a substantial decline in sea lion numbers in the Aleutian Islands (Loughlin et al., 1986), although, assessment of juvenile sea lions has been difficult and the data inadequate to evaluate whether juvenile mortality due to entanglement is significant. The extent of harassment and killing of northern sea lions is not well documented, although it is known that sea lions have been shot as nuisances (Merrick et al., 1987).

Trawl catch of walrus has been reported by the foreign observer program of NMFS, however all animals observed in 1986 and 1987 were dead, with a large proportion of them already decomposing. Trawl fisheries apparently are capturing carcasses rather than live animals (R. Nelson, NWAFC, pers. comm.). In 1989, the Council implemented 12-mile buffer zones in northern Bristol Bay to protect identified haul-out sites for walrus. It was the opinion of the Council that these areas closed to trawl fishing would reduce the noise which disturb walrus. Since 1989, the joint venture fishery for yellowfin sole has ended with the growth of other domestic groundfish fisheries. However, as domestic markets for yellowfin sole develop, it is anticipated that domestic trawl activity in northern Bristol Bay will increase.

<u>Indirect effects on marine mammals</u>: Considering that several marine mammals rely upon groundfish for an important proportion of their diet, there is concern that commercial harvests of groundfish can impact these animals. In relation to groundfish fisheries interactions, Lowry (1984) ranked northern fur seals, northern sea lions, and harbor seals as most likely to be adversely affected, but recognized that such affects have not been documented.

A Council decision to allocate pollock or Pacific cod between inshore and offshore users, could result in increased vessel traffic to and around coastal communities. This vessel activity which increases the potential for disturbance of marine mammal rookeries and haul-out sites. Chances of encountering a marine mammal during fishing related activity, could increase as a result of these animals becoming accustomed to the non-threatening presence of vessels. St. Paul, the primary rookery area for fur seals, and Akutan which is located near the area of large sea lion rookeries, are two ports where marine mammal interaction are likely to increase. Should future problems be identified, establishment of traffic lanes or other measures could be implemented to reduce the frequency of interactions.

Northern fur seals have suffered a decline in population, as indicated by reduced numbers of pups and large males on the Pribilof Islands, since the 1950-60s. Although some type of trophic interaction, mediated through pollock as prey, has been suspected as a cause of this decline, evidence such as high individual growth rates suggests that food limitation is not a problem for fur seals (Fowler, 1982). In fact, Swartzman and Haar (1983) examined the extensive data base available on northern fur seals and noted that pollock comprised an even larger portion of the Pribilof fur seal diet after the commercial fishery for pollock was initiated. Given that fur seals feed mostly on small (1-2 year old) pollock (Frost and Lowry, 1986) before their recruitment to the fishery, and that the fishery acts to shift the size distribution of pollock toward smaller, younger fish, commercial harvest of pollock may actually increase the food available to fur seals (Swartzman and Harr, 1983).

There is less information on northern sea lions. Some of the fish upon which this species depends are smaller than taken in commercial fisheries, others are not (Frost and Lowry, 1986; Merrick et al., 1987); the mean length reported by Frost and Lowry 1986) being 29.3 cm.

It is noted that harbor seals are also significantly reduced in numbers at the present time. Compared to other species, even less information is available on harbor seals and their the diet. Their dependance on some small fish may preclude complete direct competition with the groundfish fisheries (Pitcher, 1980; Frost and Lowry, 1986), however the mean length of fish consumed reported by Frost and Lowry (1986) was 24.5 cm. and more than 50% of the fish consumed, especially by weight, are within the size range taken by commercial fisheries.

In summary, as stated by Lowry and Frost (1985), and reiterated more recently in the May 14, 1991, environmental analysis of Amendment 17/22 to the groundfish plan, there is no conclusive evidence that fisheries in the Bering Sea/Aleutian Islands affect marine mammal populations through depletion of food supply. Smaller average sizes and younger average ages of pollock stocks in the Bering Sea caused by fishing may be beneficial to those species of pinnipeds which eat primarily small pollock. On the other hand, major declines have been documented in population sizes of fur seals, sea lions and harbor seals in the Bering Sea and Gulf of Alaska. These are the species that Lowry (1984) considered most likely to be affected by commercial fisheries in that area. Until such time as the causes of these declines are conclusively identified, the possibility that fisheries are a causative or contributing factor cannot be ruled out.

Available data are not adequate to characterize the diets of these and many other marine mammal species to assess whether populations have been or will be affected by commercial groundfish fisheries. It should be noted however, that physiological studies conducted on sea lions during the summer of 1991 showed that pups observed at nine sites in the area from southeastern Alaska through the Aleutian Islands generally appeared healthy and without signs of anemia or malnourishment (reported in September 1991 preliminary Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region as Projected for 1992). Additionally, the Draft Legislative Environmental Impact Statement (June 1991) , completed by NMFS on proposed amendments to the Marine Mammal

Protection Act, discusses only incidental takes in commercial fisheries, subsistence harvests and entanglement in marine debris as possible reasons for the decline in sea lions. The DLEIS remains silent on the issue of food depletion as a cause of marine mammal declines because there are no data to substantiate that conclusion.

Though the decline of Northern sea lion populations may be unknown, there is still reason to be greatly concerned. NMFS listed this species as "threatened" under the Endangered Species Act on November 26, 1990. The rule implemented protective measures including a ban on the discharge of firearms around sea lions, buffer zones around rookeries, and an incidental take quota of 675 animals in commercial fishing operations. A Stellar Sea Lion Recovery Team has been established to prepare a recovery plan which will describe measures for enhancement of these populations.

The North Pacific Fishery Management Council is considering measures for 1992 that will continue to restrict fishing operations to protect Northern Sea lions. These measures include separate quotas for pollock in the Western and Central areas of the Gulf of Alaska, restrictions on how much pollock may be taken in a quarter, and no-trawl 10-mile buffer zones around rookeries. These are overlaid on the other protective measures noted above.

Endangered Species Act. On April 19, 1991, the NMFS completed formal Section 7 Consultation on the Bering Sea and Aleutian Islands FMP and its fishery. The biological opinion issued for that consultation concluded that the FMP and fishery are not likely to jeopardize the continued existence and recovery of any endangered or threatened species under the jurisdiction of the NMFS.

2.3.6 Effects on Coastal and Marine Habitat

None of the alternatives is expected to result in identifiable increases in adverse impact on habitats of the Bering Sea and Aleutian Islands or the Gulf of Alaska. There has been speculation that increasing activity in the inshore environment could lead to degradation of the marine habitat. However, increased adverse impacts are not as much directly related to the volume of fish processed, as to how the fish waste is disposed of.

NMFS recently has studied the benthic environment of Chiniak Bay which is a dump site for fish wastes from Kodiak processors. The study was conducted using a submersible between April 14 and May 1, 1991, and samples were taken at depths of 300 ft to 600 ft to study the impacts of fish waste that had been dumped as recently as 6 months, one month, one week, and one day, as well as directly under a dumping barge. These observations were compared with a control site in Monashka Bay. Initial comparisons indicate that flounders and hermit crabs were more abundant in Chiniak Bay, whereas pink shrimp were more abundant in Monashka Bay. The dumping did not seem to have any detrimental effect on Tanner crabs, which were found in a highly concentrated mating aggregation in the middle of Chiniak Bay.

When fish waste was first dumped, thousands of seagulls appeared to consume a large portion of the more buoyant materials. Heavier parts sank quickly to the bottom. Medium sized pieces, including recognizable pieces of gills, skin, fins and viscera, filtered down to the bottom over about half an hour. Flounders and sculpins moved in on top of the debris immediately and consumed some. Other predators such as octopus and sea stars were observed eating debris that was at least several days old. Sand fleas also were attracted to the area. In areas where dumping had occurred several days previously, gray, perhaps bacterial, mats were seen surrounding decomposing waste, and bones devoid of flesh were common. Throughout the entire sampled area of Chiniak Bay, old brown fish bones were common on top of the sediment, probably representing the final stage of decomposition from years of dumping.

Debris was not observed to collect in any location except during the short term of actual dumping. Long term accumulation was not observed.

Dissolved oxygen levels were all generally above 95% saturation in surface samples and greater than 80% in bottom samples. The study preliminarily concluded that dumping had not impacted the bay adversely in terms of water quality, although it may have contributed to slight differences in species composition. Apparently, complete decomposition of organic material dumped into 500 ft of water occurs in 3-12 months.

In contrast, there have been recent news articles about the impacts of fish waste piped in to marine areas surrounding Dutch Harbor processing sites. These occurrences are being investigated by the U.S. Environmental Protection Agency and may require changes in the treatment of the wastes.

Under any of the alternatives, the disposal of fish wastes and the impacts on the marine and coastal environment could result in different degrees of degradation depending on the depth and current regime of the receiving area. If there are strong currents to broadcast the waste and maintain sufficient dissolved oxygen, the wastes will not be a problem. If the dynamics of the receiving area, whether it be inshore or offshore, are such that wastes smother an area and lead to an anaerobic environment, then operating patterns will need to be changed.

Nothing in any of the alternatives inherently will cause a critical or irreversible environmental problem. Operations and dumping practices will need to be monitored by the appropriate agencies and changed if proven to be detrimental to the environment. This will need to be done on a case-by-case basis.

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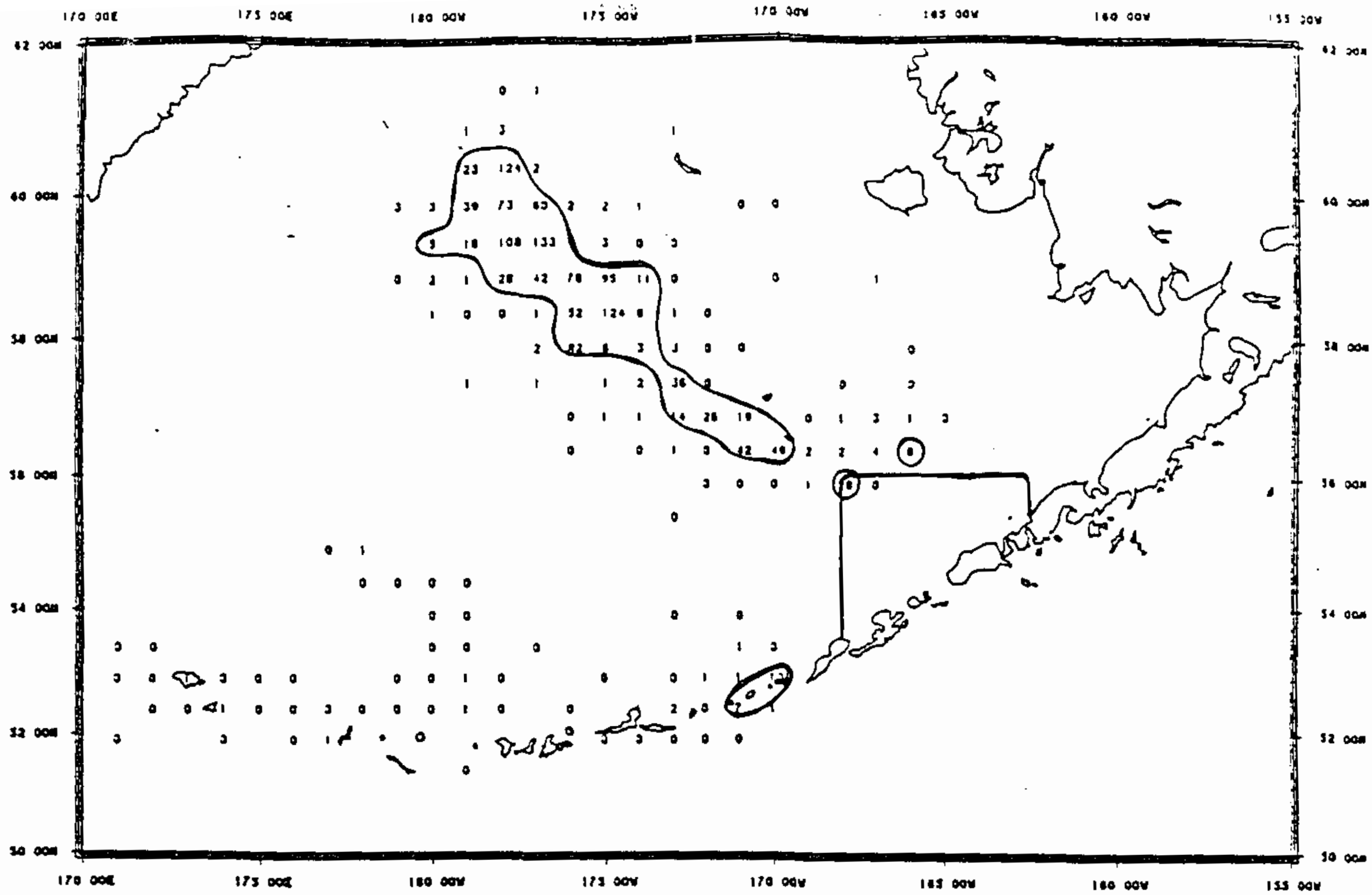
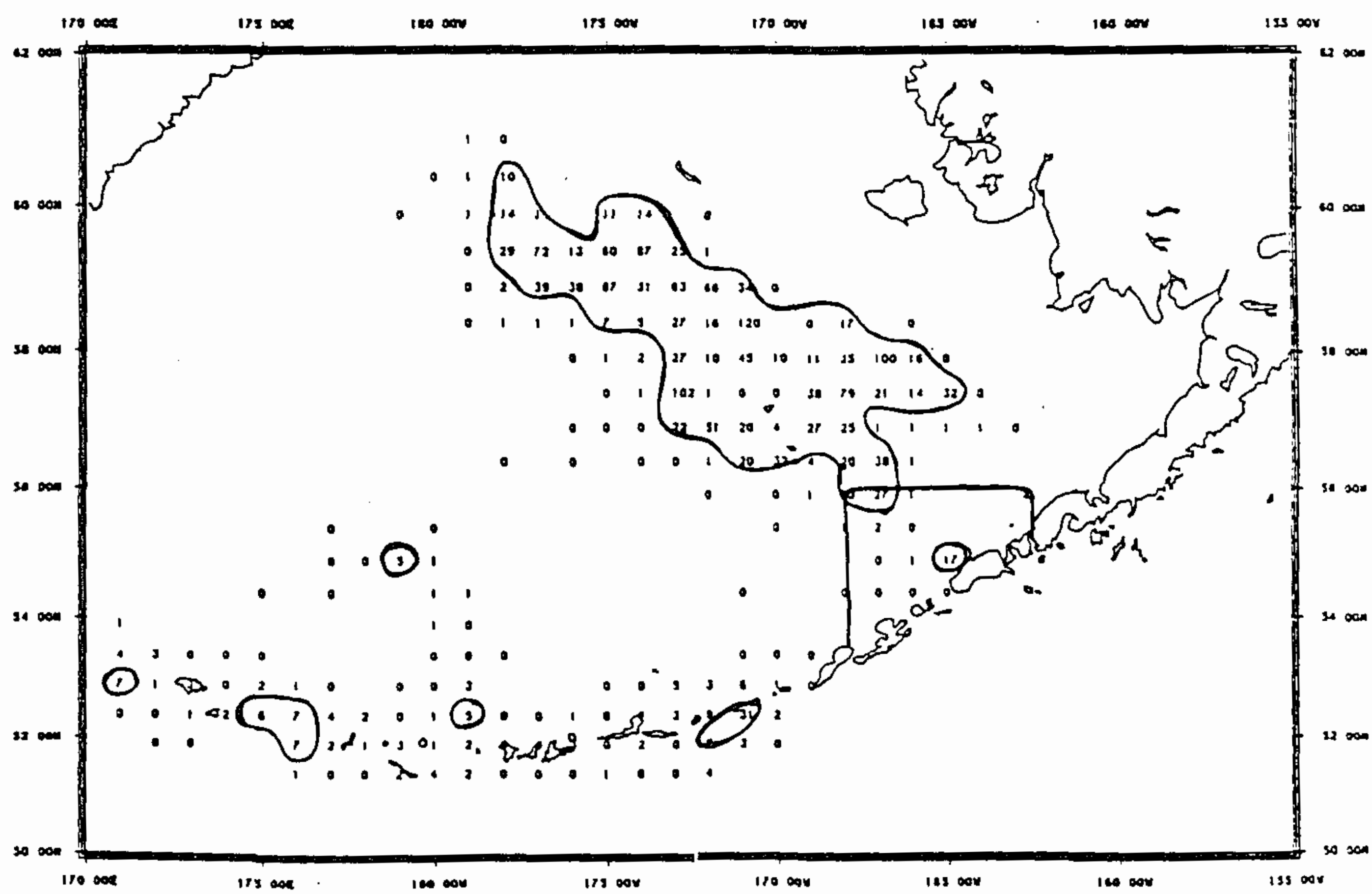
APPENDIX 2-A

Foreign Trawl Harvests of Walleye Pollock in the BSAI:

1980 - 1985



1980 FIRST QTR POLLOCK. FOREIGN REPORTED CATCHES



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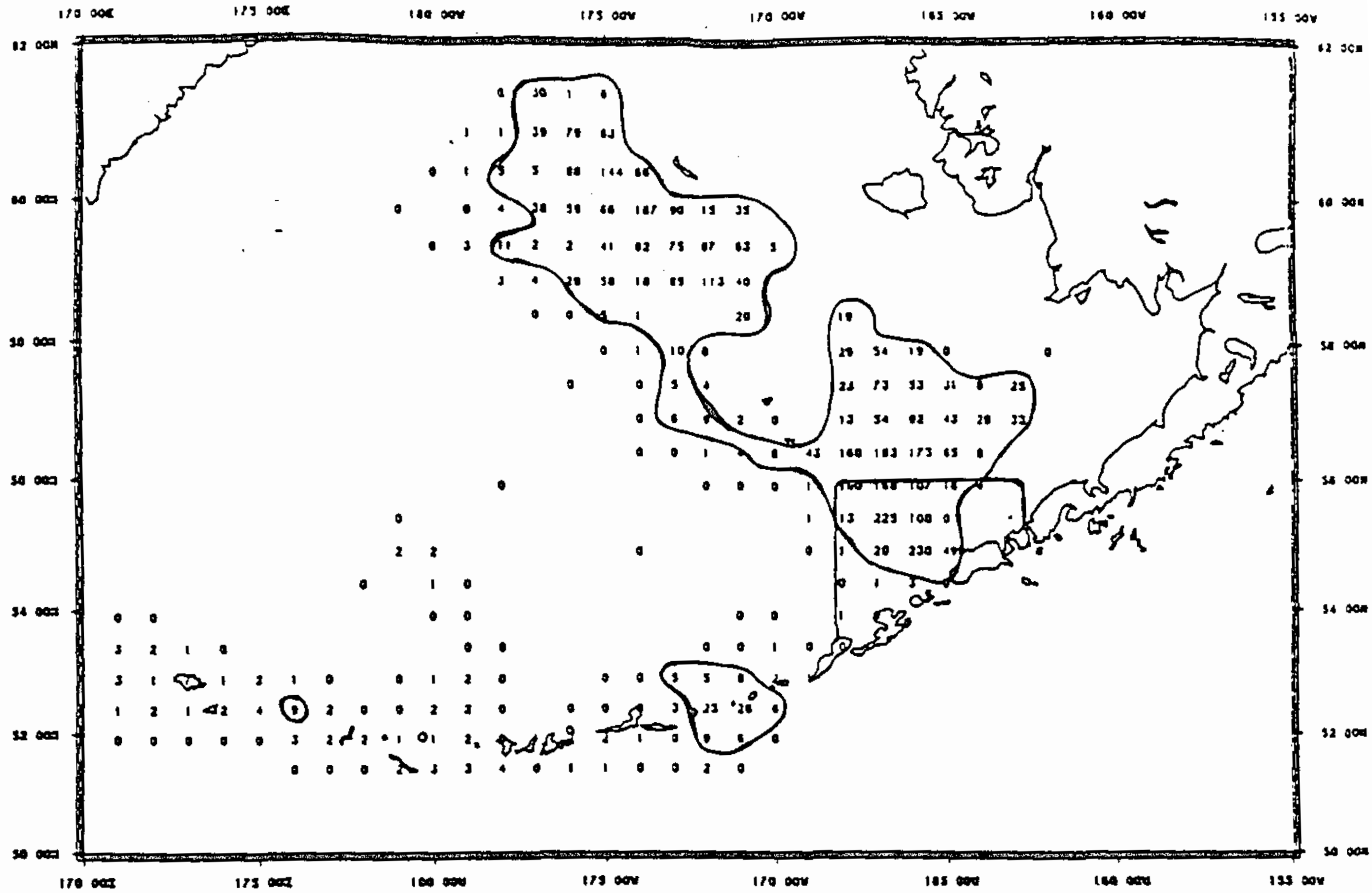
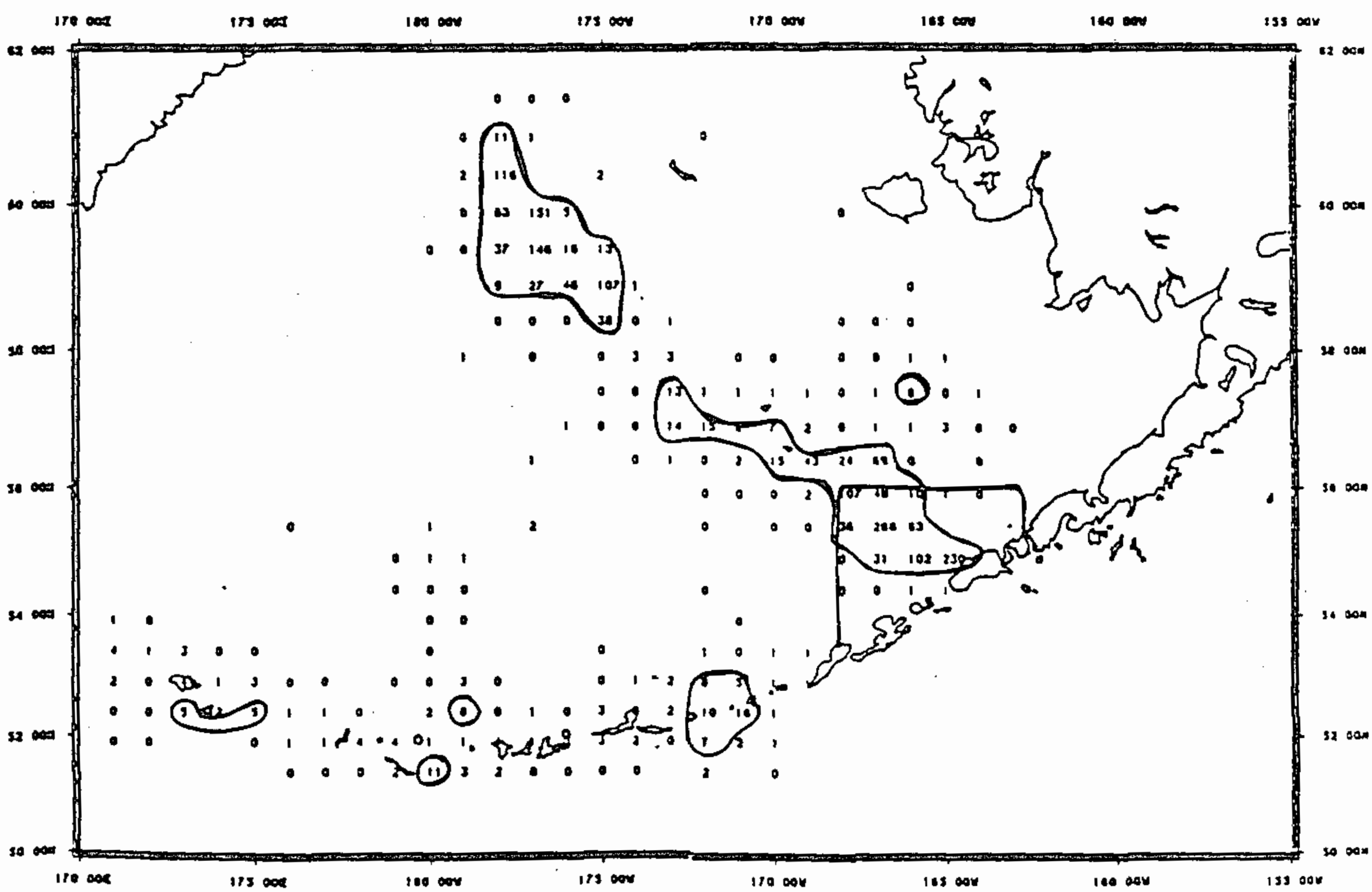


1980 3RD QTR POLLOCK, FOREIGN REPORTED CATCHES



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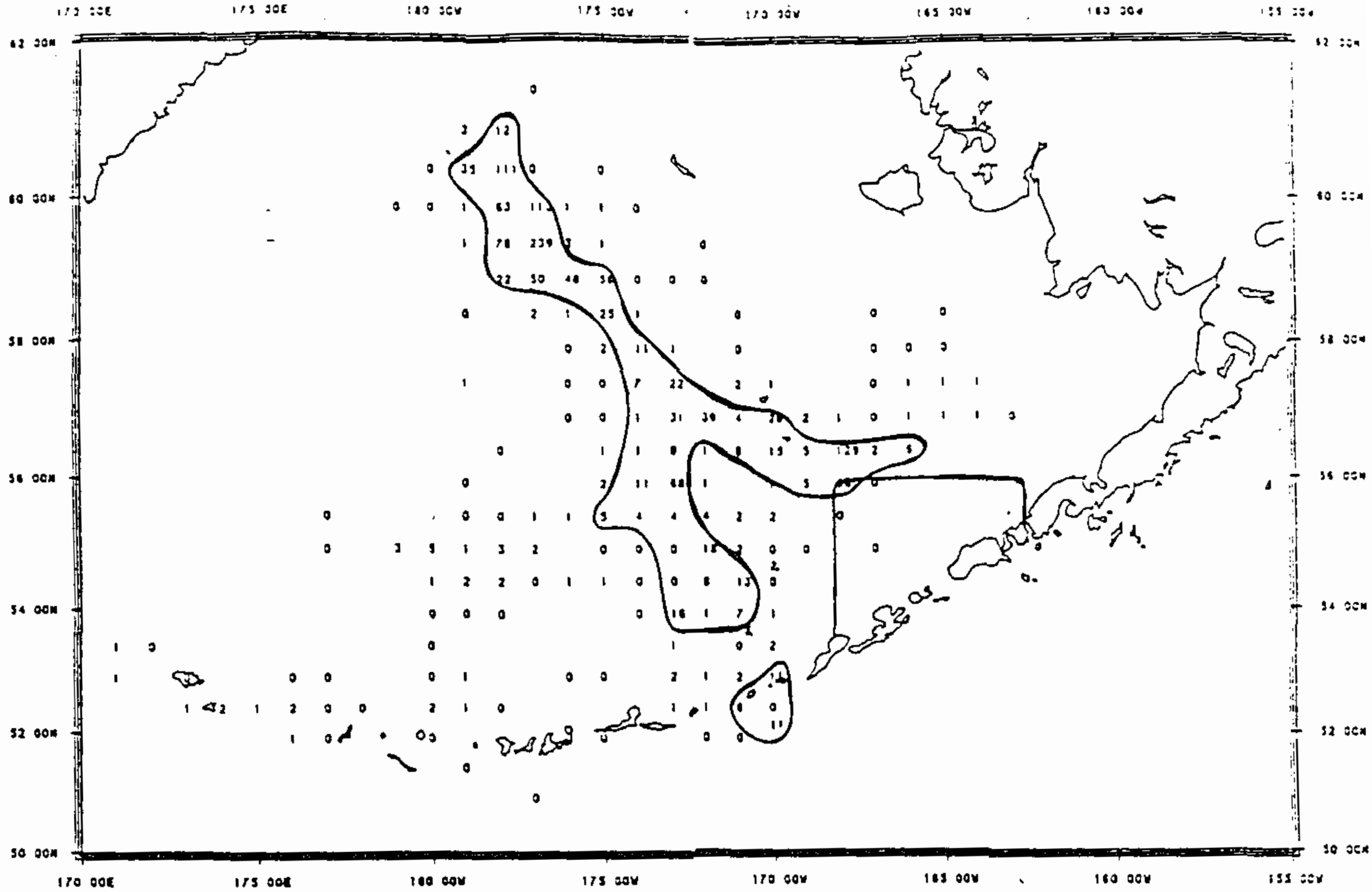

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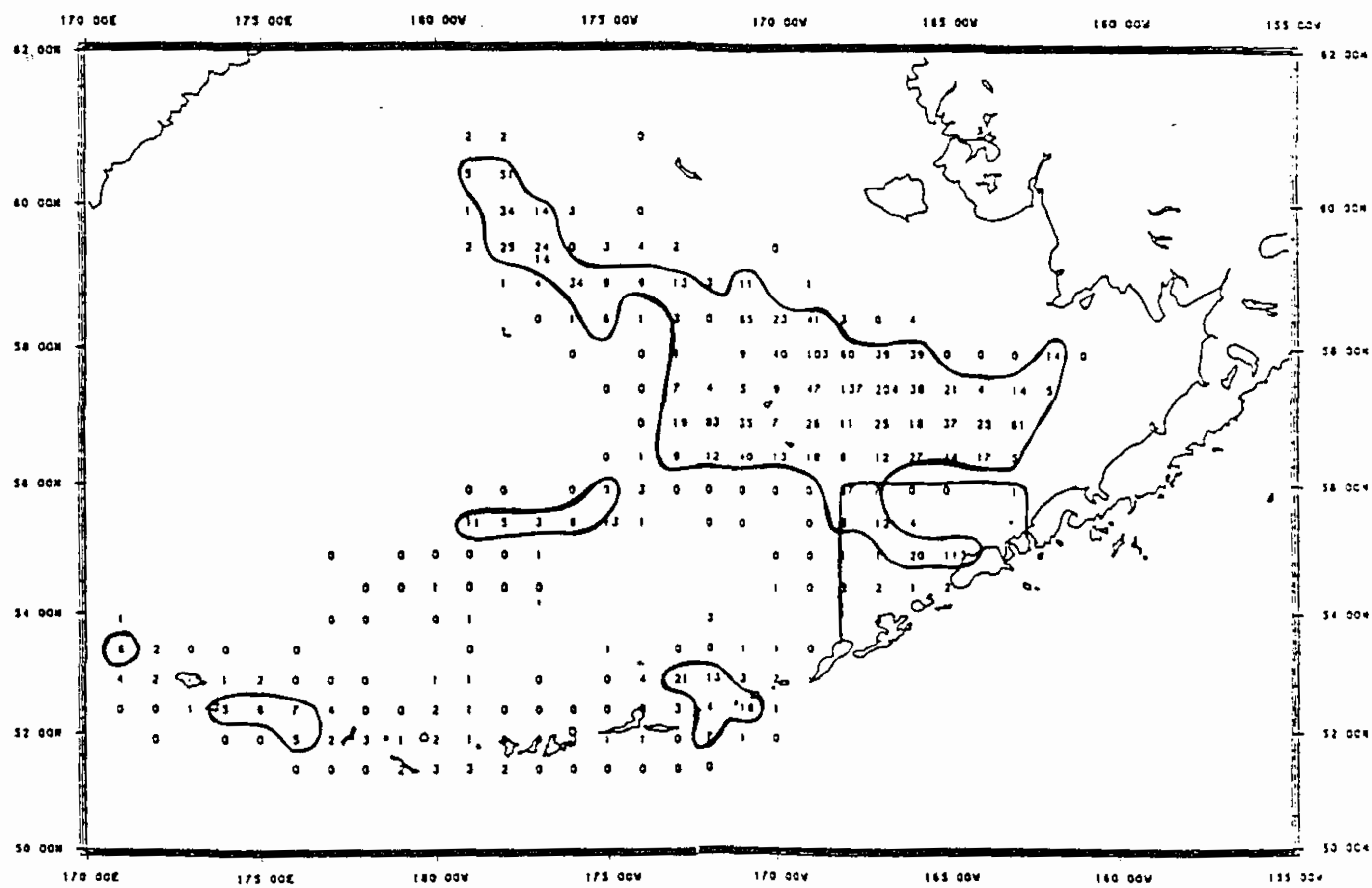

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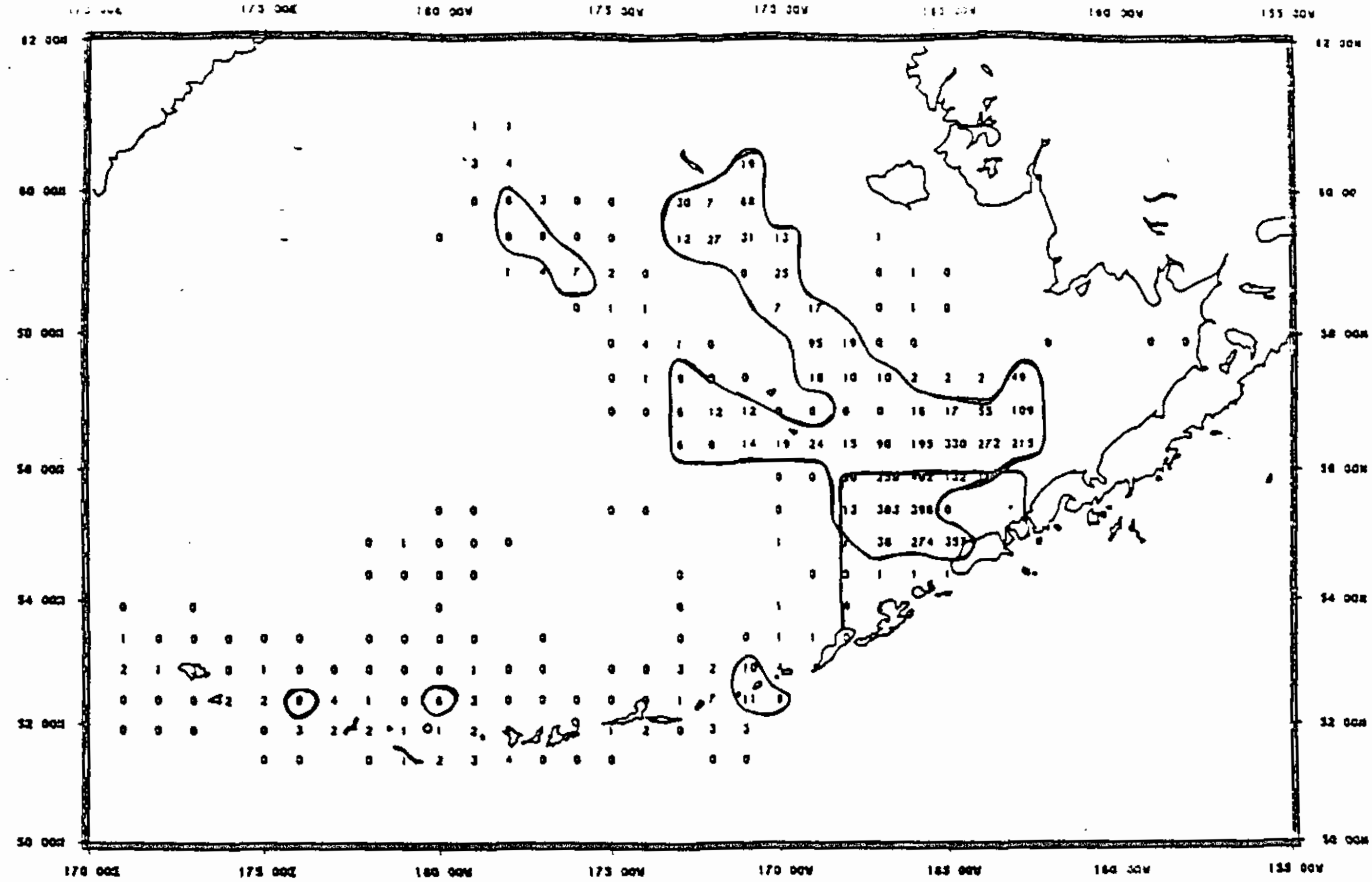

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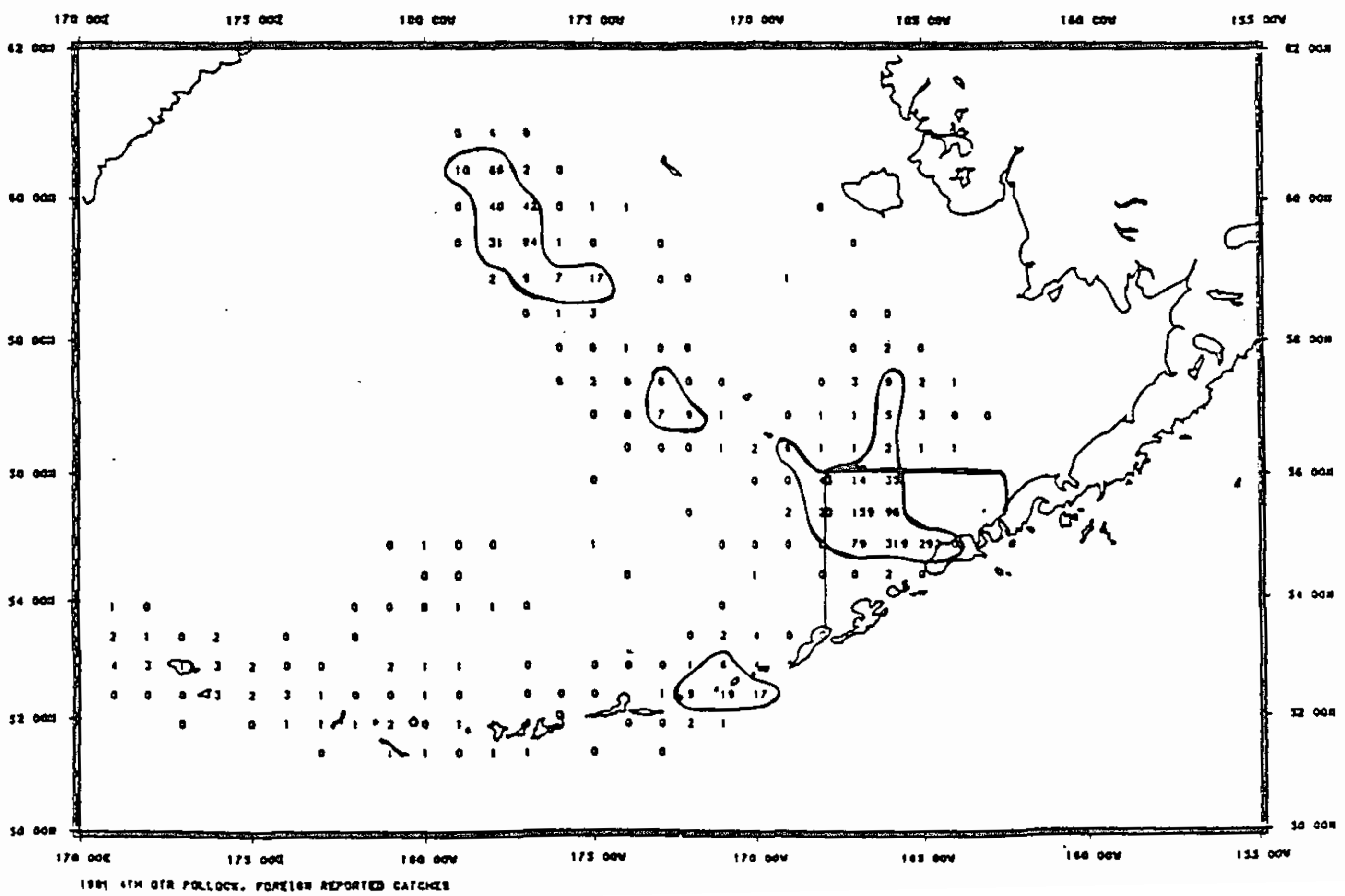

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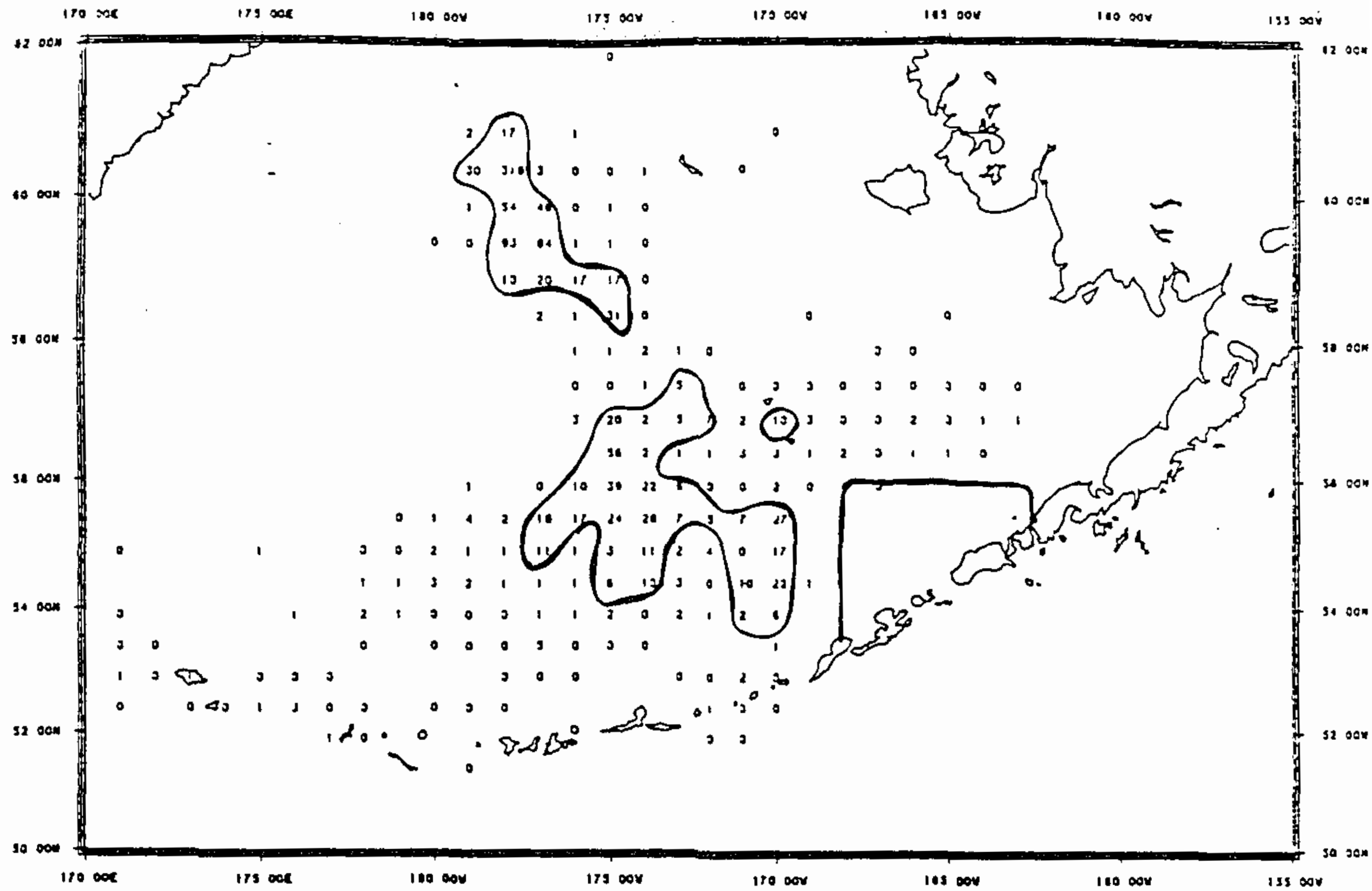

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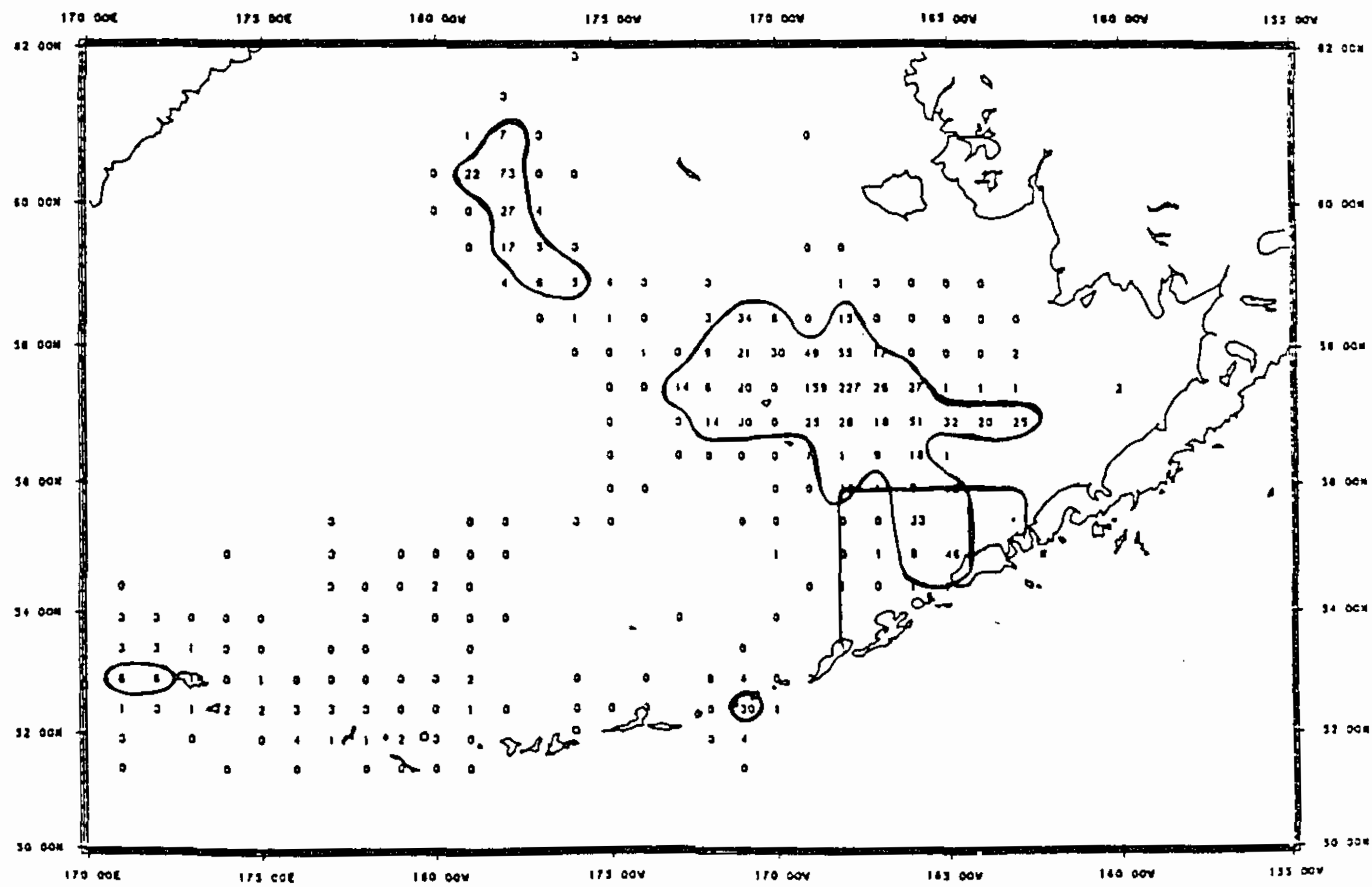

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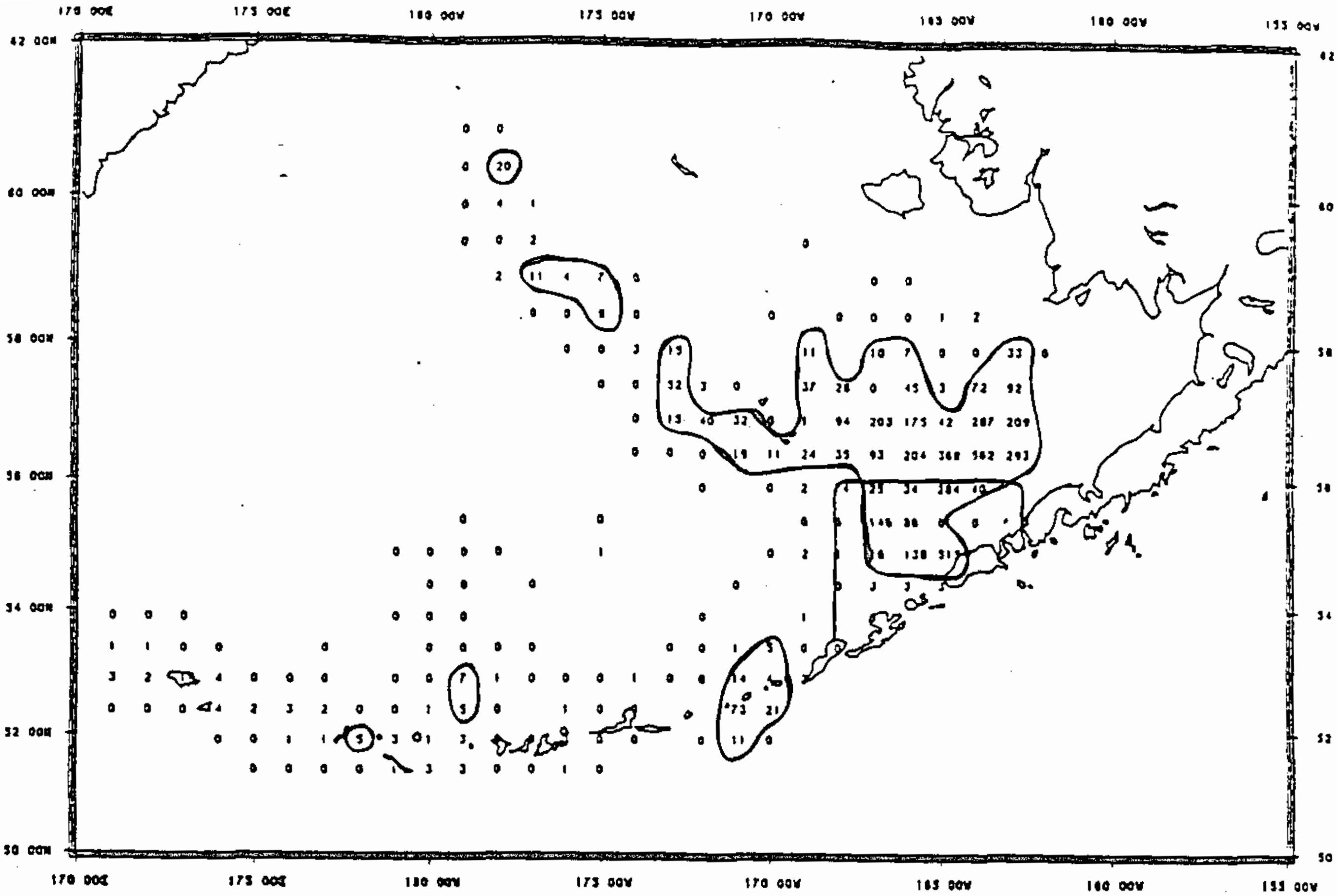

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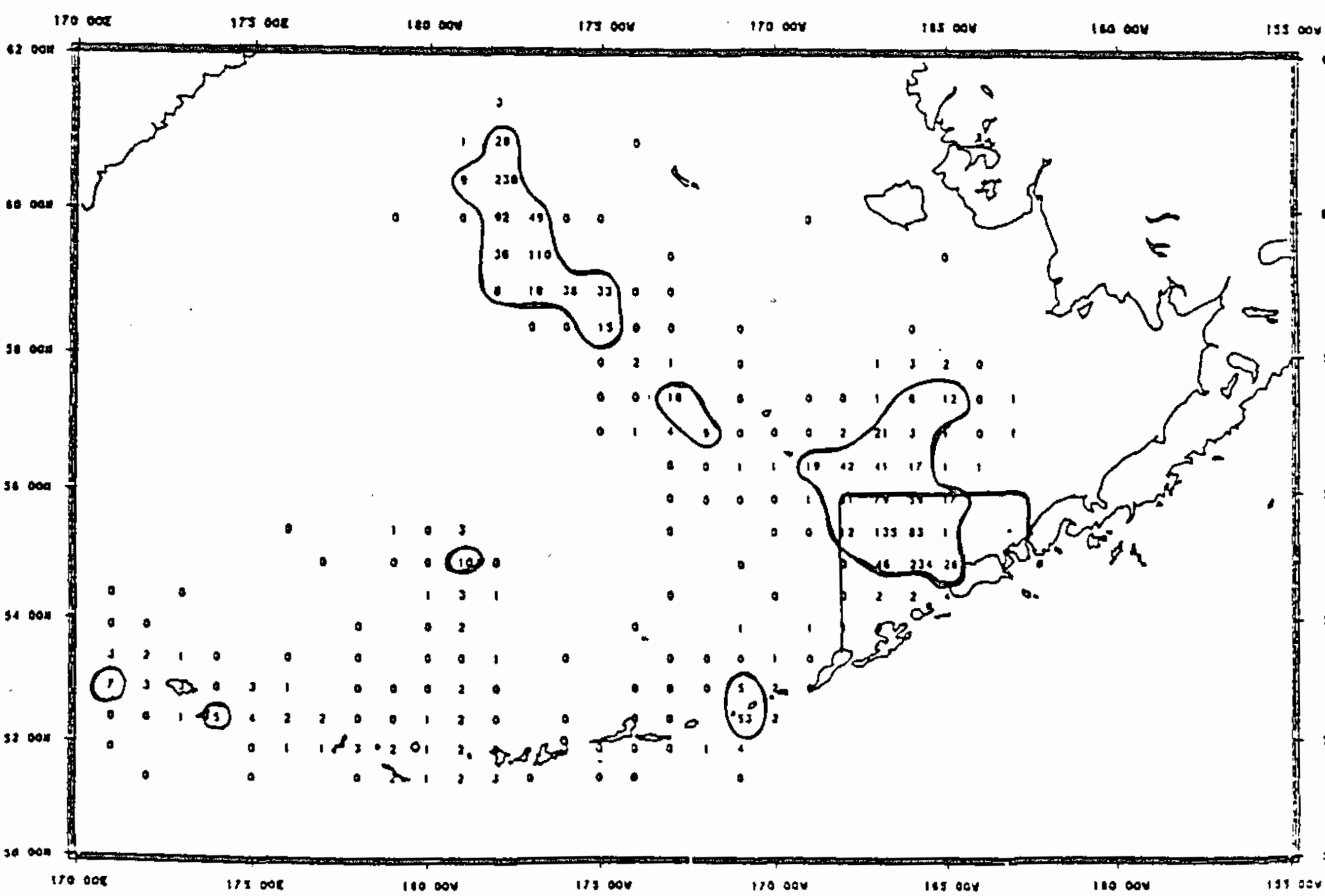

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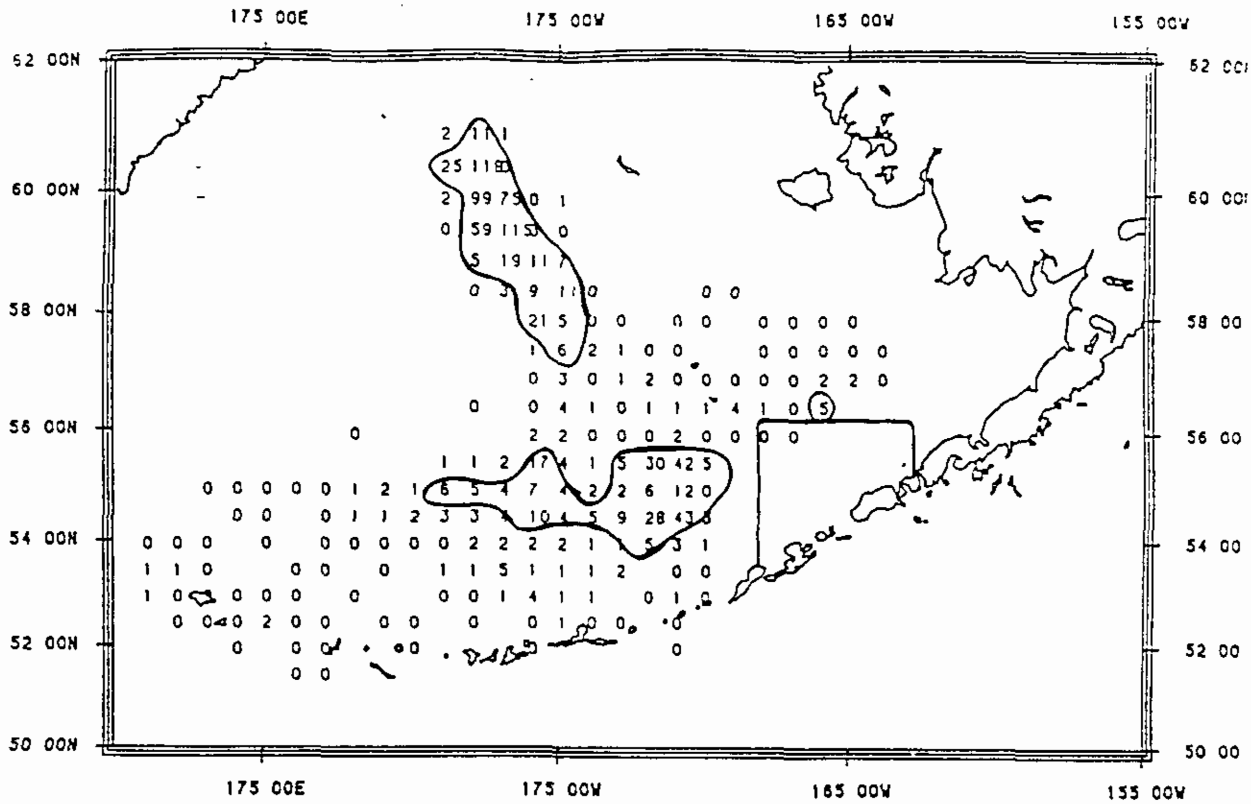

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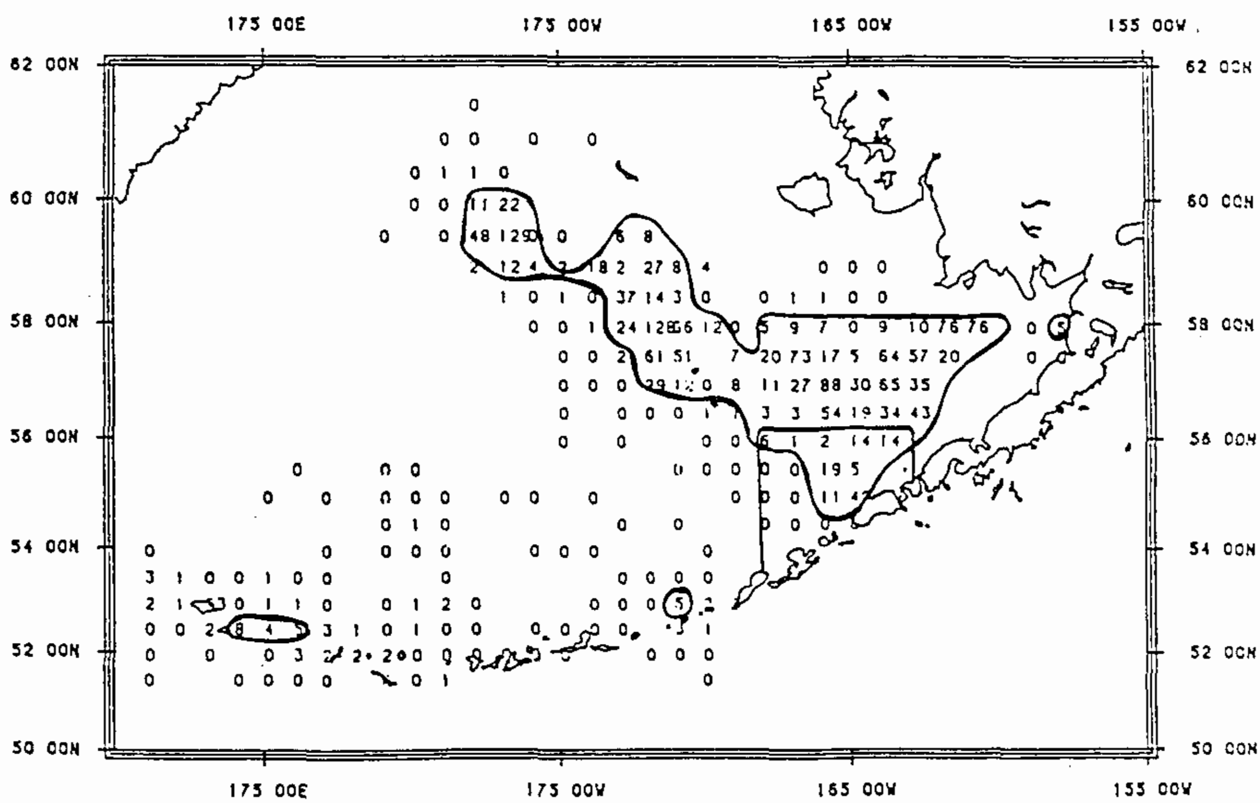

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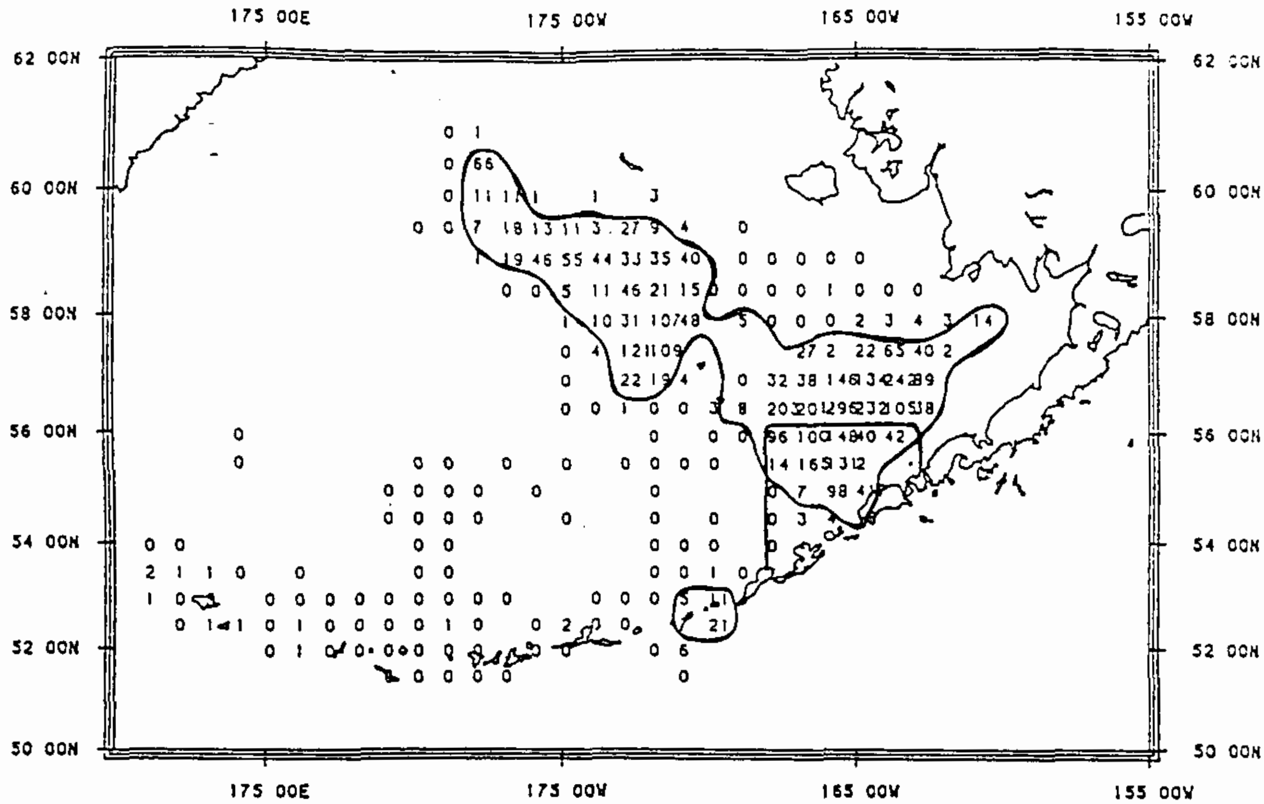

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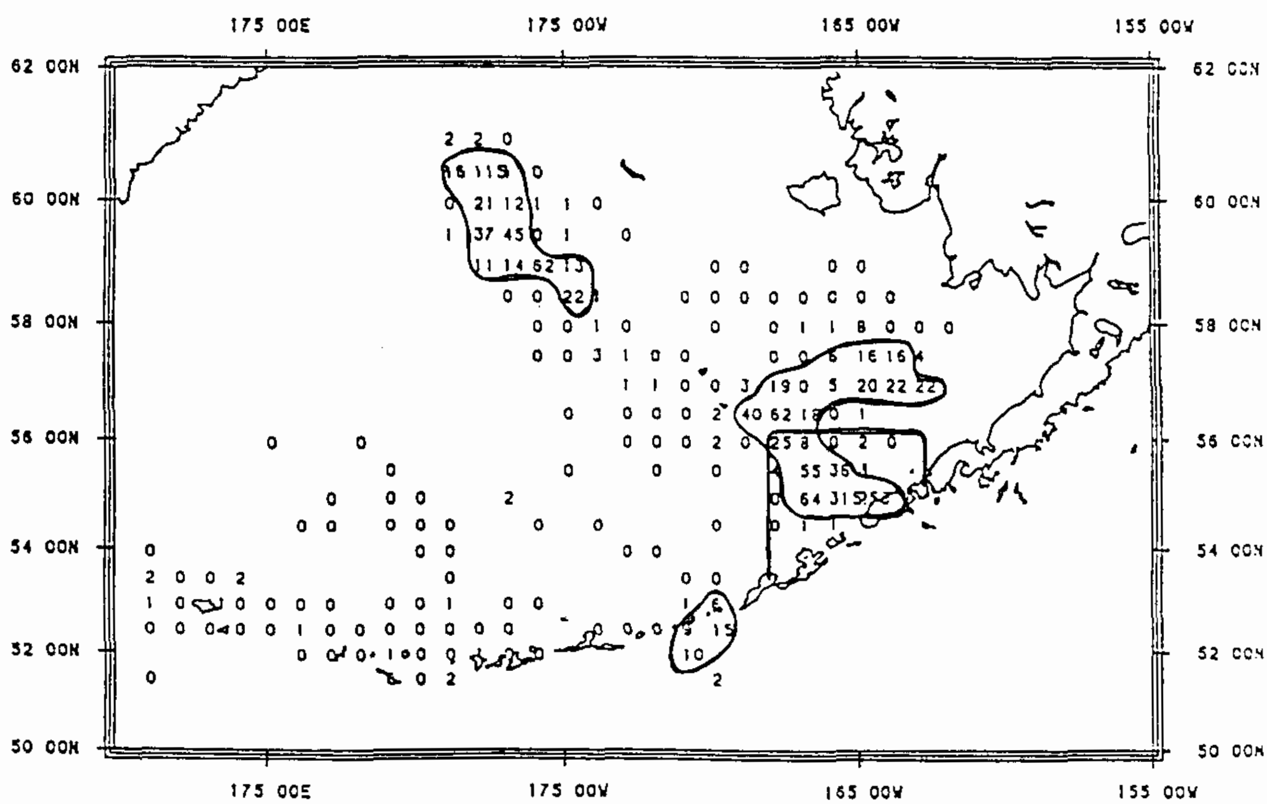
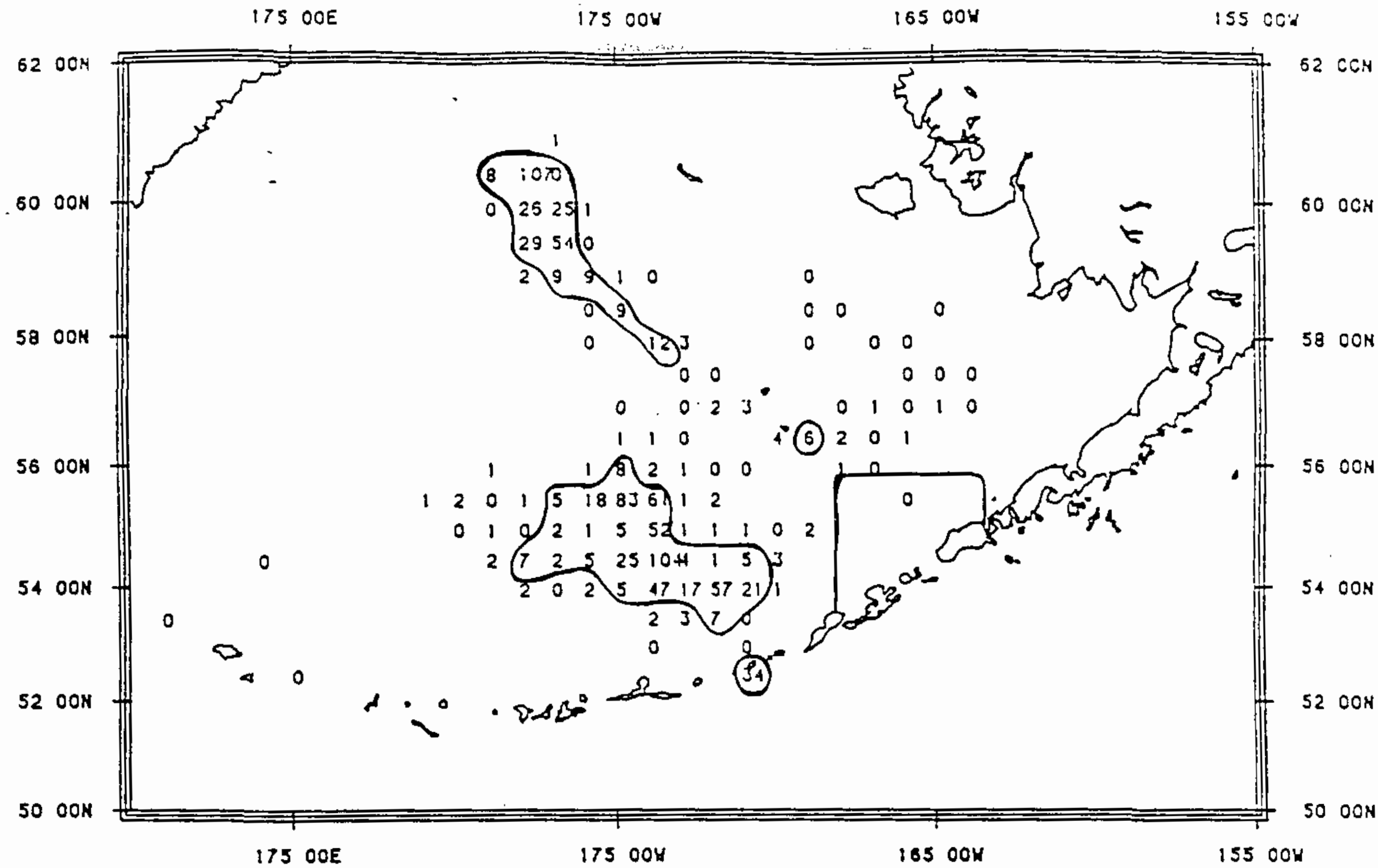
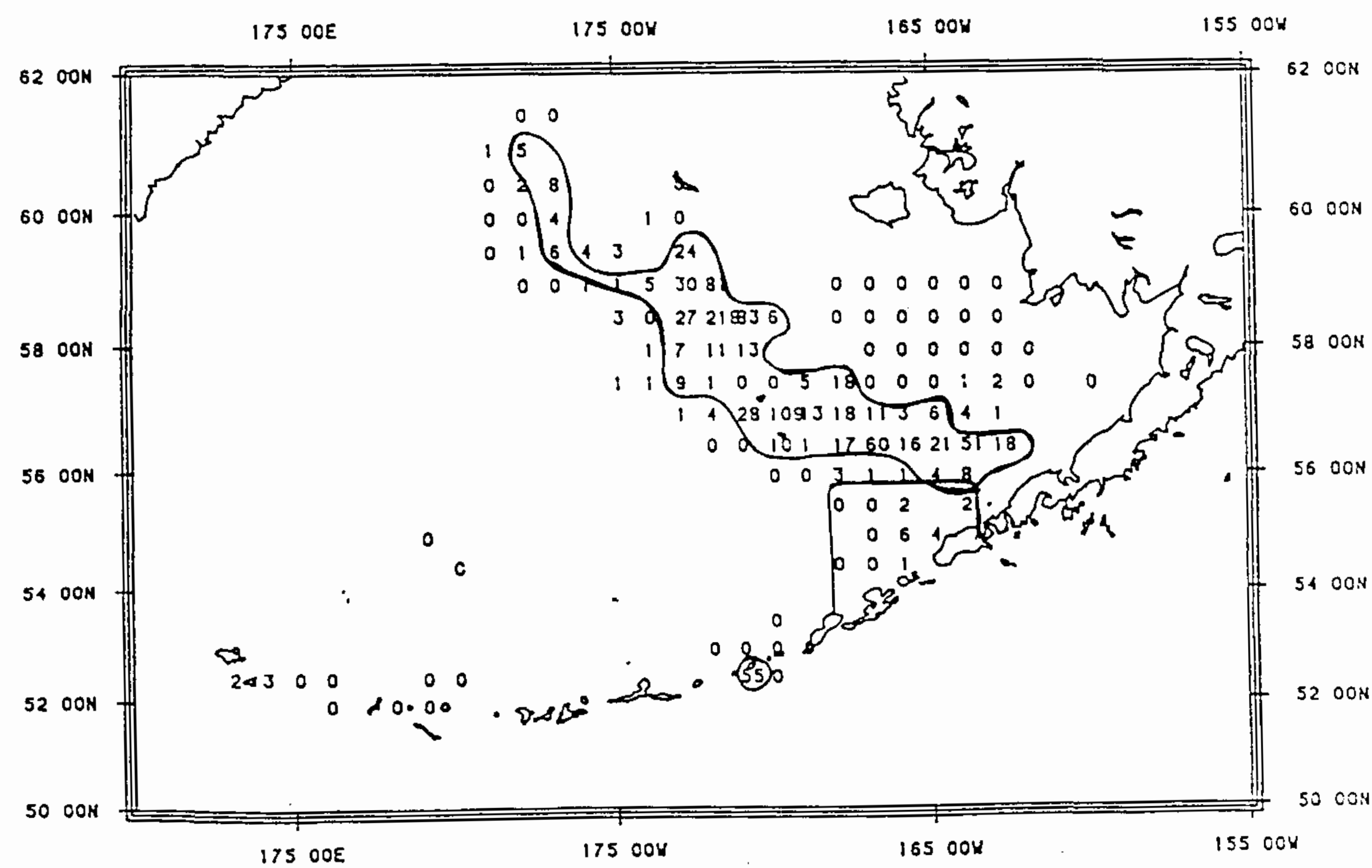


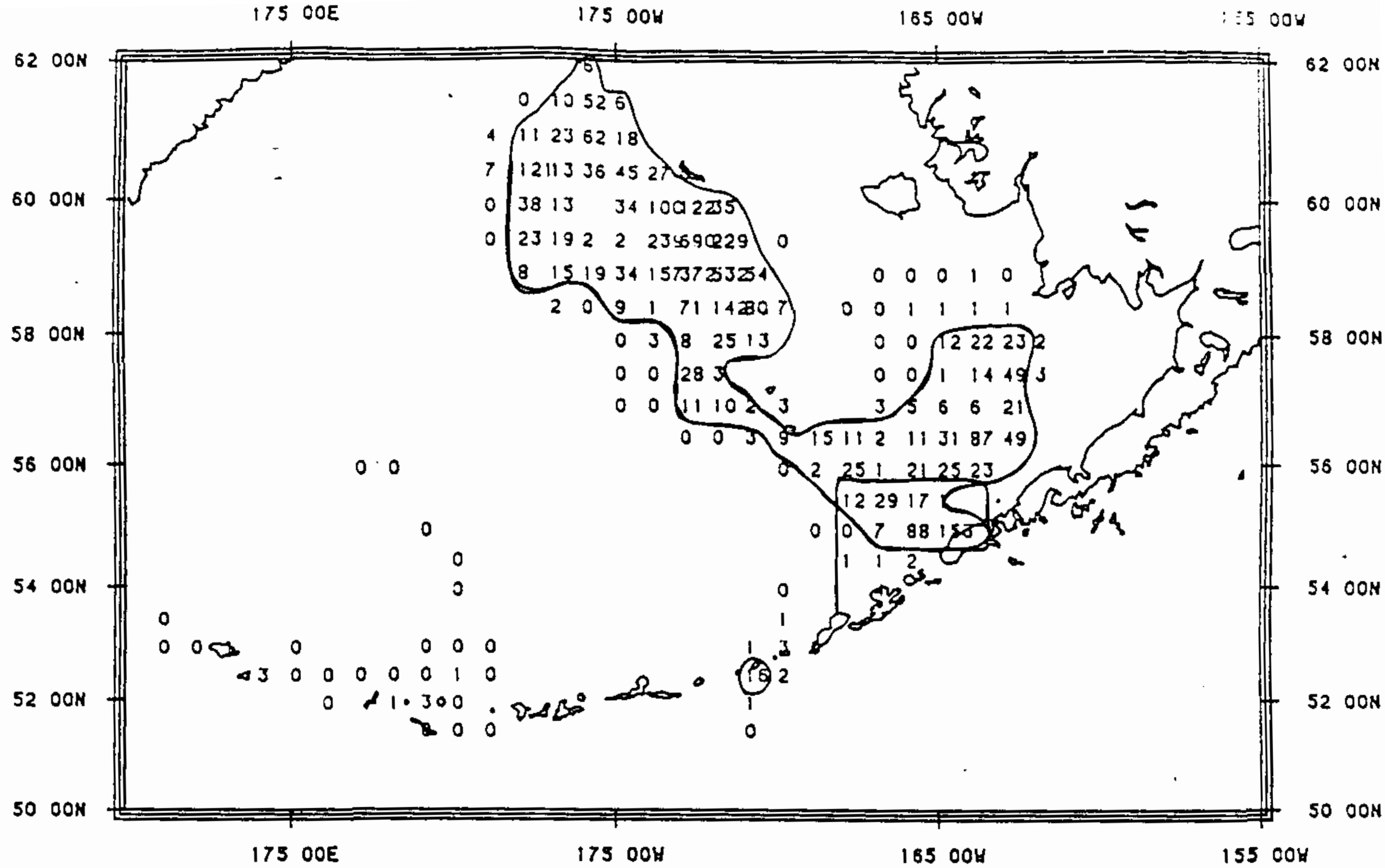
1983 4TH QTR POLLOCK, FOREIGN REPORTED CATCHES



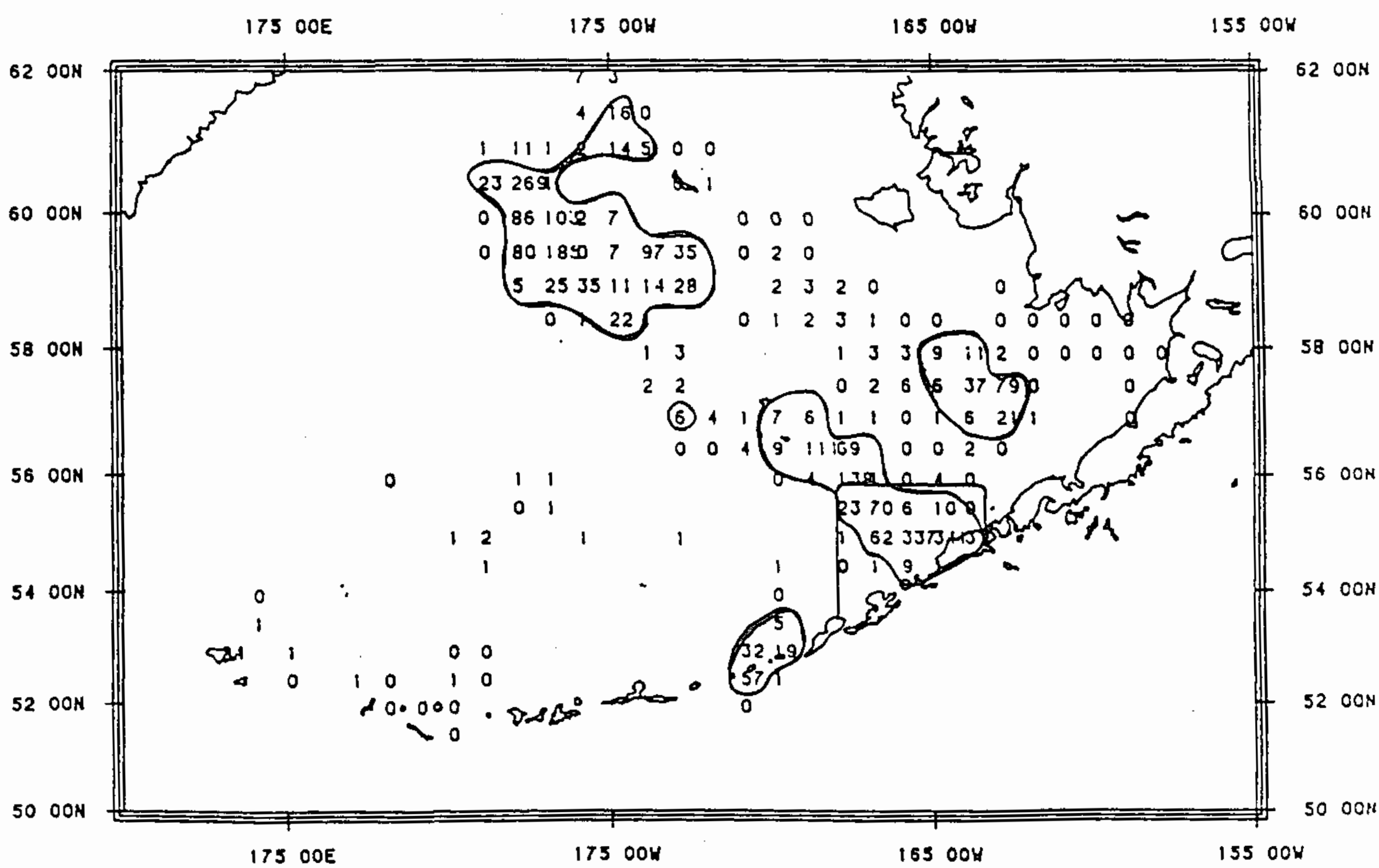
1984 FIRST QTR POLLOCK FOREIGN TRAWL CATCH IN 100 MT



1984 2ND QTR POLLOCK FOREIGN TRAWL CATCH IN 100 MT



1984 3RD QTR POLLOCK FOREIGN TRAWL CATCH IN 100 MT



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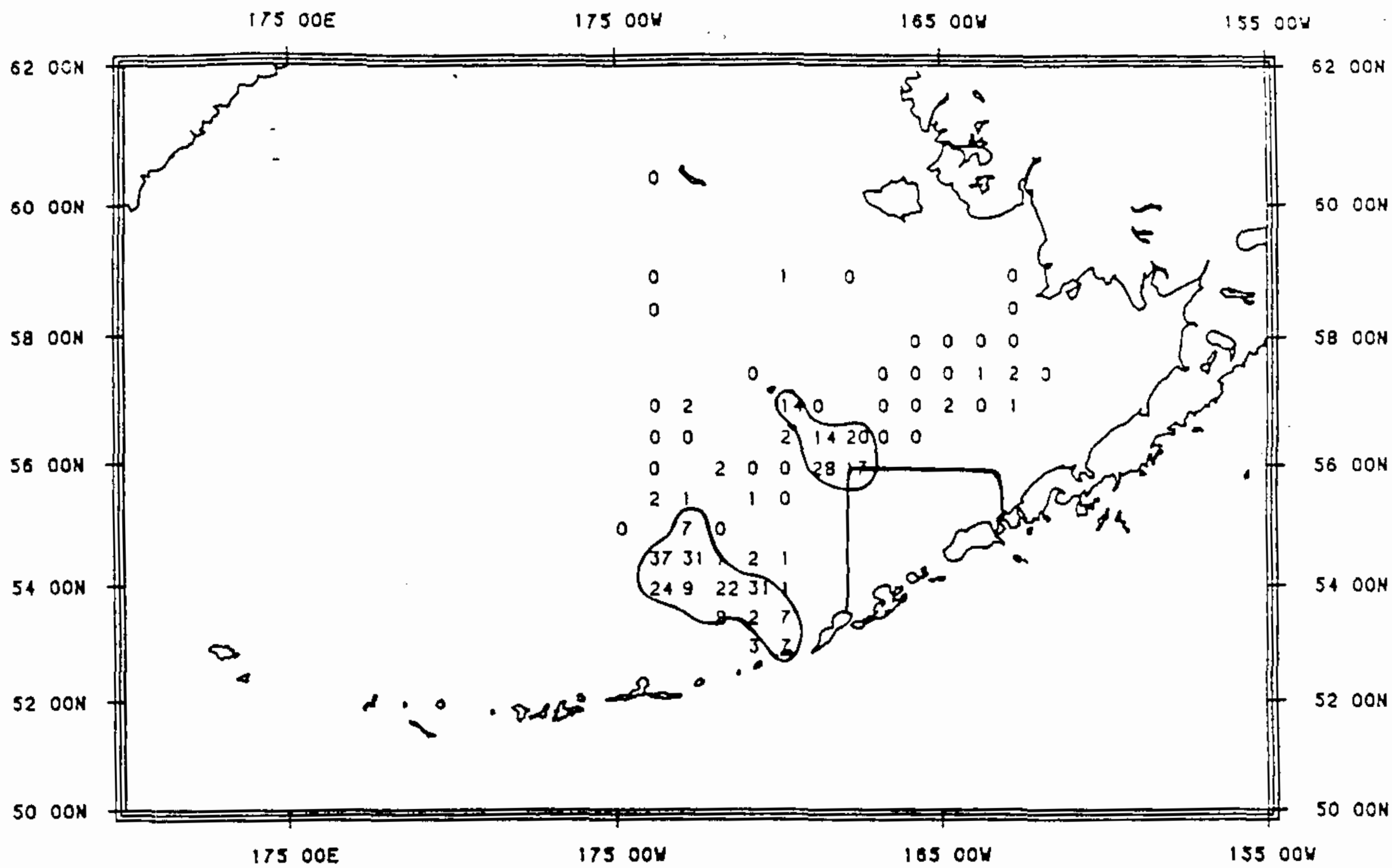

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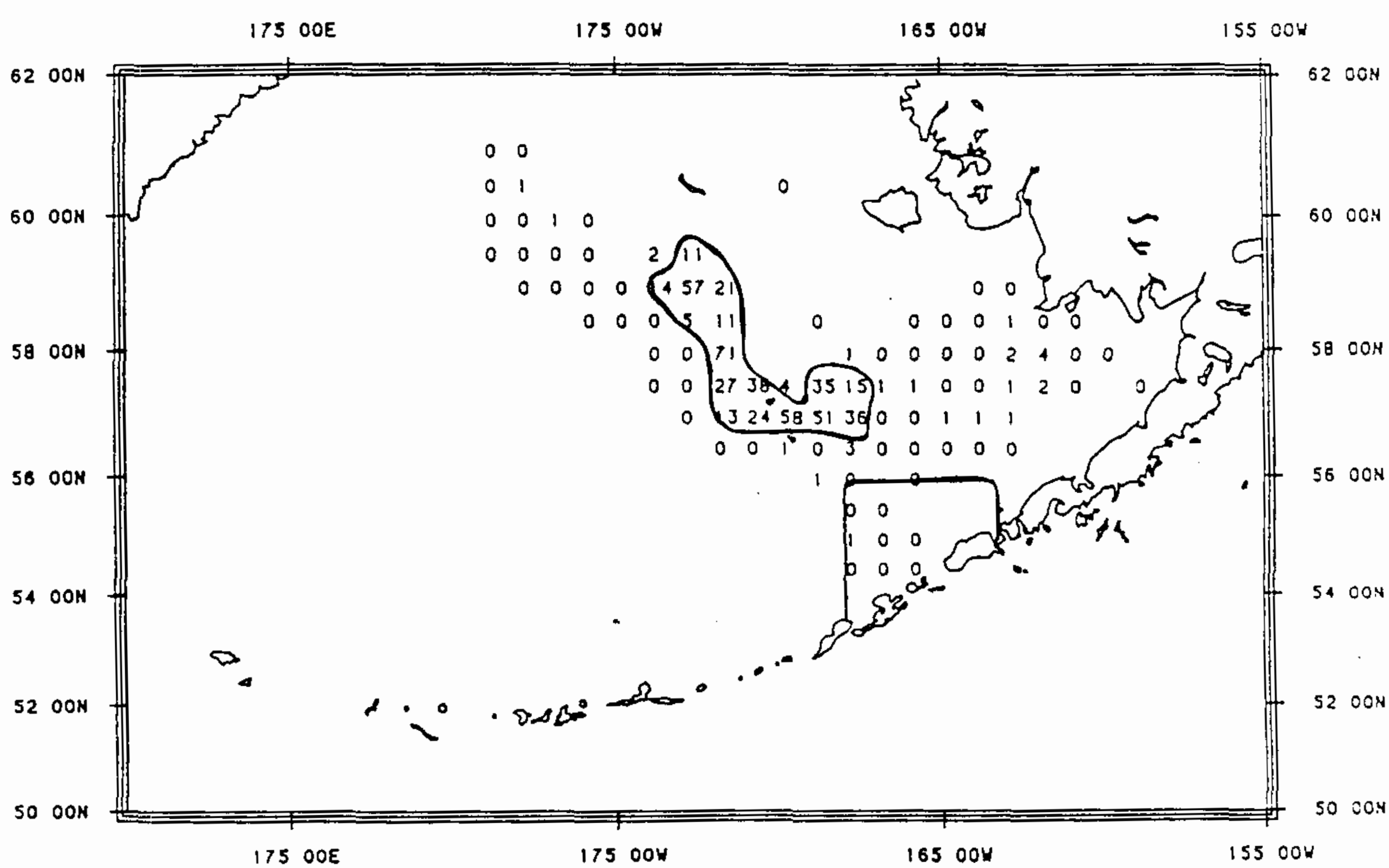

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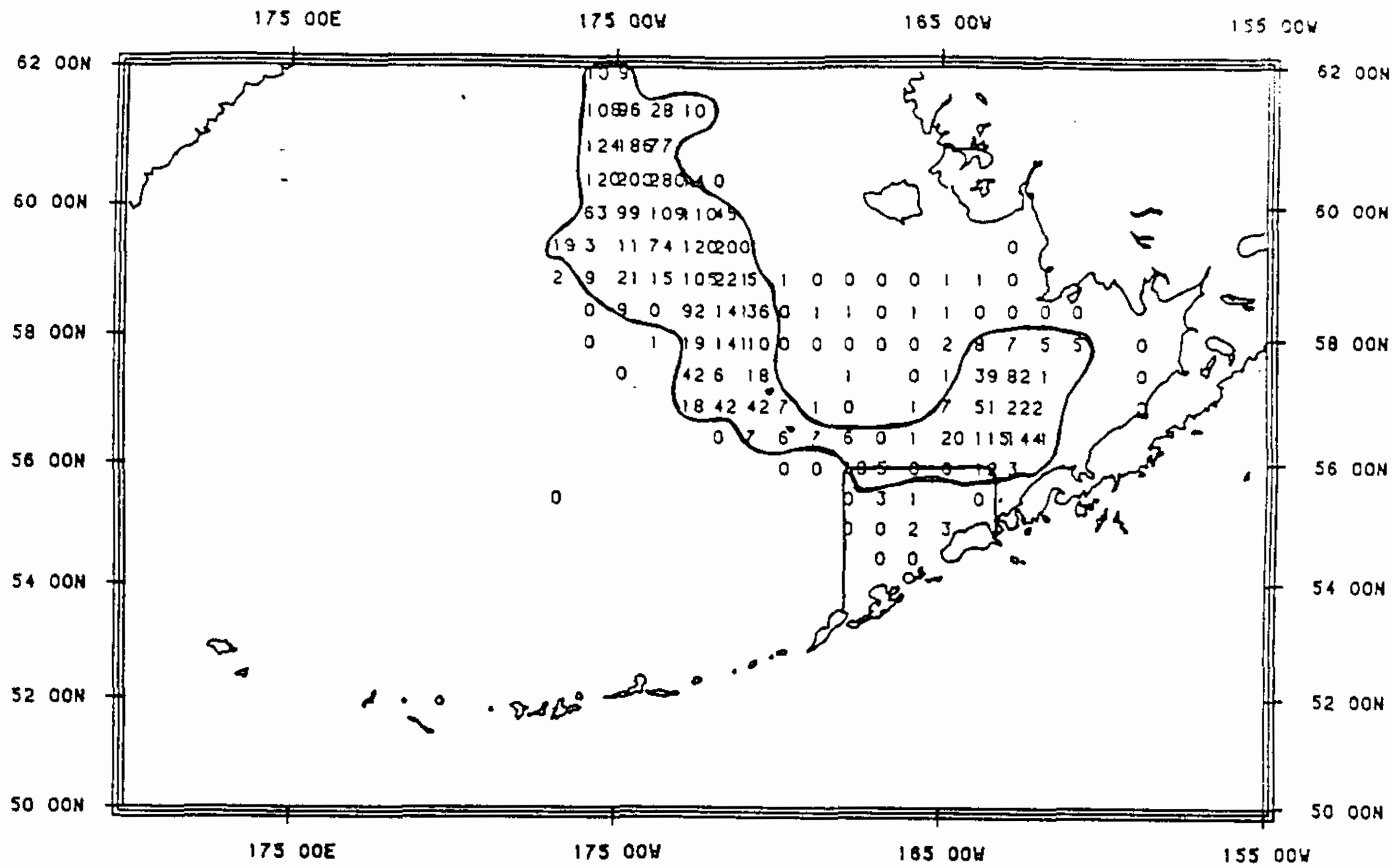

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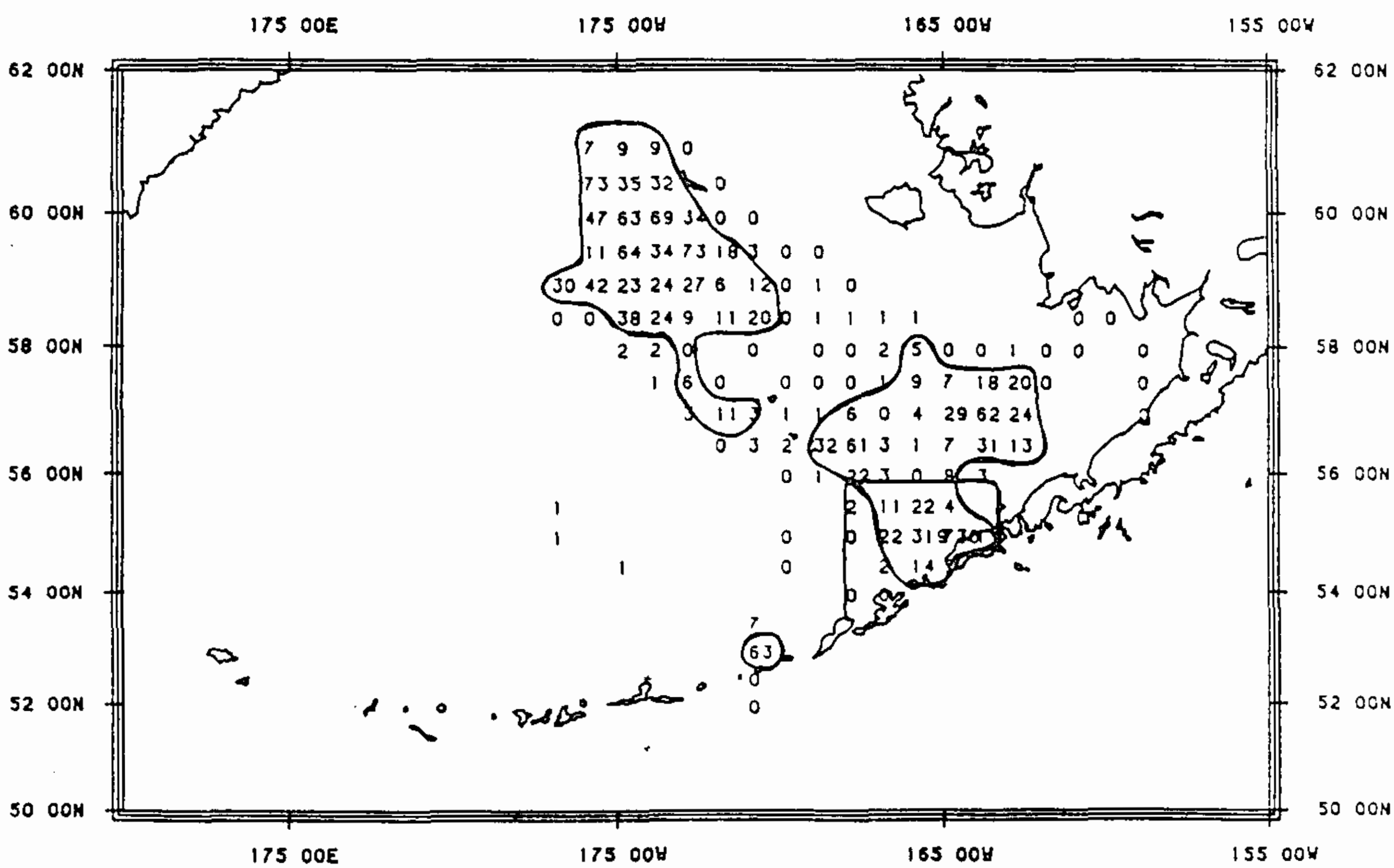
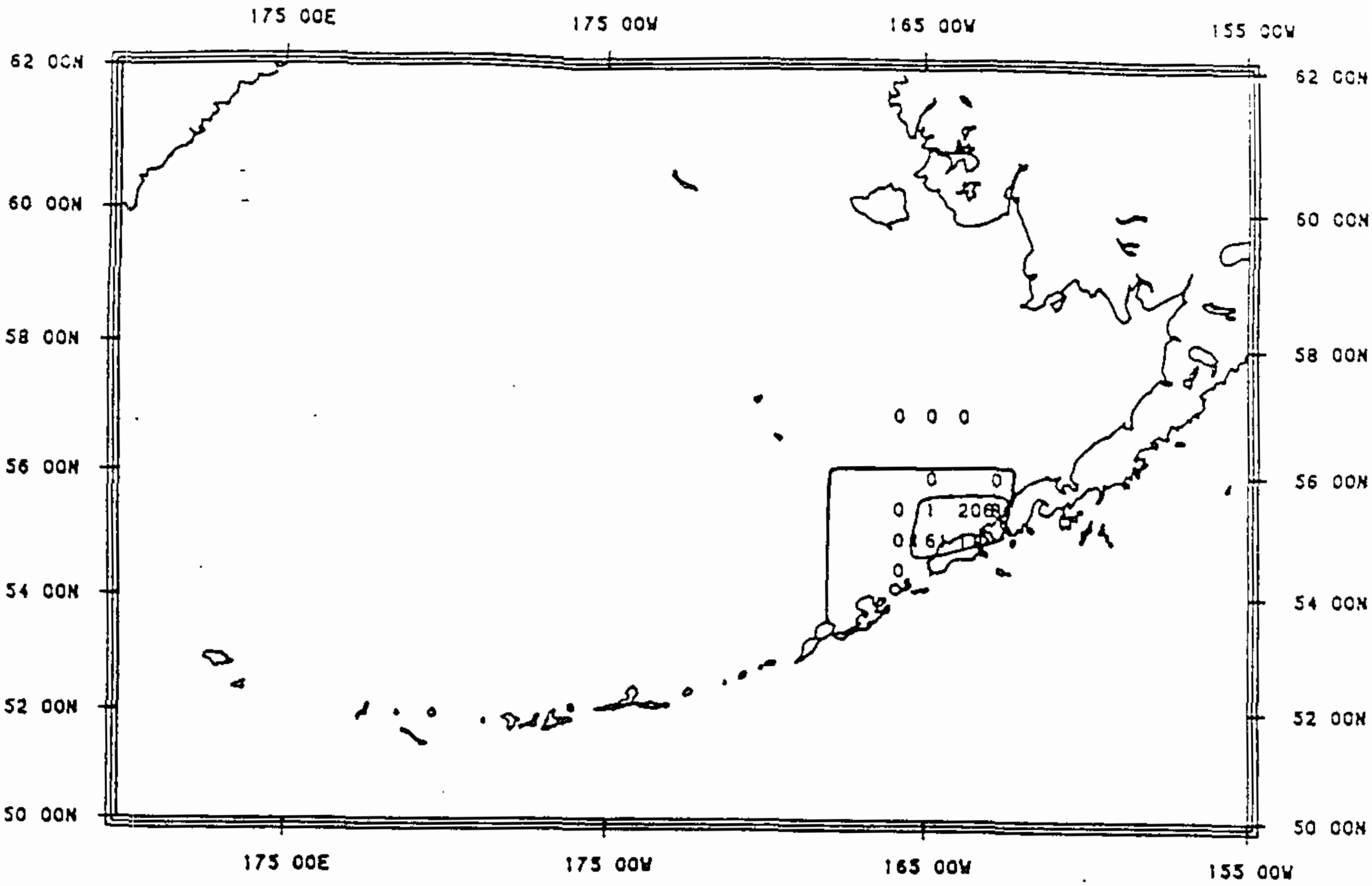


1985 4TH QTR POLLOCK FOREIGN TRAWL CATCH IN 100 MT

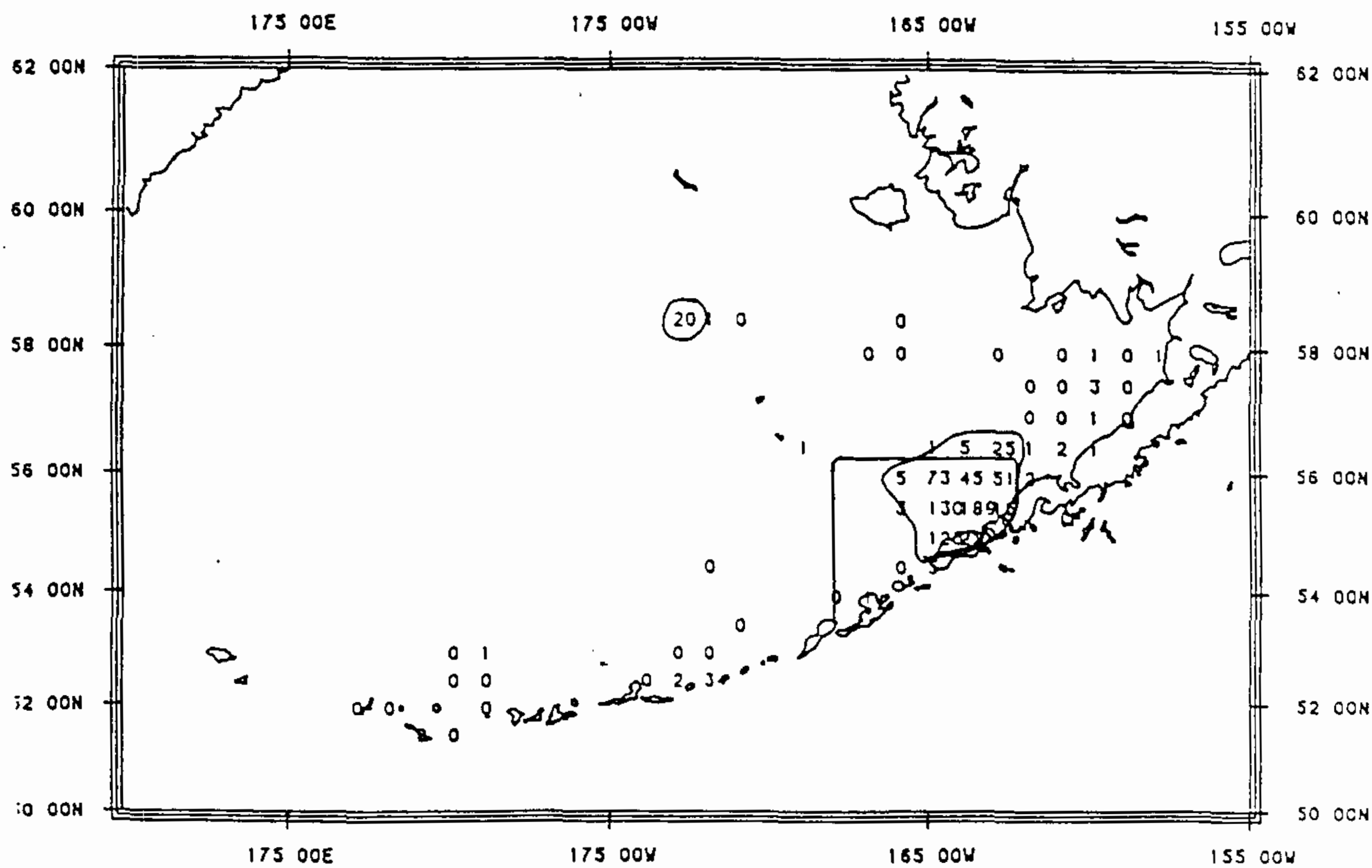
APPENDIX 2-B

Joint Venture Trawl Harvests of Walleye Pollock in the BSAI:

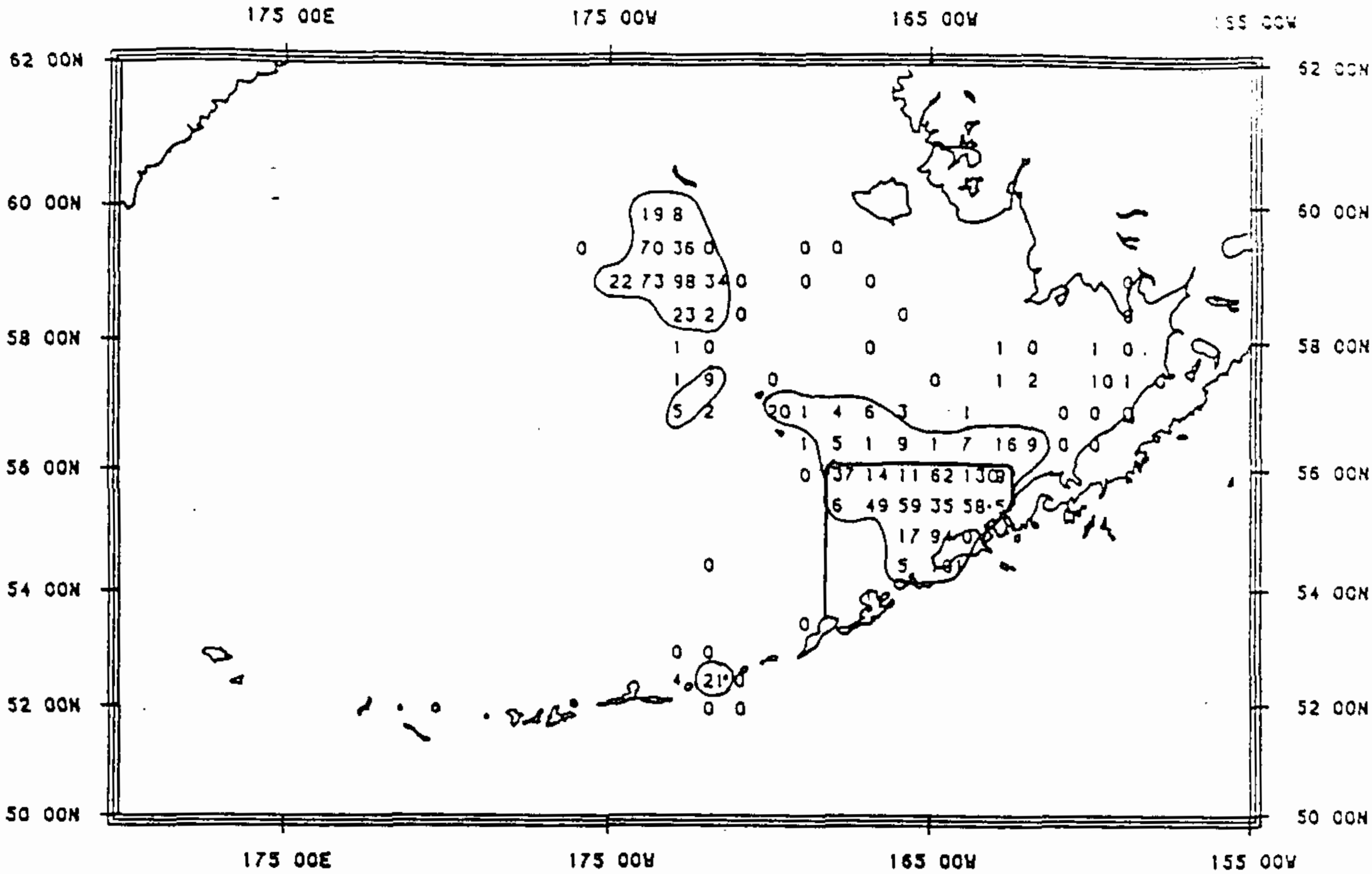
1984 - 1989



1984 FIRST QTR POLLOCK JV TRAWL CATCH IN 100 MT



1984 2ND QTR POLLOCK JV TRAWL CATCH IN 100 MT



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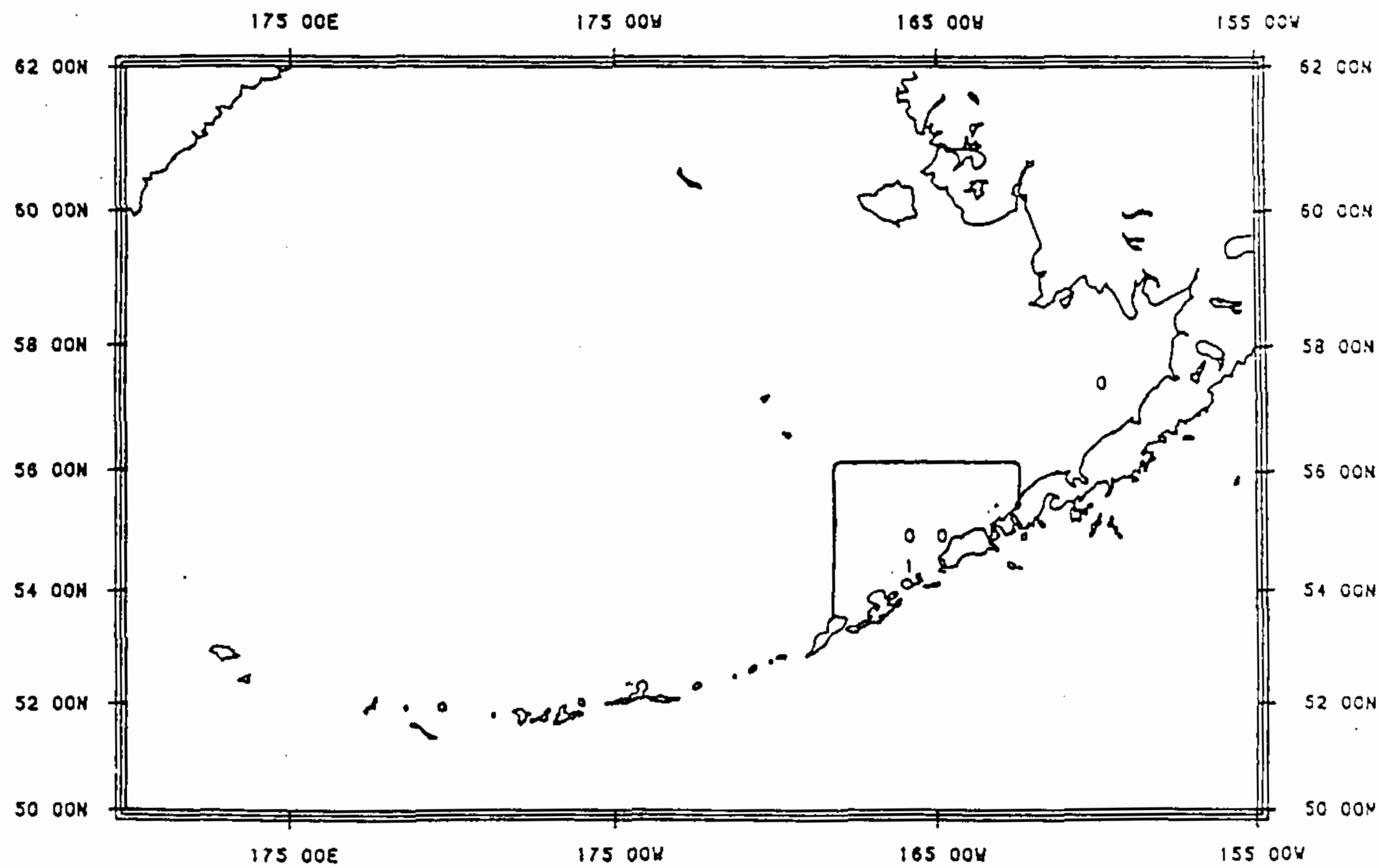

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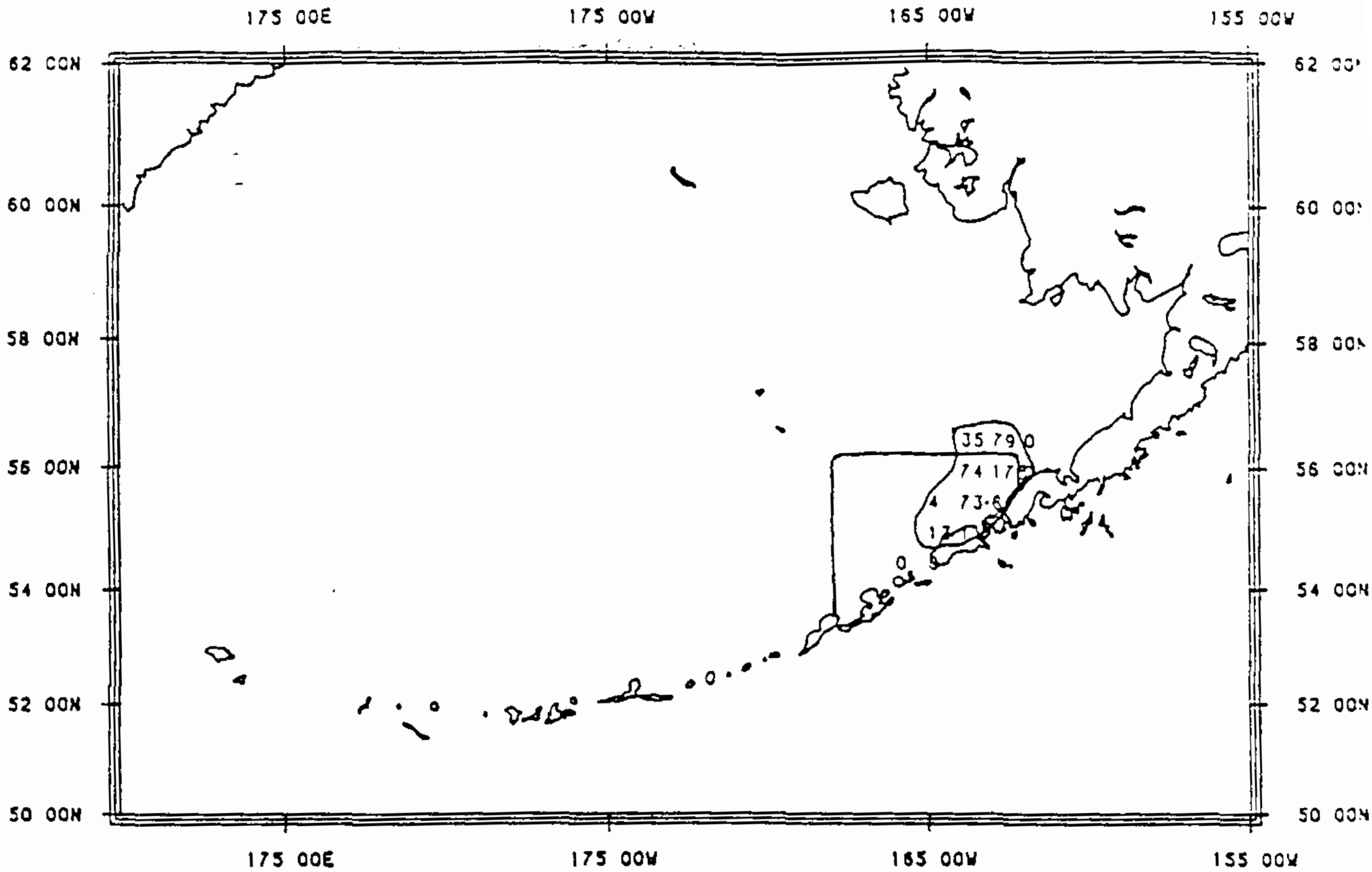

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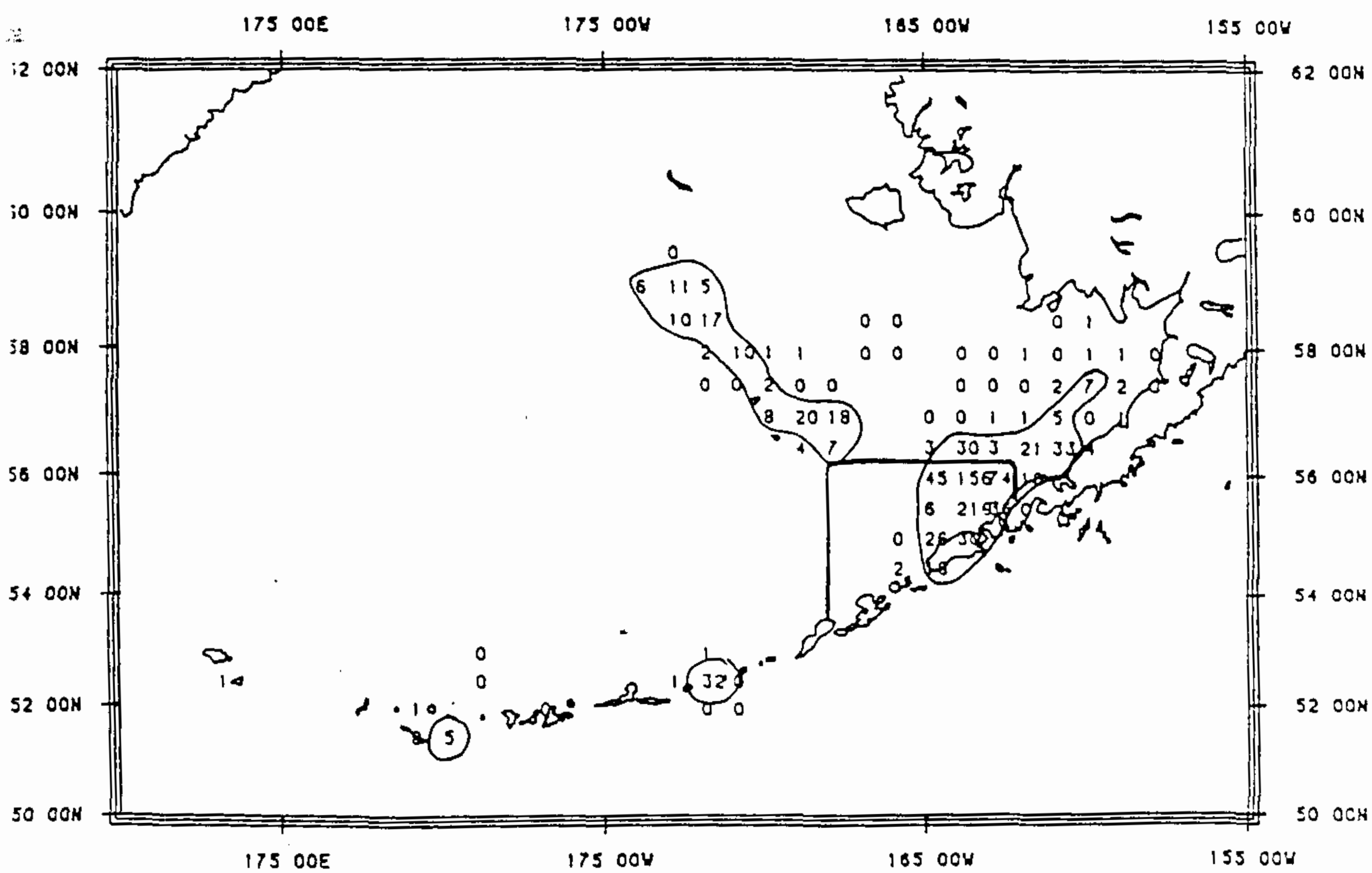

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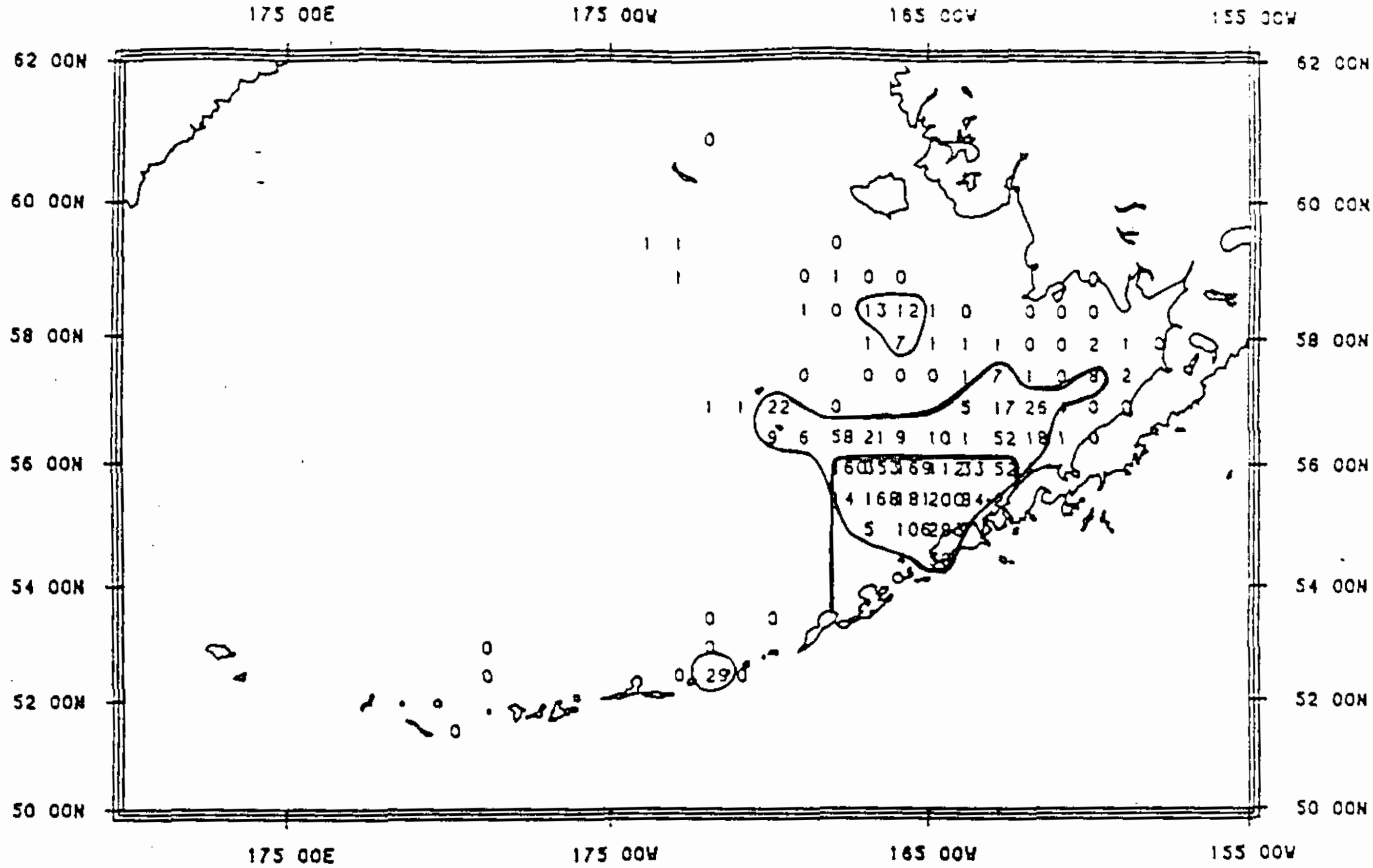

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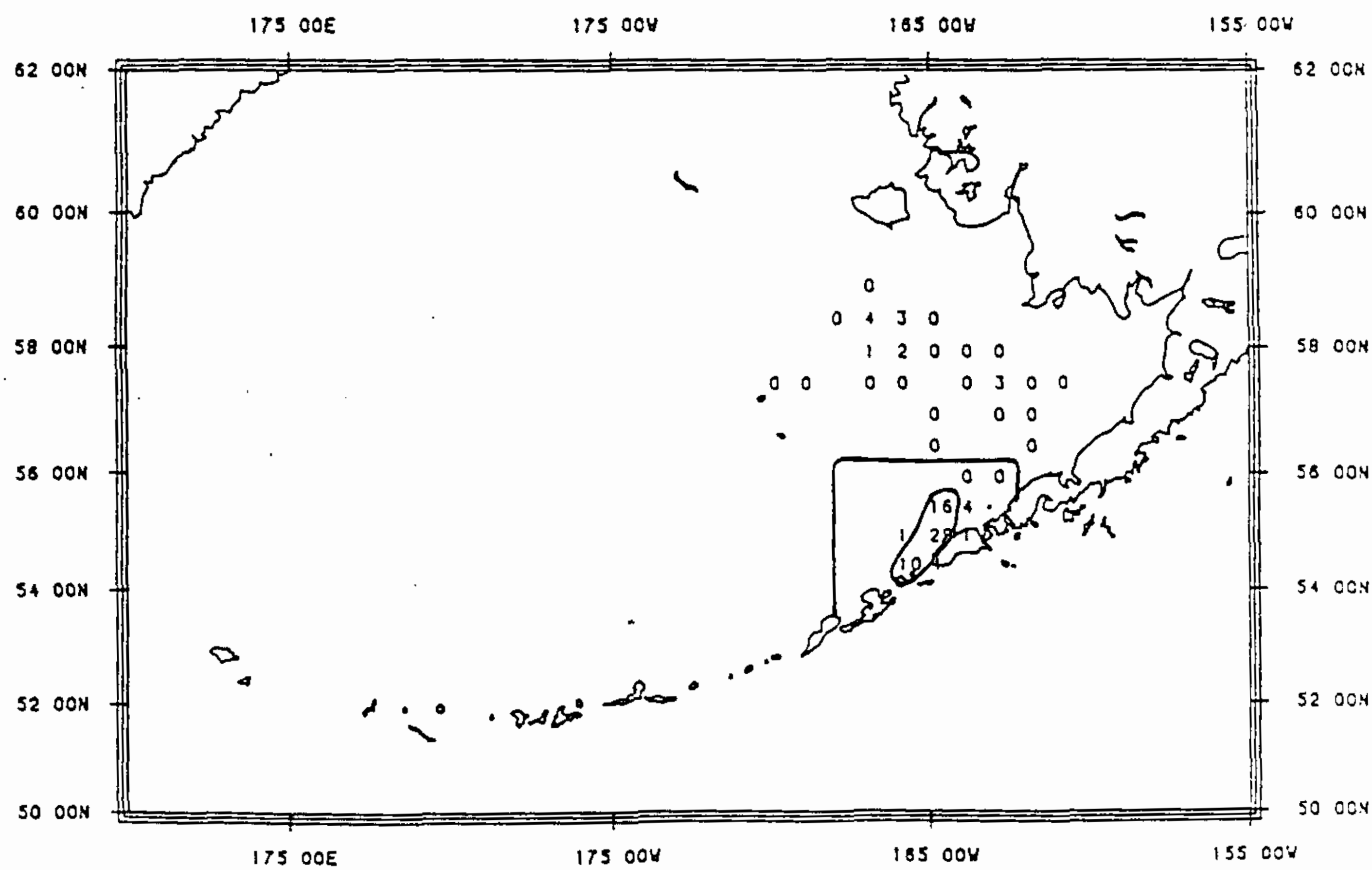
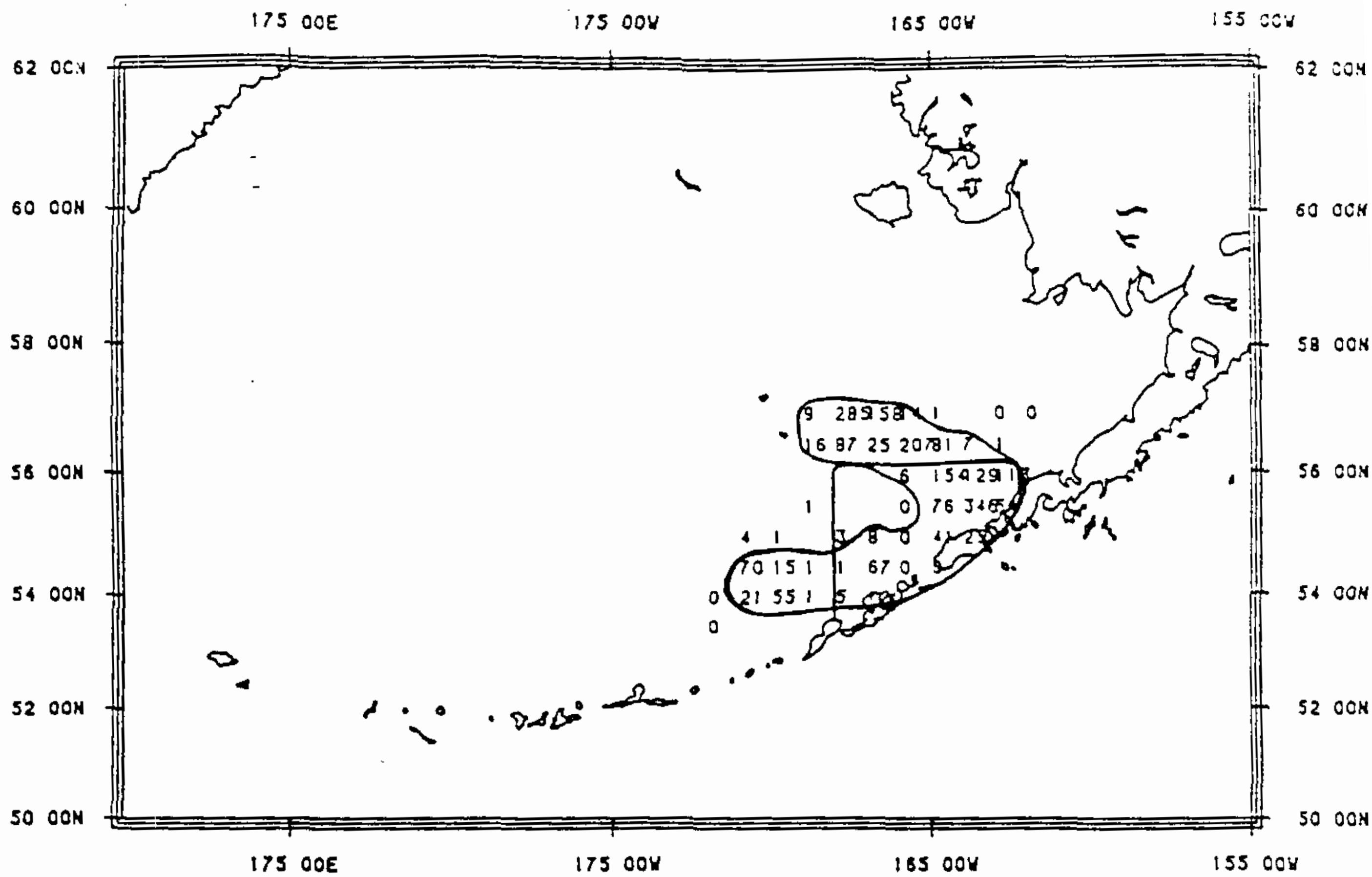
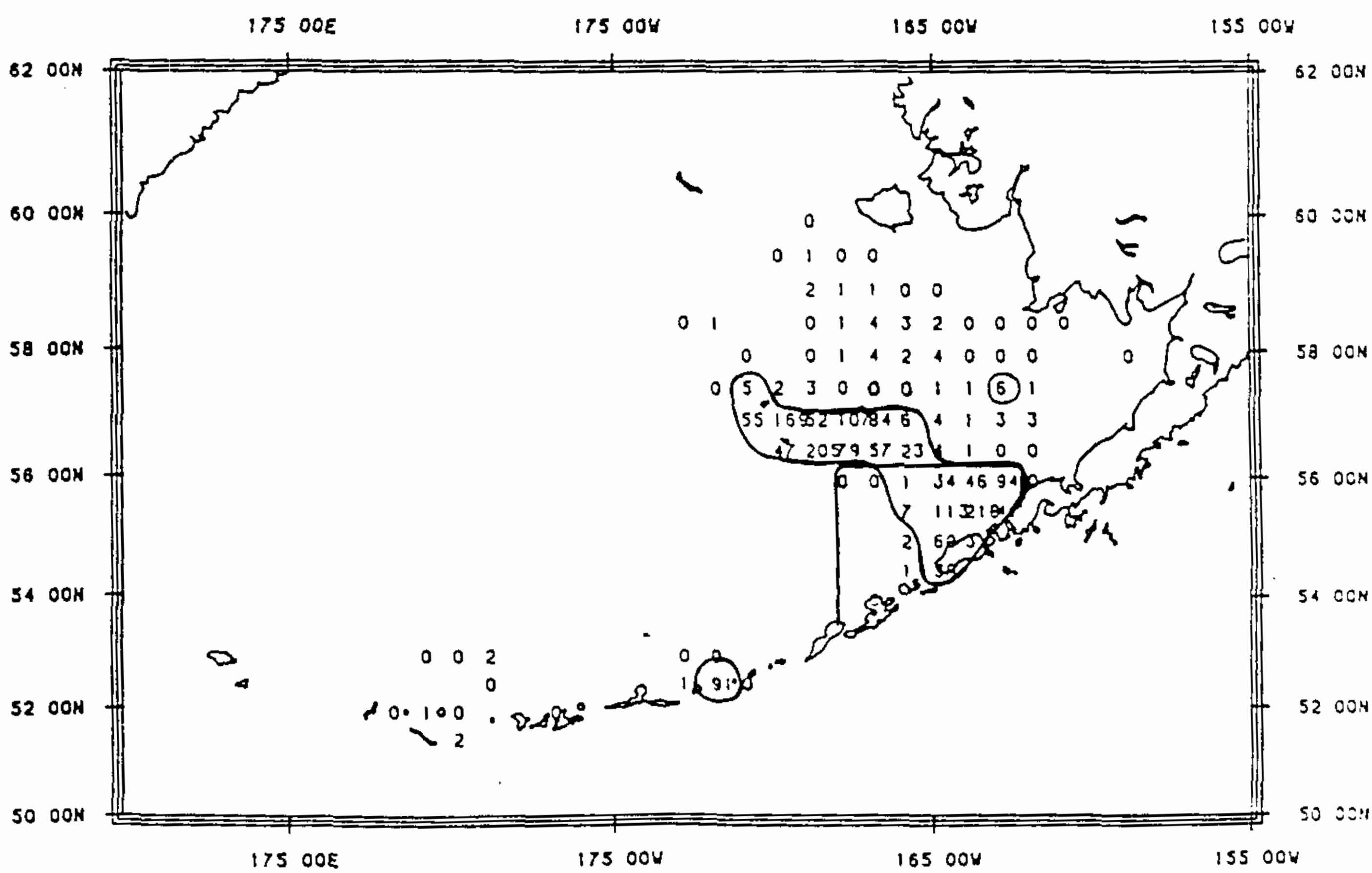


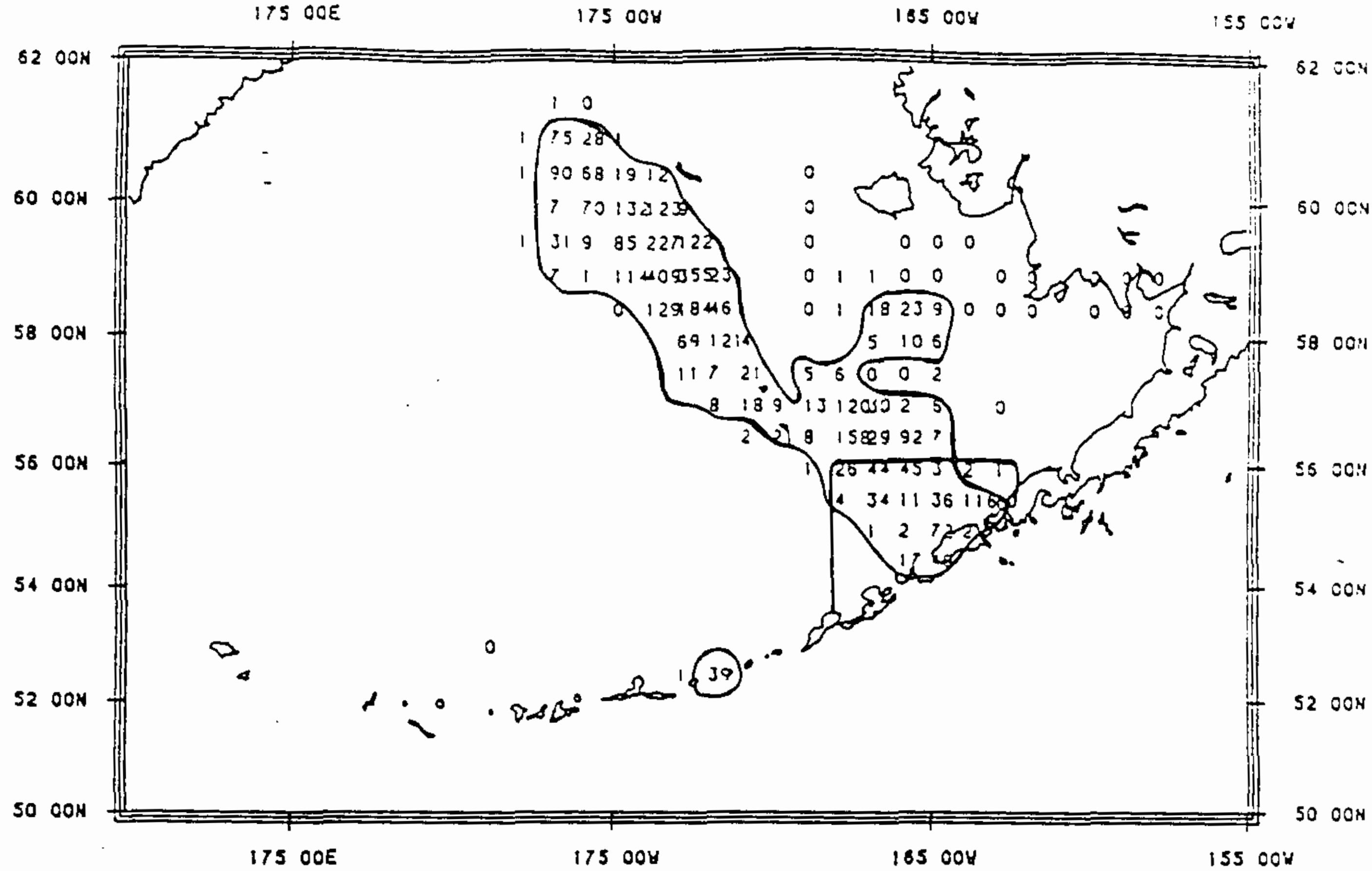
1985 4TH QTR POLLOCK JV TRAWL CATCH IN 100 MT



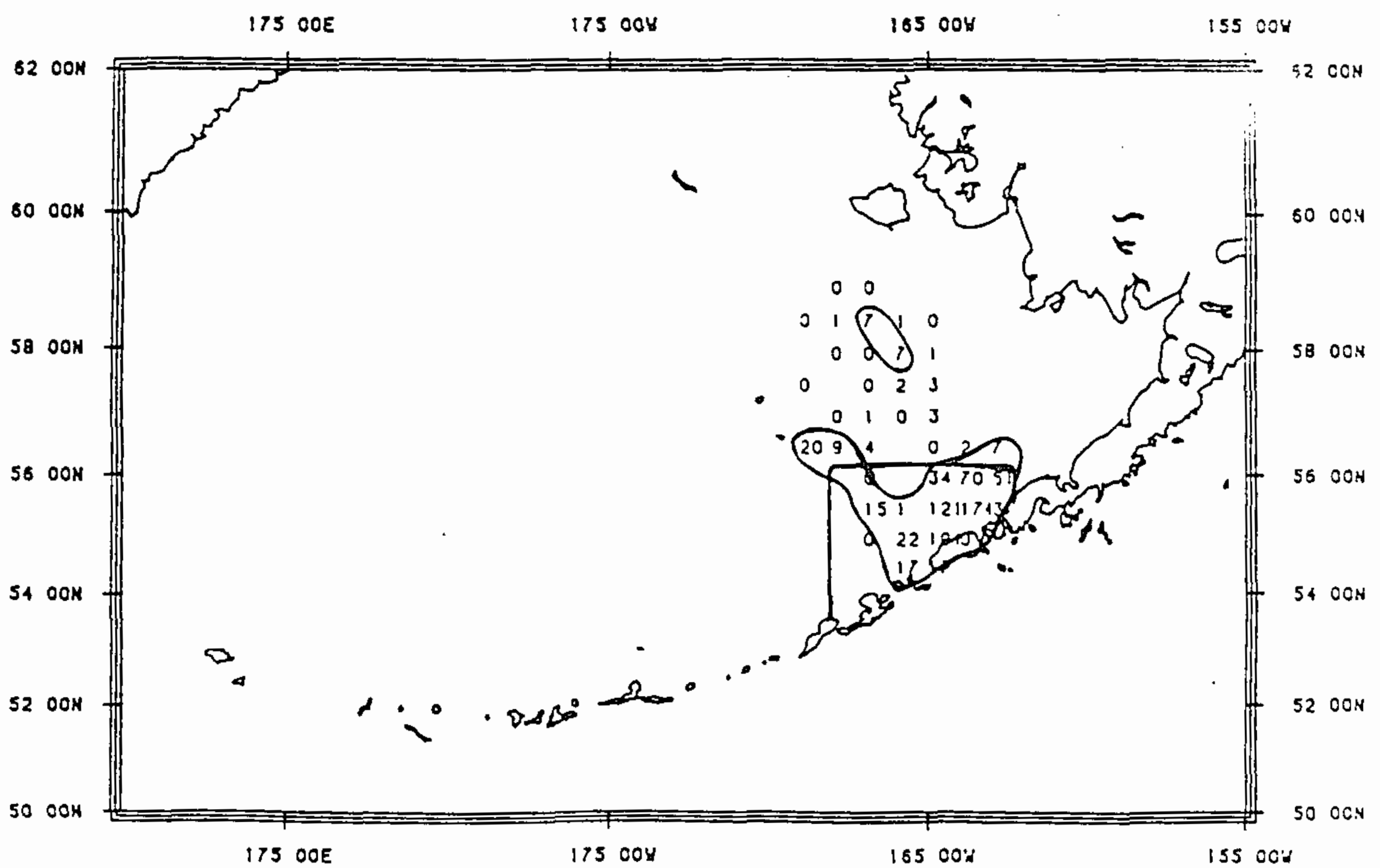
1986 FIRST QTR POLLOCK JV TRAWL CATCH IN 100 MT



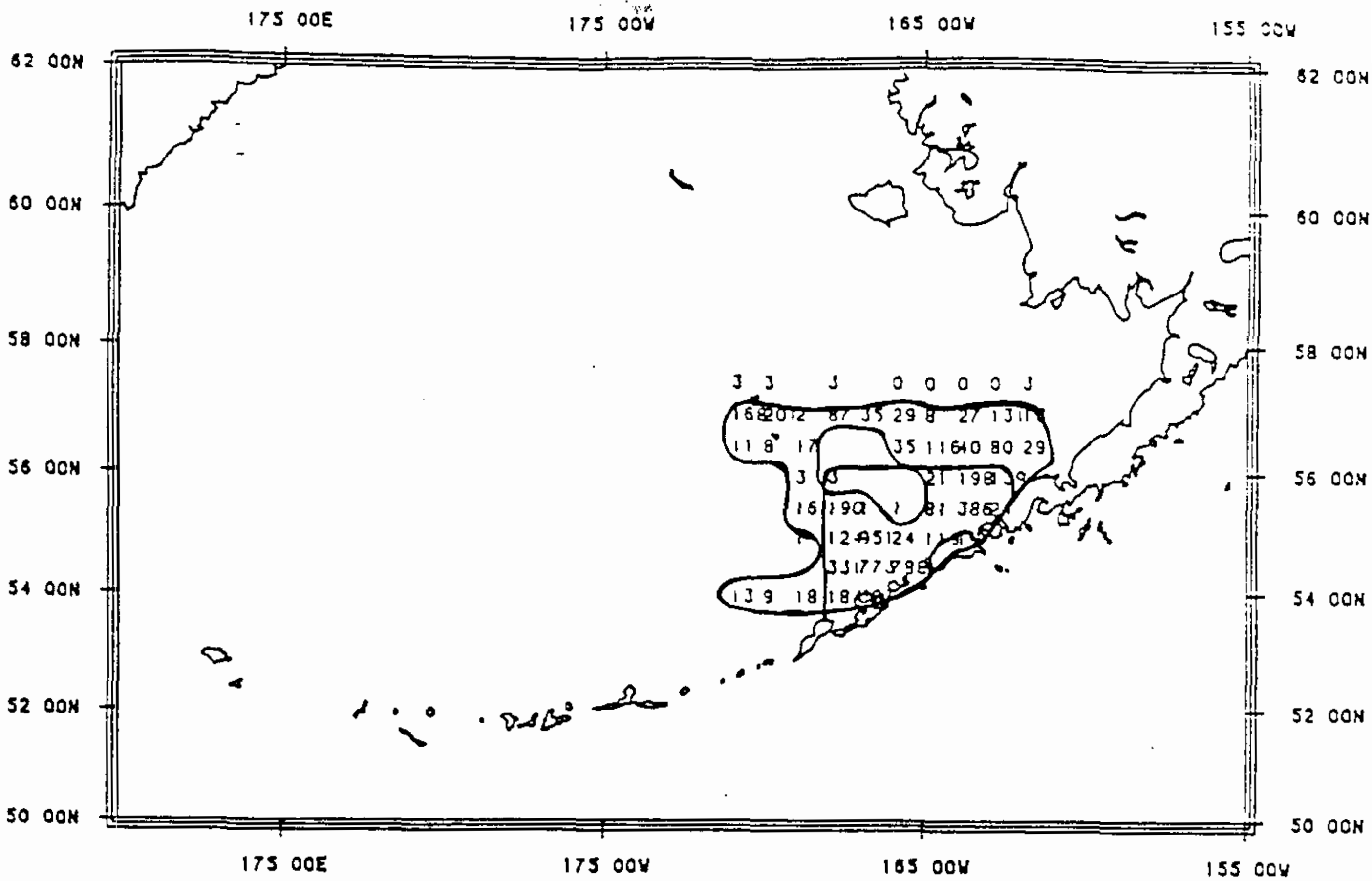
1986 2ND QTR POLLOCK JV TRAWL CATCH IN 100 MT



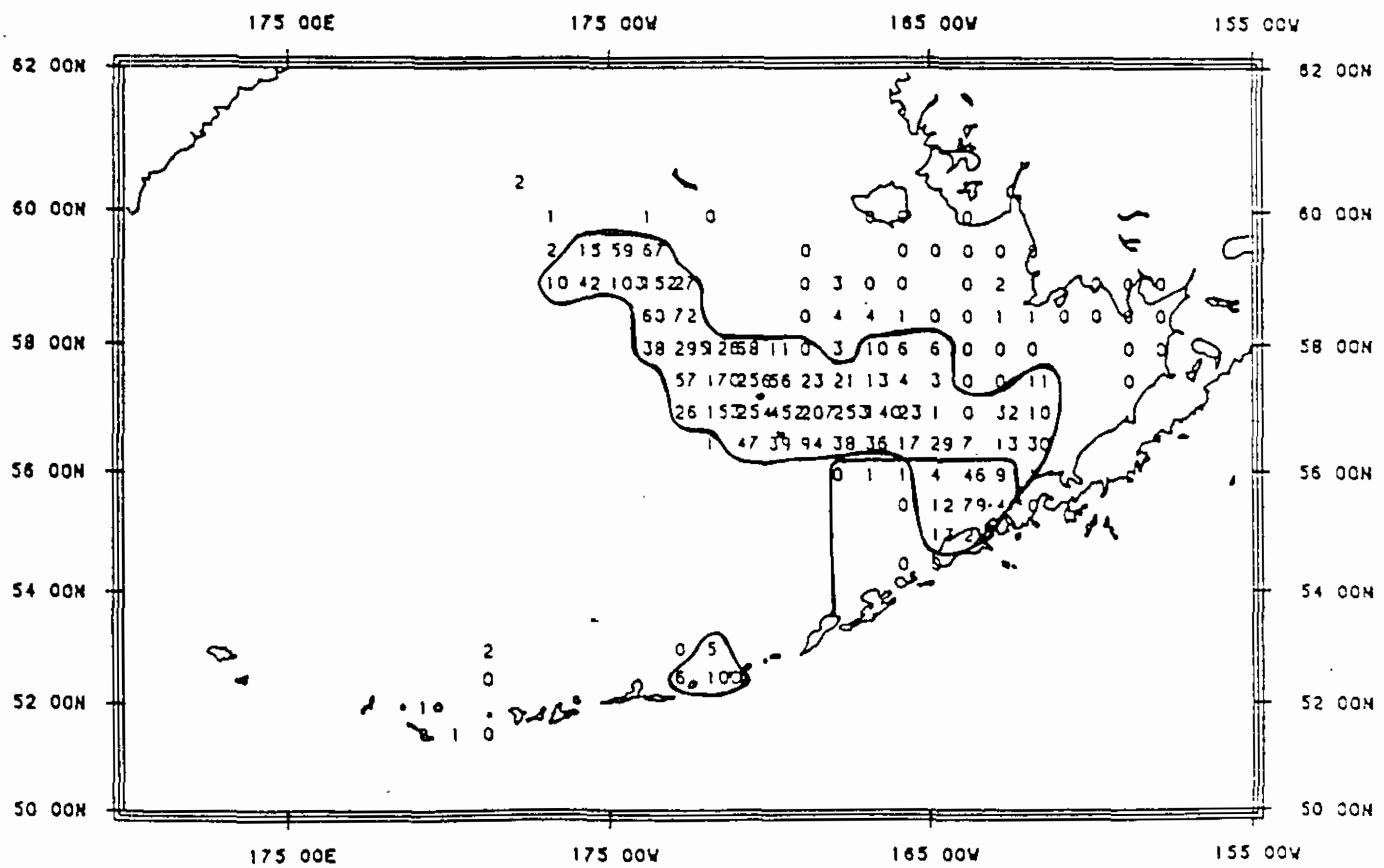
1986 3RD QTR POLLOCK JV TRAWL CATCH IN 100 MT



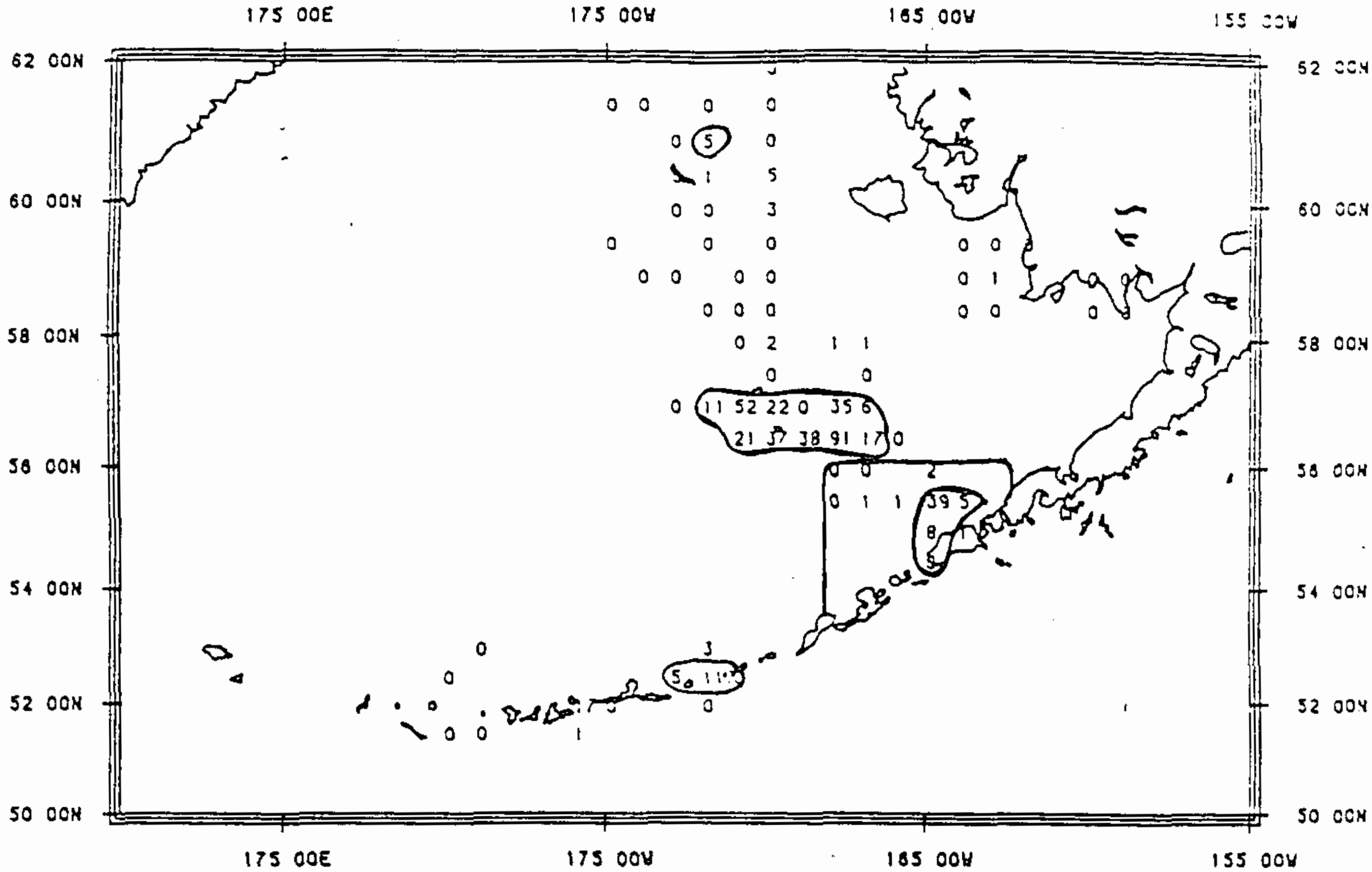
1986 4TH QTR POLLOCK JV TRAWL CATCH IN 100 MT



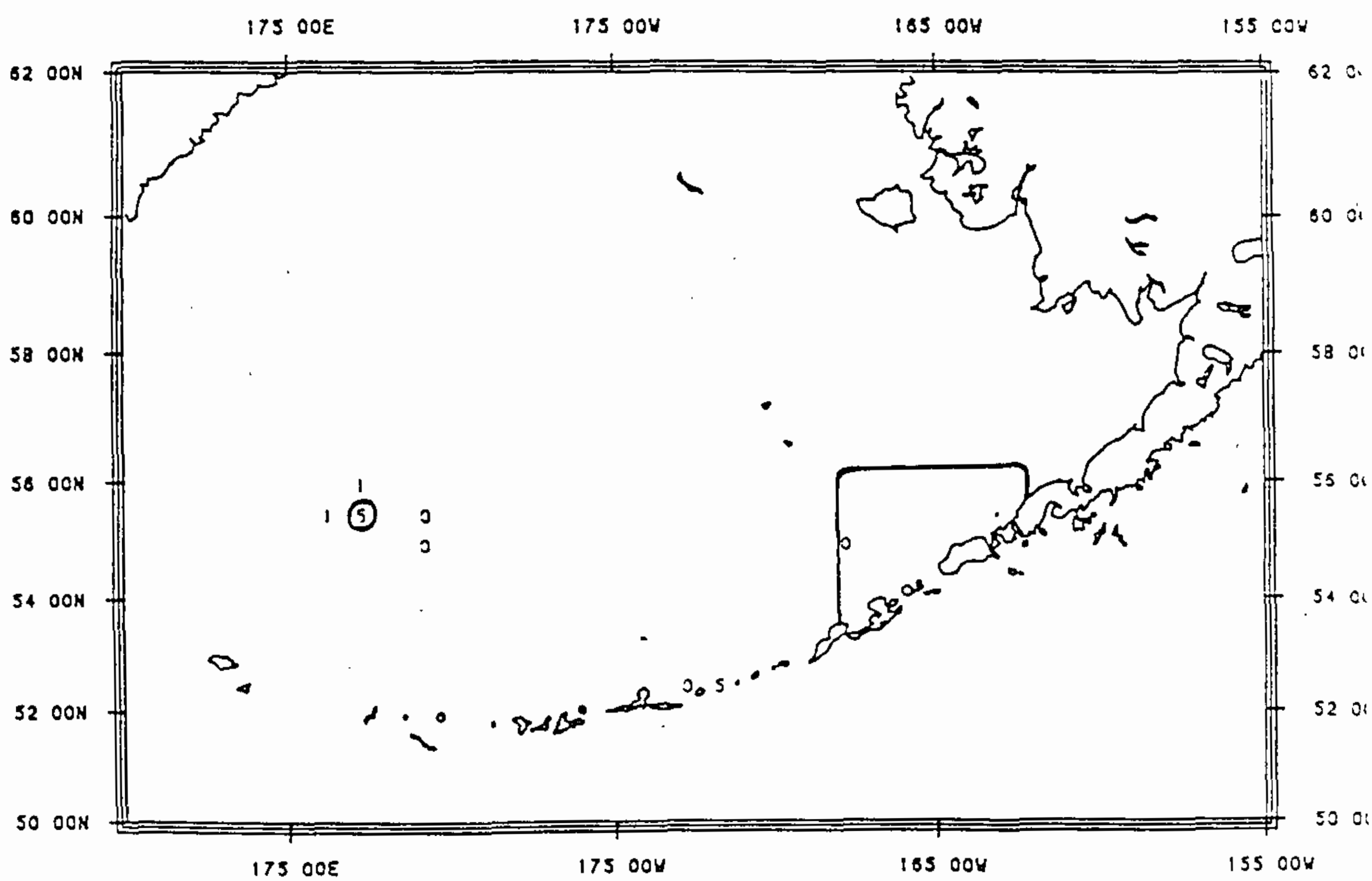
1987 FIRST QTR POLLOCK JV TRAWL CATCH IN 100 MT



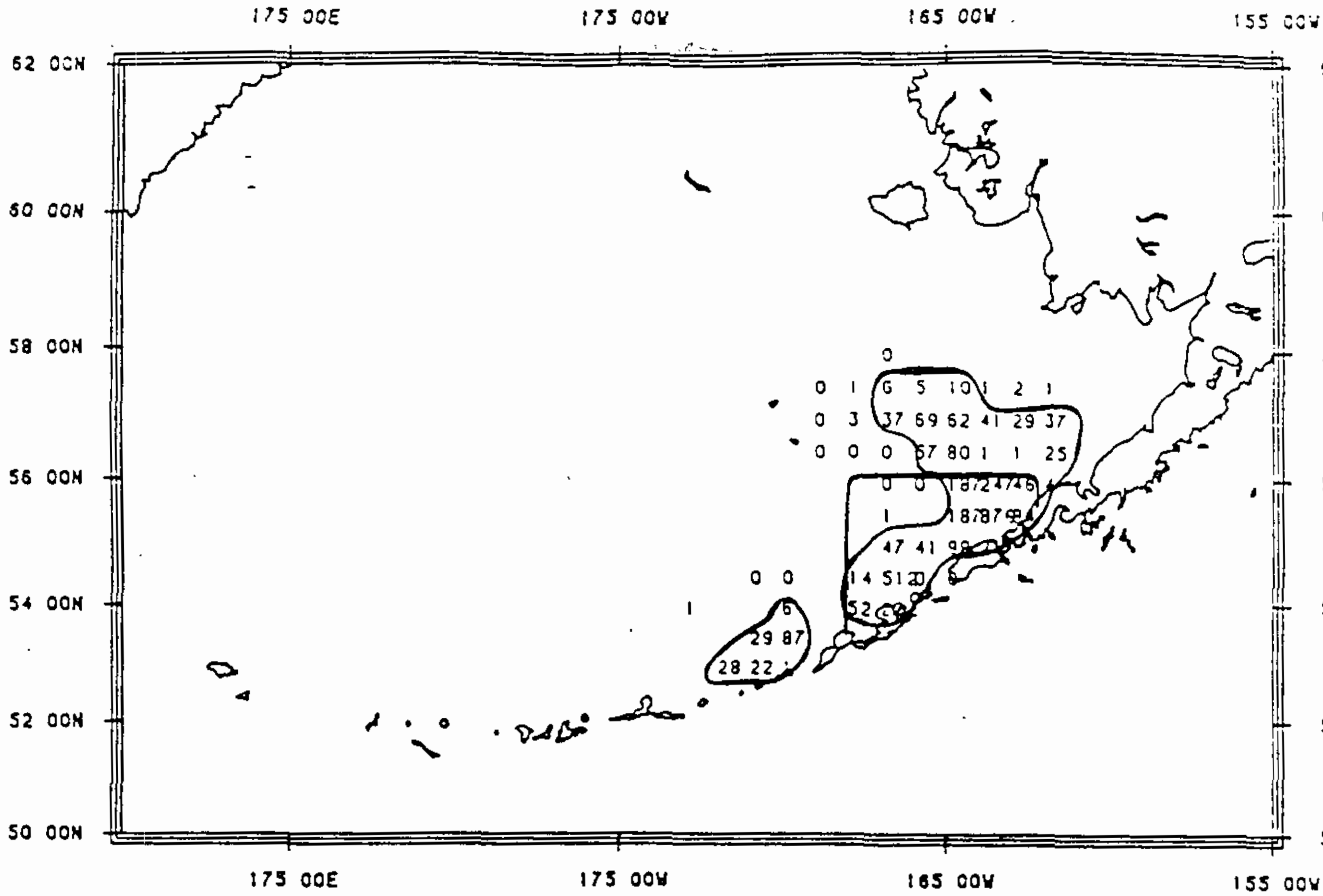
1987 2ND QTR POLLOCK JV TRAWL CATCH IN 100 MT



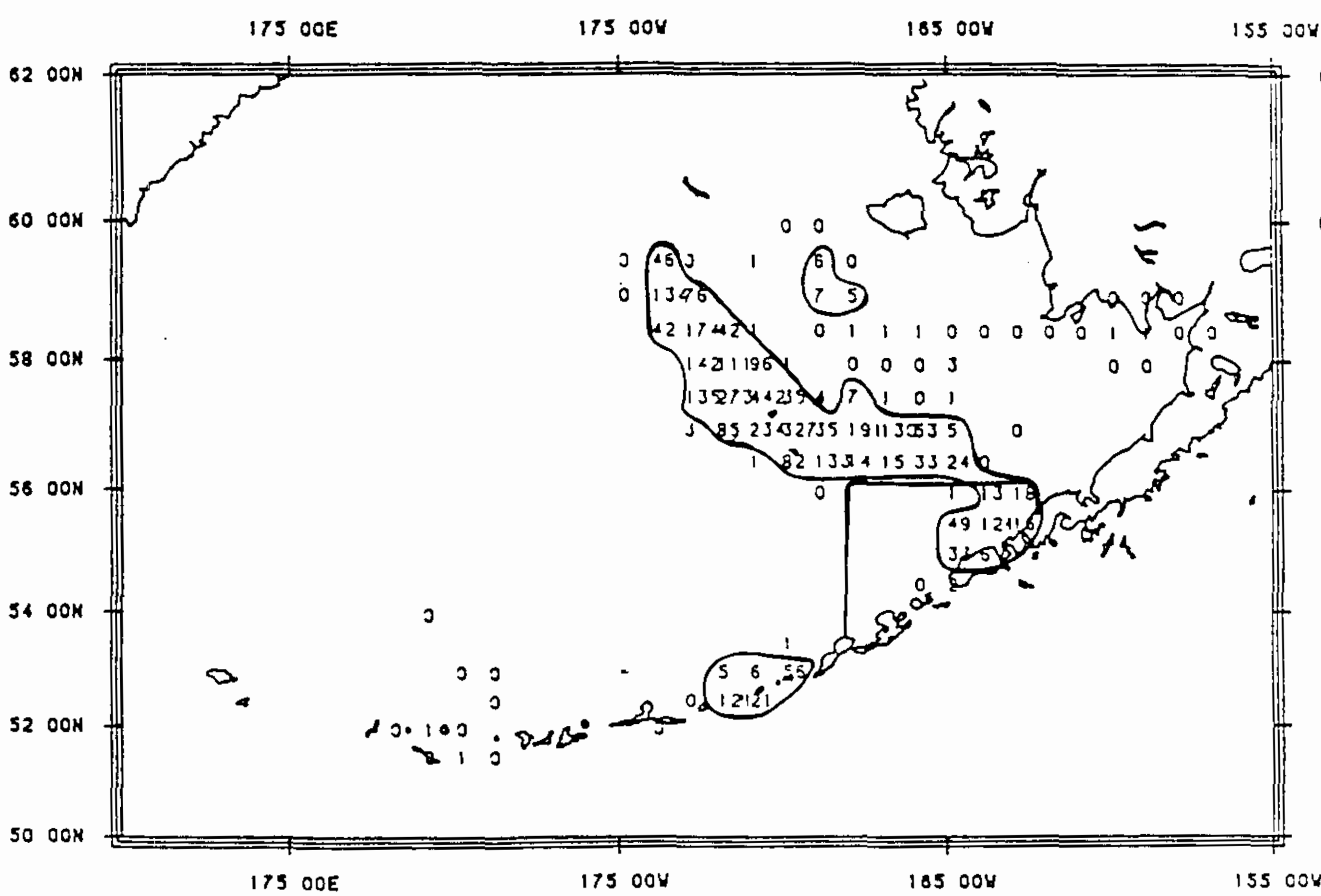
1987 3RD QTR POLLOCK JV TRAWL CATCH IN 100 MT



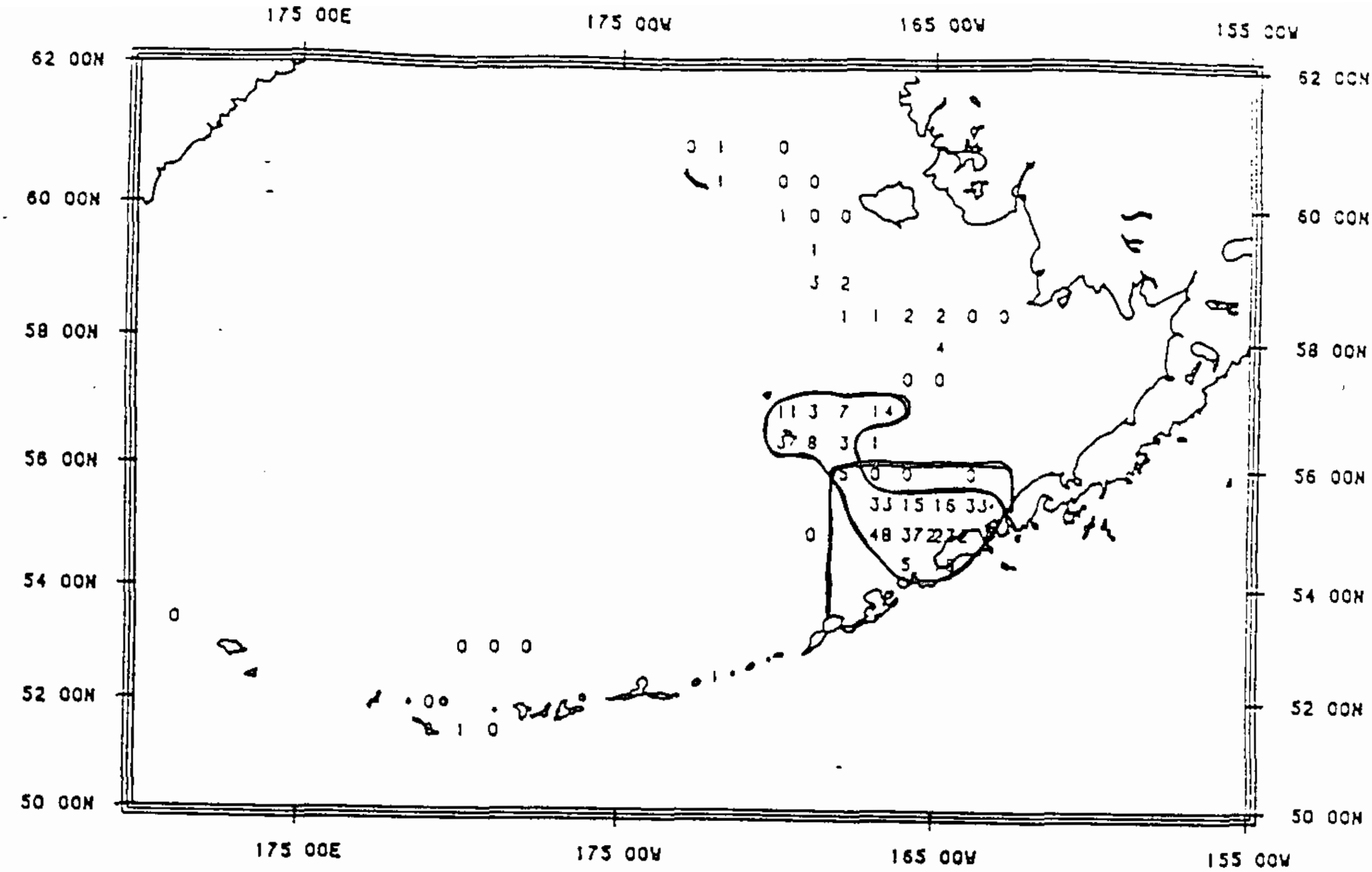
1987 4TH QTR POLLOCK JV TRAWL CATCH IN 100 MT



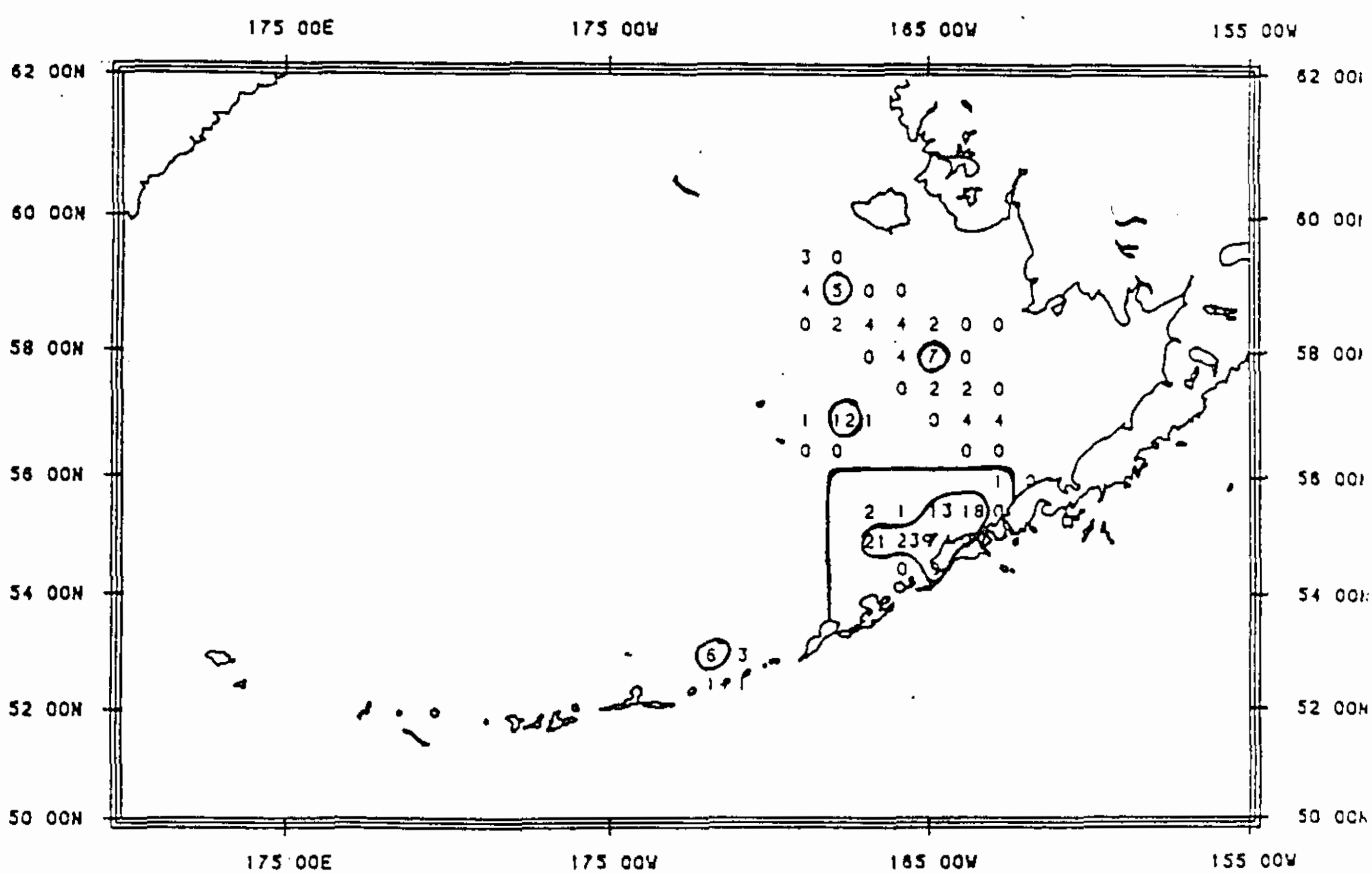
1988 FIRST QTR POLLOCK JV TRAWL CATCH IN 100 MT



1988 2ND QTR POLLOCK JV TRAWL CATCH IN 100 MT



1988 3RD QTR POLLOCK JV TRAWL CATCH IN 100 MT

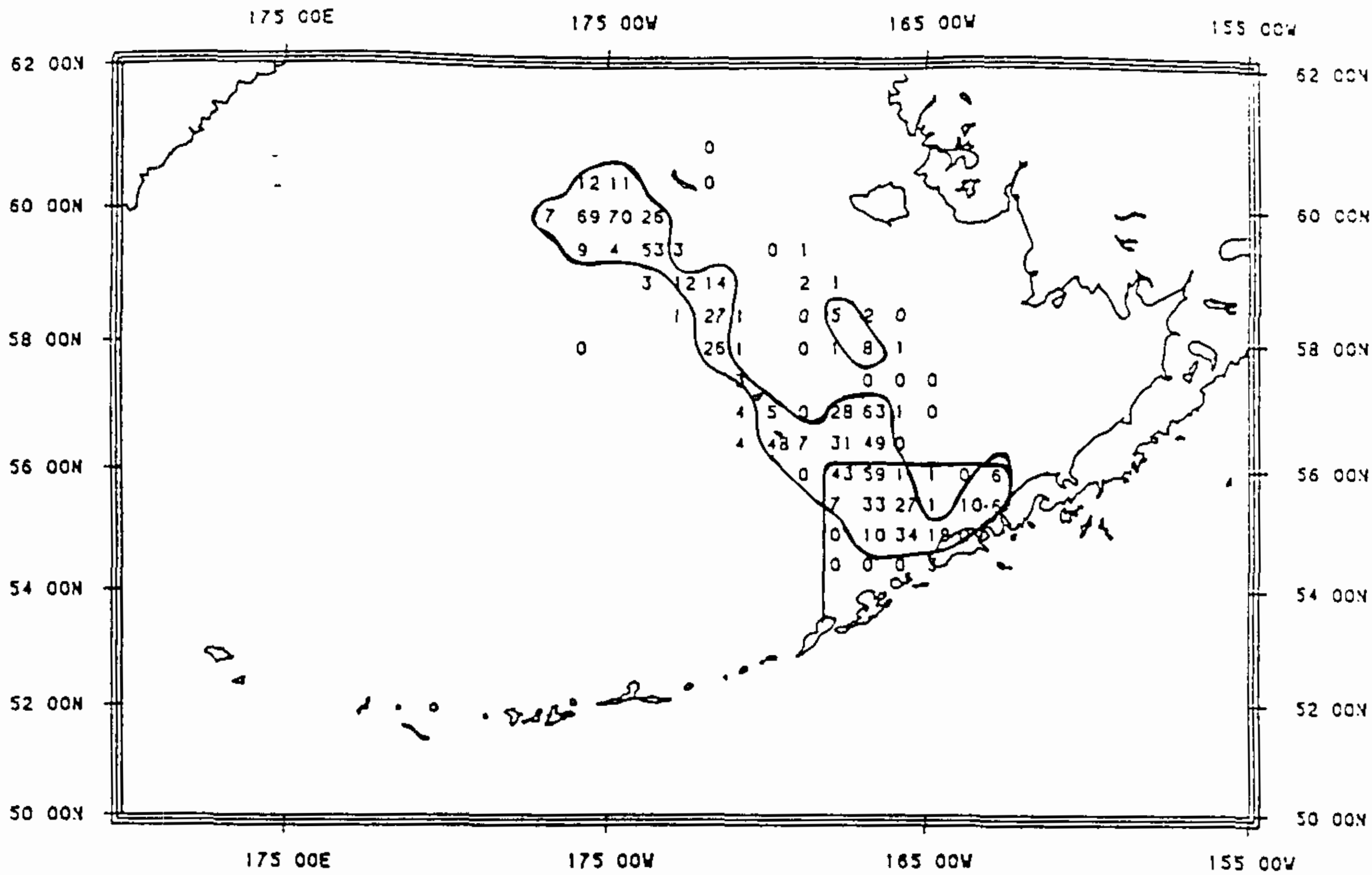


1988 4TH QTR POLLOCK JV TRAWL CATCH IN 100 MT

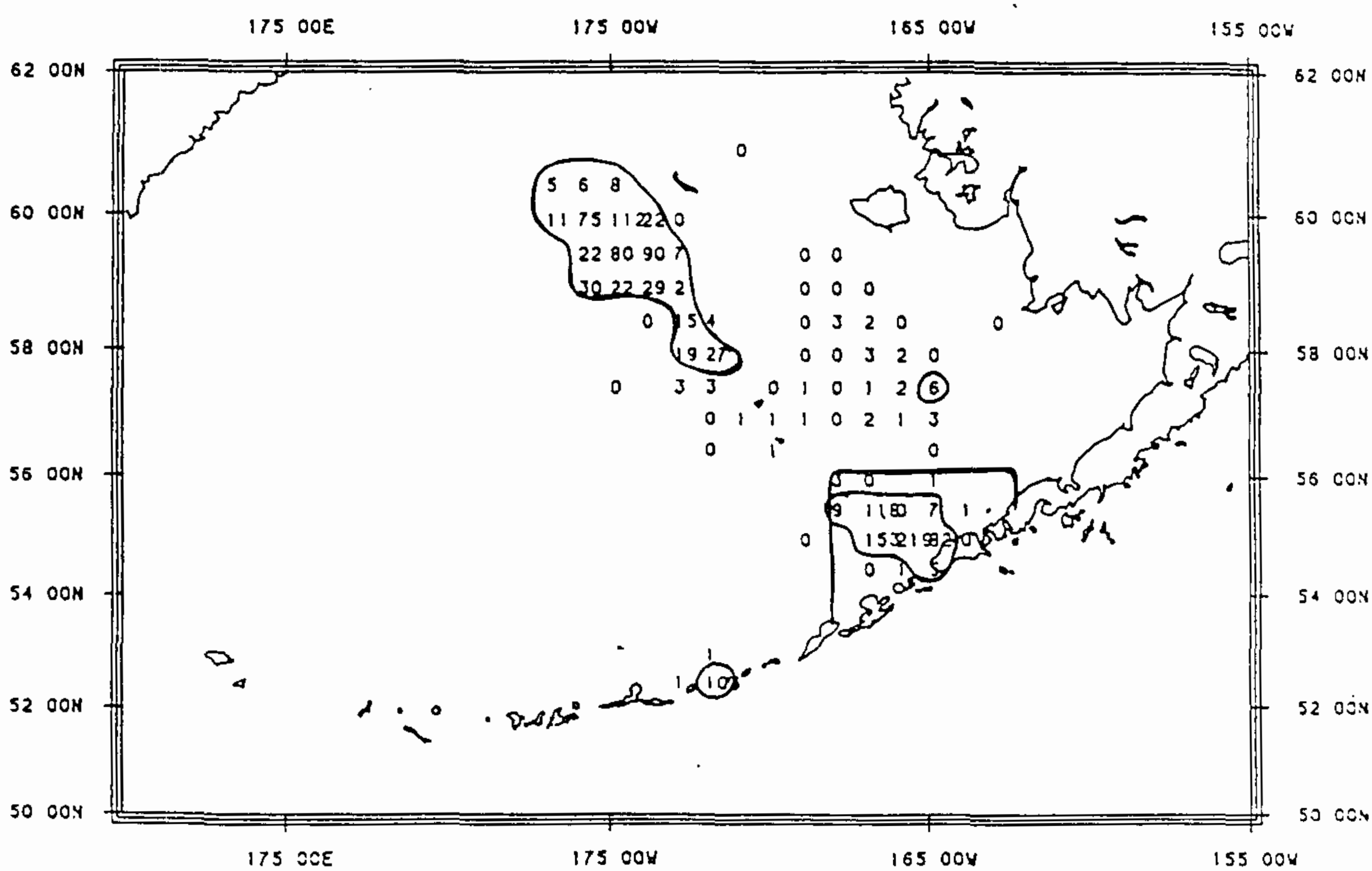
APPENDIX 2-D

Foreign Longline Harvests of Pacific Cod in the GOA:

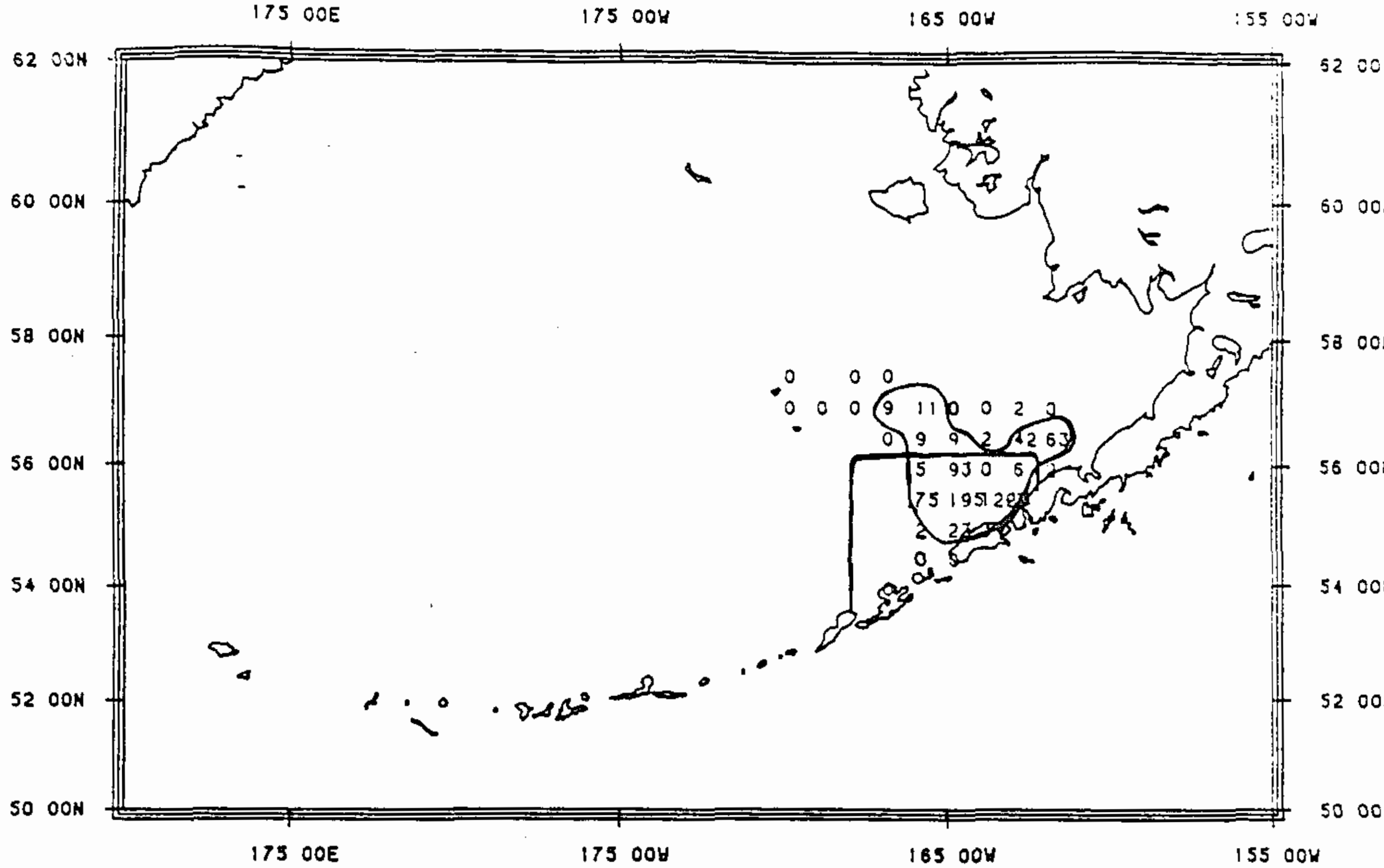
1980 - 1986



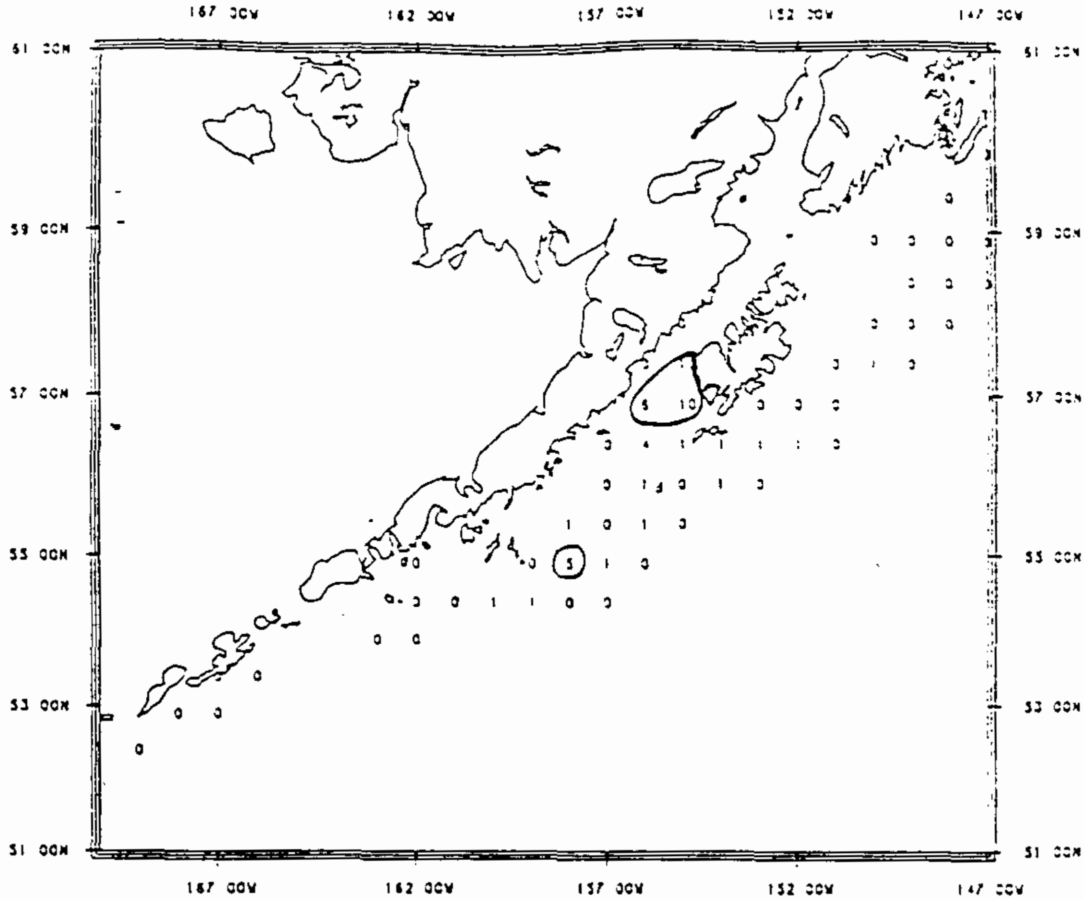
1989 3RD QTR POLLOCK JV TRAWL CATCH IN 100 MT



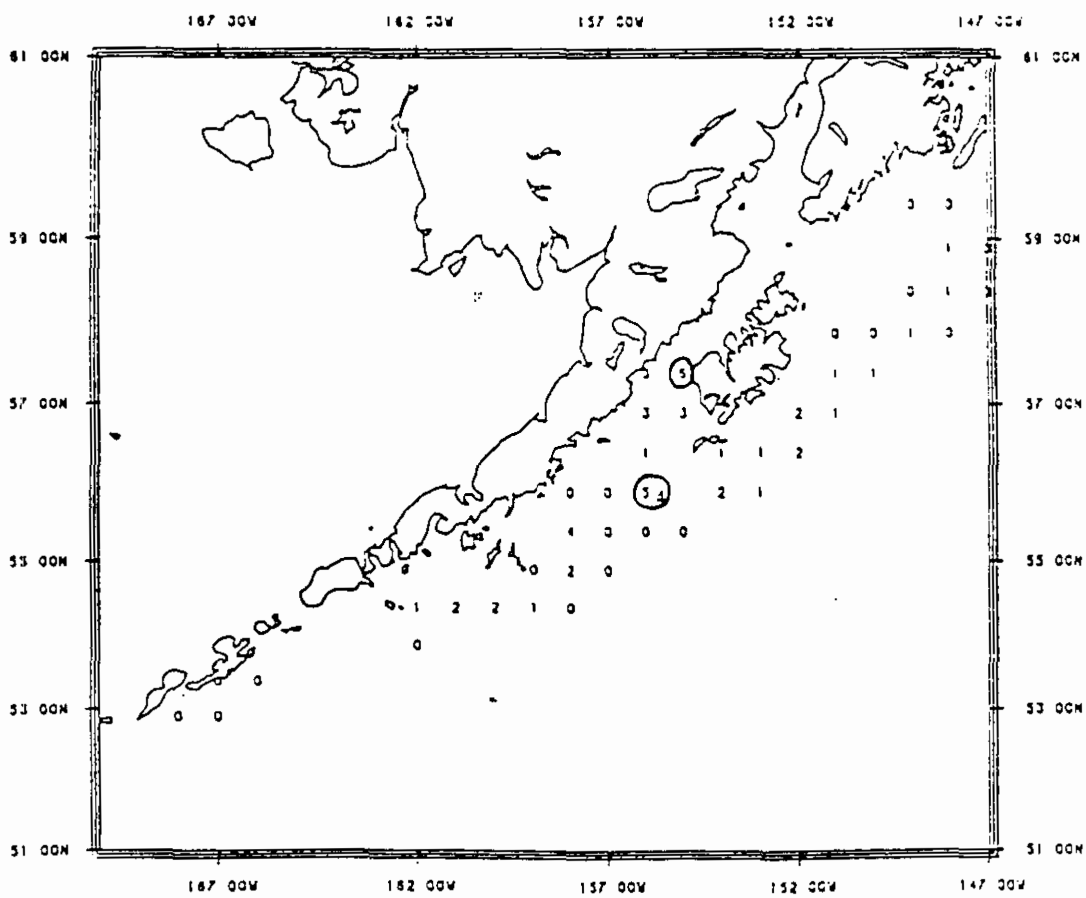
1989 4TH QTR POLLOCK JV TRAWL CATCH IN 100 MT



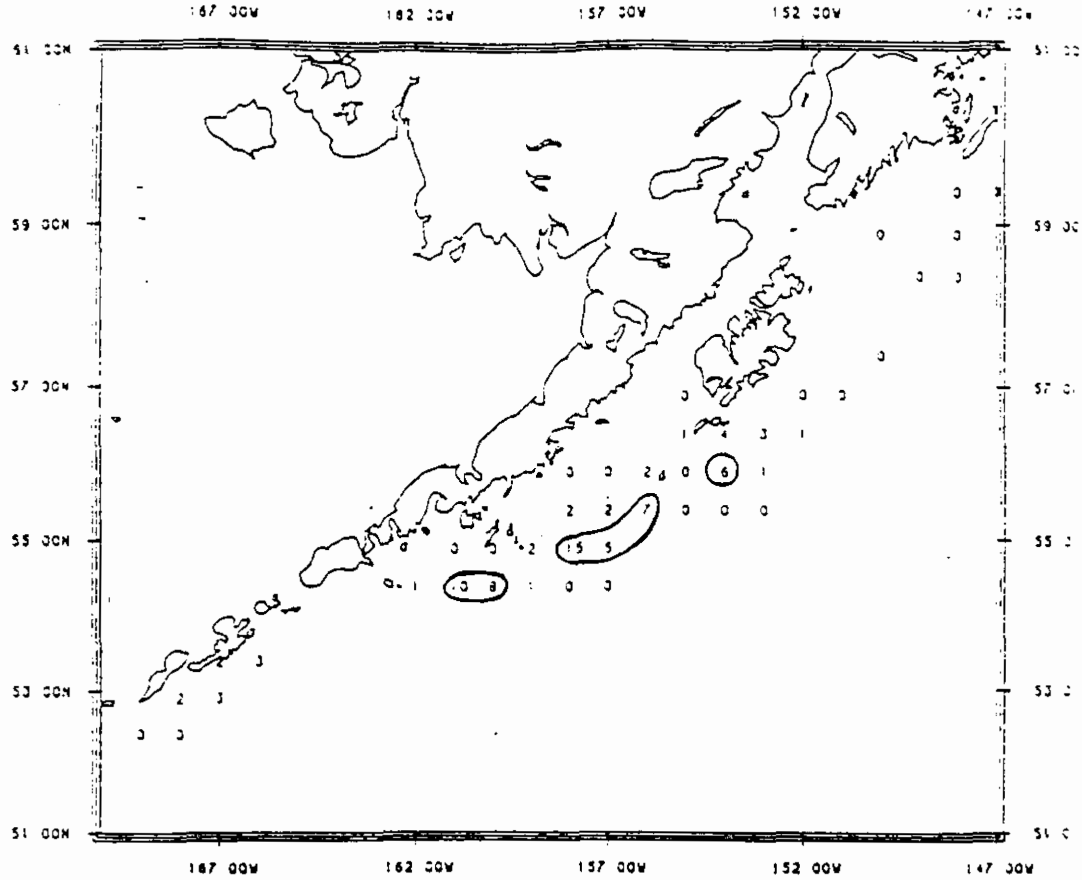
1989 FIRST QTR POLLOCK JV TRAWL CATCH IN 100 MT



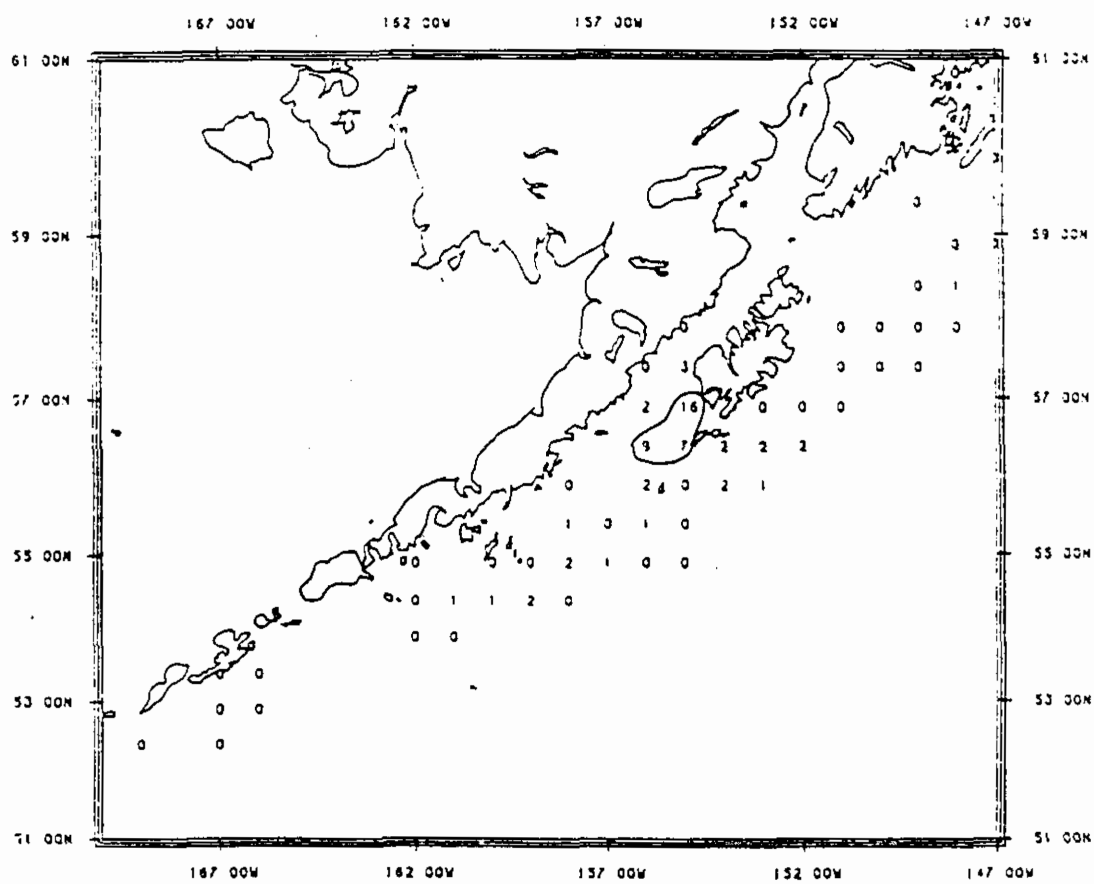
1980 3RD QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



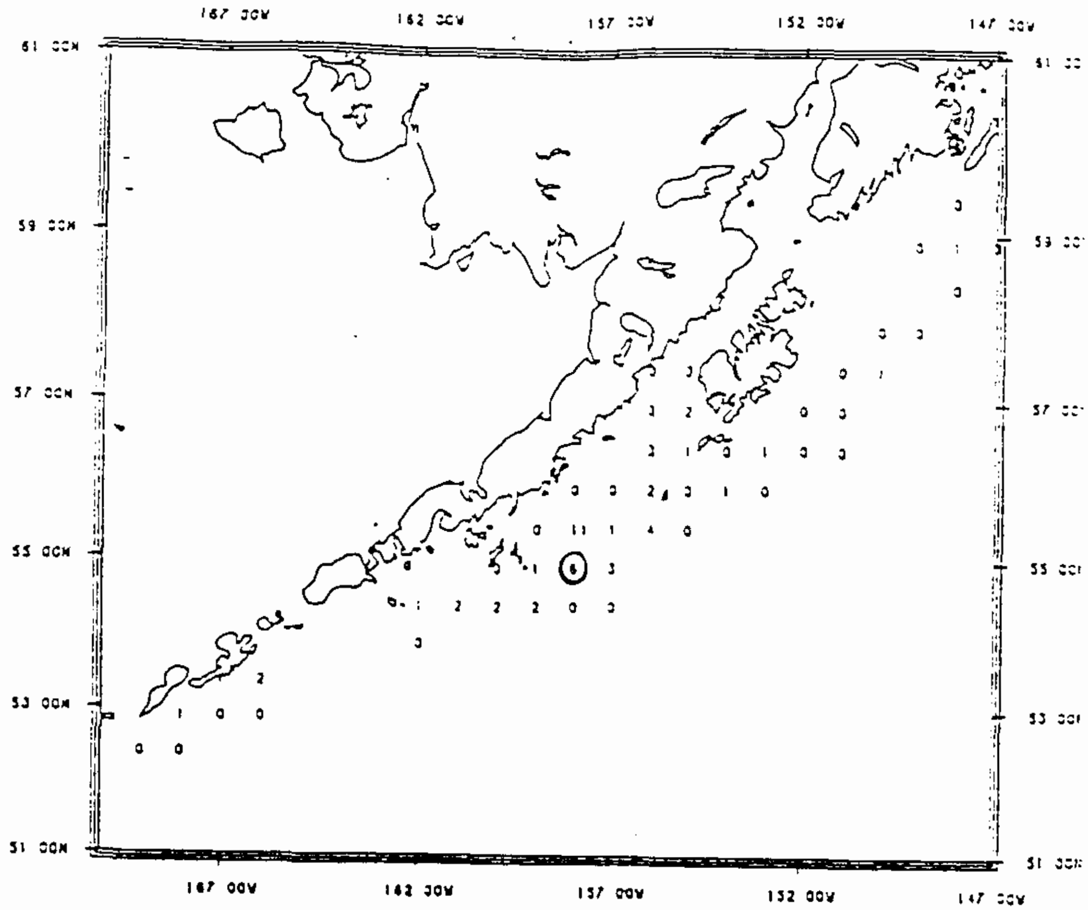
1980 4TH QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



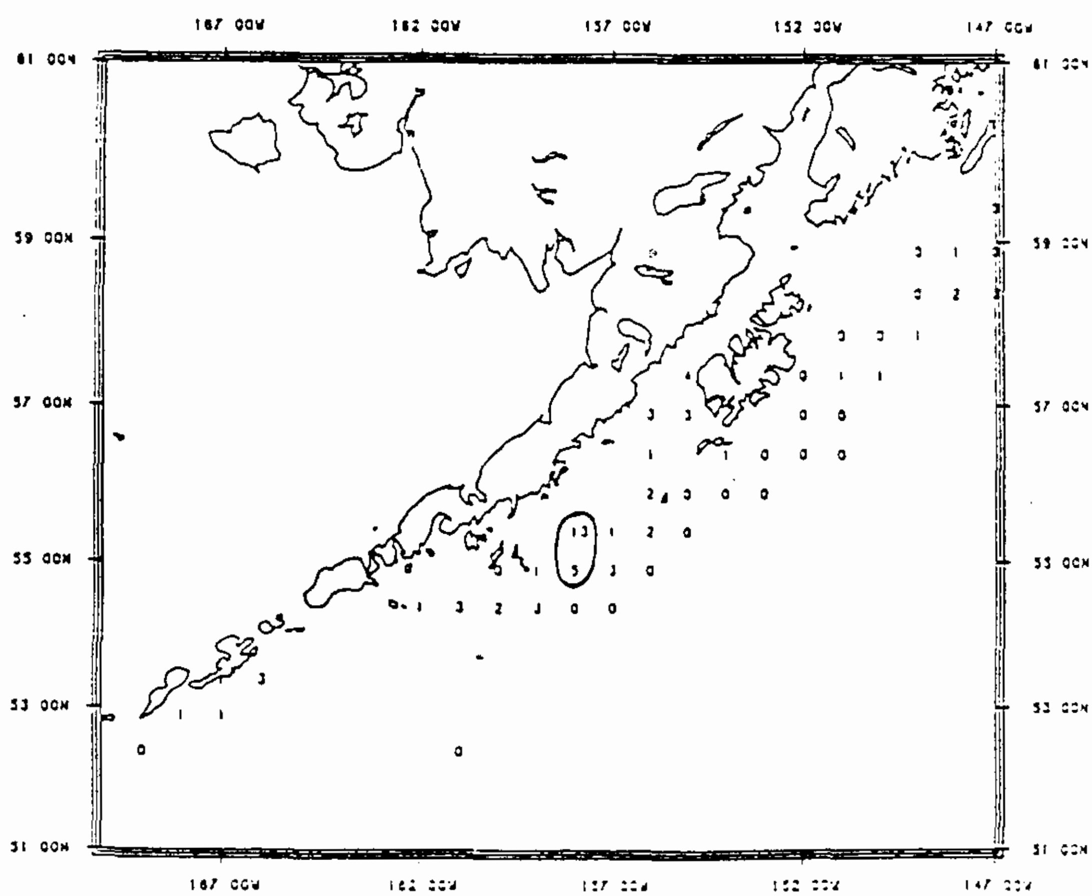
1980 FIRST QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



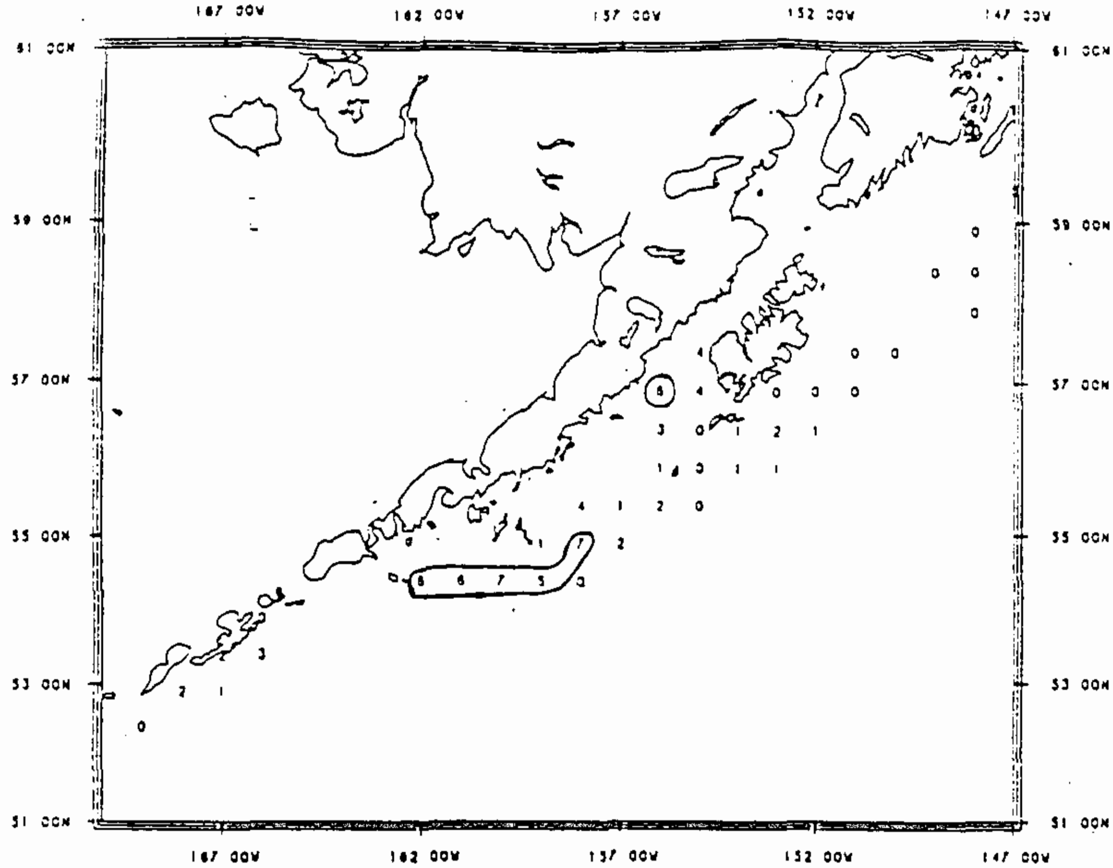
1980 2ND QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



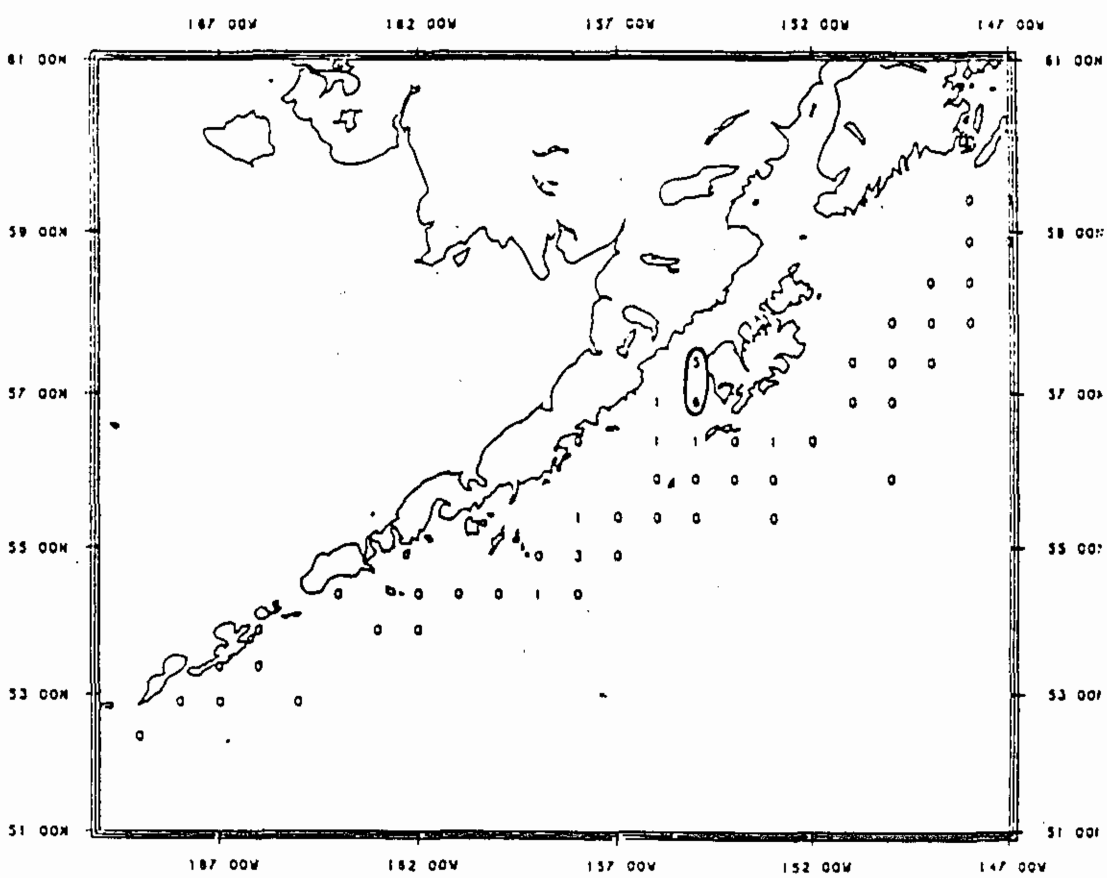
1981 3RD QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



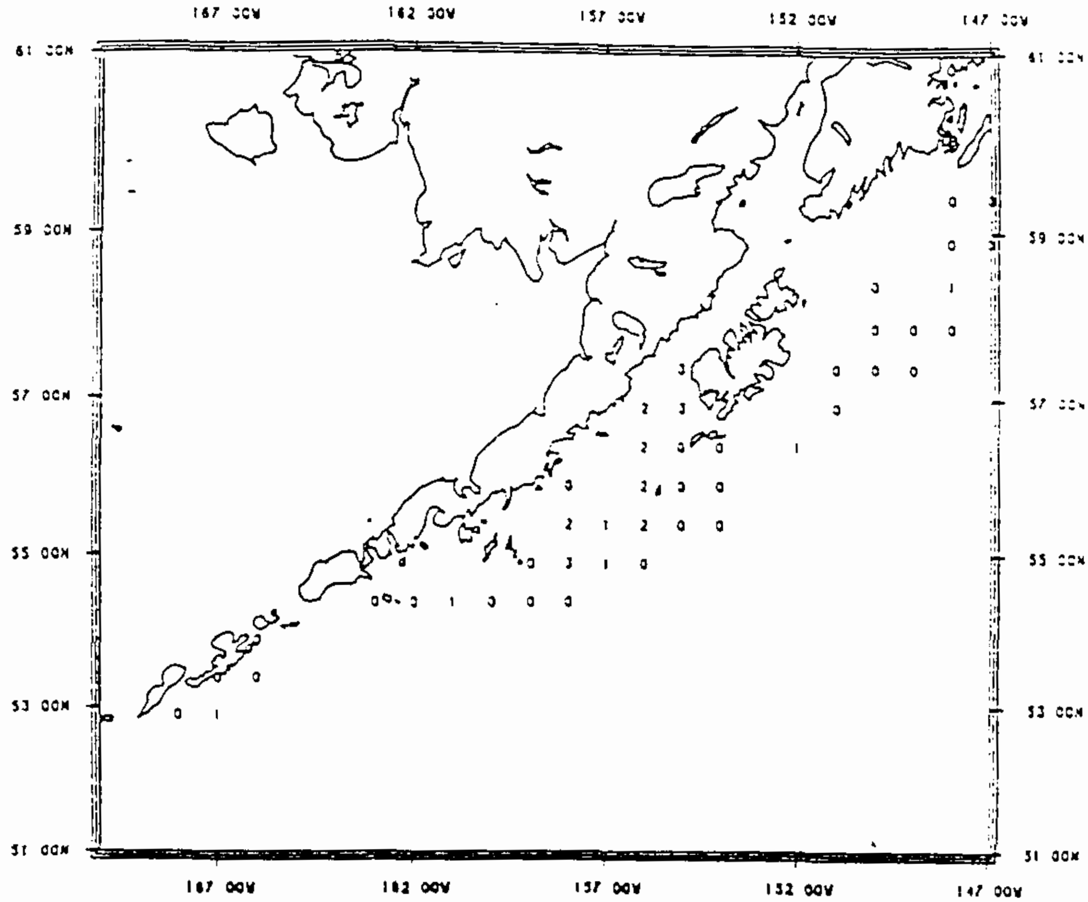
1981 4TH QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



1981 FIRST QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



1981 2ND QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



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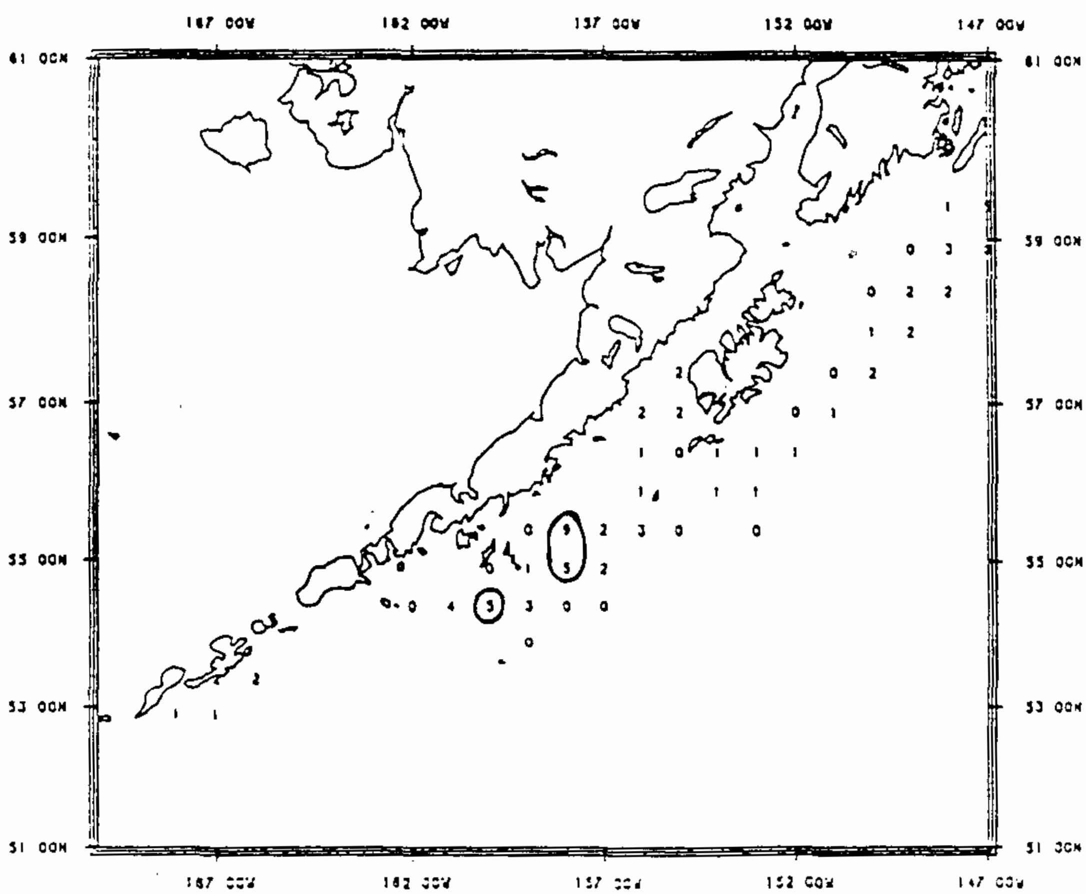
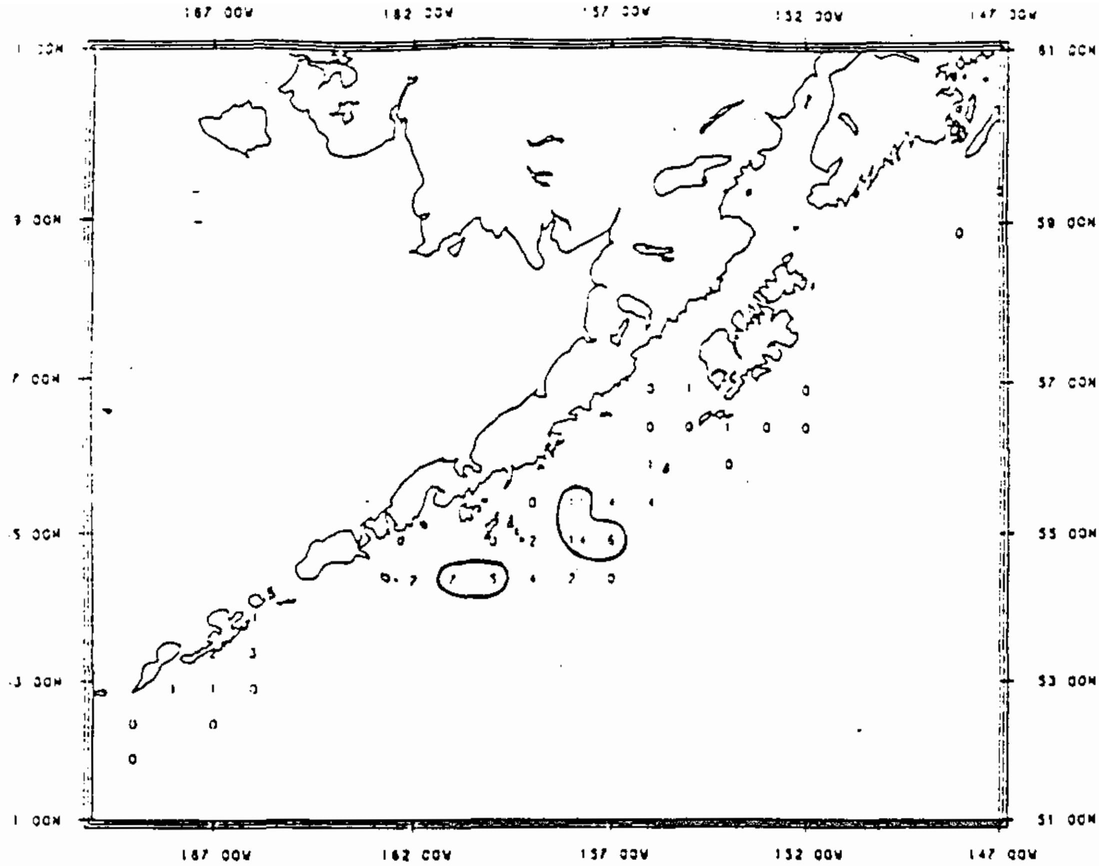
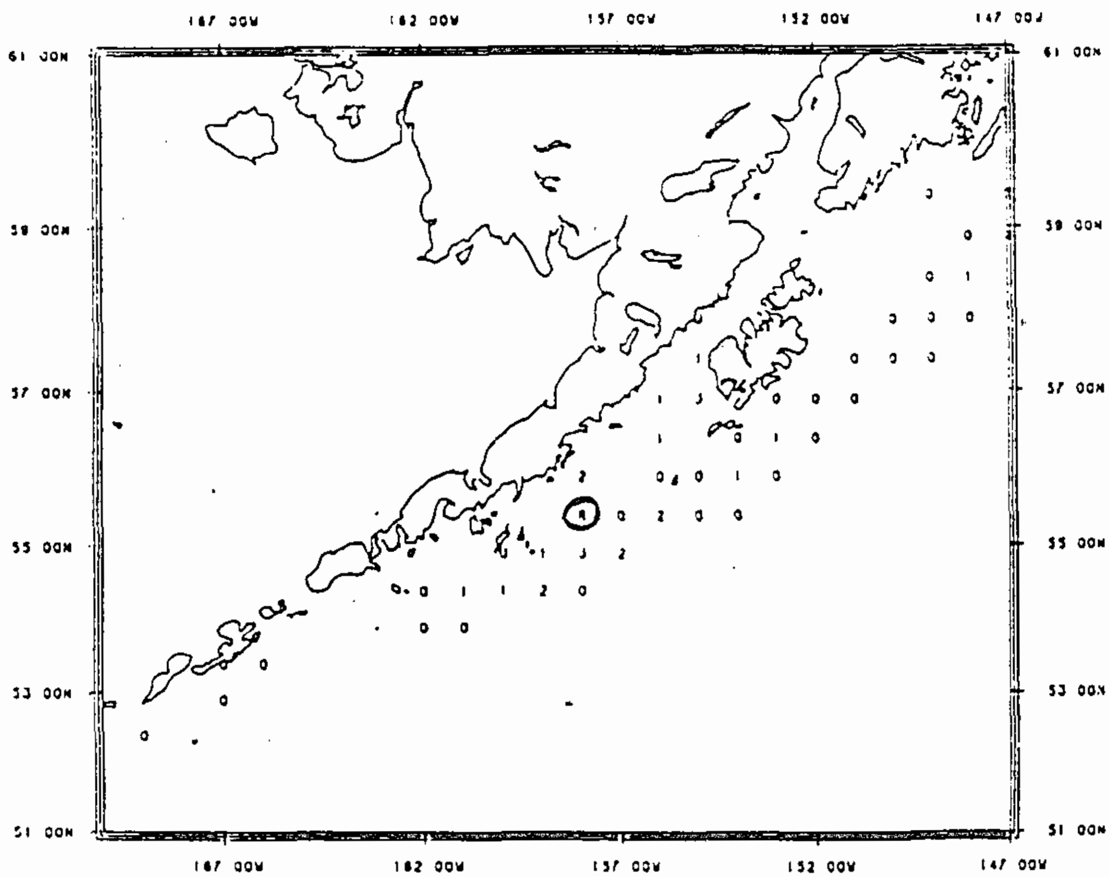


1982 4TH QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



1982 FIRST QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



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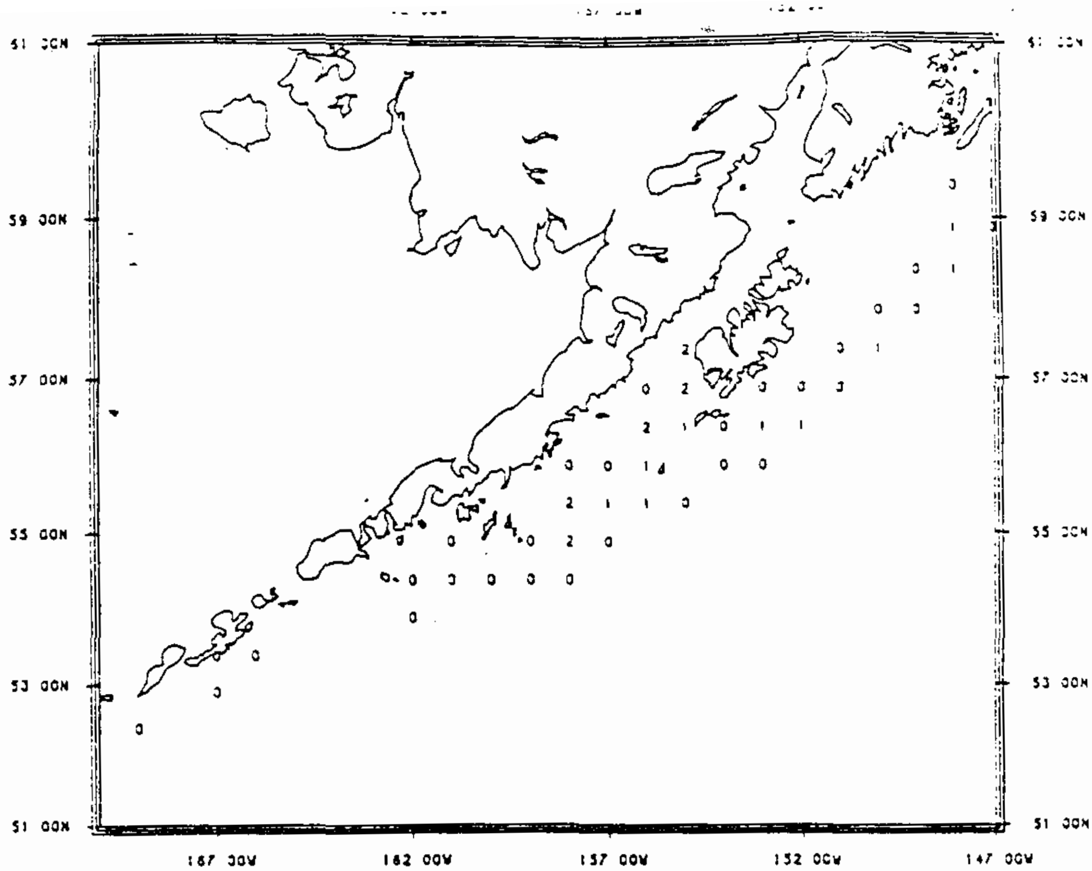
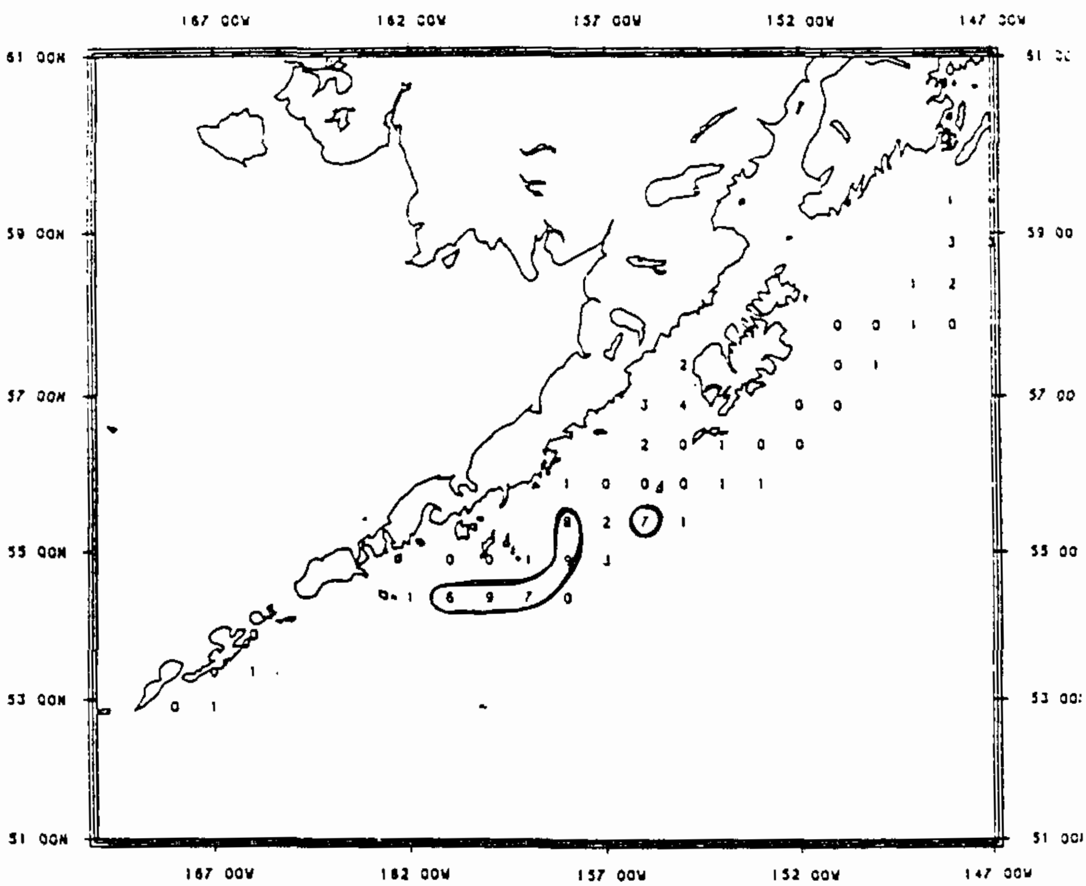


1983 3RD QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT



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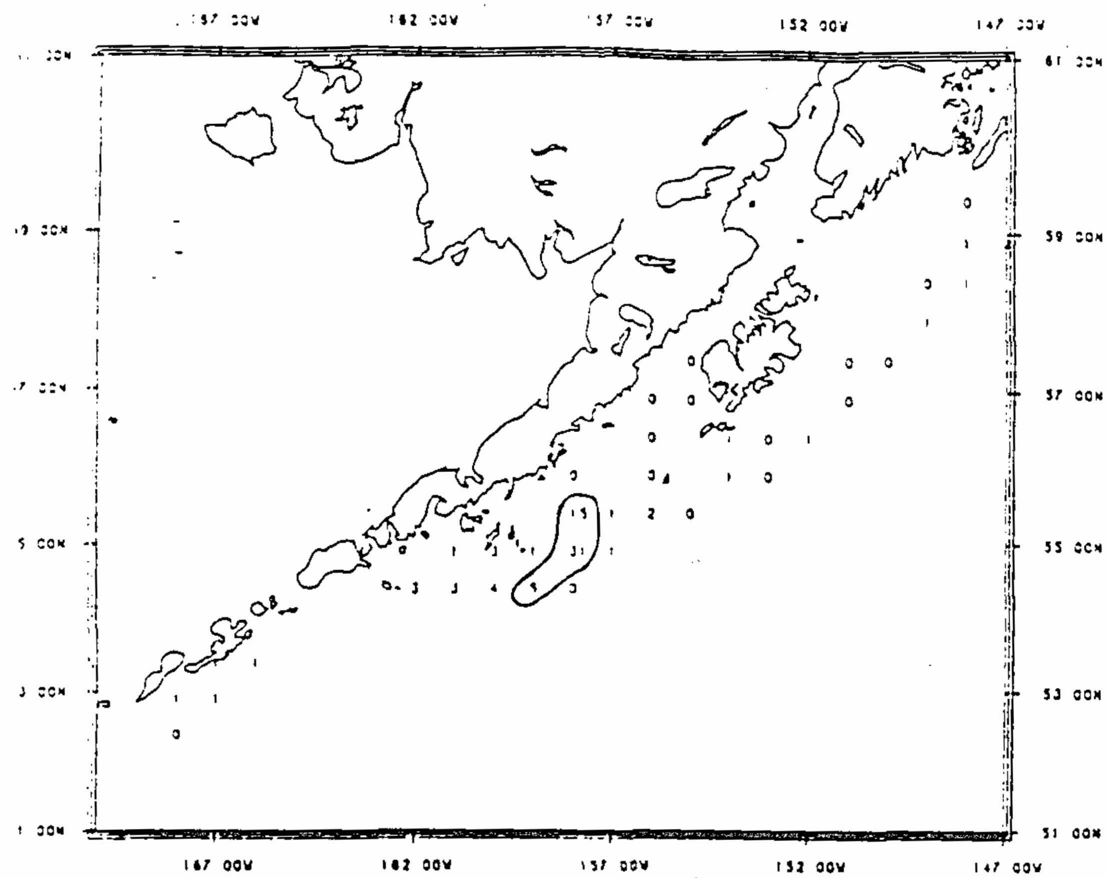

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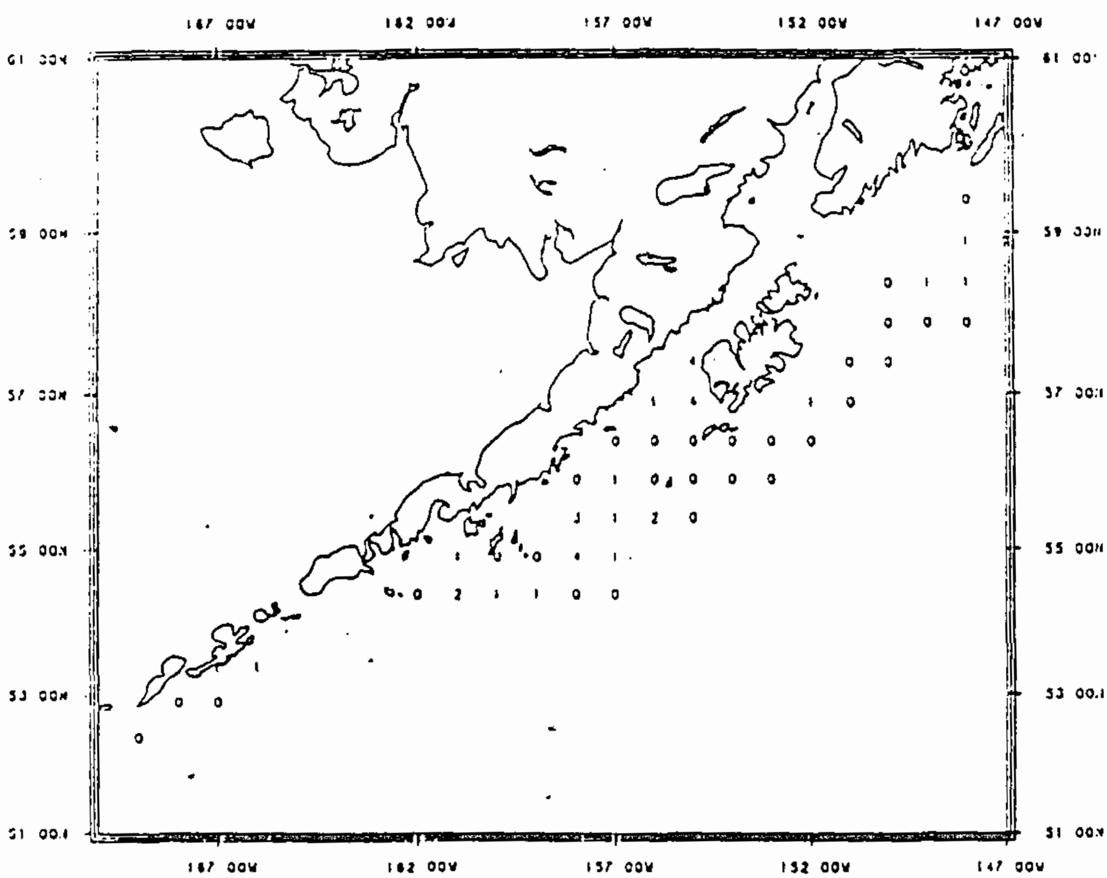

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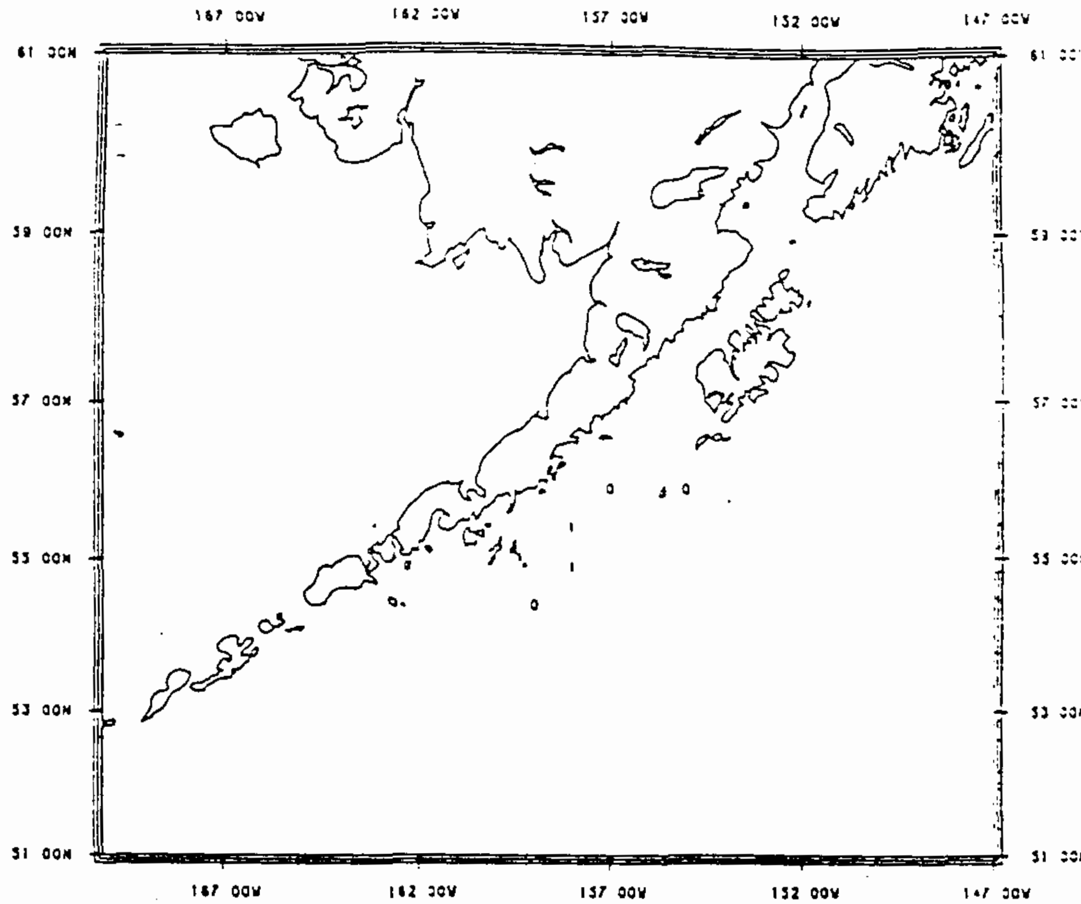

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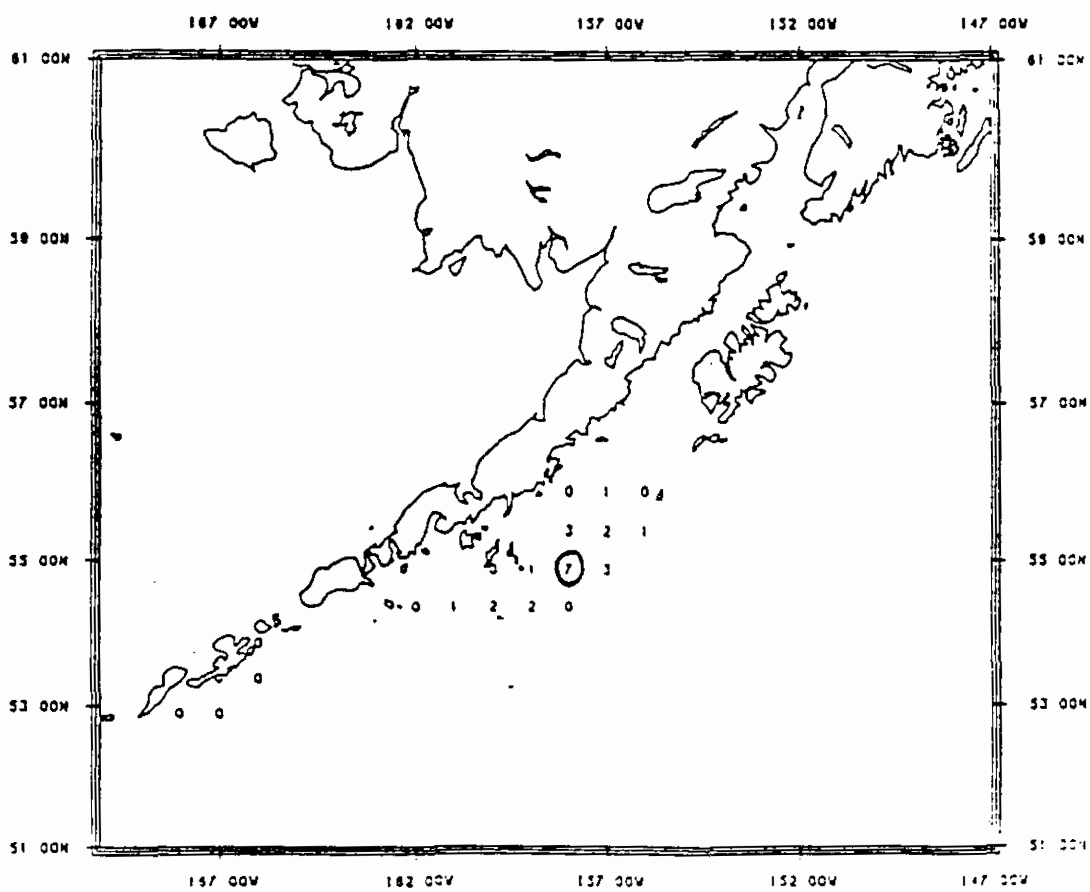

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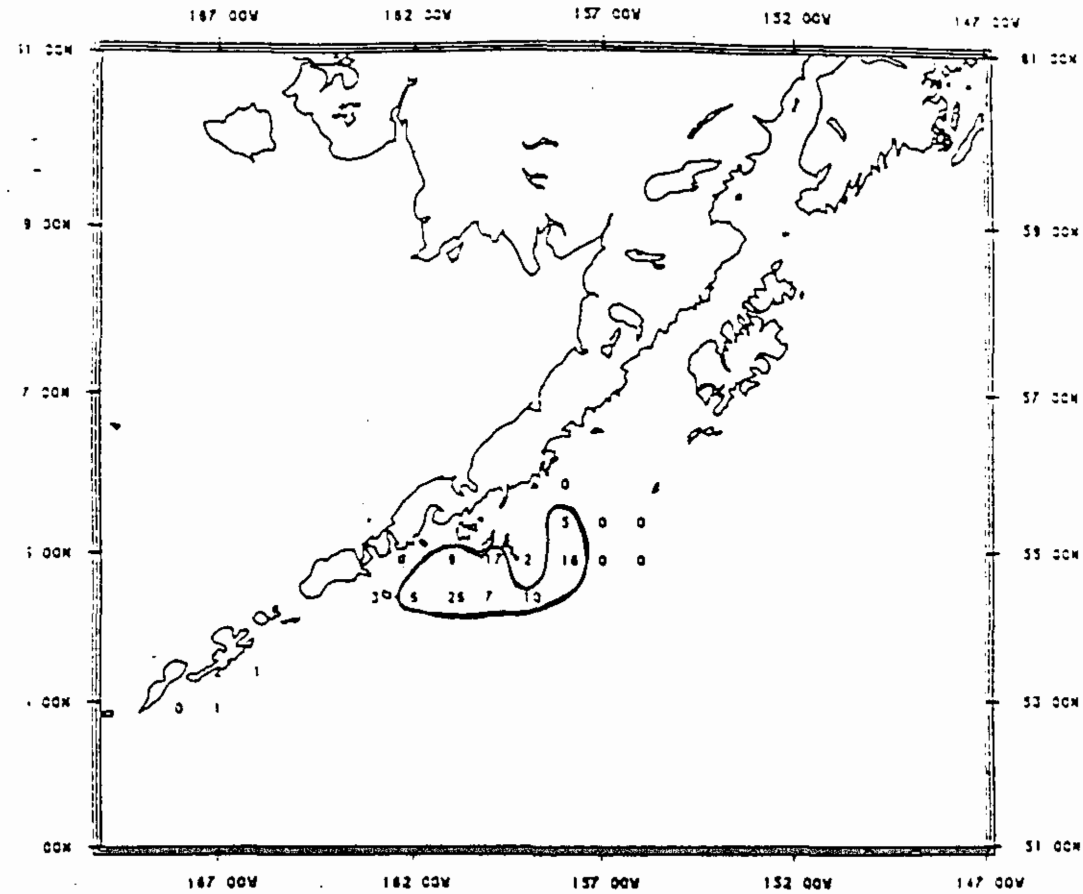

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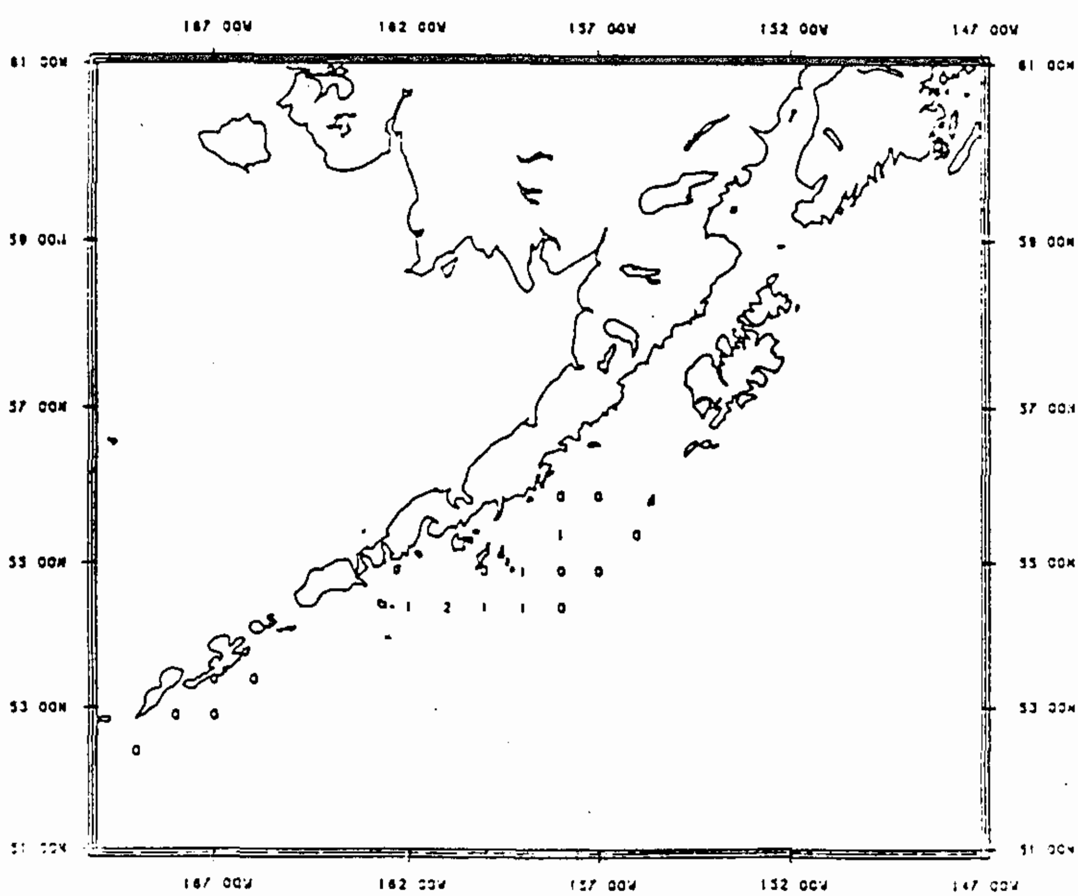

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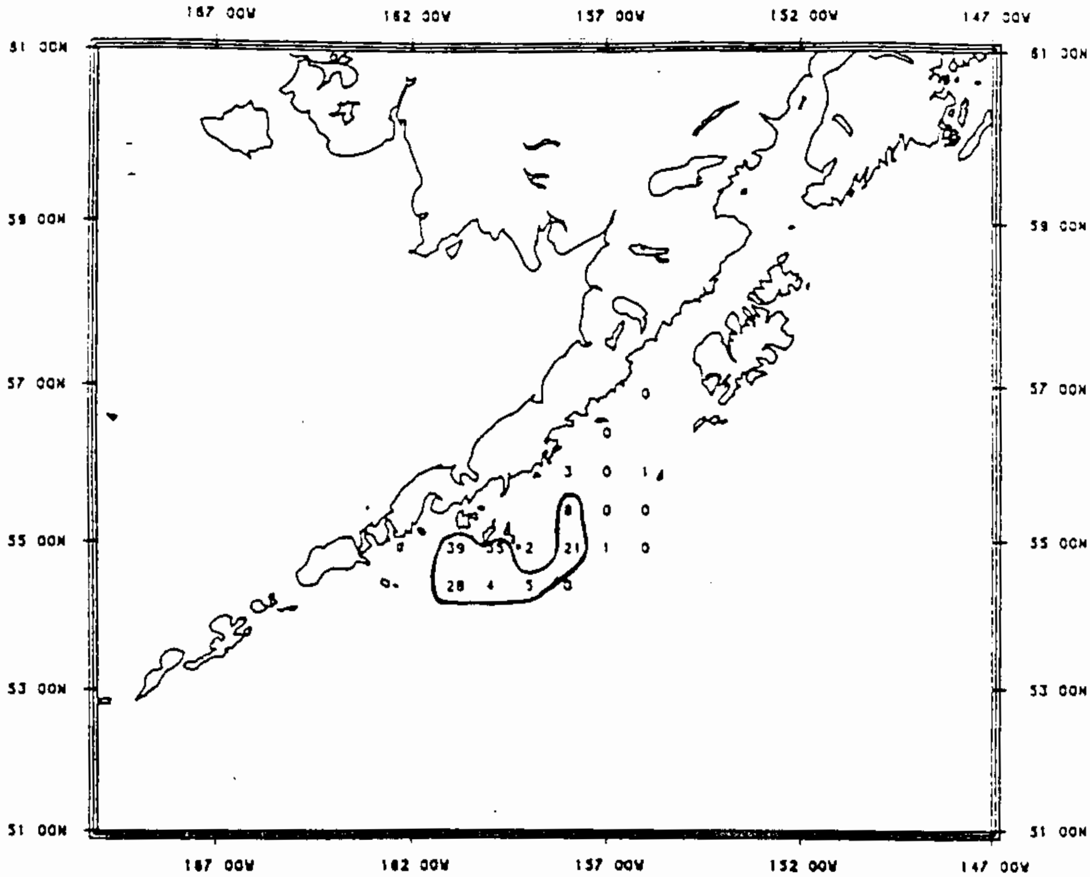

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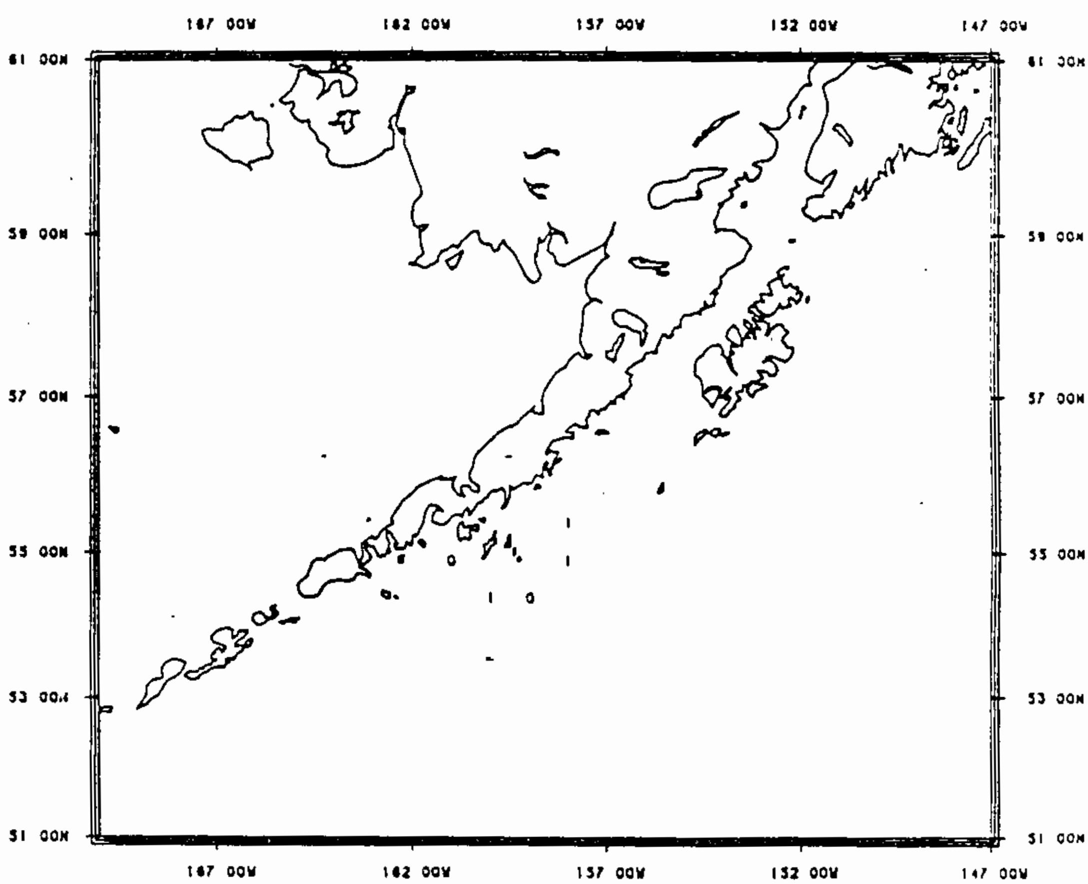

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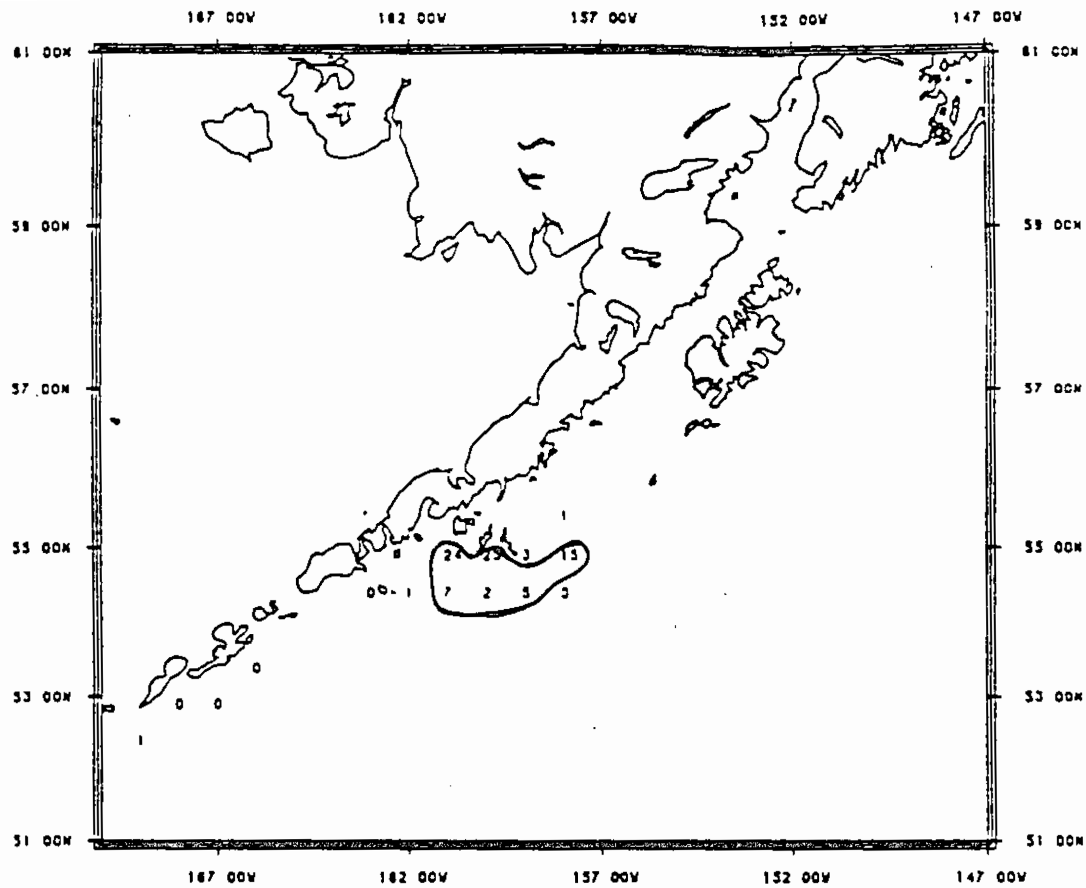

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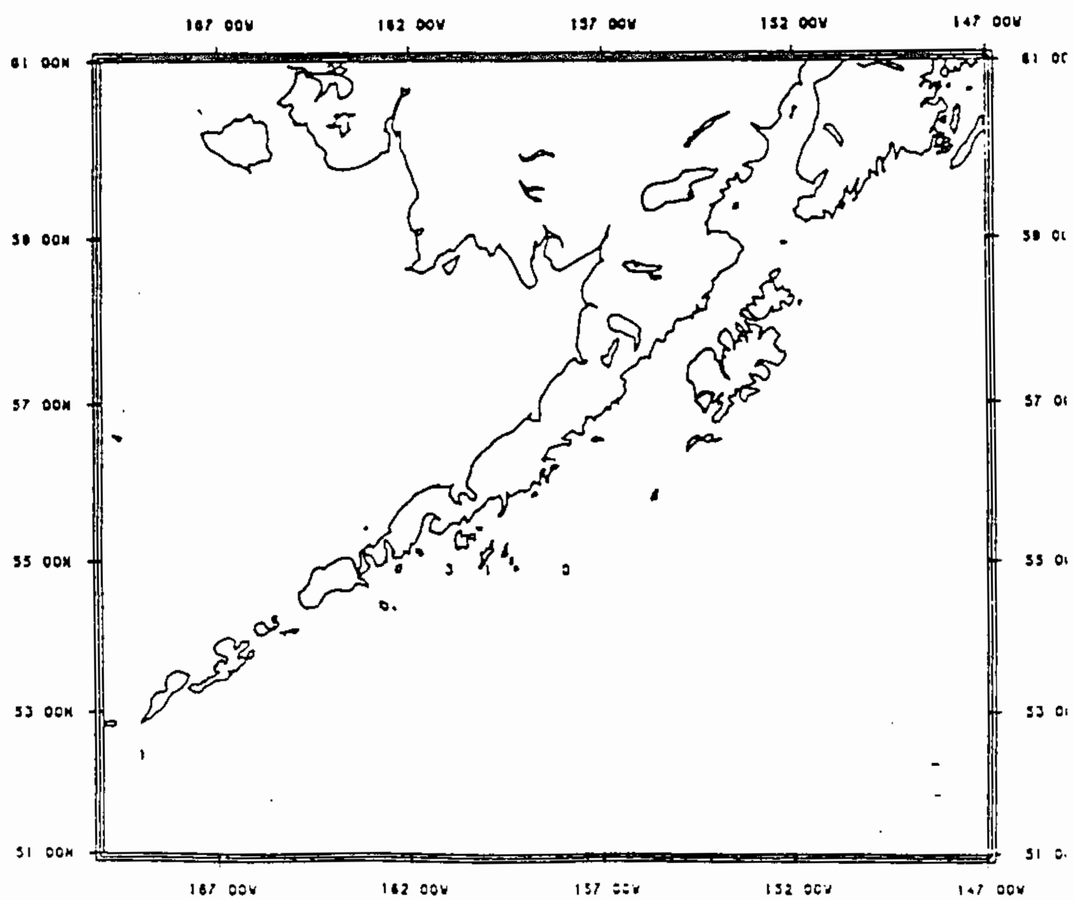
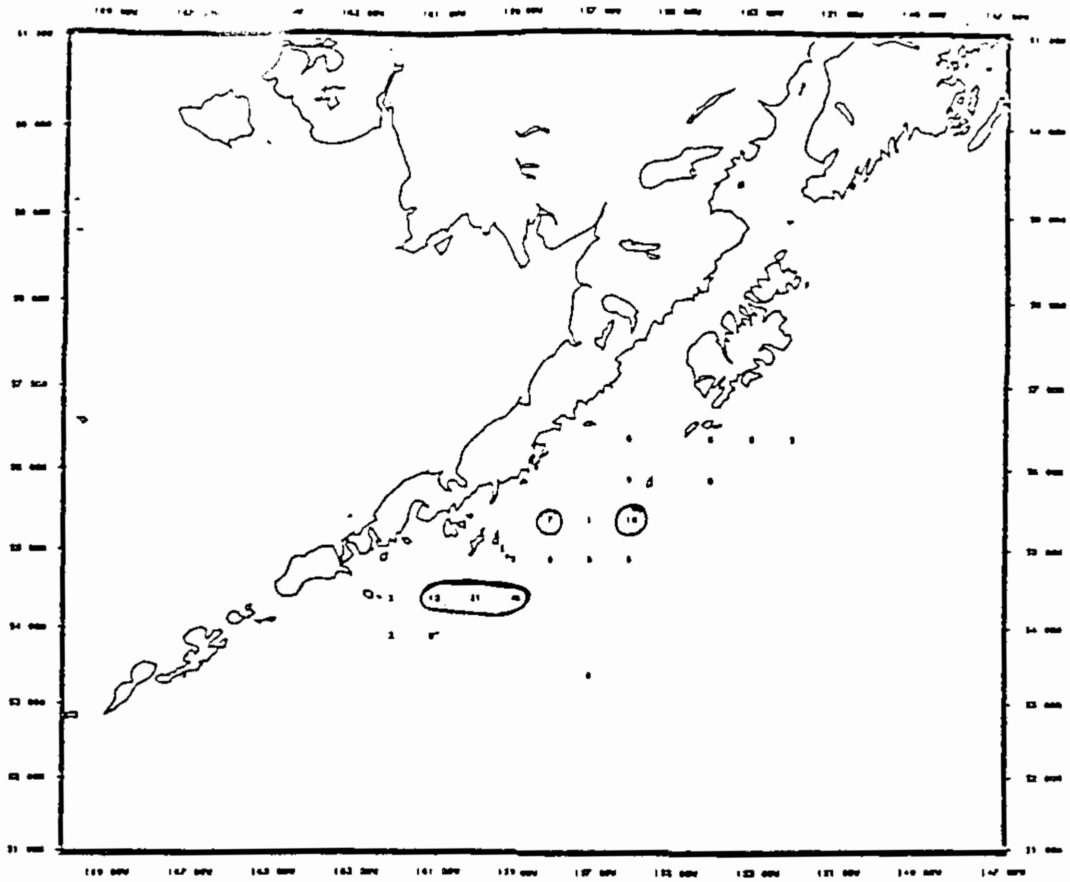


1985 2ND QTR P. COD FOREIGN LONGLINE CATCH IN 100 MT

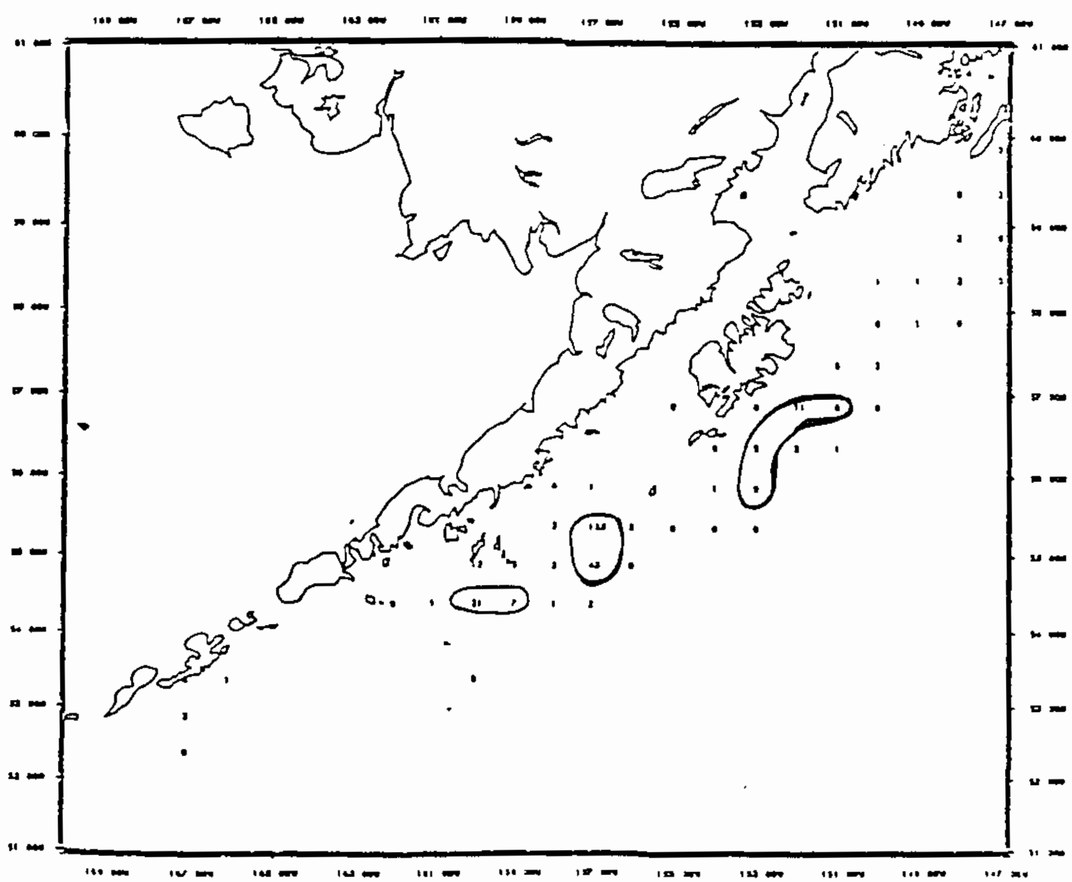
APPENDIX 2-C

Foreign Trawl Harvests of Walleye Pollock in the GOA:

1980 - 1985



1966 FIRST QTR POLLOCK, FOREIGN REPORTED CATCHES



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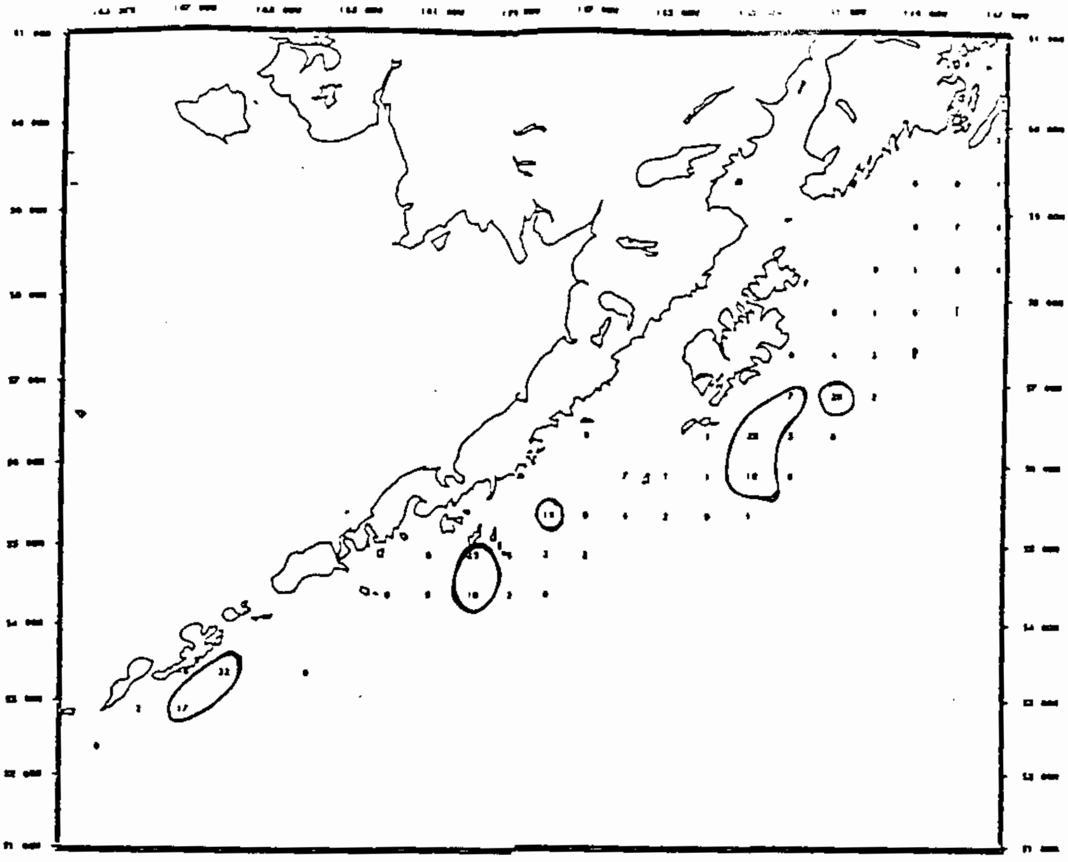

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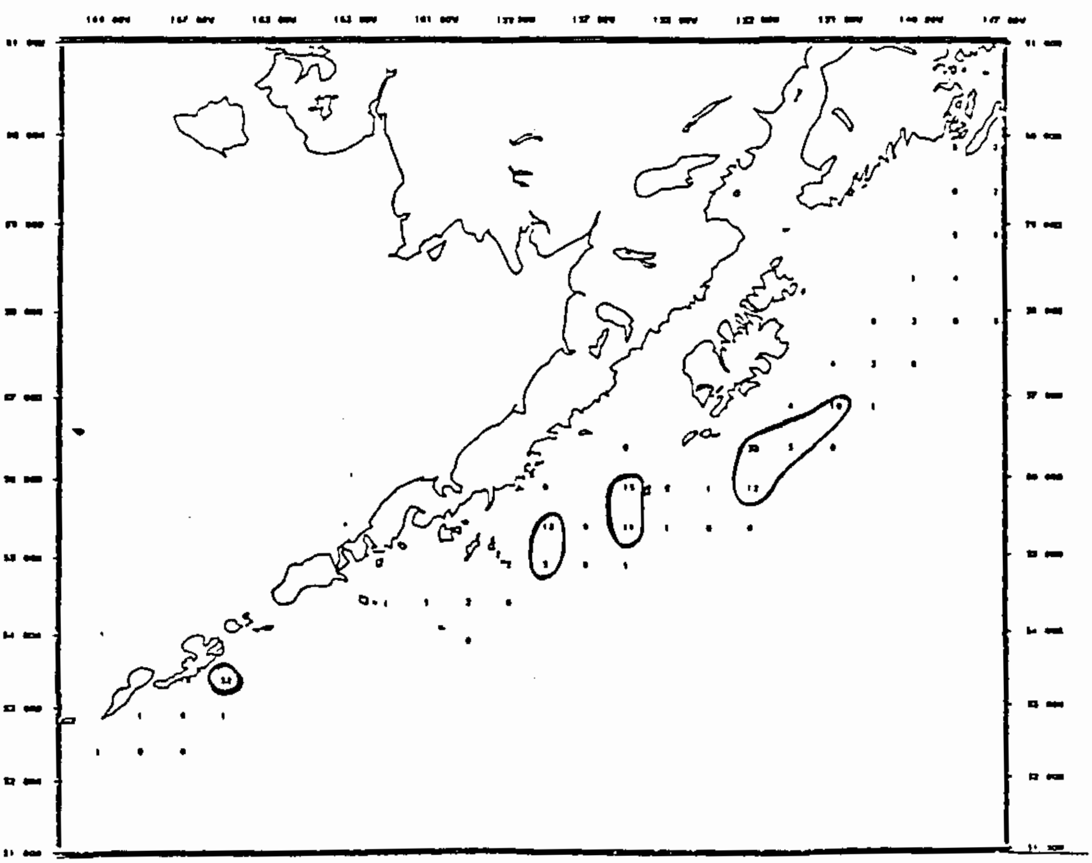

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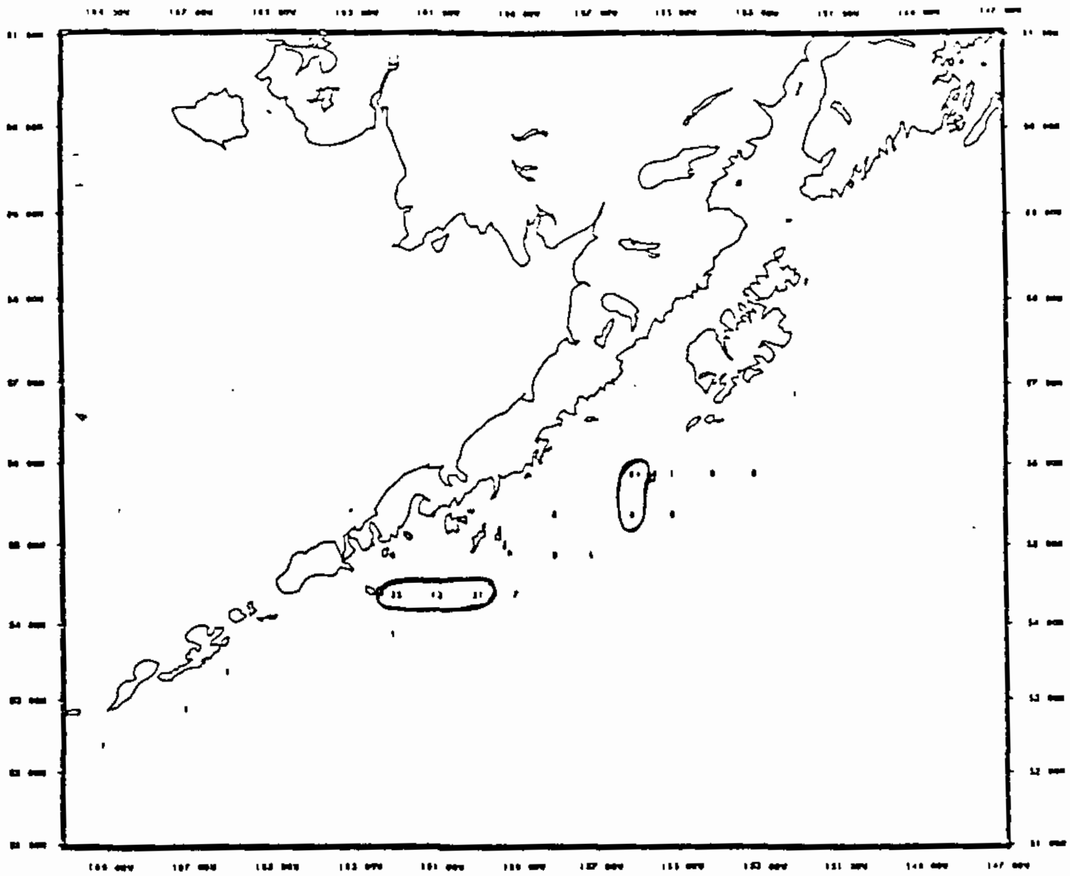

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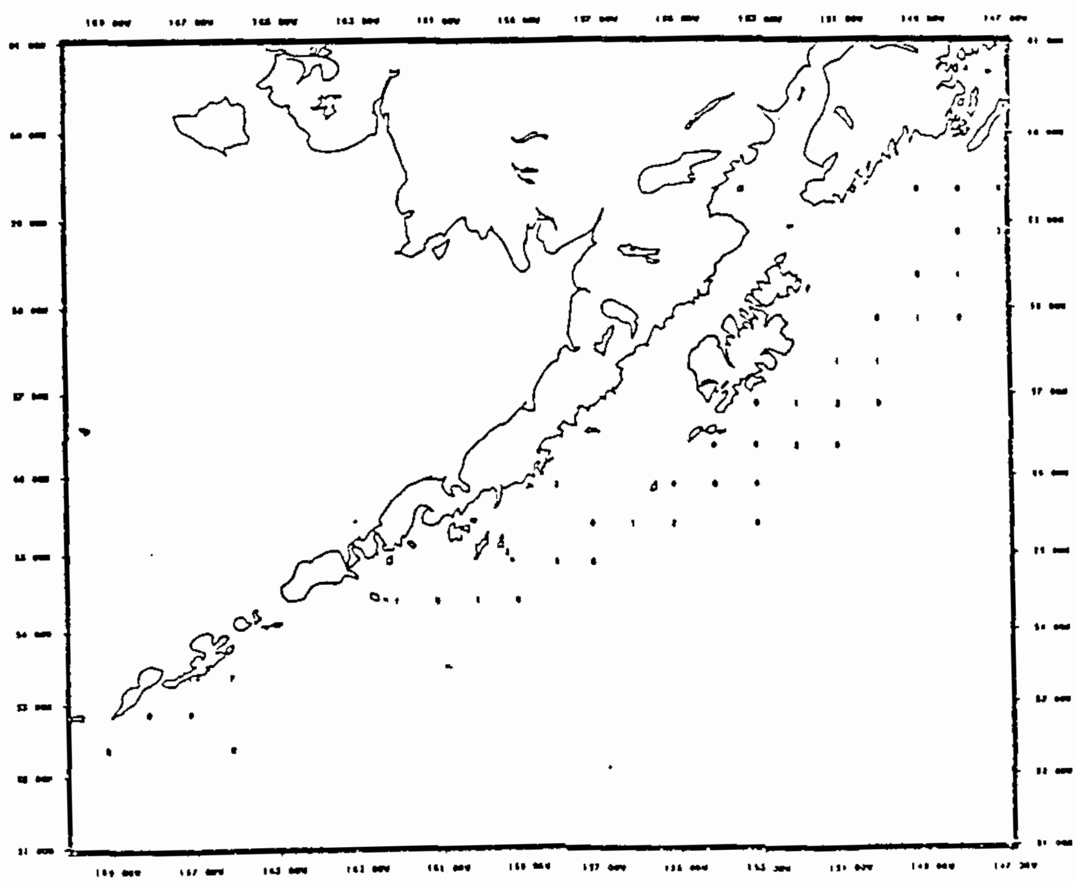

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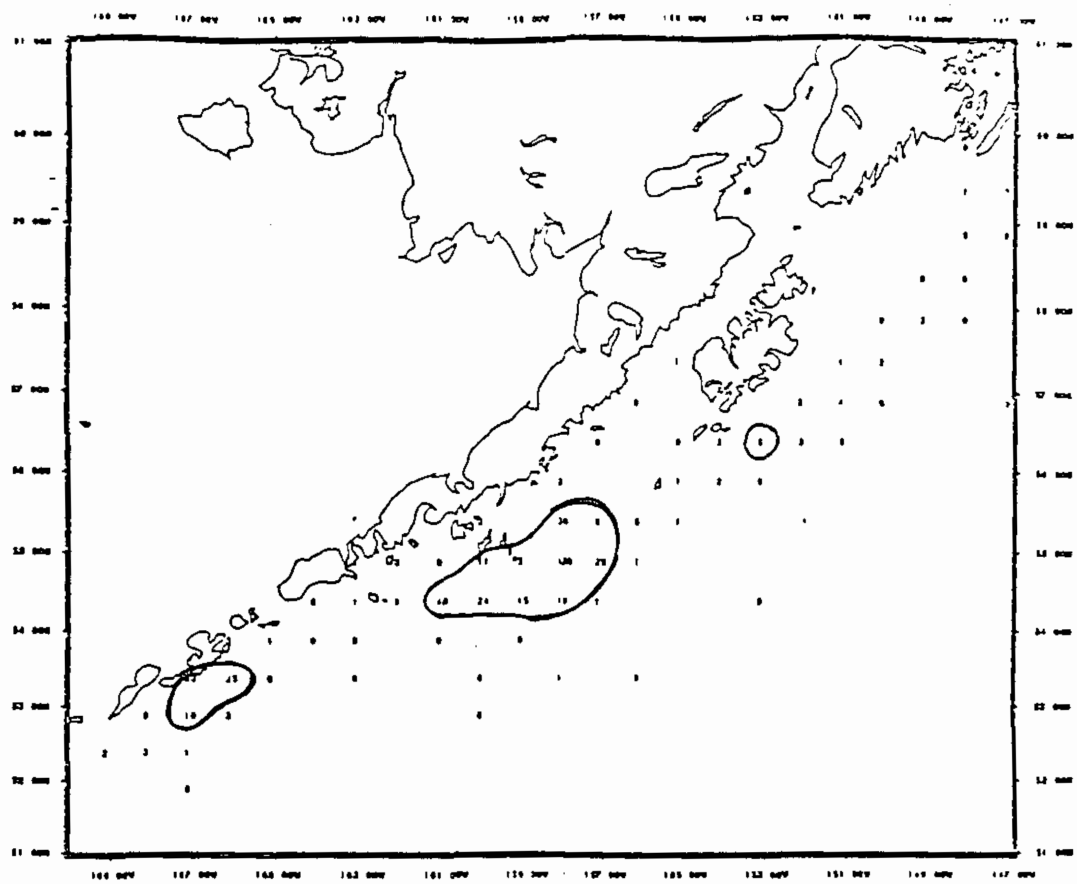

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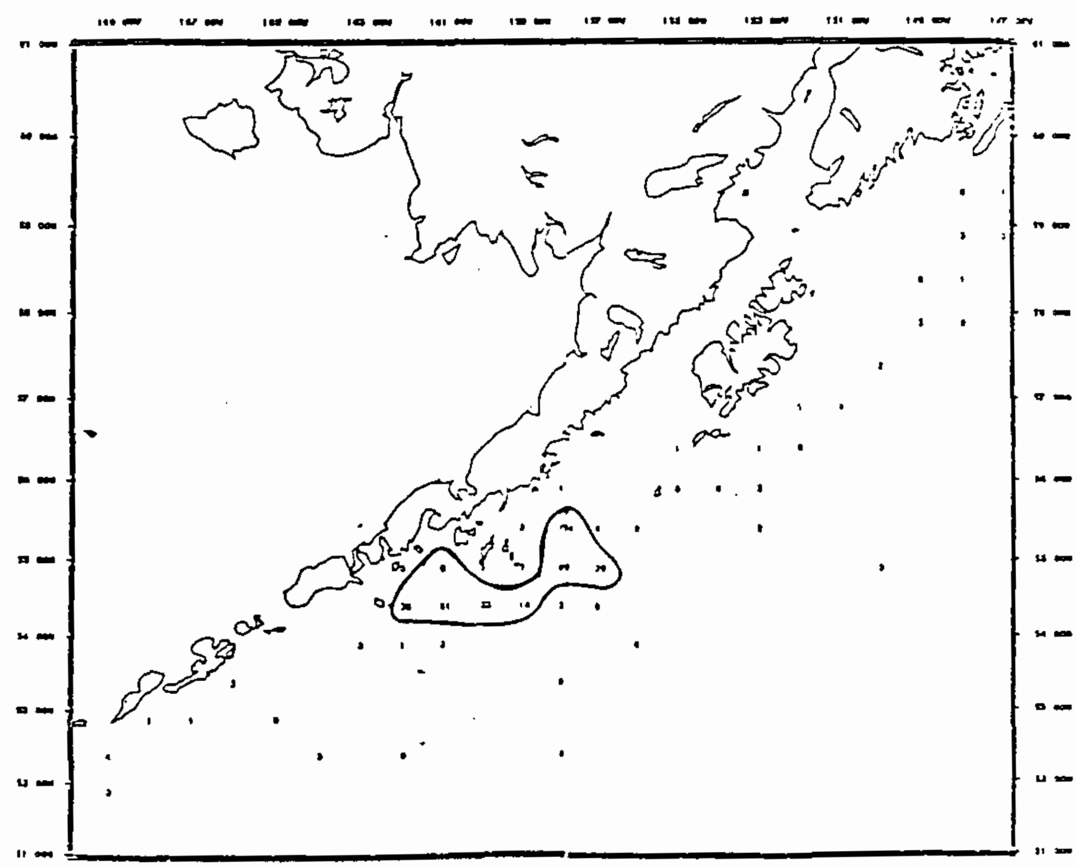

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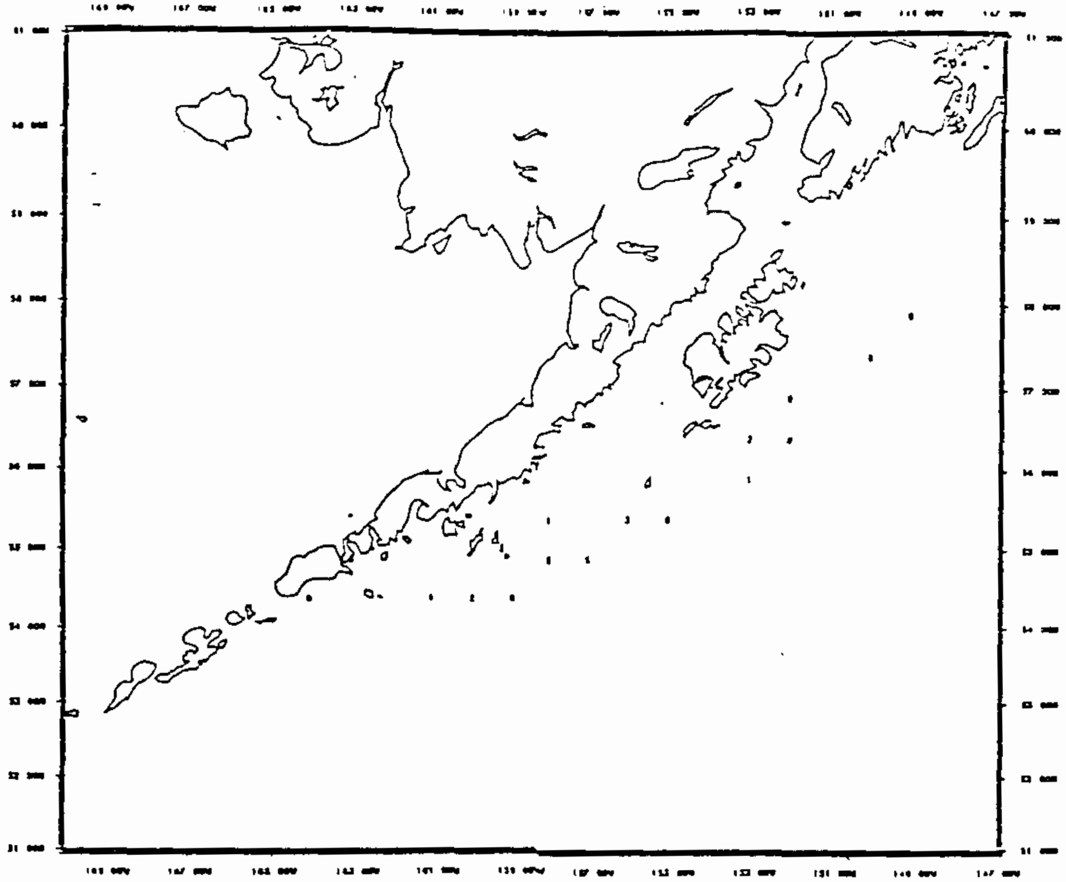

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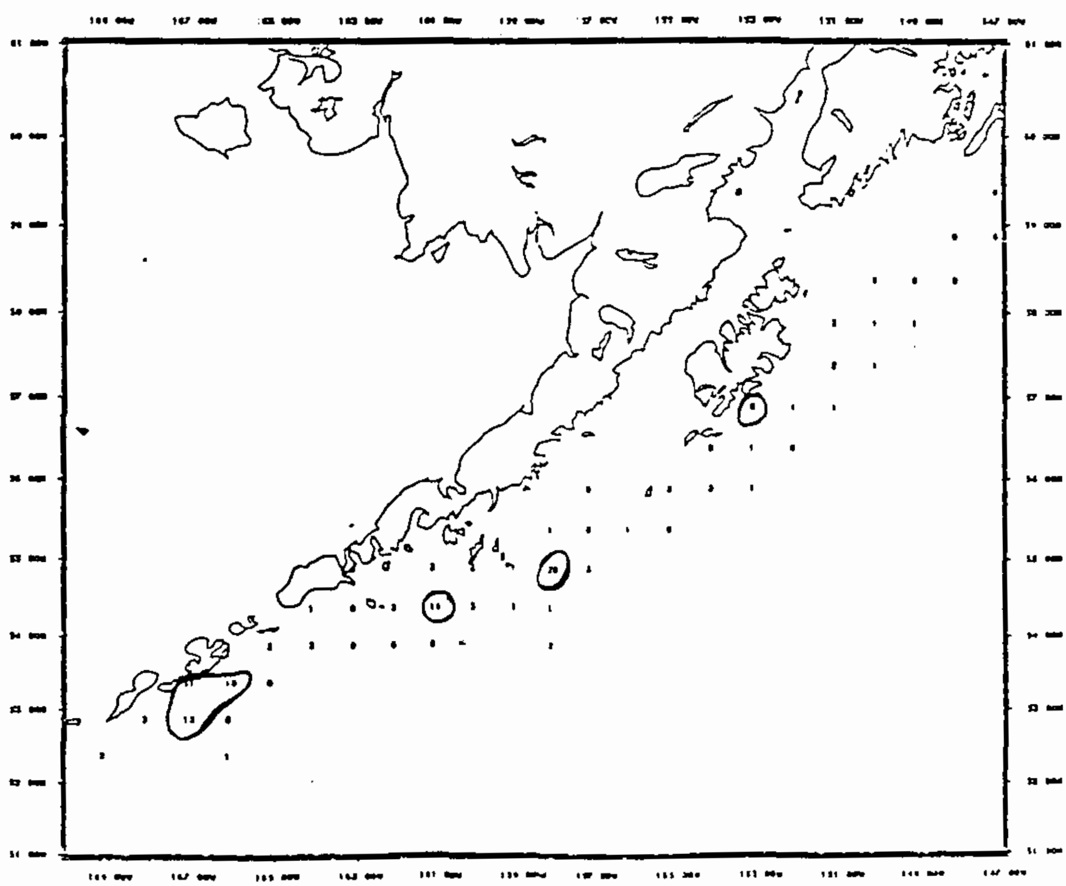

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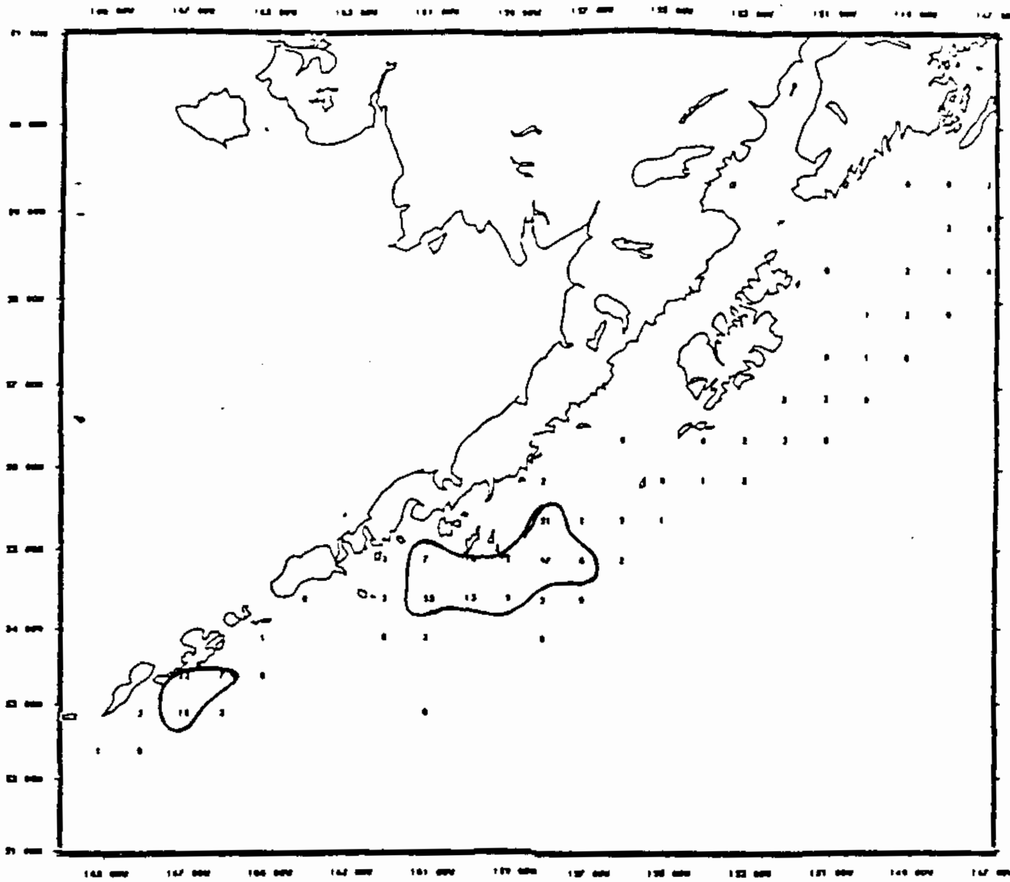

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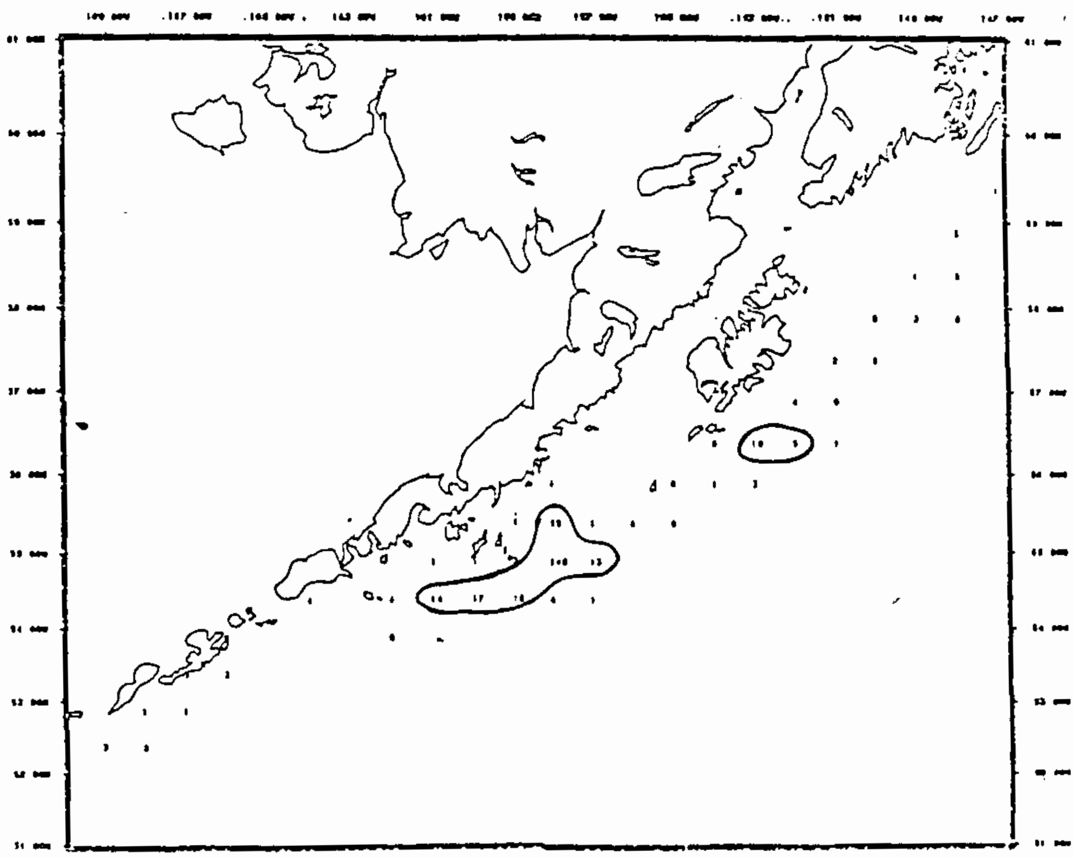

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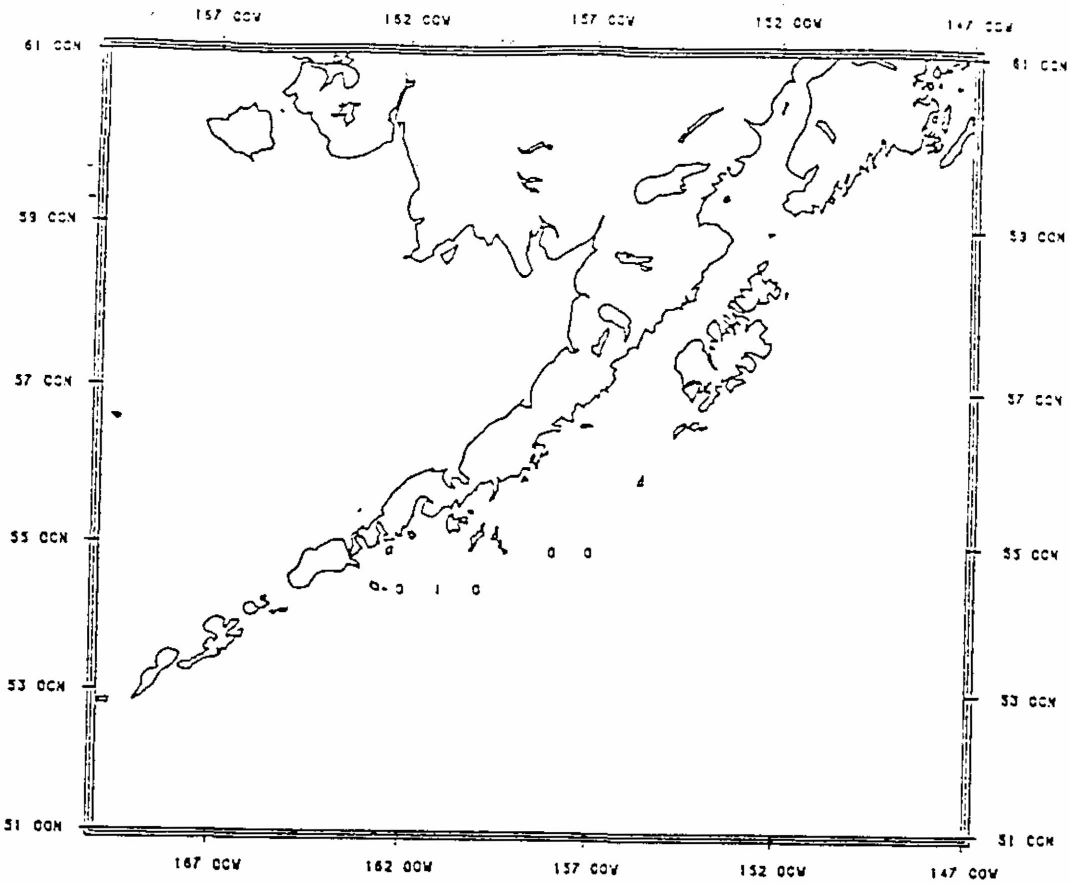

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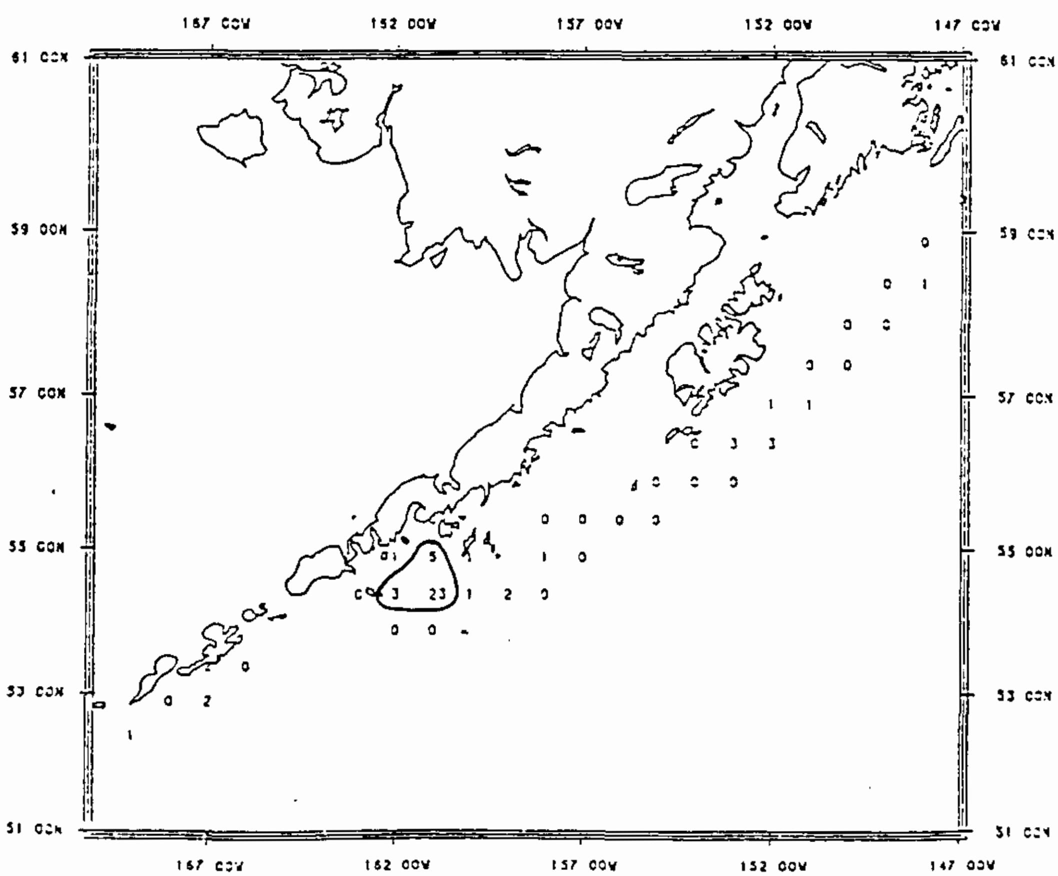

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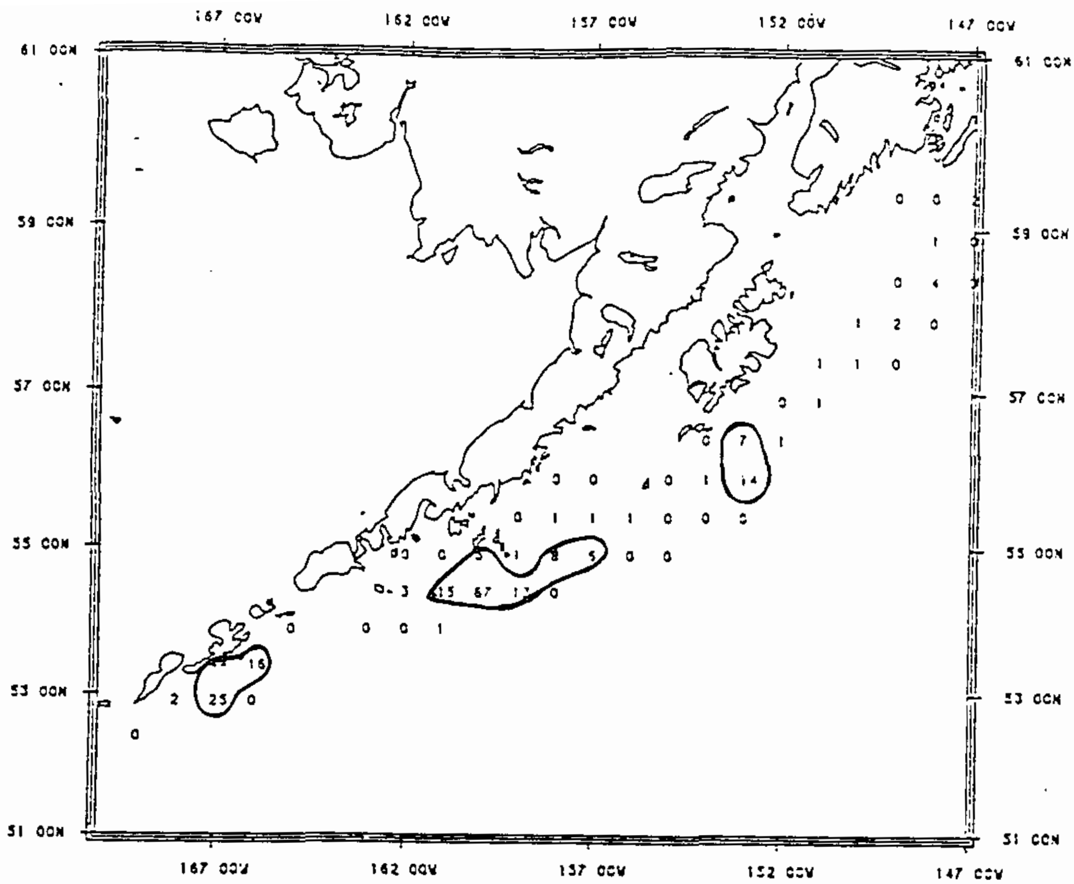

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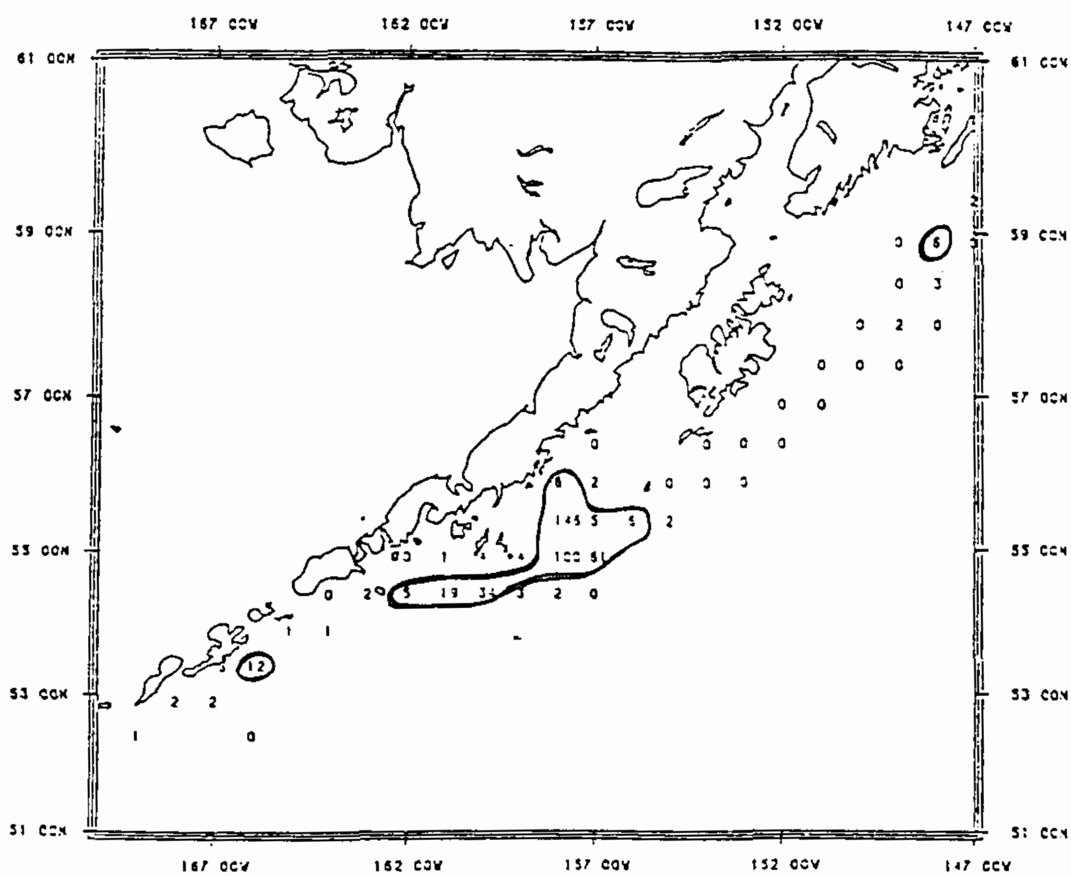

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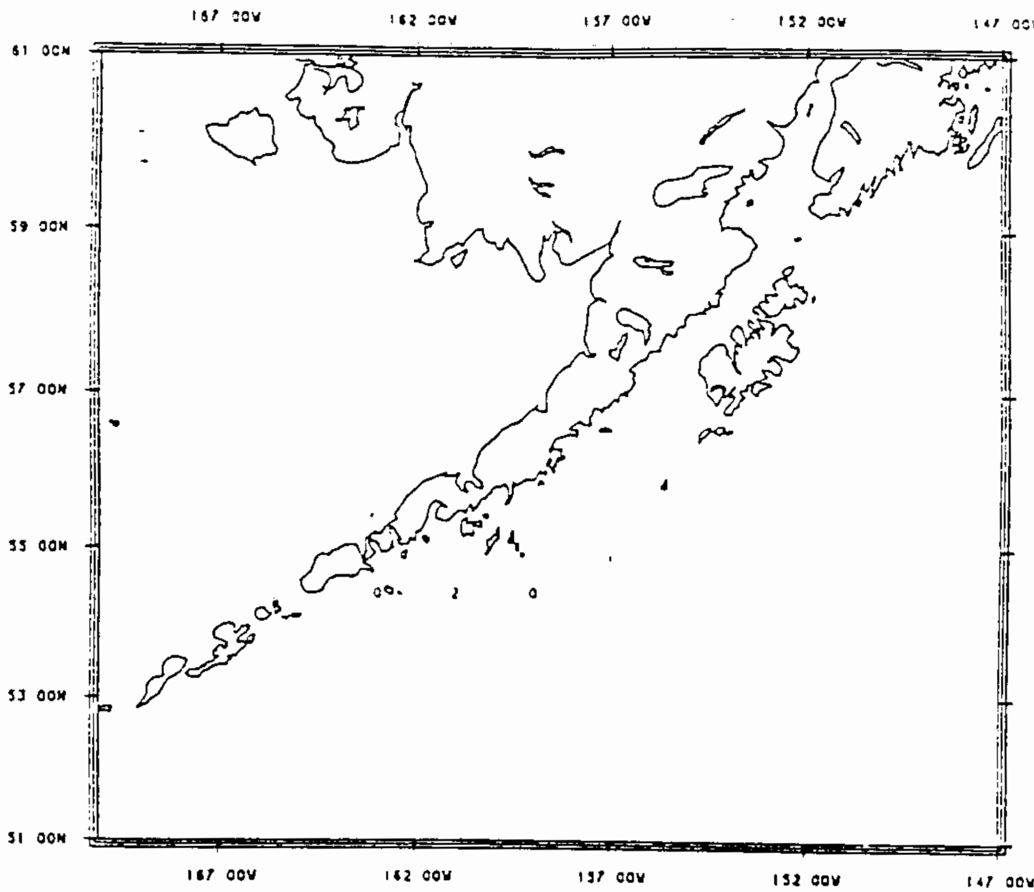
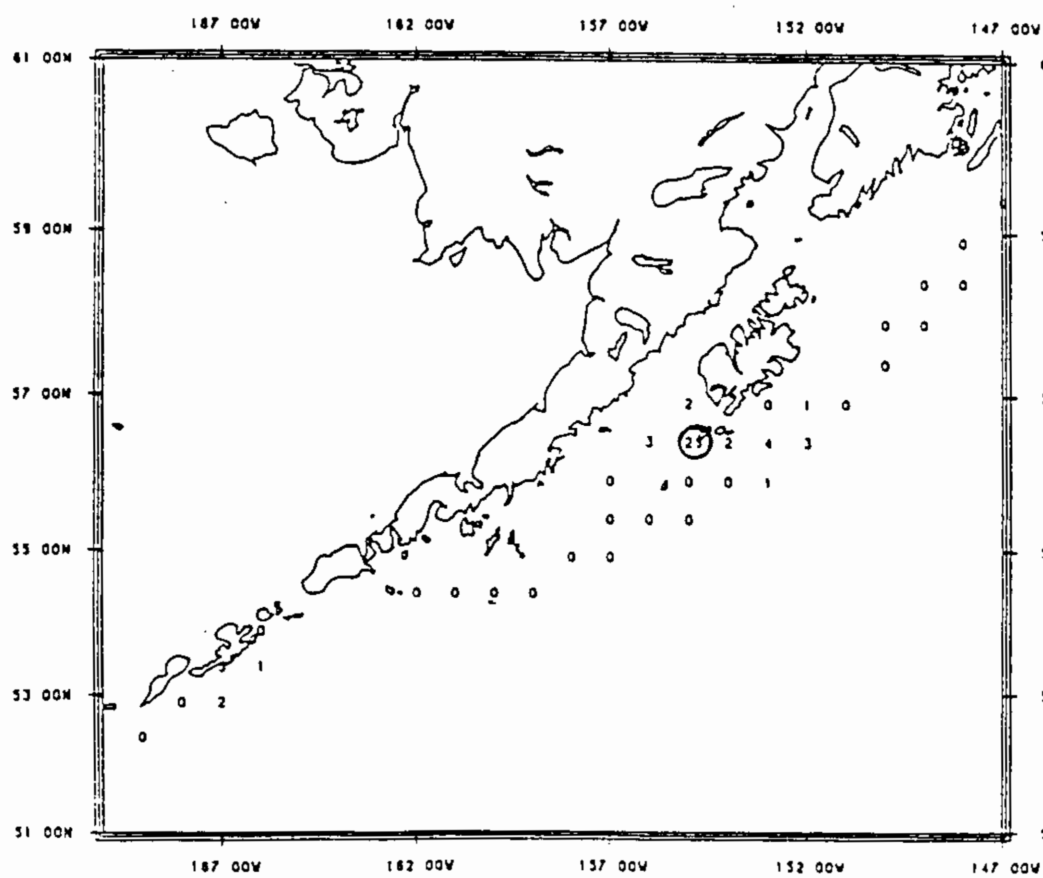


1984 FIRST QTR POLLOCK FOREIGN TRAWL CATCH IN 100 MT



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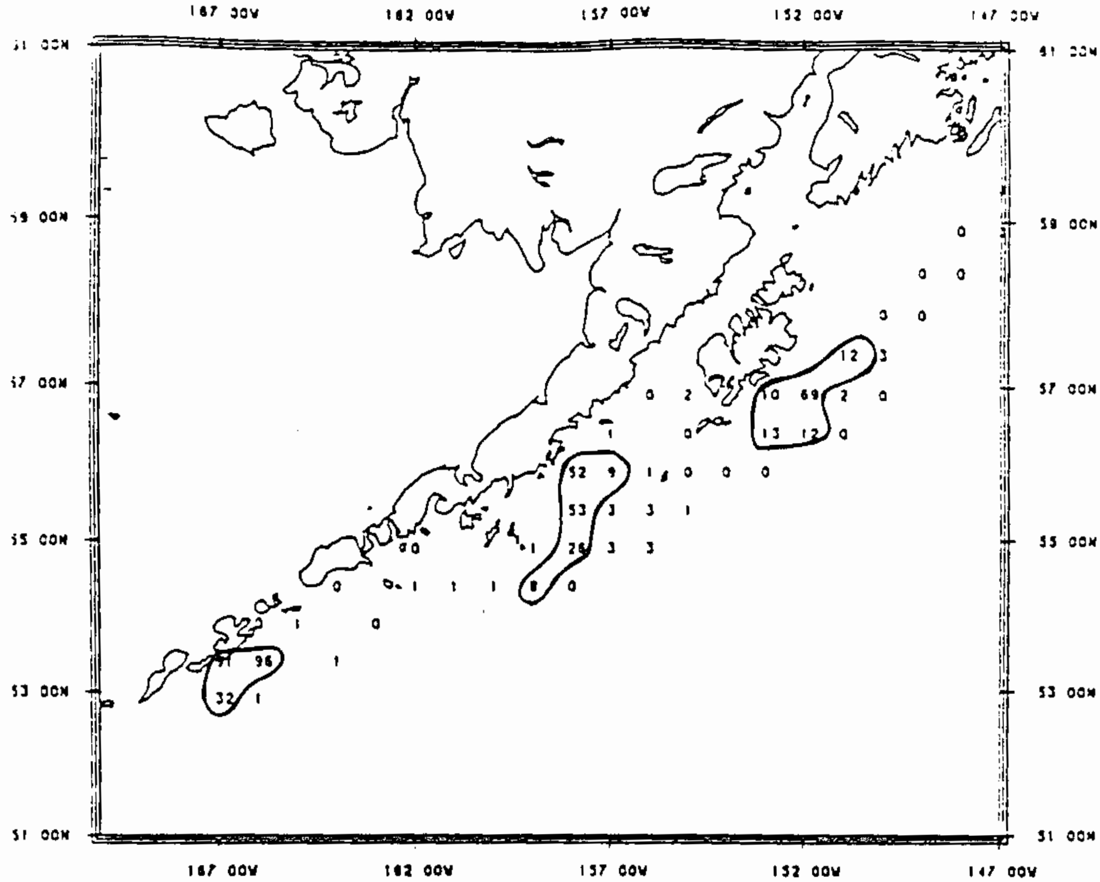

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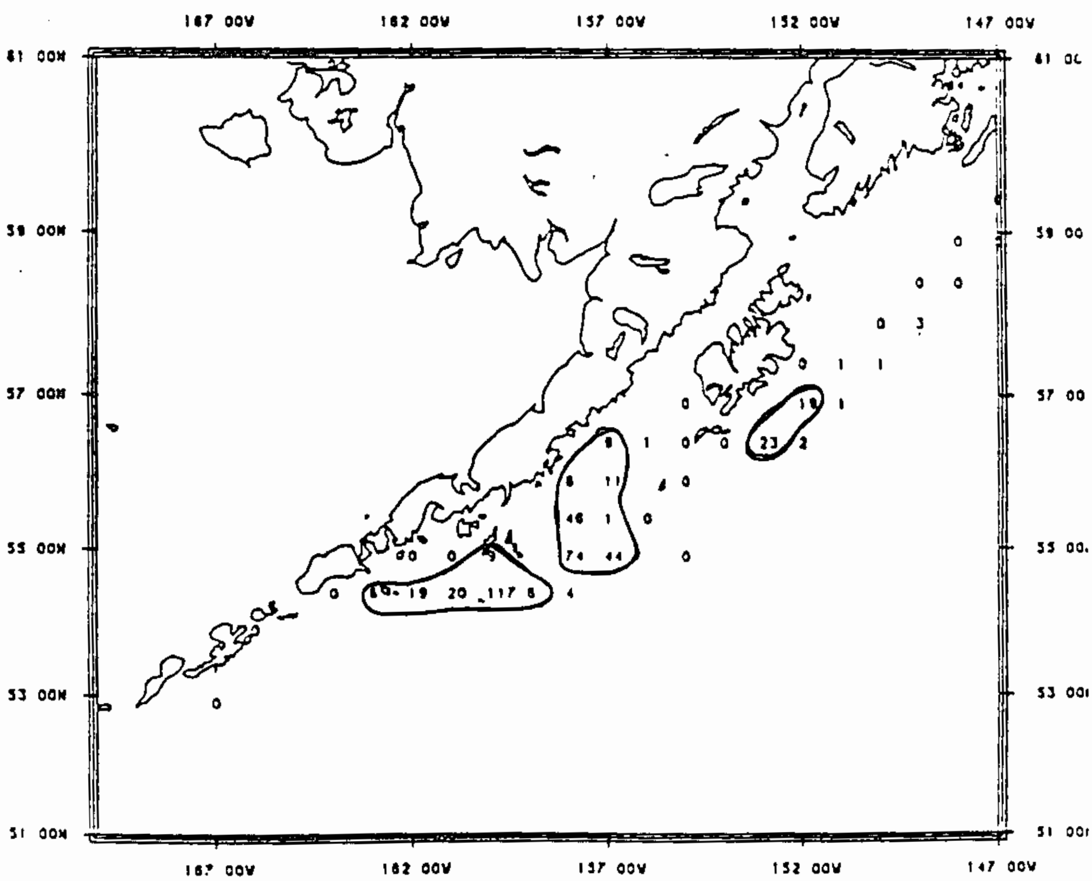

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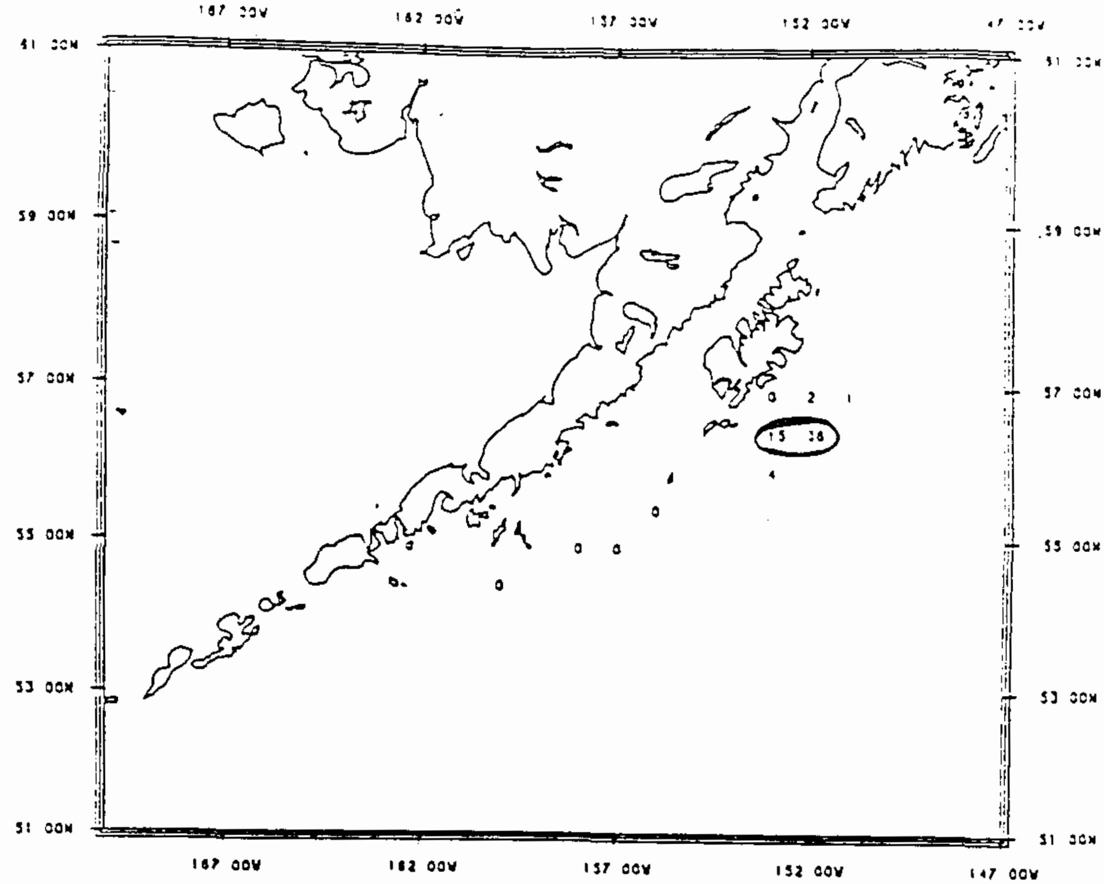

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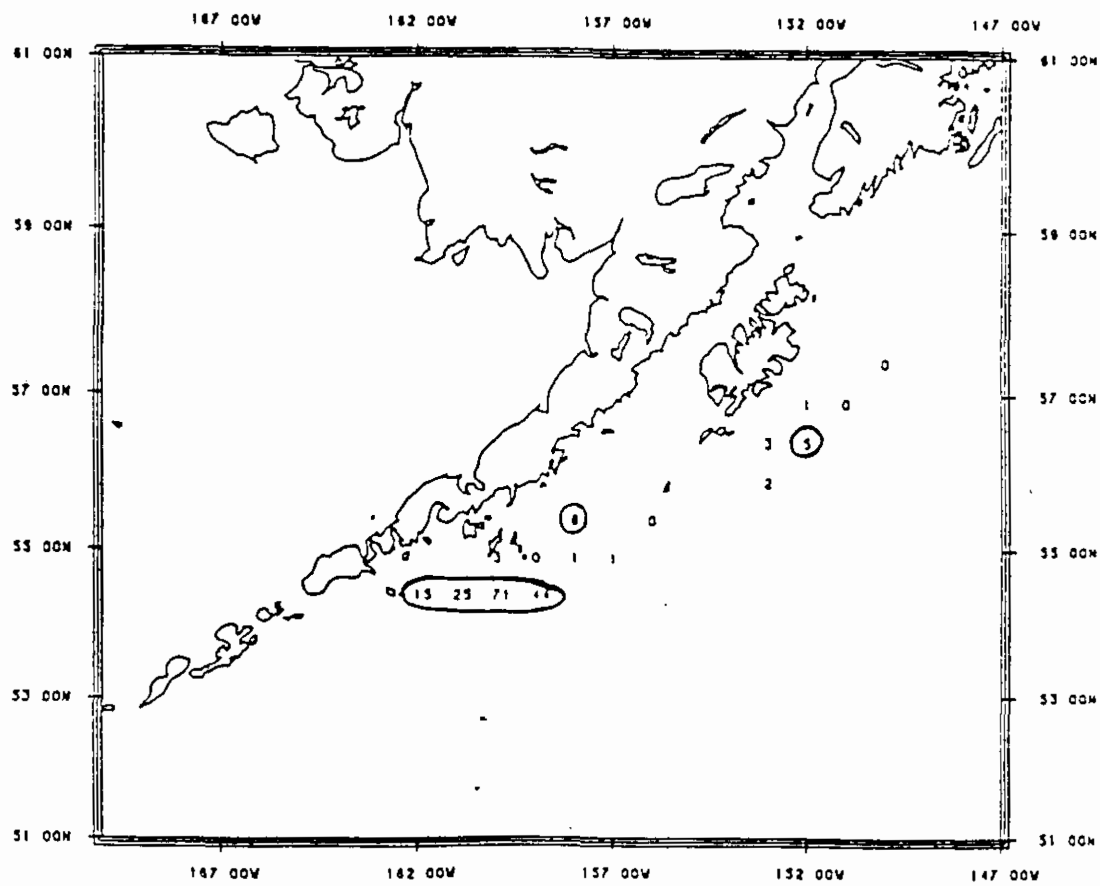

1985 4TH QTR POLLOCK FOREIGN TRAWL CATCH IN 100 MT

CHAPTER 3

DESCRIPTION OF THE ECONOMIC ENVIRONMENT AND ASSOCIATED CONSEQUENCES OF THE PROPOSED MANAGEMENT ALTERNATIVES

CHAPTER 3

3.0 DESCRIPTION OF THE ECONOMIC ENVIRONMENT AND ASSOCIATED CONSEQUENCES OF THE PROPOSED MANAGEMENT ALTERNATIVES

3.1 Basis for Estimating Economic Impacts

Economics as a scientific discipline is concerned with the allocation of scarce resources among competing users. The resource allocation issues associated with the preemption problem identified in this amendment proposal clearly have economic implications. An analysis of the economic impacts of the proposed alternatives was developed in three phases. The first step in this analysis is to identify the economic variables that are likely to be impacted by the proposed amendment. Secondly, a reliable source of data or statistics defining these economic variables is developed. Then, a procedure is employed to measure existing and potential values of these economic variables, in order to assess the economic impacts and how they change under the various alternatives.

Management Alternatives 2 through 8 propose measures to remedy the preemption problem created by harvesting/processing capacity exceeding available resources. Alternative 1 provides for no change in existing regulations. This status quo, or control scenario also serves as a basis from which to evaluate the changes proposed. In this analysis, the 1989 economic environment is specified as the reference base from which to measure relative changes, in that 1989 is the most recent complete year for which a comprehensive set of economic data was available at the time the analysis was undertaken. It is recognized that significant ongoing changes have occurred since 1989 in both the structure and operation of catching and processing activities in the affected fisheries. Where feasible, these more recent economic events are incorporated into the analysis.

The economic analysis is directed by the problem statement, alternatives, and definitions developed in Section 1.3. As such, the problem statement is relatively general, and has given rise to alternative semantic interpretations of certain issues. To the extent possible, this analysis follows the stated intent of the Council in questions of interpretation, clarified as necessary in periodic meetings with the Fishery Planning Committee during the course of the analysis.

This analysis is based on the economic organization and behavior of the principle catching and processing sectors that rely upon pollock and Pacific cod in the Bering Sea/Aleutian Islands and Gulf of Alaska fishery management areas. The proposed management alternatives are applied to the existing economic environment, and estimates made of the resulting impacts. For Alternatives 3 and 4, structured economic estimation procedures, referred to as models, are used to project impacts resulting from changes in the allocation of pollock and Pacific cod. These estimates are made for representative "target" communities in the affected fishery, as well as for the region and nation as a whole. Comparisons of the estimated economic impacts among and between the proposed alternatives provide the basis for assessing the practicality and effectiveness of each alternative.

During the April 1991 meeting, the Council adopted two further modifications of the five original alternatives for inclusion in the analysis. These two additional alternatives propose the assignment of harvest rights to catcher vessels (Alternative 6), and an explicit inshore pollock allocation to communities within a designated area of the Bering Sea (Alternative 7). Alternatives 6 and 7 are analyzed in Section 3.3.6 and 3.3.7, respectively. The problem development, data base, and methodology used to analyze these two alternatives are similar to that employed in Alternatives 3 and 4.

A final alternative was developed during Council discussion of the SEIS for the proposed inshore/offshore amendment at the June 1991 NPFMC meeting. This option (Alternative 8) incorporates features of many of the existing seven alternatives, as well as addressing concerns raised during the public review process. Alternative 8 was adopted by the Council as the preferred management alternative, and the analysis--referencing existing evaluation of Alternatives 1 through 7 where appropriate--is contained in Section 3.3.8.

3.1.1 Key Economic Variables

The resource allocation problem addressed in this analysis is defined as a situation where one industry sector faces the risk of preemption by another. The economic context of this situation is that the economic performance of the senior (existing) sector is adversely impacted by the activities of the new entrant. Reduced or restricted availability of the raw pollock and/or Pacific cod fish input over the period of a year, or the processing season may create, potentially, the following impacts: (1) reduced efficiency of the existing processing firm, leading to; (2) higher per unit costs; (3) under capacity utilization of the capital inputs and labor force; (4) reduced output of the finished product; and (5) reduced economic returns for the firm, its employees, affiliated suppliers, and the community.

Alternatives 2 through 8 are proposals to remedy this preemption problem through a variety of changes to the management and regulatory scheme. This analysis seeks to evaluate the impacts of these alternatives in solving the preemption problem, rather than the specific impacts of preemption. The appraisal of Alternative 1 (the status quo), entails some discussion of the consequences of preemption as a separate issue.

Although the perfectly competitive model of a business firm stresses the role of profitability in measuring economic performance[1], this analysis seeks to evaluate other associated impacts, as well. The market failure, or externality, associated with unregulated open access public resources is well documented, but is not the problem specified in this amendment proposal, and is not the focus of this investigation.[2]

Drawing from the previous list of possible preemption consequences, economic impacts are reflected in the following economic variables:

(1) employment,
(2) wage and salary income,
(3) business profits or losses,
(4) costs of production,
(5) quantity of fish input available,
(6) species and product mix,
(7) price levels for inputs and outputs,
(8) product and market shares, and
(9) expenditures within the affected communities.

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[1]The objective of profit maximization is the standard, but not the sole reference point for analysis in microeconomic theory. See Gould and Ferguson, *Microeconomic Theory*, or any standard Economics text book for a discussion of measures of economic performance.

[2]For a discussion of externalities, see Mishan, *Economics for Social Decisions*, or Randall, *Resource Economics*. A general explanation of the impacts on fisheries management is contained in Anderson, *The Economics of Fisheries Management*.

This set of economic variables can be used to characterize both the inshore sector, as well as the preempting offshore sector. In the larger perspective, the impact of the competitive actions among and between the two respective sectors influences a still broader population of businesses and ultimately consumers nationwide. To the extent that the affected fisheries involve foreign interests, there are international economic variables such as trade regulations, world markets, and foreign investment to consider, as well.

This analysis focuses on the impacts of the proposed management alternatives in their effort to reduce the problems associated with preemption. The economic impacts are estimated based on examination of the variables specified above, primarily in terms of the operations of catcher and processor firms directly involved in the affected fisheries. These costs and benefits also are aggregated and cast in terms of their consequences on the affected local communities, both in Alaska and the Pacific Northwest, as well. Where evidence is available, the likely impacts of these proposals on the aggregate United States economy also are developed in the context of impacts on consumer prices, resource utilization, and production efficiency. Because the amendment proposals directly impact the resource allocation of the fisheries involved, the *distribution* of the benefits and costs associated with these economic variables, both at the local and national level, is a critical measure of the resultant economic impacts.

3.1.2 Procedure for Estimating Economic Impacts

The building blocks for estimating economic impacts are the direct financial consequences experienced by affected catching and processing firms as posed by the management alternative. Specific resource allocations are proposed by Alternatives 3, 4, 6, and 8, and to a lesser extent 5 and 7. Empirical data are employed, where possible, to construct enterprise budgets (financial cost and return estimates) for representative operations. Such economic profiles require financial and operational data, detailing specific reliance upon the pollock and Pacific cod resources. Thus, preferential resource allocations of these two species, or other specified changes in the access to these fisheries can be simulated and the resulting impacts measured in the economic performance of the firms involved.

To the extent that specific categories of the catcher and processor firms involved in the two fisheries can be established based on operational similarities, the economic profile of an average representative firm can be used to evaluate the economic impacts posed by the management alternatives. Constructing representative examples is necessary where complete data are unavailable on the entire population, or where the time and resource requirements necessary to compile a complete data base are impractical. Using group averages simplifies the data collection and analytical procedure, but may depart from the empirical reality of the true population of catcher and processor firms involved, particularly for nontypical individual operations.

The estimated economic impacts at the firm level can be revealing in terms of the indicated level of employment, income, and resource use. Aggregating these representative firm impacts across relevant components of the industry allows for judgements on larger segments, such as by community, gear group, or processing category, ultimately providing a basis for evaluation of the entire industry. Such information is very useful in interpreting the direct economic impacts on the catcher and processor industry, but does not allow for an examination of the associated economic impacts on the larger economic community affected by the proposed regulations.

In order to assess the economic consequences of the management Alternatives 3, 4, 6, 7, and 8 on indirect supporting service industries, as well as the impacted local community economies, an analytical procedure called input-output modeling is employed. The input-output approach allows for the evaluation of the relevant communities in the impacted states of Alaska, Washington, Oregon, as well as the aggregate United States economy.

Input-Output Analysis

Input-output analysis is an established technique for measuring the interaction between associated inputs and outputs in an economy.[3] This methodology utilizes estimates of the degree of interaction among all components in a given economic community. In the context of specific allocations, input-output analysis is a useful procedure for assessing the direct and indirect economic impacts of changes in the allocation of the pollock and Pacific cod resources among industry segments. Increases in pollock processing volume, for example, can be traced not only to the *direct* impacts on employment or income, but to the *indirect* impacts on supporting service sectors, such as input suppliers, insurance, and finance. In addition, input-output analysis provides estimates of the *induced* economic impacts created by changes in economic activity not directly connected to the catching and processing activity. Induced economic activity might arise from wage and salary expenditures by fishing industry workers on non-industry related items, such as home furnishings or health services.

Because the U.S. economy is highly interdependent upon goods and services from throughout the nation, some portion of the consequences of economic activity in one specific location almost always "leak" out to other regions. Normally, the smaller the economic location defined, the greater the leakage to the larger national economy. Less developed economic locations, such as those represented by remote fishing communities in Alaska, also experience significant leakage of economic impacts to major supply and support centers, such as Seattle.

Input-output analysis can address both the magnitude and distribution of economic impacts. The intricate measurement of the complex interactions among the various economic segments is achieved through the mathematic calculation of coefficients representing the observed economic associations among these components. The data requirements for such measurements are immense, and beyond the scope of the analysis presented here. However, established input-output models are available that make use of U.S. national data bases to estimate these critical relationships.

The input-output model used in the analysis of Alternatives 3, 4, 6, 7, and 8 was developed by William Jensen and Hans Radtke, Ph.D. economists with extensive combined research experience in the Northwest fisheries. The model allows for the examination of economic impacts at the community, regional, and national level, providing estimates of direct, indirect, and induced effects.[4] This basic model has been used in studies of fishery resource allocation in the Pacific states, allowing for community level examination of economic impacts. As such, this procedure is not the estimation of an input-output model; rather, the use of estimated input-output coefficients to calculate economic impacts.

The locations of primary interest for this analysis that are contained in the model include: Dutch Harbor, Akutan, and St. Paul, Alaska in the Bering Sea; Kodiak, Sand Point, and King Cove, Alaska in the Gulf of Alaska; the Alaska, Washington, and Oregon state level economies; and the U.S. national economy

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[3]Wassily Leontief is credited with developing input-output analysis as a tool for economic research during the 1930s based on his study of interdependencies in the U.S. Economy. For a more contemporary explanation of input-output models and their application in economic analysis, see Miernyk, *The Elements of Input-Output Analysis*, or Miller and Blair, *Input-Output Analysis: Foundations and Extensions*.

[4]A user's reference document prepared by Jensen, "Evaluating the Economic Impact of Natural Resource Economics", is available from the NPFMC office in Anchorage.

(Figure 3.1). Specific borough-level models of the respective Alaska locations were developed in recognition of the unique nature of these communities, relative to the larger state or regional economies. For relevant Washington or Oregon fishery-related ports, specifically Seattle (Ballard), Washington, the state level economy was judged to be a fair representation of the associated county level economy, particularly with regard to the fishing industry.

The Basic Logic of the Input-Output Analysis

The model provided by Jensen and Radtke is fundamentally a disaggregated model of the input-output coefficients for specific locations. The actual catching and processing activity associated with each of the port locations was entered into the model subsequently by Council staff analysts. Sources of information about costs, returns, and operations are described in the following Section 3.1.3.

The resulting effort provides a working model of the economic impacts of pollock, Pacific cod, and other operationally-linked species (i.e., flatfish, rockfish, halibut, etc) as these resources move from catcher to processor, and from processor to further processing or the market. For example, trawl or fixed gear catcher vessels delivered specific tonnages to processors, for which fishermen received a given price per ton. These revenues can then be traced back through operating costs, crew shares, and other expenditures, to measure the direct economic impacts, at the catcher level, of a given tonnage of the resource. The direct impacts give rise to indirect and induced impacts from the same tonnage. These economic impacts are traced geographically in terms of the distribution of the expenditures made by the catcher vessels; where do crew members spend their wages?, where are repairs and maintenance performed?, where do the owners reside?, and so forth. Similarly, economic activity arising from processing the same tonnage of fish follows the expenditures arising during the processing stage.

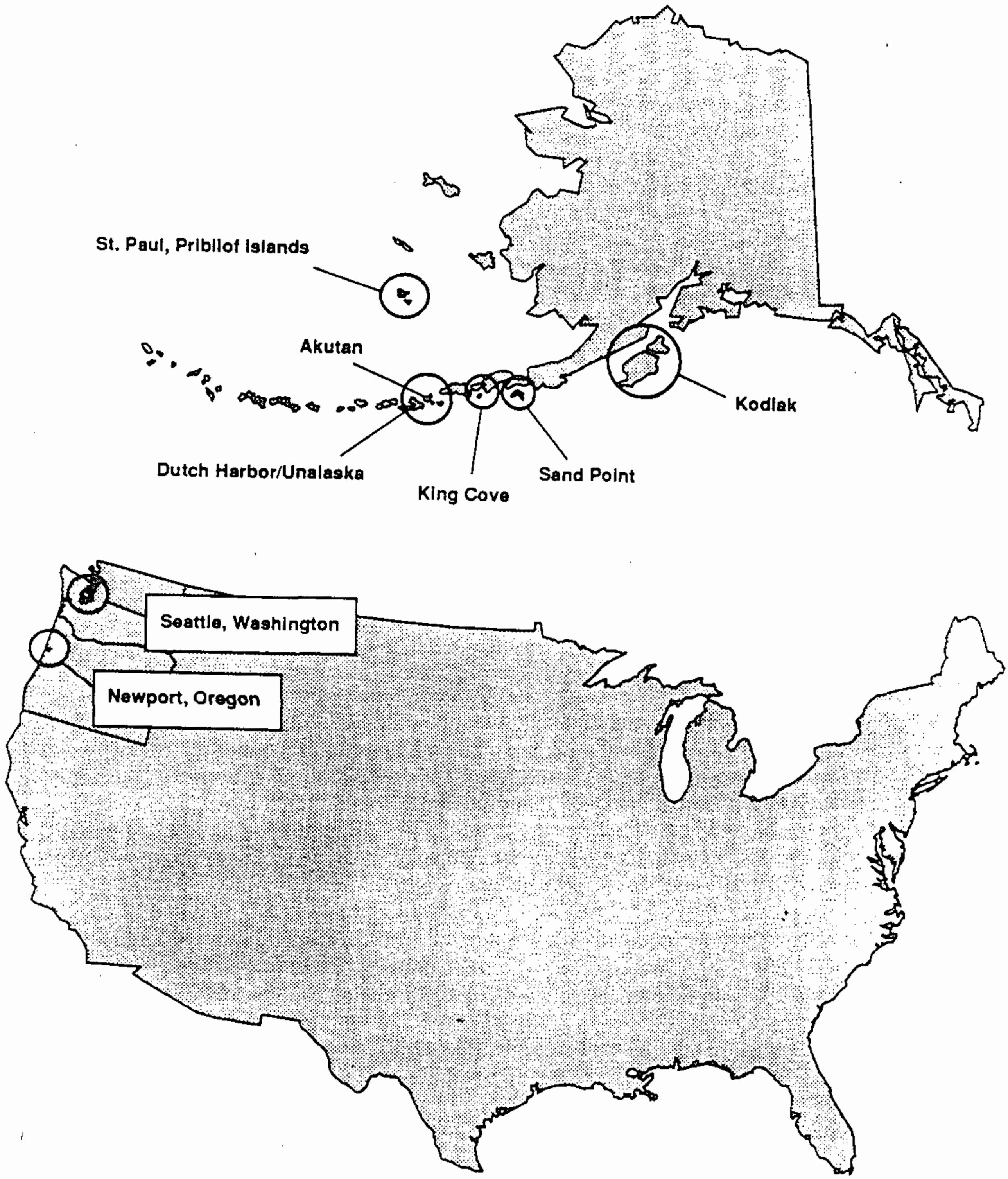
This approach is based on the relatively simple measurement of expenditures made in catching and processing, and traces the resulting dollar impacts through known or estimated economic relationships in a given location. As such, the analysis is predictive, rather than prescriptive in nature; the results model what will likely happen, not what should be done.

The Relationship between Input-Output Analysis and Cost-Benefit Analysis

Justification for adopting a change in Fishery Management Plans requires that the potential benefits to society from the regulation outweigh potential costs to society. The selection of analytical methodologies used to make such an assessment is based on both the nature of the problem under consideration, and the information available to investigate the problem. The foregoing discussion examined the nature of the economic issues under consideration, along with the rationale for use of an input-output model to assess the magnitude and distribution of allocations prescribed under selected alternatives. For purposes of clarification, it may be instructive to contrast the methodology used in this analysis with a cost-benefit type approach, often applied in public sector management.

Conceptually, cost-benefit analysis entails the measurement of all benefits and costs arising from a particular project or program. Aggregated results of such an analysis form the basis for empirical assessments as to whether or not benefits exceed costs. The comparison of benefit/cost ratios also is used as a basis for selection of the single "best" alternative; that is, the one with the "highest" ratio of benefits to costs. A change is said to be desirable so long as the aggregated improvements (benefits) exceed the aggregated costs of such action. A project may be socially desirable if the benefits exceed the costs given that gainers could be made to compensate losers. The fact that there is no compensation required is not necessarily a consideration in cost-benefit analysis. Benefit-cost analysis can be interpreted as component

Figure 3.1 Test Port Locations



of welfare economics, although practical applications rarely satisfy the rigorous demands of the theoretical model.[5]

In practice, cost-benefit analysis can pose demanding information requirements, since conceptual costs and benefits ultimately must be expressed in some comparative quantitative framework. This can create significant difficulties in enumeration and evaluation, particularly for diverse or complex projects that contain intangible or indeterminate outcomes. Relevant costs and benefits include not only the private sector calculations of profitability and expenditures, but also the less tangible concept of public benefits and costs. Moreover, cost-benefit analysis does not offer a convenient means of examining the distribution of economic impacts, an issue central to the analysis of allocation decisions such as the inshore/offshore proposal. In the past, this methodology has been employed regularly in the evaluation of capital projects such as dams, fish hatcheries, and other public works. Such analyses typically exhibit a predictable stream of capital costs and economic benefits accruing over time, which are then discounted to a comparable present value basis for comparison of costs and benefits.

While the casual reference to, or partial examination of, benefits and costs is common in the allocation of natural resources, the thorough enumeration and evaluation of these effects are seldom undertaken or achieved. A review of contemporary EIS, SEIS, and RIR documents dealing with fishery allocation issues reveals that the use of qualitative or narrative descriptions, generalized per unit resource values, inventories of various attributes, and broad generalizations of social value are commonly used to derive judgements of net national economic impact, rather than the rigorous quantitative estimation of consumer and producer surplus called for in theoretical models of welfare economics. Comprehensive estimates of aggregate demand for natural resources are frequently unavailable to provide quantitative, thorough measures of consumer benefits and costs.

This does not imply that cost-benefit analysis of natural resource allocation issues is inherently flawed, or inappropriate. Rather, that the theoretical rigor called for in comprehensive cost-benefit analyses of these issues often exceeds the scope of practical applications. Thus, it is important to differentiate between considerations of costs and benefits on one hand, and definitive conclusions regarding net national economic benefits, on the other. The former does not necessarily lead to the latter. Despite such obstacles, cost-benefit analysis still provides a conceptual standard for framing analyses in the recognition that all costs and benefits need to be systematically examined and compiled in measures of overall social welfare.

Input-output analysis is not the same as cost-benefit analysis. Input-output analysis is concerned with estimating economic impacts--including benefits and costs--but provides no absolute criteria for selecting among alternatives. Input-output analysis allows for the systematic examination of economic benefits and costs resulting from a change in economic activity such as would accompany the allocations proposed in the proposed amendment. Input-output analysis does not necessarily measure or define economic variables in the same manner prescribed by cost-benefit analysis, so the input-output findings must be carefully interpreted when applied to conclusions regarding net economic benefits. In this regard, the strength and weaknesses of the input-output model used in this analysis are emphasized in presentation of the results.

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[5]The terms "cost-benefit" and "benefit-cost" often are used interchangeably in referring to this procedure. For a more in depth discussion of cost-benefit analysis, the reader is referred to the collected articles contained in Prest and Turvey, *Cost Benefit Analysis: A Survey*. A comparison of input-output analysis and cost-benefit analysis is available in the NMFS Technical Report #94, "An Economic Guide to Allocation of Fish Stocks between Commercial and Recreational Fisheries," by Edwards.

A fundamental consideration in the design of analytical methodology is matching the nature of the problem to an suitable research procedure. The nature of the problem dictates the appropriate analytical tool. The problem recognized by the Council in the proposed Amendment 18/23 is clearly a resource allocation issue, closely linked to the distribution of economic effects associated with resource allocation. Conclusions regarding whether or not regulatory actions are justified in the interest of net national benefits are tied directly to this issue. In order to assess the economic impacts and distributional effects of alternative allocations, the input-output procedure was elected by the analytical team as the appropriate analytical tool, given the dimensions of the problem, data available, and time allowed for the investigation. Consideration of costs and benefits, including an assessment of net national economic impacts, is derived from information provided in the input-output analysis, as well as the investigation of other economic variables outside the context of the input-output model.

Other Quantitative and Qualitative Evaluations

In addition to the cost analysis and input-output model discussed above for Alternatives 3, 4, 6, 7, and 8, the analysis also draws upon a variety of analytical assessments concerning economic impacts and performance, particularly in addressing the more open-ended courses of action proposed in Alternatives 1, 2, and 5. Such analyses may draw upon the historical record or basic economic theory, but do not entail formal modeling or empirical verification. In other instances, quantitative estimates may prove overly speculative, in which case qualitative descriptions of relevant economic impacts are provided.

3.1.3 Sources of Information

The OMB Groundfish Survey

In the early design of the analysis of this amendment proposal, it was recognized that a detailed set of information would be required concerning the economic structure of the affected catching and processing components of the industry. In early 1990, five different surveys were developed, focusing on different segments of the industry, to deal with the perceived data requirements for the inshore-offshore allocation issue. The questions covered a comprehensive spectrum of operational, financial, economic, and demographic variables believed pertinent to the analysis. Following regulatory procedures prescribed for the "collection of new information" relevant to amendment of the two affected fishery management plans, the surveys were reviewed and authorized by the Federal Office of Management and Budget. The voluntary surveys (referred to as the "OMB Survey") were mailed out in mid August, 1990, with a suggested 45 day deadline for completion.

The OMB groundfish survey proved to be a time consuming, often frustrating exercise for the industry. The 5.7% overall response rate (106 usable surveys returned from the 1,852 sent out) was disappointing in terms of hopes to establish a comprehensive economic data base for this industry. Even among the usable surveys, many questions were left unanswered, or contained ambiguous, contradictory responses. The low response rate to the OMB survey was likely influenced by the inclusion of a large number of catcher vessels far removed from the geographical or species-related concerns raised by the inshore-offshore debate.

Based on subsequent analysis of NMFS catch and processing records covering 1989, and discussions with industry representatives, the target population of catcher and processor firms was revised downwards significantly. The targeted segments of the revised population estimate provided a much higher response rate, allowing for the development of an empirical data base representing 28% of the estimated population as illustrated in Table 3.1.[6]

The information provided by the OMB groundfish survey serves as a base in many key aspects of this analysis. Critical economic assumptions concerning costs and returns, recovery rates, seasonal operating characteristics, species and product form mix were framed based on returned surveys. The survey proved less useful in estimating catch rates, discards, expenditure patterns, or capacity utilization. For these and other supporting data, a variety of sources were tapped to complete information needs.

Other Data Sources

National Marine Fishery Service (NMFS) records were accessed to verify and supplement the catch and processing statistics obtained in the OMB survey. In addition, the NMFS records proved valuable in developing operational profiles of catcher and processor categories used in the input-output analysis.

Relevant economic data were also gleaned from existing Council analyses of Amendments and Proposals, including the Amendment 19/14 package (the Roe-Stripping document), and the EA/RIR prepared on the proposed fixed gear IFQ management system for sablefish. Enterprise operational cost budgets developed by the University of Alaska Sea Grant Marine Advisory Program served as additional references on cost and return estimates for various vessel categories.

Generally, there is a comprehensive data base available concerning the historical catch and processing activities involving groundfish in the Alaska fisheries. The annual *Stock Assessment and Fishery Evaluation* (SAFE) reports prepared by the Council plan teams for the BSAI and GOA, along with the annual report on the *Economic Status of the Groundfish Fisheries Off Alaska* prepared by the NMFS provide comprehensive baseline data and some descriptive narrative of aggregated supply and demand statistics relevant in this analysis.

Information on expenditure distribution patterns was perhaps the most difficult data to obtain and verify. Some studies are available to provide reference,[7] but most of the estimates contained in the input-output model are based on secondary sources, reflecting qualitative judgements. In order to account for possible errors in the expenditure distribution estimates, as well as other questionable data, the analysis includes sensitivity tests of the model results to changes in the underlying variables.

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[6]Completed survey response forms continued to trickle in to the NPFMC office as late as February, 1991. All responses are being compiled into the economic data base for the groundfish industry. However, the late arriving surveys were not included in the development of the empirical industry model which was undertaken in December 1990 and January 1991.

[7]Estimates of expenditure patterns by selected industry components for specific items are contained in studies prepared by the Department of the Interior, Minerals Management Service (MMS 90-0026), Coopers & Lybrand (*Economic Impacts of the North Pacific Factory Trawler Fleet*), The McDowell Group (*Alaska Seafood Industry Study*), National Resources Consultants (*Commercial Fishing and the State of Washington*), and others. These analyses, however, do not always provide the location-specific reference (community/state/nation/foreign) required in the input-output model. There are other, still unexplored sources of expenditure distribution information, such as merchant surveys, local tax authorities, port districts, or the IRS. The scope of such an inquiry, however, exceeds the time and resource restraints established for this analysis.

TABLE 3.1 **Economic Survey Results (as of March 8, 1991)**

	Harvest Vessel	Catcher/ Processor	Onshore Processor	Mothership	Total
Surveys Sent Out a/	1,332	358	140	22	1,852
Revised Population Estimate Total Expected b/	250	100	20	13	383
Returned	76	44	20	12	152
Not Applicable c/	19	4	5	1	29
Refusals c/	3	7	4	3	17
Useable Surveys Returned	54	33	11	8	106
Useable Return Percentage:					
Of Revised Population	22%	33%	55%	62%	28%
Of Total Sent Out	4.05%	9.22%	7.86%	36.36%	5.72%

a/ Surveys were sent based on federal groundfish permits. Therefore, a troller which freezes salmon but not sablefish would qualify as a catcher/processor.

b/ These totals were revised based on analysis of NMFS catch and processing reports, and discussions with industry representatives, to include primarily the segments of the industry directly involved with Pollock and Pacific cod.

c/ Not applicable and refusal are based, respectively, on responses received by the Council indicating those who do not land or process groundfish and those who do not intend to complete the survey.

As a means of verifying OMB Survey results, and the assumptions drawn from these results, a series of industry review meetings was held during December, 1990, with nine industry groups in Seattle, and eight groups in Kodiak, reaching a combined total of 73 industry representatives. Besides serving as a review of progress on the analysis, these meetings were used to gather additional data on key economic and operational aspects of the catching and processing industry affected by Council actions on pollock and Pacific cod.

Previous Research Relating to the Proposed Amendment

Examples of preferential allocations of fishery resources among competing domestic industry groups are rare in the relatively brief period time period since implementation of the Magnuson Fishery Conservation and Management Act in 1976. Expansion of the U.S. domestic groundfish industry has lead to a steady displacement of foreign fishing and processing capacity, and the emerging conflicts among domestic interests for access to the now fully utilized fisheries is not unique to the Alaska fishery.

The establishment of specific allocations based on harvest vessel categories for Pacific whiting stocks off the coast of Washington and Oregon was approved by the Pacific Fishery Management Council under Amendment 4 of that Fishery Management Plan. Although the issues before the Pacific Council are similar to the amendment proposal under analysis here, there is an important distinction in that the whiting fishery does not yet have a large scale established inshore processing component. That is, the problem is not one of preempting existing business activity. Rather, the issue facing the Pacific Council is establishing future allocation rights as the whiting fishery evolves from a joint venture operation, previously dependent upon foreign processors, to a domestic industry attractive to both inshore and offshore processors.[8]

In a 1981 study, Butcher, et al examined the economic consequences on Alaska's shellfish industry of several potential allocative policies. In one scenario, a preferential allocation was simulated for Alaskan vessels. Although Alaska incomes were projected to increase with larger allocations of the resource to the state, even greater offsetting costs were estimated for the undercapitalized Alaskan fleet, leading to a net reduction in total income.

In many countries, preferential allocations to domestic firms over foreign interests are common, particularly following the extension of fishery jurisdiction (EFJ) in the mid 1970s [Johnston]. For some nations, such as Japan, there are established access rights granted to local fishing organizations over competing nonlocal but domestic components of the fishing industry, as well. Care must be taken in extrapolating the precedents set by such foreign allocations, however, since the rationale for such action can be deeply rooted in a long history of cultural and economic relationships.[9]

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[8]The reference document, "Pacific Whiting Resource Availability, Market Use, and Economic Development Potential", prepared by the Oregon Coastal Zone Management Association, presents a review of these allocation issues.

[9]Ruddle's examination of allocation criteria in *Administration and Conflict Management in Japanese Coastal Fisheries* reveals that preferential treatment of coastal villages in assigning rights to fisheries is founded in time honored custom and tradition tracing back through several hundred years of established resource use.

A common foundation of conflicts between local (inshore) and distant (offshore) segments, even in long-established fisheries, can be traced to considerations of local employment or economic livelihood[10], concerns very similar to the preemption issue raised in this proposed amendment. In a more fundamental context, the inshore/offshore confrontation reflects different technologies assembled for the harvest and processing of EEZ groundfish. Boyce remarks on the questionable stability of coexisting technologies in long run economic equilibrium, but finds the persistence of coexisting technologies not uncommon in the fishing industry.

The allocative decisions embodied in the inshore/offshore controversy are neither trivial or new. The socioeconomic considerations involving allocation of the Nation's resources is at least as old as the United States, itself. The classic debates between Thomas Jefferson and Alexander Hamilton over the proper distribution of the nation's lands have since formed the basis for *egalitarian*, rather than strictly *efficient* allocations of natural resources, as embodied in the concept of Jeffersonian Democracy. The philosophical discussion of allocative equity can be traced back even further, to the seventeenth century works of Rene Descartes.

Existing literature does not prescribe a uniform economic solution to the conflicts posed by domestic preemption of one segment by another. Johnston, in discussing the worldwide extension of fishery jurisdiction since the 1970s observes that "The consequence [of EFJ] was an enormous transfer of wealth...The justification was the argument that, as long as '*somebody*' owns the resource, externalities will be internalized and economic efficiency will result." As competing segments in the Alaska groundfish industry divide up the economic benefits associated with the pollock and Pacific cod fisheries, the still unanswered question is who the resource rights should be assigned to. Thus, the fundamental issue is the distribution, and means of distribution, in allocating these fishery resources.

Allocation Rules in Other Natural Resources

Looking to the management of other categories of public owned natural resource management, at least four forms of allocating rights have evolved.[11] (1) Historical use, or "grandfathering", where the first documented users acquired senior use rights, typical in the allocation of water and public grazing resources. (2) Public auctions, where the resource is allocated to the highest bidder, such as in timber or certain minerals rights. (3) Lotteries, in which allocations are made based on the luck of the draw, common in sportsmen's drawings for trophy hunting. (4) "First come, first served", applicable in establishing telecommunications and satellite orbits. Each procedure has both positive and negative attributes in terms of economic equity and efficiency arguments. In most cases specific laws frame the alternatives available for making allocations. Generally, grandfathering, or historical use has characterized the distribution of rights in fisheries, although "first come, first served" may be a more typical allocation mechanism where no formal rights to the resource are prescribed.

[10]A review of the role of labor in forming fisheries policy is contained in an article by Charles, "Fishery Socioeconomics; a Survey." Research by Charles, and Moss and Terkla has sought to model the linkages between fishery resources and employment, as well as the adjustment patterns in employment in response to changing stock availability.

[11]This summary of allocation mechanisms was gleaned from the NOAA Technical Memorandum "Fishery Management - Lessons from Other Resource Management Areas", published in July, 1985. This publication also includes a review of salient legislation influencing the management of natural resources.

3.2 Structure and Performance of the Affected Catching and Processing Industry

Information on individual firm operations was obtained from the OMB survey, and used to construct economic descriptions of representative firms. Strict confidentiality rules are observed in the compilation and reporting of individual surveys. The low number of respondents in many of the economic categories precludes publication of catch, cost, and return data in this analysis. Aggregated survey responses that do not reveal individual operations are reported, but specific operational characteristics of small sample (less than four observations) groups are presented only in very general terms.

3.2.1 Categories of Catcher and Processor Firms

Conventional stereotypes of the vessels and processing plants operating in the groundfish industry make up the basic categories, although some modification of these divisions was made to reflect economic identities. The most basic categorization recognizes catching (fishing) activities and processing activities, further divided into inshore and offshore components. The inshore segment includes shorebased processors along with the fishing vessels that catch and deliver fish to the processing plant. In addition, there is recognition that certain vessels who technically conduct at-sea processing are closely linked to the inshore segment such as smaller catcher/processor vessels with home ports in Alaska waters. Because of the economic attachment to the local inshore communities, and the relatively small volume processing capacity represented by such vessels, they are not perceived as the same preemptive threat as are their larger at-sea counterparts. As a result, the identifying criteria for the *inshore* segment under Alternatives 3 and 8 includes certain classes of catcher/processor vessels. For Alternative 3, all fixed gear catcher/processors are categorized as inshore, while only defined "small" catcher/processors (under 124' in length with round weight processing volume less than 18 tons/day) are categorized as inshore under Alternative 8. The offshore segment includes catcher-processor firms (factory trawlers), as well as at-sea delivery catcher vessels, and at-sea processing vessels (motherships, or floating processors).

For purposes of this analysis, eight categories of processing were identified, five inshore and four offshore components. These representative processor types are shown in Table 3.2a. Eleven catcher vessels were classified, seven inshore and four offshore (Table 3.2b). Note particularly the three columns in each table delineating the number of processors (vessels) modelled, the number of OMB survey returns, and the number of actual processors (vessels). These provide some insight into the reliability of the estimates regarding operational characteristics of the categories. As is readily discernable, many categories had very few OMB survey returns, however note also that in the case of processors the actual numbers in the population were quite small as well. In cases where it was felt that the OMB survey provided insufficient information other data sources as described in Section 3.1.3 were used. In all cases where possible, operational characteristics were "ground-truthed" with representatives of the industry sectors involved.

These categories reflect an important characteristic about firms in this industry; most depend upon a variety of fisheries over the period of a year. That is, an inshore processor relies upon more than just pollock. The level of dependency by both catchers and processors on other species can be instrumental in determining the overall profitability of operations. The investment in fixed plant and equipment is spread over several species that might otherwise be individually unprofitable. Short-season high-value fisheries may be used to compliment the low-margin high-volume species such as pollock. This situation requires that some account be made for the dependency of various firms upon fisheries besides pollock or Pacific cod. With the possible exception of surimi factory trawlers and shore based trawlers, all of the representative industry categories exhibited this dependence on a harvest or product mix.

Figures 3.2a and 3.2b illustrate the species mix reported for the respective inshore and offshore processor categories. Five related measures of species mix are shown, covering round weight, exvessel value,

Table 3.2a

1989 Harvest Vessel Categories as Defined in the Economic Impact Analysis a/

Category	Products b/	Modelled MT Round Weight	Reported Groundfish c/	Principle Species d/	Processors in Model	OMB Survey Returns	Actual Processors e/	Gears	Total Harvestors in Model f/	Actual Groundfish Vessels g/
SS1 - Bering Sea	S,F,SC,HG,R,M	< 90,000/Unit	218,953	P,C,Cr	3	3	4	All	70	45
SS2 - Western Gulf	F,SC,HG	< 10,000/Unit	16,523	C,S,H,Cr	2	2	4	All	116	79
SS3 - Kodiak-A	S,F,HG,R	< 15,000/Unit	36,893	P,C,S,H,Sf,Cr	3	2	3	All	122	56
SS4 - Kodiak-B	F,HG,R	< 5,000/Unit	26,042	C,H,P,Sf,S,Cr	5	1	12	All	122	106
Surimi F. Trawler	S,F,R,M	< 50,000/Unit	542,244	P,C	12	11	12	Tr	12	14
Filet F. Trawler	F,HG,R,M	< 20,000/Unit	343,705	P,C,F,R	20	14	21	Tr	20	22
H&G F. Trawler	HG,R	< 5,000/Unit	80,717	R,P,F,C,Sf	14	4	16	Tr	14	18
Mothership	S,F,HG,R,M	< 60,000/Unit	113,738	P,C,R,F	2	3	8	Tr	6	19
Freezer Longliner g/	HG	< 1,000/Unit	22,668	C,Sf,F,R	20	4	30	Ll,Pt	20	30

a/ Characteristics reflect 1989 operations only.

b/ Product Codes: S=Surimi, F=Fillets, SC=Salt Cod, HG=Head & Gut, R=Roe, M=Meal

c/ Total groundfish reported in NMFS weekly processor reports and in ADFG fish-tickets.

d/ Species Codes: P=Pollock, C=P.Cod, Cr=Crab, S=Salmon, H=Halibut, Sf=Sablefish, F=Flatfish, R=Rockfish

e/ Actual number of processors reporting in 1989 using categories developed for this analysis.

f/ Total harvestors includes vessels delivering species other than pollock and Pacific cod.

g/ Number of vessels which made deliveries to specified categories. For catcher/processors, vessel numbers include the processors and any delivery vessels.

h/ Freezer Longliners are categorized as a component of the inshore sector as specified by the Council, although their operations are at sea.

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Table 3.2b

1989 Harvest Vessel Categories as Defined in the Economic Impact Analysis a/

Category	Vessel Length	Modelled MT Round Weight	Reported Groundfish b/	Principle Species c/	Vessels in Model	OMB Survey Returns	Actual Vessels d/	Gears e/
Purse Seiner	0' - 49'	< 100	5,870	S,H,Cr	127	10	143	S,Ll,Pt
Limit Seiner	50' - 59'	< 200	9,515	S,C,H,Sf,Cr	101	9	59	S,Ll,Tr,Pt
Longline	60' - 80'	< 200	32,277	C,Sf,H	104	13	98	Ll,Pt
Combination	81' - 125'	< 5,000	251,223	P,C,H,Cr	58	17	77	S,Ll,Tr,Pt
Shorebased Trawler	126' +	< 20,000	96,567	P,C	18	2	14	Tr
At-Sea Trawler	126' +	< 20,000	37,631	P,C,F,R	12	2	1	Tr
Crabber f/	125' ±	< 1,000	0	Cr	15	0	?	Pt

a/ Characteristics reflect 1989 opearions only.

b/ Total groundfish reported in NMFS weekly processor reports and in ADFG fish-tickets.

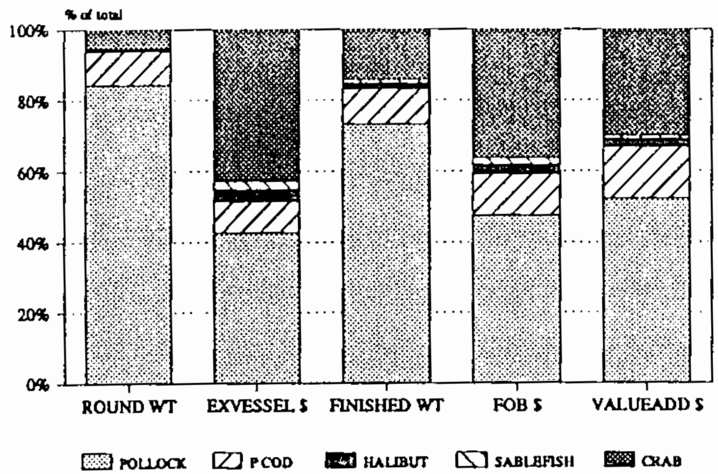
c/ Species Codes: P=Pollock, C=P.Cod, Cr=Crab, S=Salmon, H=Halibut, Sf=Sablefish, F=Flatfish, R=Rockfish

d/ Number of unique vessels which made deliveries to processor categories modelled.

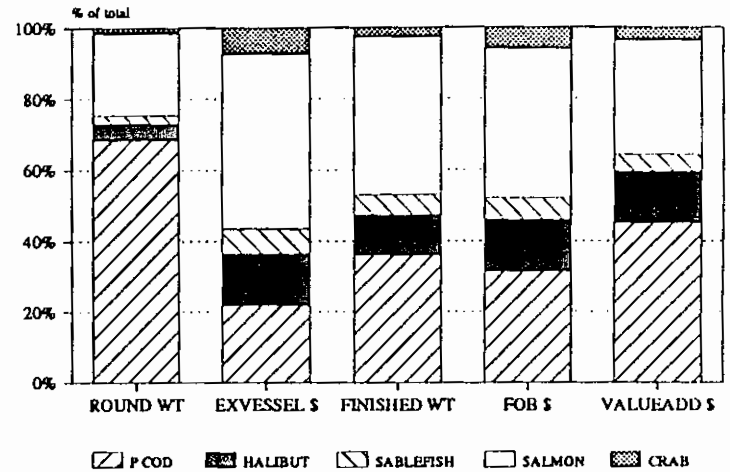
e/ Gear Codes: S=Seine, Ll=Longline, Pt=Pot, Tr=Trawl

f/ Specialized crab vessels did not make groundfish landings and are not included in NMFS catch or vessels data.

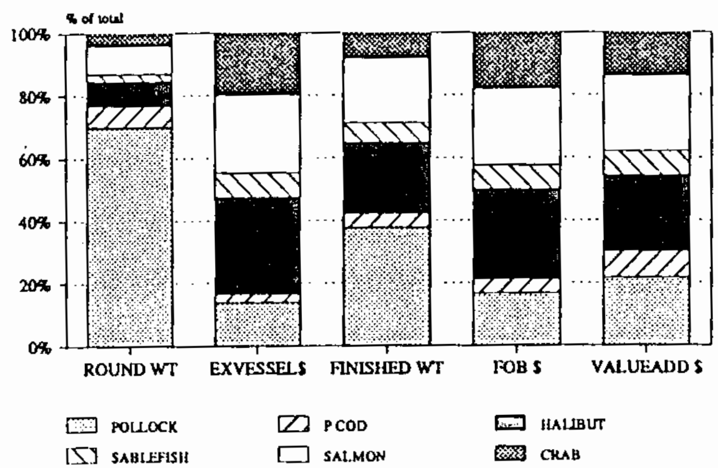
Figure 3.2a Inshore Processor Species Mix



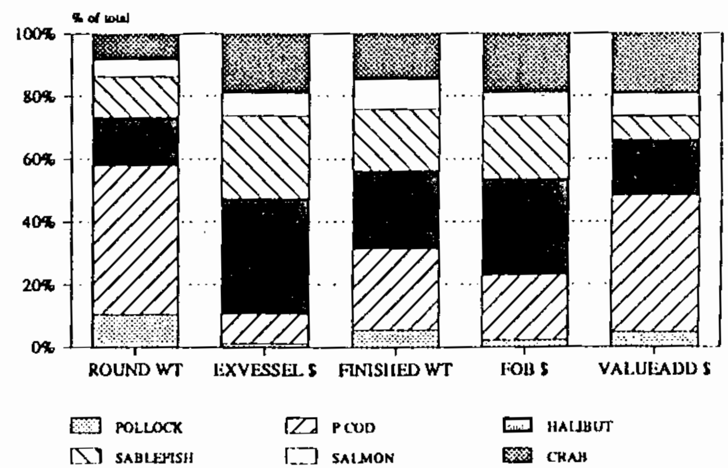
SS1 Dutch Harbor Inshore Processor



SS2 Western Gulf Inshore Processor

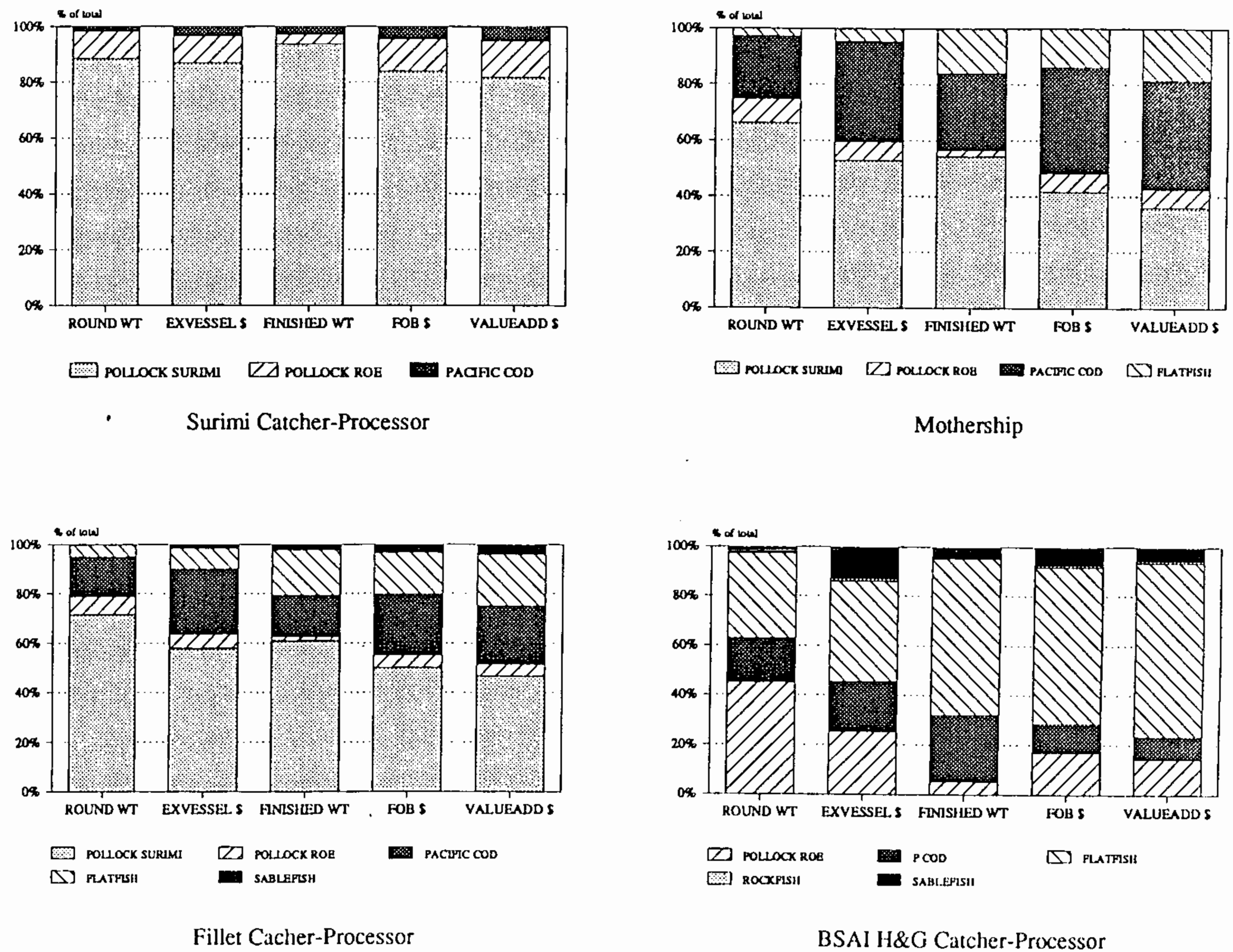


SS3 Kodiak "A" Inshore Processor



SS4 Kodiak "B" Inshore Processor

Figure 3.2b Offshore Processor Species Mix



finished weight, finished (FOB) value, and value added. In this case, the value added is the simple difference between the exvessel value and the finished product value. These illustrations demonstrate the relative dependence of each processor category on pollock and Pacific cod, as well as the general level of specialization/diversification modeled for these representative operations.

To account for the economic influence of other species on the overall economic performance of the affected firms, an average "harvest mix" of these products was factored into both cost and return estimates for each representative category. For example, the SS1 Dutch Harbor Inshore Processor trawler was modeled based on an average 1989 catch history of pollock and Pacific cod, as well as a compliment of halibut, sablefish, and crab. Halibut, sablefish, crab and salmon proved to be very important for inshore processing facilities, requiring the estimation of separate fleet of vessels to supply some of these resources. The king crab and purse seine catcher vessels are included in the vessel categories for this reason. Flatfish, and other groundfish comprised an important portion of the product mix for fillet and H&G factory trawlers, and these species were included in the economic models, accordingly.

Having established average product or harvest mixes for the respective categories, the role of other species was not rigorously examined in the further analysis of the management alternatives. Thus, changes in the allocation of pollock were examined without altering the relative dependence of a factory trawler upon flatfish or rockfish, although the potential for modification of fishing effort is discussed.

3.2.2 Estimates of Local Port Economies

The various industry components described above comprise the building blocks for the local port economic impacts. In order to develop the pollock and Pacific cod based economy for each of the representative ports, the appropriate type, mix, and number of catcher and processor operations were combined into working models. Processing categories were location-specific in this regard, as noted in Table 3.2a. Processing activity in a given community could be traced through both NMFS processing activity reports, as well as returned OMB surveys. Similarly, catcher vessels were matched with processors, and numbers and delivery shares estimated for the appropriate product mix. The economic identity modeled for each community is unique in terms of the vessel, processor, and fishery resource inventory, approximating actual operations in each location. Annual tonnage, sales revenues, and expenditures for each component were modeled for the 1989 calendar year. The economic impacts of these expenditures can be traced through the local and subsequent economies, generating the estimates used in the analysis of the alternative allocation schemes under consideration.

For existing inshore processing activity, the determination of the appropriate port location is obvious. This assignment is less clear for the mobile offshore processor fleet. In the approach taken here, all at-sea catching and processing activity is associated initially with one of the Alaska inshore port locations. This does not imply or require that the offshore fleet channels all of its economic activity through the local Alaska ports. Further estimation and modeling were undertaken to determine the magnitude of economic impacts generated in these local ports, as well as all impacts associated with home ports in Washington or Oregon.

Four representative Alaskan ports--Kodiak, Sand Point, Dutch Harbor/Unalaska, and St. Paul--were initially specified for the analysis. Washington, and to a-lesser extent Oregon, were identified as representative ports in the Pacific Northwest that served as home ports or service/supply centers for the Alaska groundfishery (Figure 3.1). Akutan, King Cove, and Chignik, Alaska were subsequently added in order to give a nearly complete coverage of processing activity for the affected fisheries in the GOA and BSAI. At-sea processing was modeled through Kodiak in the GOA, and Dutch Harbor in the BSAI. Thus, Kodiak and Dutch Harbor feel the direct economic consequences of both inshore and offshore catching and processing. The majority of the offshore economic impacts (estimated about 90%) are channeled through Dutch Harbor. In order to separate the influences of inshore and offshore activity of Kodiak and Dutch Harbor, separate models were constructed for each component in each community.

With both the offshore and inshore activity, the impacts in local ports depend upon the nature of the economies in each location--services, labor supply, infrastructure, and so forth--as well as the distribution of fishing and processing expenditures within that community. The input-output coefficients define the ability of the local economies to generate economic impacts, and the distribution of expenditures determines how much is spent locally.

Beyond the local Alaska ports, expenditures accrued in the rest of Alaska, Washington and Oregon (the Pacific Northwest), the rest of the United States, and in foreign countries. In effect, these become additional economic communities, or locations, at which economic impacts are assessed. Accounting for "leakage" and all associated impacts is necessary in order to avoid overestimating the economic consequences at any given level. For purposes of this analysis, the primary interest is in: (1) the distribution of economic impacts at the local port level, both in Alaska and the Pacific Northwest; and (2) the overall distribution of these impacts nationwide.

3.2.3 Economic Impacts

Possible economic consequences of preemption, or preventing preemption, were enumerated in Section 3.1.1. These impacts must be evaluated in a consistent fashion to allow for a comparison of effects across locations and sectors of the industry. The methodology established for this analysis examines economic impacts from the perspective of expenditure patterns associated with catching and processing the fishery resources, and the consequences these expenditures have as they move through the local, state, and national economy. The value users place on the fish is based on the economic benefits derived from these activities. In the interpretation of the input-output model results, however, a distinction is necessary, between *economic activity*, and *economic benefits*.[12]

Economies benefit when resources are available in excess of local consumption demands, and the surpluses can be sold outside of the immediate area. These sales may bring resources or dollars (called export earnings) back into the local economy to promote growth through investment or consumption expenditures. The amount of value that can be added by the local economy depends upon its efficiency, technology, location, and natural resource endowment. The value created or added becomes a critical factor in this process. The most important value added in natural resource-based economies typically is income, primarily salaries, wages, or returns to owners.

Catching and processing activities result in a significant level of expenditures beyond wages. All expenditures, however, do not have the same impact on economic growth. Consider the value added in the purchase of fuel, or packaging materials. These two inputs may represent large cash expenditures, but they do not add a corresponding dollar value to the fish resource. This is because the value has already been added to many such inputs in their primary manufacture. The value added in paperboard containers accrues to the wood products industry, when wood fiber is converted to packaging materials. To include the value of the packaging material as value added by fish processing "double counts" or overstates the true economic benefit. The incremental value of packaging material expenditures added in the fish

[12]This may be different than the "net national benefit" associated with cost-benefit analysis, which has a more specific interpretation. See section 3.5 for a discussion of net national benefits and their measurement.

processing industry comes from the sales margins tacked on by suppliers in return for their efforts, and such margins are the incomes of workers in the supplying firms. Additional value may be added to the fish product in further processing or merchandizing activities, but those operations are beyond the scope of this analysis.

Economic benefits or losses can also accrue to non labor (capital) inputs, such as machinery and equipment. This value added is expressed as "profits", or more accurately, the net return to owners and investors. The calculation of net returns to owners in this analysis is the simple difference between reported costs and total revenues. This is different than a technical accounting of the true economic "profits," which includes consideration of opportunity costs.

Incomes and other value added may be accompanied by considerable economic activity--buying, selling, processing, and so forth--but economic activity by itself does not constitute the benefits associated with value added. Large populations may be conducting intensive economic activity, but only meeting local needs. Economic growth requires the creation of additional value, not just activity. This is the distinction between a subsistence economy, such as feudal Europe during the dark ages, and a dynamic economy such as Western Europe today.

The relationship of expenditure categories to economic impacts is expressed in this analysis by the input-output coefficients, discussed in Section 3.1.2. Economic impacts--beneficial or adverse--will be initiated with the level of value added to the resource by individual catcher and processor firms. The associated economic activity of service and supply firms, and that commerce that accrues as the effects flow through the larger economic community, contributes indirect and induced economic activity, some of which may add further value to the fish product. This creates additional economic activity, and associated employment. The relationship between value added and additional economic activity can be technically measured and expressed through the development of economic multipliers.[13]

Limitations to Economic Benefits from Resource Development

The premise to the above description of economic impacts is valid so long as the application is cast in terms of the larger economic environment. That is, resources are developed, export earnings accrue, value is added, and activity results, *within the parameters of the competitive market economy*. This is intuitive in the real world, but can be overlooked in simulated outcomes that do not account for competition among and between firms.

The technical capability to perform some activity is not the same as economic feasibility. The difference can usually be explained in terms of economic efficiency. Economic efficiency accounts for competitive and market realities, and can be expressed in terms of the total costs of production relative to prices received. Other things equal, the firm with the lowest costs relative to prices received achieves a higher level of economic efficiency that can be an advantage in market competition. The least cost firm can undercut the price of competitors, and remain in operation when others fail. Consumers also benefit from such efficiencies and competitive pressures, to the extent that prices are maintained at lower levels.

[13]Multipliers are defined for a variety of relationships between economic variables; some caution is needed in applying these factors because of differences in their derivation and interpretation. Basically, multipliers seek to measure total impacts on economic activity, based on changes in key underlying variables. The input-out references cited in section 3.1.2 contain more in-depth explanations of this concept.

In the context of this analysis, the relationship between achieving competitive, economically efficient operations, and providing for localized economic benefits is important in evaluating the consequences of changes in resource-allocations. Changes to localized use of the pollock and Pacific cod resource must be considered in terms of subsequent efficiency and competitiveness in the marketplace. The use of the input-output model calls for cautious interpretation in this regard, particularly in the estimation of economic impacts of resource allocations that represent significant changes to present market allocations.[14]

Another area of consideration in interpreting economic impacts is the time period over which indicated changes might occur. Generally, the economic parameters established for the catcher and processor segments of the industry reflect annualized, 1989 conditions. Many of the direct effects occur within a one year time period. The indirect and induced economic consequences may take much longer to develop, extending several years into the future. This delayed reaction in some of the economic activity might be considered in a discounted present value context, to the extent that immediate term benefits or costs are more heavily weighted that values five years in the future. However, there is no consistent means of forecasting the time path of impacts associated with the induced economic impacts estimated here. Furthermore, unanticipated future events may alter the course of economic activity initiated by current actions. As a general guideline, the immediate benefits and costs associated with regulatory changes such as proposed in this amendment often fall on apparent, identifiable groups, whereas the longer term impacts are spread over a much broader, less defined population. Thus, it is important to look beyond the most vocal segments in assessing overall impacts.

3.3 Estimated Economic Impacts of Management Alternatives

The eight management alternatives proposed in this amendment do not represent a convenient graduated level of actions in terms of their design or economic impacts. Each alternative, and to some extent the options within each alternative, stand as separate proposals. As a result, each alternative calls for a separate initial analysis, and unique interpretation of the results. Where feasible, the summary analytical conclusions, presented in the Section 3.6, are drawn across all alternatives.

3.3.1 Alternative 1: **"Status quo with no change in regulations to address the problem."**

Alternative 1 represents an important reference, or control against which proposed changes can be compared. In addition, economic impacts under the "no change" scenario serve as a proxy for conditions that exist under the preemptive competitive conditions addressed in the amendment proposal. The original concerns expressed in the Problem Statement (Section 1.3) are broad-based, touching on resource conservation, operating characteristics of firms, competitive behavior, and *possible* preemption of one industry component by another with the attendant social and economic disruption. It is worthwhile to note that these concerns were raised in 1989, and the industry has continued to change since then, both competitively and in terms of the regulatory environment. Thus, the specifics of the problem have changed, but are still framed in terms of concerns over preemption. A general assessment of the consequences of Alternative 1 can be gleaned from the changes that have occurred in the pollock and Pacific cod fisheries since 1989.

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[14]The input-output model, as developed for this analysis, does not contain a convenient means of measuring or simulating changes in market or price variables. In order to account for this, sensitivity testing of basic economic parameters in the model was undertaken to assess the influence on key economic estimates.

From a regulatory perspective, significant changes in pollock harvest management were enacted with the passage of the Amendment 19/14 package, banning pollock roe stripping and establishing a more stringent harvest management regime in both the GOA and BSAI. The effects of Amendment 19/14 closely parallel the proposals put forward in management Alternative 5, which is examined in Section 3.3.5.

The concerns over excess harvest and processing capacity expressed in 1989 have likely intensified given the further expansion that has occurred in the groundfish industry during 1990. Figure 3.3 illustrates that pollock and Pacific cod processed tonnage expanded significantly in the past year, a net increase of 38.1% combining both species and processor categories. The largest tonnage increase came in pollock volume, up nearly 400,000 tons (37%) from 1989. Most of that increase (85%) was attributable to offshore processing activity.

The expansion in pollock processing volume during 1990 was made possible largely by the shift of 287,700 metric tons to DAP from 1989 joint venture (JV) pollock. Informal industry agreements appear to have lessened certain areas of conflict[15], but the basic problem remains one of overcapacity relative to available stocks. The addition of the 1989 JV allocation to the 1990 DAP may have postponed preemption concerns in the short run, but with no additional pollock allocation available in 1991, competitive pressures are expected to increase, as processor and catcher segments vie for limited stocks. Industry reports note an addition to the Alaska groundfish industry of two large Bering Sea inshore processors, and fourteen offshore processors since 1989. This combined inshore and offshore sector has the capacity to process nearly 3.2 million tons of pollock--more than twice the TAC--according to the NMFS 1990 DAP requests survey.

The Consequences of Industry Over Capacity

If the Council were to enact no additional management actions concerning the excess catching and processing capacity in these pollock and Pacific cod fisheries, the anticipated increase in pressure on the limited stocks implies that decreased shares of the resource will be available to individual industry segments. Shorter seasons, reduced capacity utilization, and heightened competition both among and between inshore and offshore components are likely. As an example, the season (days during which the season is open) for pelagic trawl pollock in the Bering Sea has gone from 365 days in 1989, to 286 days in 1990, and could be as short as 150 days in 1991. Based on early season 1991 actual harvest rates, the entire Bering Sea pollock TAC could be taken in 18 to 20 weeks by the combined inshore and offshore industry. In itself, such conditions need not lead to imminent failure of firms in the industry. New technology, changes in plant operations, or expansion into other fisheries could serve to lessen the direct impacts of reduced pollock or Pacific cod supplies. Intuitively, however, to make no changes in plant procedures, and continue operations with reduced fish inputs, would result in higher costs per unit, to the extent fixed costs are spread across reduced output, or operating efficiency of the plant is reduced.

Processors characterize pollock as a high-volume, low-margin fish. Large volumes must be processed in order to realize a positive net return due to the nature of the production costs and market prices for pollock products. For inshore Kodiak plants, in particular, a year-around pollock processing season helps support a resident seafood manufacturing labor force, reducing plant overhead costs associated with housing, food, and transportation. Shortened pollock seasons could lead to higher labor costs across the plant's product mix, with uncertain but ominous financial consequences.

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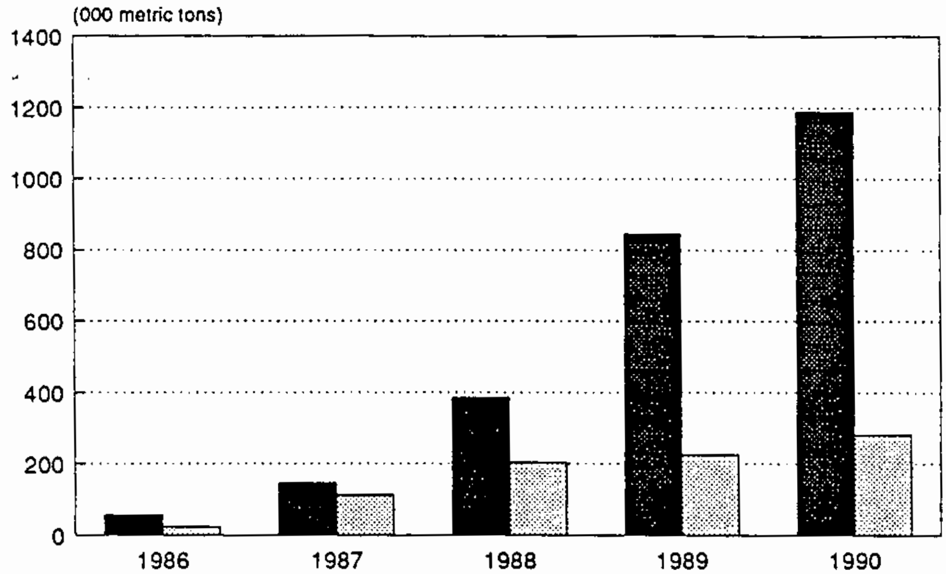
[15]The early closure of the 1989 GOA pollock season due to increased factory trawler processing activity is considered to be the focal event crystallizing concerns over preemption. Coincidentally, factory trawlers reduced directed pollock fishery operations in the GOA during 1990.

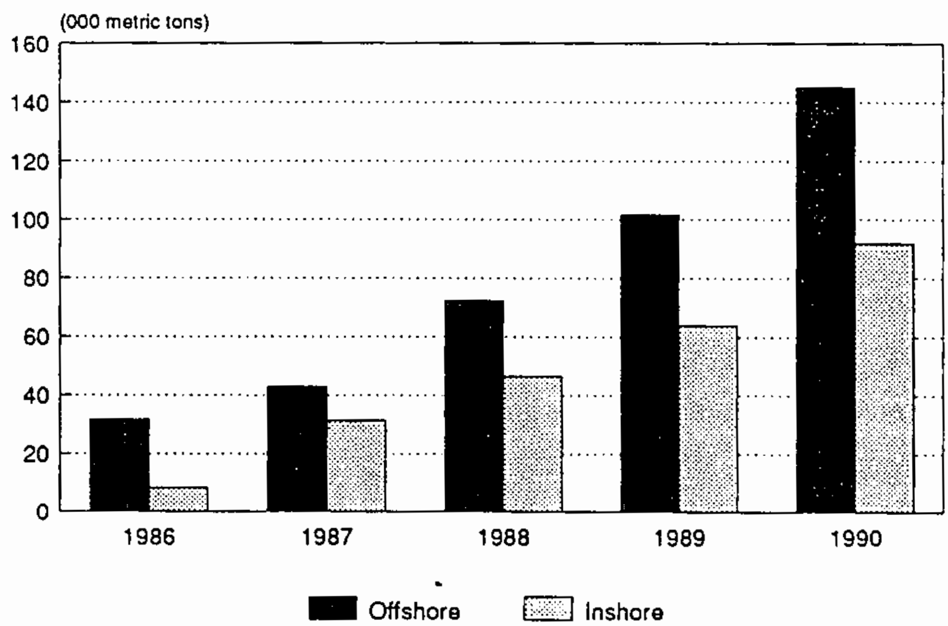
Figure 3.3 DAP Processing by Category

Relative Changes 1986 - 1990

Pollock: BSAI & GOA Combined



Pacific Cod: BSAI & GOA Combined Tonnage



NMFS data, 1990 numbers are preliminary.
Freezer-Longliners included as at-sea

Simulated Effects of Reduced Processing Volume on Net Returns

The sensitivity of processor net returns to a 10% increase in the manufacturing labor overhead costs was analyzed to estimate this specific dimension--shortened seasons and/or reduced capacity utilization--of pollock availability. The manufacturing overhead costs modeled in the enterprise budgets for the two representative Kodiak inshore processing plants (discussed in Section 3.2.1) were increased by 10%. The change in plant operating costs were relatively small, approximately a 0.7% increase in total costs for both operations. This small change in total costs is because manufacturing overhead costs in aggregate comprise only about 8% of total plant costs. A more telling consequence of the increased labor cost was the impact on net returns, which decreased about 22% for both Kodiak processor categories. This reveals that net returns in these operations were small in 1989, such that even small increases in costs can threaten the viability of the operation.

A more direct means of measuring cost sensitivity is to simulate a decrease in processing volume of the affected fisheries. As a test of this effect, the supply of pollock available to each processor was simulated by a ten percent reduction in tonnage. Recognizing that excess harvesting capacity exists for both inshore and offshore processors, the reduction in supply was analyzed across a sample of both sectors of the industry, based on 1989 level of operations. The impact was calculated relative to net returns, and average per unit pollock processing costs achieved in the 1989 base case. The results are summarized in Table 3.3. Net returns are calculated as total revenues less total costs, with both cost and revenue estimates developed from the OMB survey data, as explained in Sections 3.1.2 and 3.2.1.

Table 3.3 Simulated Effect of a 10% Reduction in Pollock Processing

Category	Percentage Change in Per Unit Cost	Percentage Change in Net Return
Surimi FT	6.6%	-52.2%
Fillet FT	1.9%	-24.5%
SS1	2.3%	-82.9%
SS2	1.8%	-37.0%

For the surimi factory trawler category, a 10% reduction in processed volume resulted in a 52% decline in net returns. Comparable reductions in net returns were 24% for the fillet factory trawler, 83% for the Dutch Harbor processor, and 37% for the Kodiak "A" processor. As in the case of labor overhead costs, relatively small percentage changes in processing tonnage result in proportionately larger changes in net returns. For the more pollock-dependent categories (Dutch Harbor inshore processor and surimi factory trawler), the cost and returns impacts are proportionately greater.

The significant changes in net revenue are not necessarily indicative of imminent failure for any of these four categories due to the accounting cushions available through depreciation, or deferring certain fixed costs. Also, each operation's relative dependence upon pollock will influence the impact of reduced supplies on overall firm survivability. It does appear, however, that in the absence of alternatives, the average net income of average firms in the industry will be significantly reduced, so long as overcapacity conditions persist.

Further analysis of the relationship between net returns and capacity utilization indicated that the Surimi factory trawler would be unable to cover critical variable costs (the theoretical shut down point in operations) when pollock supplies were reduced by roughly 60%. Such analysis draws the simplistic assumption that other operations of the firm remain unchanged. Under the same simulated condition, the Dutch Harbor plant faced shut down conditions at a 50% decline in pollock processing volume.

Neither the Kodiak "A" plant, nor the fillet factory trawler reached shut down conditions based on pollock availability, because both operations continued to generate sufficient returns from other species enabling them to cover essential variable costs. While continued short run operation in this situation might prove feasible, economic survival ultimately requires that revenues cover all costs. Thus, the sensitivity of firm-level net returns to capacity utilization suggests that continued industry-wide operations at reduced capacity will ultimately squeeze some firms out of business, or force them into other fisheries or different modes of operation.[16]

3.3.1.1 Effectiveness of Alternative 1 in Resolving the Preemption Problem

Conventional economic doctrine in a market economy places a premium on the existence of competition as the force rewarding efficiency, encouraging innovation, and keeping consumer prices low. Experience shows that a market economy also can result in less desirable consequences such as cartels, monopolistic control, restraint of trade, or destructive competition. The consequence of Alternative 1 as a "do nothing" option would appear to relegate the resolution of the preemption and excess capacity problem to the marketplace, and it is not clear which of the above scenarios might emerge. Insufficient information concerning the future direction and performance of this dynamic industry is available from this analysis to draw a convincing conclusion. The indications are that competitive pressures will build as the "race for fish" intensifies. Preemption and subsequent firm failures are possible, as indicated by the sensitivity tests on net returns, but these are not the only potential outcomes or consequences.

Alternative 1 is an ambiguous option, in that the status quo, or "do nothing" scenario conceivably includes all regulatory actions that have occurred since the formulation of the inshore/offshore amendment in 1989. To have "done nothing" in 1989 is different than "doing nothing" in 1991 or 1992, since other management actions have taken place in the interim. The essence and intent of this alternative, however, is to take no direct action regarding the preemption problem, and its effectiveness must be judged on this interpretation, rather than including the impact of subsequent regulatory initiatives.[17] In this regard, Alternative 1 offers little to solve the preemption problem, other than suggest that the fatalistic actions of the open access, free market conditions will continue to allocate the fishery resources. While recognizing the importance of competition in the Alaska groundfish industry, the consensus of the Council is that Alternative 1 does not adequately address the preemption problem inherent in the proposed amendment.

3.3.2 Alternative 2: **"Use traditional management tools including but not limited to: trip limits, periodic allocations, super-exclusive registration areas, and gear sizes."**

This alternative provides for the use of traditional management measures such as trip limits, periodic allocations, super-exclusive registration areas, and gear sizes, to address the inshore-offshore issue. The alternative was added to the list of alternatives in September 1989. After reviewing that list in January

[16]Various alternatives available to offshore processors, specifically, are examined in Section 3.4.4, as well as Addendum II to this chapter.

[17]Alternative 5 better captures the effect of regulations adopted between 1989 and 1991 that impact preemption and the inshore/offshore controversy.

1990, the Council's Scientific and Statistical Committee commented that it was unclear how traditional tools would ensure that fish would be delivered to inshore processors. Nevertheless, the Council accepted the Fishery Planning Committee's recommendation then to leave this alternative in the amendment package so that it would be available for future use.

The Council has considerable experience using traditional management measures to address fisheries problems; fishery management plans are replete with these types of measures. In the past five years, the term "traditional management measure" generally has encompassed all management tools except limited access. In context of the current amendment proposals on inshore-offshore, the term also excludes direct allocation between industry sectors, a measure which in itself constitutes a major alternative.

The issue at hand is one of preemption, and whether traditional management tools will satisfactorily address it. Preemption is not a new issue to the Council, which has had to deal with preemption in various forms under different circumstances in other fisheries, especially fully developed ones such as halibut, sablefish, crab, and more recently, groundfish and the problem of bycatch. For halibut fisheries in particular--as discussed next in reference to the efficacy of trip limits--the Council and the International Pacific Halibut Commission (IPHC) have worked since 1982 to address the needs of local Bering Sea native communities, but have had only marginal success considering the time and effort spent to analyze and implement traditional management measures. These tools did not work as intended, despite numerous subsequent revisions over the years.

<u>Trip Limits</u>

Trip limits provide a cap on the amount of fish that may be landed by a harvesting vessel. They have been used to reduce the risk of high fishing effort exceeding the harvest quota. IPHC has used trip limits for this purpose in the Gulf of Alaska and other areas where there is large halibut fishing capacity and very short seasons. Trip limits do slow, at least temporarily, the rate of harvesting and processing, but it is problematical whether such a measure would effectively address the inshore-offshore preemption problem. The halibut fisheries in the Bering Sea illustrate why such a measure probably would have only marginal success.

Beginning in 1983, IPHC established smaller areas within IPHC Area 4 to provide local fishermen from the Pribilofs and Nelson Island more opportunity to develop their small boat halibut fishery in areas of the Bering Sea traditionally fished by larger, non-local boats. The Commission did not provide a direct allocation, but instead, chose to apply various management measures such as short fishing periods, onerous vessel clearance requirements for non-local boats, and trip limits to discourage non-local fishermen and thus enhance opportunities for local fishermen to participate in the fisheries.

In 1987, NOAA clarified that the Council, based on the North Pacific Halibut Act of 1982, was the more appropriate entity to take the lead in providing advantages for local fishermen of the Bering Sea. The Council retained trip limits, short openings, and clearance requirements as management approaches, and those measures remain in effect today. However they have not been successful in providing for local fishermen as shown by the following tabulation of percentages of halibut landings in areas 4B (Atka) and 4C (Pribilofs) by local and outside boats:

Year	Area 4B Outside (%)	Local	Area 4C Outside (%)	Local
1984			57	43
1985			56	44
1986			82	18
1987	99.8	0.2	70	30
1988	99.3	0.7	30	70
1989	98.6	0.4	50	50
1990	98.5	0.5	64	36
1991			73	27

These numbers illustrate that the use of traditional management measures to indirectly address preemption issues does not work very consistently. There has been little advantage gained by the local fishermen in Area 4B, and in Area 4C, non-local boats have increased their share of the harvest over the past eight years, though the proportions have varied considerably since 1984.

Continual revisions have been required to try to reduce the efficiency of one fleet sector in favor of another. The Council continues to receive requests for help from local fishermen in the Bering Sea despite the fact that Area 4 has been subdivided numerous times and regulations have been enacted to discourage use of these areas by non-local boats. Each of the two halibut areas has sufficient harvest levels to make them attractive to non-local boats that have limited opportunities elsewhere.

The above example from the Bering Sea halibut fisheries shows that, while a trip limit, and the concomitant reduction in the rate of harvesting and processing per unit of capacity may appear to be a useful tool to address preemption in the pollock fisheries, its usefulness could be short lived. As more capacity enters each sector, the efficacy of the trip limit would erode, and the Council would be requested once again to reduce the limit or add further restrictions.

As trip limits were progressively reduced, a second problem would surface, and that is that most if not all processors require minimal amounts of fish to maintain economic viability. Trip limits restrictive enough to address the preemption problem might still put them out of business, even though they may have discouraged offshore processors that require high production rates, from working in an area with a processing limit. Had trip limits been in effect in 1989 when mobile processors moved into the Gulf of Alaska, the rate of pollock harvest would have been slower and the season extended. In 1990 when fewer at-sea processors participated in the Gulf of Alaska pollock fishery, the quota was not achieved until the second quarter, rather than in the first as in 1989. So trip limits could have a limited effectiveness in reducing rates of harvest and processing, but in the long term, as shown in the Bering Sea halibut fisheries, they would only be marginally successful in addressing the inshore-offshore preemption issue.

Periodic Allocations

Periodic allocations, also known as timed releases of quota, have been suggested as a traditional management tool which could be used to address the inshore/offshore problem. The concept here is that a timed release of pollock and cod quota over the course of the season would assure that these two species would be available to harvesters and processors throughout the year. However, it would not necessarily reduce the threat of preemption. The offshore harvesting and processing fleet could still compete directly with the inshore fleet except now the available quota would be less.

It has been suggested that an indirect effect of periodic allocations might be that due to the reduced size of the quota and with the assumption that other fisheries remain open, the offshore fleet may choose to fish in less competitive areas. However, one result is that the offshore fleet may indeed choose to fish away from Kodiak, for example, but by concentrating efforts in the Bering Sea increases the risk of preemption of shore plants in that area. Another result could be that only part of the offshore fleet chooses to move into a less competitive area. Market prices and catch rates may encourage some members of the offshore fleet to remain and compete directly with the shoreside industry regardless of periodic allocations.

Referring again to the halibut fisheries in the Bering Sea and Aleutians, the short seasons of three-day openings followed by four- to five-day closures in Area 4B, and one day on/ one day off seasons in Area 4C, serve indirectly as periodic allocations. These measures, even in concert with trip limits and onerous clearance requirements for non-local boats, have not been very successful in providing for local fisheries. In addition, as will be discussed in Section 3.3.5, the pollock management measures advanced in Alternative 5, many of which have been implemented with amendments 14/19 to the groundfish plans, include seasonal allocations of the resource. They have not been successful in resolving the inshore-offshore preemption problem.

Exclusive Registration Areas

Registration areas are a management tool with a long history in Alaskan shellfish fisheries. The concept requires establishing defined management areas and requiring fishermen to register to fish in an area prior to fishing. The registration areas may have specific residency requirements. In the State of Alaska King Crab Regulations, the following types of registration areas are defined:

> Superexclusive - a vessel registered for a superexclusive registration area may not be used to take king crab in any other registration area during that year.
>
> Exclusive - a vessel registered for an exclusive registration area may not be used to take king crab in any superexclusive registration area or in any other exclusive registration area during that year.
>
> Nonexclusive - during the year, a vessel may be registered to fish for one or more nonexclusive registration areas and registered to fish in one exclusive registration area, but may not be used to take king crab in any superexclusive registration area or in more than one exclusive registration area.

These measures have been used by shellfish managers to better estimate fishing effort in advance of the season for each management area and as an attempt to spread out the crab harvest over several geographic areas. Superexclusive areas have been used to protect localized, small boat fleets from the larger, more mobile fleet. A vessel choosing to fish in a superexclusive area (presumably due to an optimistic preseason quota forecast) is restricted to that area for all of its king crab operations for the entire year. It can select another registration area, but only for another species. A vessel choosing to fish in an exclusive area is prevented from fishing in any other exclusive or superexclusive area for king crab. However, this vessel can fish in any or all nonexclusive areas. Exclusive registration requires some economic commitment to fishing in a geographic area but not to the degree of a superexclusive area.

It has been suggested that use of some form of registration areas may be a method of solving the inshore-offshore preemption problem, and that the management measure could be tailored for either harvesting vessels (like the state regulations), processing vessels, or both. The Council, however, has always been cautioned in the past about the use of overly restrictive exclusive areas that may run afoul of National Standard 4 which prohibits management measures from discriminating between residents of different states. Certainly that issue has been raised vociferously by industry before the Council many times in the past in dealing with the use of exclusive crab management areas in the EEZ.

Most recently in July 1989, when the Secretary implemented the Council's crab plan which incorporated the State of Alaska's exclusive registration system, industry commented that such a measure was an indirect form of limited entry that would ultimately favor resident small boat fishermen that do not depend on the need for mobility, to move from one fishery to another within the geographic area. The Secretary held that exclusive areas were allowable under the Magnuson Act if carried out in such manner as to be fair and equitable to all fishermen and non-discriminatory between fishermen from different states. However, in the inshore-offshore issue, exclusive registration, used alone to address inshore-offshore preemption, may need to be so restrictive that it would be in jeopardy of violating National Standard 4 in fact or intent.

Secondly, it is not clear that exclusive registration would solve the preemption problem, in the face of increasing competition for a limited resource. The Bering Sea halibut fisheries are again instructive. As noted above, the onerous clearance requirements, short seasons and trip limits fell short of addressing the needs of local fishermen in Area 4C. These fishermen requested the Council to encourage IPHC to establish seasons for their area concurrent with other fixed gear seasons in to distribute fishing effort more widely. Operationally this measure would have the similar impacts of an exclusive registration area wherein--out of necessity--a fisherman had to choose which area to fish. IPHC set concurrent seasons for Areas 4C and 4B beginning June 17, 1991. Area 4C has a quota of 600,000 lbs and Area 4B has a quota of 1,700,000 lbs. Sufficient non-local capacity still entered the fishery in Area 4C so as to account for 73% of the harvest compared to 27% for local boats. Given sufficient capacity, and insufficient opportunity to fish elsewhere, this example shows that the fleet may still operate in such a manner as to nullify any intended benefits that an exclusive registration area may have in addressing preemption.

Gear Restrictions

Gear restrictions usually refer to regulations affecting the use of fishing gear in a particular fishery. In Alaskan fisheries, these measures have taken the form of allowing only that certain gear be used; requiring only certain size mesh or material be used in the construction of the gear; requiring that the allowable gear be used only at certain times of the day or year; and requiring that allowable gear only be fished at specified depths. These management measures have been used in the past to slow the rate of harvest, reduce bycatch, and prevent ghost fishing. How gear restrictions may effect the preemption problem is unclear. As with trip limits, a slower rate of harvest resulting from a large mesh trawl may lengthen the pollock or cod season. Depending on the economic requirements of processing plants, a reduced rate of harvest may not be desirable for a successful operation. It could however reduce mixed size catches, sorting and discards. Gear restrictions could affect where offshore catcher/processors choose to operate since these measures will likely increase operating costs in an area.

As with exclusive registration areas, the Council, industry, and the Secretary have considerable experience with the use of gear restrictions as a management tool. The State of Alaska traditionally uses limits on the numbers of pots that may be fished by crab vessels to control the rate of harvest and reduce gear interference on the grounds. The State's use of pot limits and exclusive registration areas was challenged yearly by Seattle-based interests during 1983-1986, especially as the Council attempted to revise its Tanner crab plan to conform to State management. For example, Amendment 8 to the Tanner crab plan was implemented on October 5, 1983. Only one of six provisions was disapproved by NMFS, the one dealing with establishing vessel pot limits in the Kodiak and Prince William Sound areas. Though it was disapproved by NMFS on August 18, 1983, for enforcement and effectiveness reasons, there was considerable testimony indicating that representatives of the large-boat, out-of-state crab fleet viewed the regulation as giving a preference to the local fishermen. This view was brought forth further at the Council's September 1983 when it was considering lowering the pot limits around Kodiak from 250 to 200 pots, and designating the Chignik-South Peninsula and Southeastern Area as exclusive registration areas. After review and public comment on the amendment package, the Council voted against sending it forward.

Disparities between State and Federal management of the Tanner crab resource were brought to a head in March 1986 when the Council voted to suspend federal regulations implementing the Tanner crab plan. At that meeting, representatives of out-of-state fishermen argued vehemently against suspending the plan because, in the vacuum of no federal regulations, State regulations would predominate. These were perceived to violate National Standard 4. The North Pacific Fishing Vessel Owners' Association, which represented a major portion of out-of-state crab fleet had taken legal action against the State of Alaska earlier to overturn crab pot limits and exclusive registration zones which they contended disadvantaged large out-of-state vessels.

The Council voted to suspend the Tanner crab plan, to a large part, because of the January 31, 1986, letter of NOAA GCAK to Jim Brennan recommending such action. In that letter, Pat Travers noted that the plan contained provisions such a "... gear limitations and area registration procedures, some of which were intended to reduce the competitive advantages of large vessels capable of fishing over great distances." He went on to speak about many of the perceptions of out-of-state residents that state regulations were discriminatory, noting that "The Alaska courts, for example, have recently cast into doubt the permissibility under State law of the 'exclusive registration areas' that have been a major concern of the non-Alaskan participants in the Tanner crab fishery."

Seattle industry continued to note their concerns with discrimination in a long letter to the NMFS Regional Director on April 20, 1987 signed by eleven of the largest associations and companies in Seattle, commenting on the proposed Secretarial amendment which would repeal the Tanner crab FMP, thus leaving only state regulation to manage the fishery. Nevertheless, the Tanner crab plan was repealed by the Secretary on April 29, 1987. The Council then developed and submitted a combined FMP for King and Tanner crab in the Bering Sea and Aleutians. It was approved and implemented on June 2, 1989. As noted earlier, the *Federal Register* notice of July 11, 1989, approving the plan, responded to an industry comment complaining that exclusive registration areas were defacto limited entry that would ultimately favor resident small boat fishermen that do not depend on mobility to move from one fishery to another within the geographic area.

3.3.2.1 Effectiveness of Alternative 2 in Resolving the Preemption Problem

In summary, while traditional management tools may appear attractive as a least burdensome solution to major preemption problems, the Council's experience with such measures, documented above, shows that they seldom are effective. Considerable revision and enhancement are required as the preemption problem resurfaces each year. The Council and industry repeatedly are called upon to expend precious time and resources on further analysis and consideration of the same allocative issue. Additional management measures are overlaid on earlier measures, incrementally increasing the burden on industry.

In contrast, for sablefish, grounds preemption problems arose off Southeast Alaska in early 1985 when three large vessels began fishing sablefish using pot gear on grounds that were traditionally fished by many fishermen using lighter weight hook-and-line gear. The Council was asked to address this grounds preemption problem, but instead of using management measures then "traditional" at the time, the Council moved the pot vessels out into the Bering Sea and Aleutians where the fishery was less fully subscribed, and allocated the Gulf of Alaska sablefish resource among the two remaining gear types, longliners and trawlers, thus addressing what otherwise would have been an emerging gear conflict problem. Industry has lived with these allocational arrangements for the past six years without significant additional conflict.

3.3.3 Alternative 3: **"Allocate the Total Allowable Catch (TAC) between inshore and offshore components of the industry. This alternative examines the GOA pollock and Pacific cod fisheries, and BSAI pollock fishery under various allocation percentages and defined operational areas for pollock in the Bering Sea."**

This alternative does not provide a direct allocation of the fishery resources to processors in the sense of granting property rights to individual companies or ports. The allocation is intended to regulate the amount of groundfish that can be delivered to or harvested by the defined inshore and offshore processing sectors.

Alternative 3 consists, in turn, of 3 suboptions, each establishing different set percentage allocations of the affected fisheries between inshore and offshore components of the industry. Specific definitions and criteria are established to enable classification of operational status. These definitions are contained in Section 1.3 of this document. The inshore/offshore categorization of operations is intuitive with the exception that longline and pot catcher/processors (e.g. fixed gear catcher processors) are classified as inshore, and both motherships and factory-trawlers can change their status from offshore to inshore by converting to a non-fishing mode and restricting their processing activities to specific "inshore" locations.

As illustrated in Table 3.4, each of the options under Alternative 3 offers a different set of fixed percentage allocations by segment, species and management area.[18] In addition, the actual processed tonnage shares reported to NMFS are displayed as "actual" 1989. The actual percentages provide a control or base case against which the changes proposed in each of the three alternatives can be compared.

For a historical perspective, Figure 3.4 shows the relative shares of the total Alaska groundfish catch over the past ten years. The evolution of the domestic processing component has been relatively recent, and dramatic. Figures 3.5a, 3.5b, and 3.5c illustrate the trends in inshore and offshore shares of Pacific cod and Pollock in the Gulf of Alaska and Bering Sea, respectively. The figures also portray the allocation of these resources to the inshore and offshore sectors proposed by the alternative percentage shares proposed under each of the options in Alternative 3, in comparison to the historical trend since 1986. Each of the proposed allocations represents a unique situation, precluding simple, direct parallels among or between these options.

Generally, the alternatives provide for preferential allocations to inshore components of the industry, or at least set fixed resource shares which cannot be encroached upon by the other segment. Table 3.5 expresses the implied allocation under each alternative as both a tonnage and as a dollar valuation at representative exvessel and processed product levels. Subsequent analysis of each alternative addresses the economic impacts associated with the implied resource change from the base case.

The rationale for percentage allocations in Alternatives 3.1 and 3.2 references processing shares based on specific time periods. Alternative 3.3 is an arbitrary allocation of the resources without reference to historical share, but it offers some intuitive pretense (i.e., split pollock 50-50 in the BSAI, but allocate

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[18]Minor changes to the initial proposed percentage allocations were made with the approval of the Council's Fishery Planning Committee as a result of errors uncovered in the original data base used to calculate the allocations in Alternatives 3.1 and 3.2.

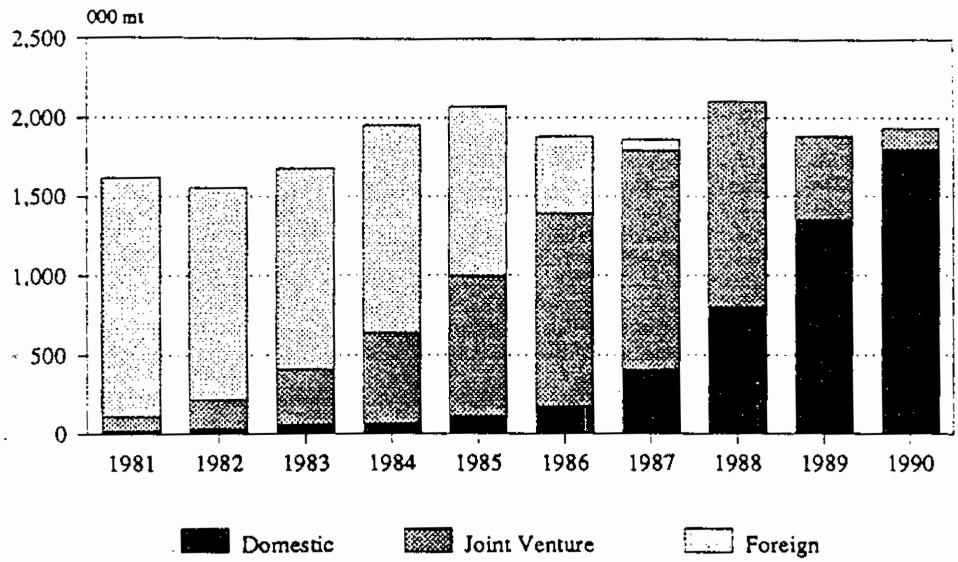
TABLE 3.4 Revised Inshore-Offshore Allocation Under Alternative 3

Management Alternative	Revised Inshore	Revised Offshore	Original Inshore	Original Offshore
Actual 1989				
BSAI Pollock	19.1%	80.9%	--No Change--	
GOA Pollock	45.2%	54.8%		
GOA Pacific Cod	87.1%	12.9%		
Alternative 3.1				
BSAI Pollock	33%	67%	34%	66%
GOA Pollock	46%	54%	46%	54%
GOA Pacific Cod	93%	7%	87%	13%
Alternative 3.2(A)				
BSAI Pollock	59%	41%	59%	41%
GOA Pollock	69%	31%	69%	31%
GOA Pacific Cod	83%	17%	81%	19%
Alternative 3.2(B)				
BSAI Pollock	59%	41%	59%	41%
GOA Pollock	77%	23%	77%	23%
GOA Pacific Cod	83%	17%	81%	19%
Alternative 3.3				
BSAI Pollock	50%	50%	--No Change--	
GOA Pollock	100%	0%		
GOA Pacific Cod	80%	20%		

Figure 3.4

Historical Trends in the Commercial Alaska Groundfish Catch by Component

(in 1000 metric tons, round weight)



SOURCE: National Marine Fishery Service

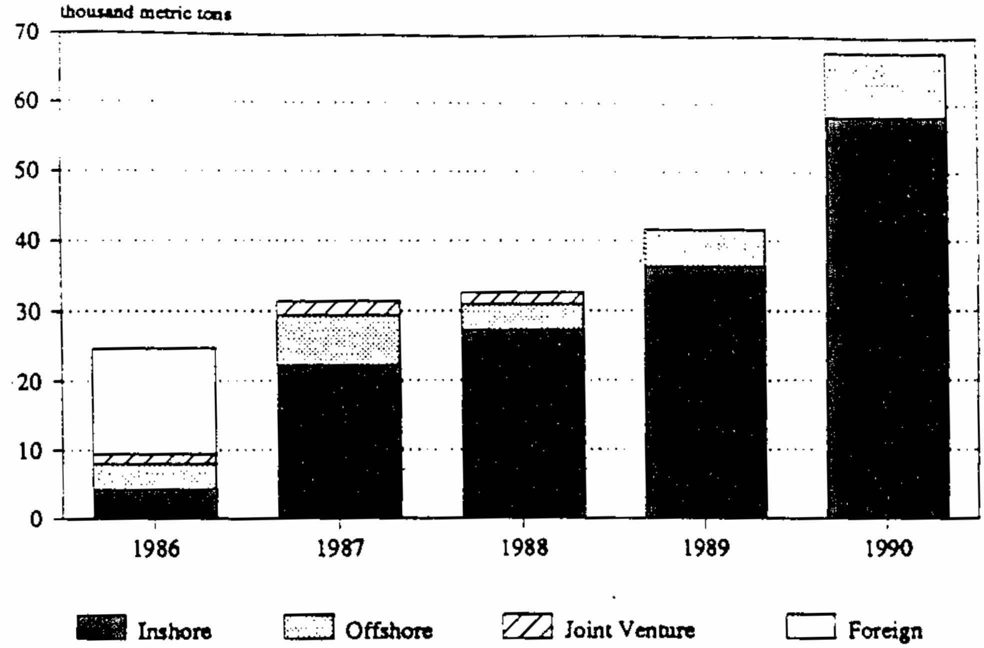
Commercial Groundfish Catch off Alaska: 1981-90 a/
(1,000 metric tons, roundweight)

Year	Domestic	JV	Foreign	Total
1981	18.9	95.5	1,505.4	1,619.8
1982	33.3	182.8	1,339.9	1,556.0
1983	55.5	353.0	1,271.3	1,679.8
1984	63.2	577.2	1,314.9	1,955.3
1985	114.7	883.6	1,074.4	2,072.7
1986	167.7	1,221.7	490.7	1,880.1
1987	407.3	1,388.0	68.7	1,864.0
1988	803.7	1,304.8	0.0	2,108.5
1989	1,352.6	531.0	0.0	1,883.6
1990	1,802.5	133.3	0.0	1,935.8

a/ 1990 data are preliminary

Figure 3.5a

Distribution of GOA Pacific Cod Catch



1986-90 GOA DAP Pacific Cod Shares and Allocations under the Proposed Options

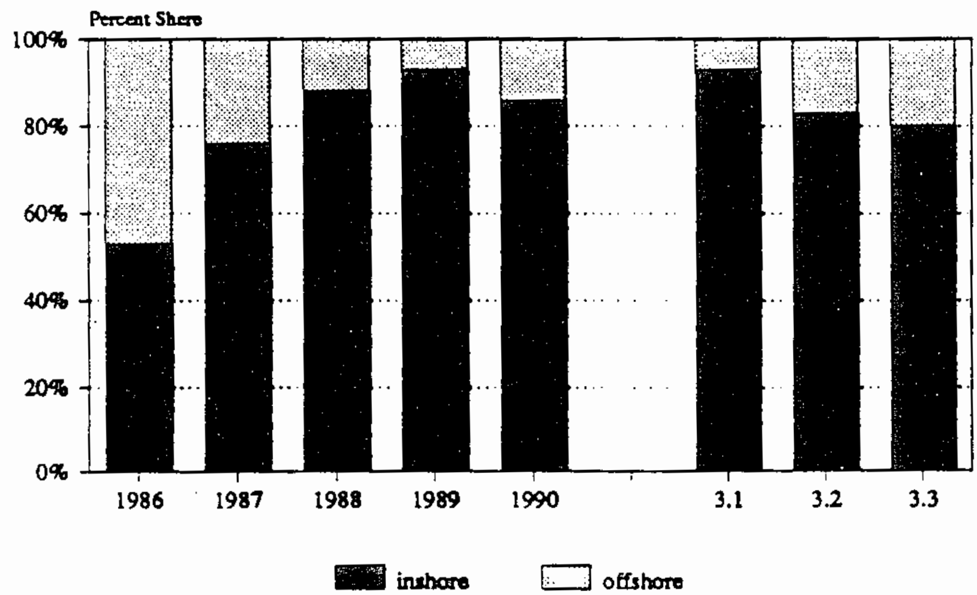
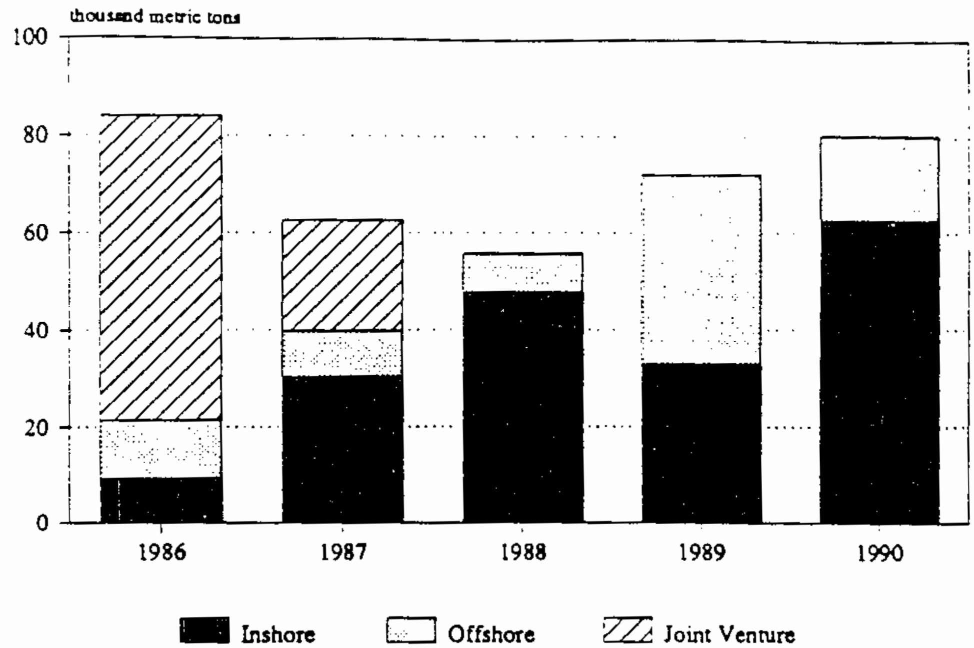


Figure 3.5b

Distribution of GOA Pollock Catch



1986-90 GOA DAP Pollock Shares and Allocations under the Proposed Options

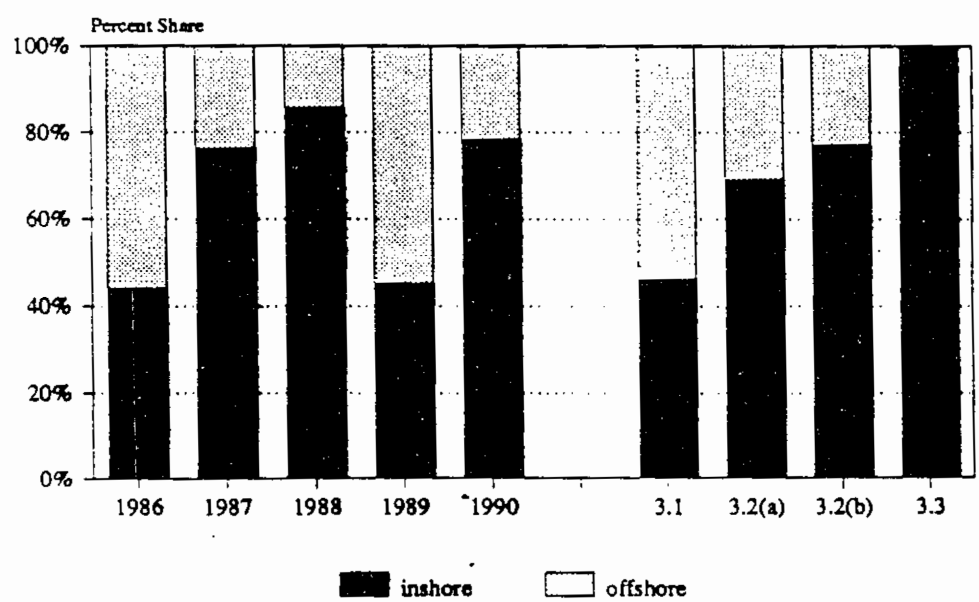
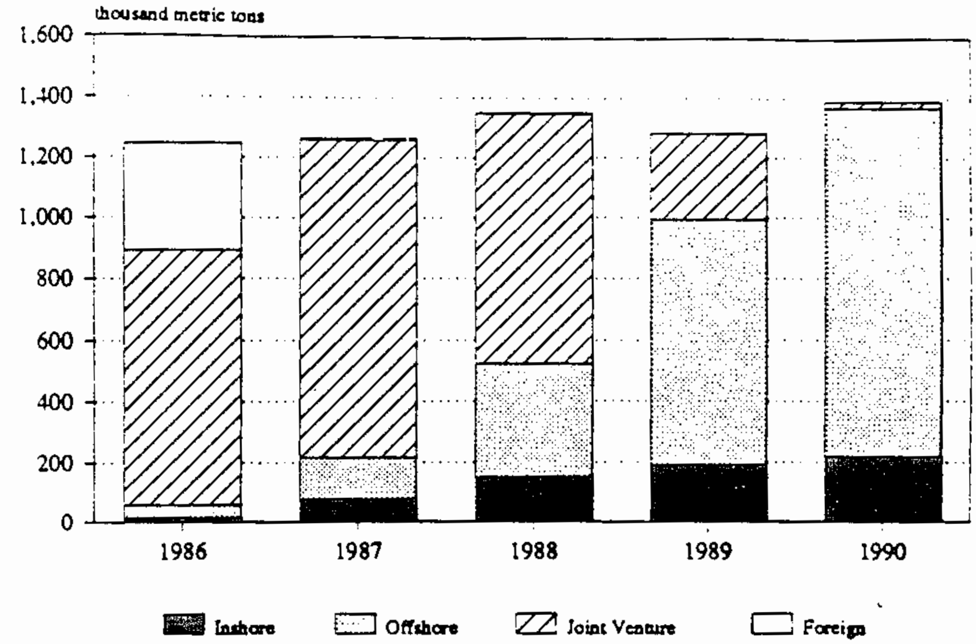
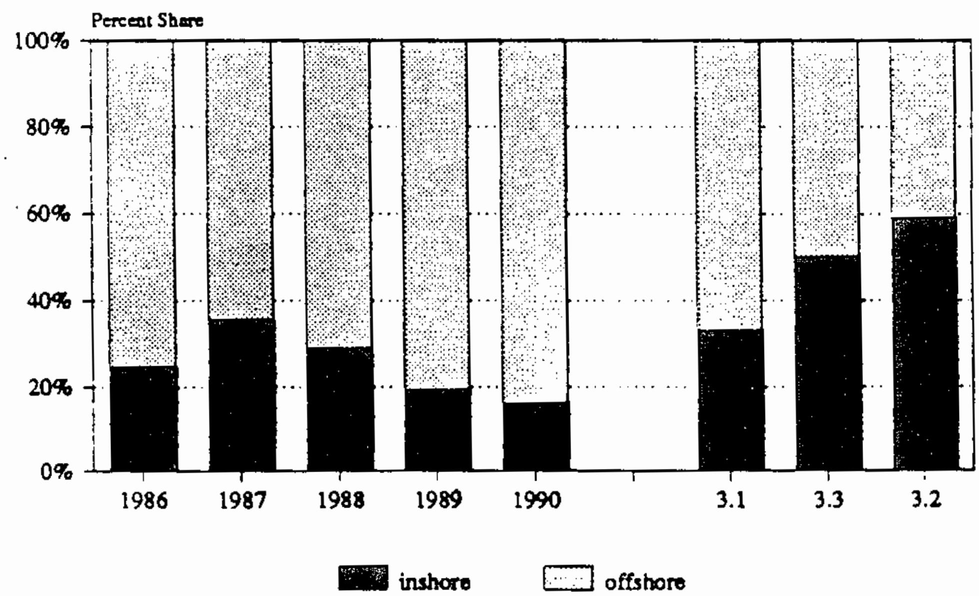


Figure 3.5c

Distribution of BSAI Pollock Catch



1986-90 BSAI DAP Pollock Shares and Allocations under the Proposed Options



100% inshore in the GOA). There is not a consistent progression of allocation percentages either among or between these three alternatives. For example, pollock allocations in both the BSAI and GOA effectively increase the inshore processing share over the base case. For Pacific cod in the GOA, however, the processing share is generally increased for the offshore sector.

3.3.3.1 Estimation Procedure

The input-output model explained in Section 3.1.2 is used to evaluate the impacts associated with the shares/percentage allocations prescribed in Alternative 3. The operations, revenues, and expenditures of individual industry components (firms) are modeled for specific port locations, and the base run established given actual shares (tonnages) reported 1989. Changes in allocation proposed in Alternative 3 (Table 3.5) are then analyzed using the same economic model of the firms and local economies. The economic consequences of each option can be measured based on the change in economic impacts, relative to the base.

The economic impacts are categorized as direct, total community, and employment. The direct impacts are the actual wages, salaries, and returns to ownership calculated using the enterprise budgets of the various firm categories (vessel and processor types are described in Section 3.2.3). The indirect and induced impacts created by successive respending are also calculated, summed, and added to the direct income figure to produce an estimate of total community impacts. Thus, income effects are included in total impacts.

As a proxy for the employment impacts of this dollar economic activity, total community impacts are divided by the average income of the respective community to estimate full time equivalent (FTE) jobs. Since the income level is an average of the community, it reflects the different jobs and wage levels that will be influenced by changes in the economic activity generated by changes in catching and processing volume. The higher the average wage rate in a community, the less FTE a corresponding level of economic activity will support. Thus, employment estimates are not necessarily interchangeable across locations, but the total community dollar economic impact is interpreted the same for each community.

Since the harvest/product mix of many industry components includes multiple species besides pollock and Pacific Cod, the estimates of economic activity are likely to be higher than those associated with just the two affected species. To clarify the impacts on pollock and Pacific cod, it is necessary to focus on the relative change in economic impacts between each of the alternative options and the base case. Since no changes are made to processing volume of the other species, any changes can be attributed to just pollock and Pacific cod.[19] The relevant economic impacts given this estimation procedure are therefore the changes from the base case. This approach casts 1989 as the reference for evaluating alternative allocations that never actually occurred. To the extent the industry is familiar with conditions that existed in 1989, such simulations comprise a set of "what if's", against which the known performance can be compared. The 1989 base year implies no specific standard of optimality; it serves only as a known reference.

[19]Alternative 3 concerns both pollock and Pacific cod, but the allocations of Pacific cod are only applicable in the GOA, since Pacific cod is not included in the BSAI allocations.. In the following discussions the two species are referenced together, but the analyses examine only those changes specified in the alternatives. Thus, the economic impacts arising from allocations in the BSAI are attributable to pollock only.

TABLE 3.5 Quantified Changes Resulting from Alternative 3

Management Alternative	Allocation Inshore (%)	Allocation Offshore (%)	Inshore Tonnage Change From 1989 (mt)	% Change Inshore From 1989 (%)	% Change Offshore From 1989 (%)	Inshore Change Valued at Exvessel a/ ($)	Inshore Change Valued at Processor a/ ($)
Alternative 3.1							
BSAI Pollock	33%	67%	138,325	72.4%	-17.1%	$21,350,450	$43,920,925
GOA Pollock	46%	54%	11	0.0%	0.0%	$1,757	$3,613
GOA Pacific Cod	93%	7%	221	0.6%	-6.9%	$65,816	$201,251
Alternative 3.2(A)							
BSAI Pollock	59%	41%	397,794	208.3%	-49.3%	$61,399,502	$126,307,548
GOA Pollock	69%	31%	16,651	50.1%	-42.6%	$2,570,005	$5,286,867
GOA Pacific Cod	83%	17%	(4,060)	-10.3%	126.2%	($1,208,501)	($3,695,327)
Alternative 3.2(B)							
BSAI Pollock	59%	41%	397,794	208.3%	-49.3%	$61,399,502	$126,307,548
GOA Pollock	77%	23%	22,438	67.4%	-57.4%	$3,463,308	$7,124,520
GOA Pacific Cod	83%	17%	(4,060)	-10.3%	126.2%	($1,208,501)	($3,695,327)
Alternative 3.3							
BSAI Pollock	50%	50%	307,978	161.2%	-38.2%	$47,536,369	$97,789,102
GOA Pollock	100%	0%	39,077	117.5%	-100.0%	$6,031,557	$12,407,774
GOA Pacific Cod	80%	20%	(5,344)	13.5%	161.0%	($1,590,796)	($4,864,301)

a/ Offshore tonnage and dollar value changes will be the opposite of the Inshore estimates; i.e., positive Inshore values become negative to the Offshore component and vice versa.

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The estimated economic impacts are organized by port location (i.e., Kodiak, inshore), and level of impact. The level of impact refers to the level at which the income and expenditures ultimately accrue. Levels identified in this regard include the local port economy associated with the location designation, other impacts within the state of Alaska, and "outside" impacts, reflecting economic impacts accruing in Washington and Oregon. In addition, a separate estimation of the model calculated the aggregate impacts on the U.S. economy, adjusted for leakage to foreign countries. "Outside" economic impacts in Washington and Oregon are adjusted for these estimates of the foreign leakage, as well.

3.3.3.2 Results of the Model

A large array of economic impacts are estimated considering the specification of: alternative option (5 possibilities, including the suboptions under 3.2, and the base case); port location (7); economic measure (3); and level of impact (4). The combinations result in over 400 economic impacts, each with its own interpretation. Table 3.6 presents these results, organized primarily by port location and alternative option[20]. The estimates of inshore and offshore impacts in Dutch Harbor and Kodiak, respectively (Table 3.6, items 1(a) & (b) and 2(a) & (b), are further aggregated (gains and losses combined) in order to portray net or cumulative economic impacts (items 1(c) and 2(c)). Similarly, all locations in the respective BSAI and GOA areas are aggregated to reflect cumulative management area effects (items 7 and 8). Lastly, the economic impacts of all six locations are combined in a single aggregated picture (item 6). The interpretations possible from the latter aggregated synopsis provide some useful insights, but must be used with caution in drawing conclusions about specific economic impacts.

The dollar and employment values reported in Table 3.6 may create a false illusion of precision, given their seeming exactness. The numbers reported are taken directly from the economic model, and likely capture no more accuracy in the context of this analyses than would the same estimates rounded to the nearest three or four digits (the nearest thousand, or 10 thousand dollars), given the nature of the data inputs. The employment estimates are rounded to the nearest whole number based on average annual 1989 salaries reported for the appropriate local, state, and national location.

Implications drawn from the model results presented in Table 3.6 are first discussed in the context of the individual management alternative options.

3.3.3.3 Alternative 3.1

The first option is the "snapshot" of 1989 fisheries, with the important distinction that a division of 1989 BSAI JVP catch (discussed in Section 3.3.1, above) is included in the allocation percentage. The JVP catch is divided 80%/20% between inshore and offshore categories, respectively. This has the effect of allocating future supplies of pollock to the inshore BSAI segment at a larger share than actually occurred in 1989, so the impacts are different than the base case. The categorization of freezer longliners as inshore under Alternative 3 also creates a deviation from the actual 1989 processing shares by effectively reclassifying 5% of the GOA Pacific cod from offshore to inshore.

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[20]The specific ports appear numbered as the left-most column in this multiple-paged table. Options are listed as columns. Simplified summaries of the Table 3.6 results are illustrated in Figures 3.6a-3.6c, discussed later in this report. The local, instate, and "outside" (Washington and Oregon) economic impacts can be combined to estimate total *regional* impacts. The total U.S. results include the Alaska/PNW regional impacts, as well as the effects from the rest of the United States. Thus, the local,instate, and outside results are only a portion of the total U.S. economic impacts.

Table 3.6 Estimated Economic Impacts of Alternative 3 by Location

1(a). KODIAK INSHORE

	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$40,775,918	$40,824,566	$48,648	0.12%	$42,301,552	$1,525,634	3.74%	$43,131,911	$2,355,993	5.78%	$45,246,102	$4,470,184	10.96%
TOTAL COMMUNITY ($)	$67,010,255	$67,079,835	$69,580	0.10%	$69,167,932	$2,157,677	3.22%	$70,347,214	$3,336,959	4.98%	$73,346,944	$6,336,689	9.46%
EMPLOYMENT (FTE)	2,396	2,398	2	0.10%	2,473	77	3.22%	2,515	119	4.98%	2,622	227	9.46%
INSTATE IMPACTS													
INCOME ($)	$6,464,286	$6,470,170	$5,884	0.09%	$6,682,466	$218,180	3.38%	$6,794,448	$330,162	5.11%	$7,083,501	$619,215	9.58%
TOTAL COMMUNITY ($)	$18,875,652	$18,887,956	$12,304	0.07%	$19,350,108	$474,456	2.51%	$19,590,532	$714,880	3.79%	$20,213,031	$1,337,379	7.09%
EMPLOYMENT (FTE)	642	642	0	0.07%	658	16	2.51%	666	24	3.79%	687	45	7.09%
OUTSIDE IMPACTS													
INCOME ($)	$8,236,153	$8,247,508	$11,355	0.14%	$8,542,388	$306,235	3.72%	$8,719,087	$482,934	5.86%	$9,163,159	$927,006	11.26%
TOTAL COMMUNITY ($)	$31,531,529	$31,559,089	$27,560	0.09%	$32,480,824	$949,295	3.01%	$32,980,456	$1,448,927	4.60%	$34,262,480	$2,730,951	8.66%
EMPLOYMENT (FTE)	1,482	1,483	1	0.09%	1,526	45	3.01%	1,550	68	4.60%	1,610	128	8.66%
TOTAL U.S. IMPACTS													
INCOME ($)	$55,476,357	$55,542,244	$65,887	0.12%	$57,526,406	$2,050,049	3.70%	$58,645,447	$3,169,090	5.71%	$61,492,762	$6,016,405	10.84%
TOTAL COMMUNITY ($)	$242,139,556	$242,372,841	$233,285	0.10%	$250,017,237	$7,877,681	3.25%	$254,191,917	$12,052,361	4.98%	$264,886,773	$22,747,217	9.39%
EMPLOYMENT (FTE)	9,995	10,005	10	0.10%	10,320	325	3.25%	10,493	497	4.98%	10,934	939	9.39%

1(b). KODIAK OFFSHORE

	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$750,273	$743,264	($7,009)	-0.93%	$751,914	$1,641	0.22%	$708,303	($41,970)	-5.59%	$623,130	($127,143)	-16.95%
TOTAL COMMUNITY ($)	$1,448,222	$1,437,512	($10,710)	-0.74%	$1,388,975	($59,247)	-4.09%	$1,301,135	($147,087)	-10.16%	$1,109,790	($338,432)	-23.37%
EMPLOYMENT (FTE)	52	51	(0)	-0.74%	50	(2)	-4.09%	47	(5)	-10.16%	40	(12)	-23.37%
INSTATE IMPACTS													
INCOME ($)	$786,221	$780,094	($6,127)	-0.78%	$749,219	($37,002)	-4.71%	$697,789	($88,432)	-11.25%	$585,377	($200,844)	-25.55%
TOTAL COMMUNITY ($)	$2,517,847	$2,503,783	($14,064)	-0.56%	$2,293,348	($224,499)	-8.92%	$2,127,554	($390,293)	-15.50%	$1,731,125	($786,722)	-31.25%
EMPLOYMENT (FTE)	86	85	(0)	-0.56%	78	(8)	-8.92%	72	(13)	-15.50%	59	(27)	-31.25%
OUTSIDE IMPACTS													
INCOME ($)	$10,251,421	$10,169,279	($82,142)	-0.80%	$9,924,886	($326,535)	-3.19%	$9,295,121	($956,300)	-9.33%	$7,954,401	($2,297,020)	-22.41%
TOTAL COMMUNITY ($)	$33,010,432	$32,811,153	($199,279)	-0.60%	$30,922,739	($2,087,693)	-6.32%	$28,950,248	($4,060,184)	-12.30%	$24,414,081	($8,596,351)	-26.04%
EMPLOYMENT (FTE)	1,551	1,542	(9)	-0.60%	1,453	(98)	-6.32%	1,360	(191)	-12.30%	1,147	(404)	-26.04%
TOTAL U.S. IMPACTS													
INCOME ($)	$11,787,916	$11,692,637	($95,279)	-0.81%	$11,426,020	($361,896)	-3.07%	$10,701,330	($1,086,586)	-9.22%	$9,162,907	($2,625,009)	-22.27%
TOTAL COMMUNITY ($)	$63,964,990	$63,596,737	($368,253)	-0.58%	$58,749,130	($5,215,860)	-8.15%	$54,638,039	($9,326,951)	-14.58%	$44,910,196	($19,054,794)	-29.79%
EMPLOYMENT (FTE)	2,640	2,625	(15)	-0.58%	2,425	(215)	-8.15%	2,255	(385)	-14.58%	1,854	(787)	-29.79%

1(c). TOTAL KODIAK

	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$41,526,191	$41,567,830	$41,639	0.10%	$43,053,466	$1,527,275	3.68%	$43,840,214	$2,314,023	5.57%	$45,869,232	$4,343,041	10.46%
TOTAL COMMUNITY ($)	$68,458,477	$68,517,347	$58,870	0.09%	$70,556,907	$2,098,430	3.07%	$71,648,349	$3,189,872	4.66%	$74,456,734	$5,998,257	8.76%
EMPLOYMENT (FTE)	2,447	2,449	2	0.09%	2,522	75	3.07%	2,561	114	4.66%	2,662	214	8.76%
INSTATE IMPACTS													
INCOME ($)	$7,250,507	$7,250,264	($243)	-0.00%	$7,431,685	$181,178	2.50%	$7,492,237	$241,730	3.33%	$7,668,878	$418,371	5.77%
TOTAL COMMUNITY ($)	$21,393,499	$21,391,739	($1,760)	-0.01%	$21,643,456	$249,957	1.17%	$21,718,086	$324,587	1.52%	$21,944,156	$550,657	2.57%
EMPLOYMENT (FTE)	727	727	(0)	-0.01%	736	8	1.17%	738	11	1.52%	746	19	2.57%
OUTSIDE IMPACTS													
INCOME ($)	$18,487,574	$18,416,787	($70,787)	-0.38%	$18,467,274	($20,300)	-0.11%	$18,014,208	($473,366)	-2.56%	$17,117,560	($1,370,014)	-7.41%
TOTAL COMMUNITY ($)	$64,541,961	$64,370,242	($171,719)	-0.27%	$63,403,563	($1,138,398)	-1.76%	$61,930,704	($2,611,257)	-4.05%	$58,676,561	($5,865,400)	-9.09%
EMPLOYMENT (FTE)	3,033	3,025	(8)	-0.27%	2,979	(53)	-1.76%	2,910	(123)	-4.05%	2,757	(276)	-9.09%
TOTAL U.S. IMPACTS													
INCOME ($)	$67,264,273	$67,234,881	($29,392)	-0.04%	$68,952,426	$1,688,153	2.51%	$69,346,777	$2,082,504	3.10%	$70,655,669	$3,391,396	5.04%
TOTAL COMMUNITY ($)	$306,104,546	$305,969,578	($134,968)	-0.04%	$308,766,367	$2,661,821	0.87%	$308,829,956	$2,725,410	0.89%	$309,796,969	$3,692,423	1.21%
EMPLOYMENT (FTE)	12,635	12,630	(6)	-0.04%	12,745	110	0.87%	12,748	112	0.89%	12,788	152	1.21%

Table 3.6 Estimated Economic Impacts of Alternative 3 by Location (Continued)

2(a). DUTCH HARBOR INSHORE

	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$9,361,905	$13,409,156	$4,047,251	43.23%	$21,000,968	$11,639,063	124.32%	$21,000,968	$11,639,063	124.32%	$18,373,033	$9,011,128	96.25%
TOTAL COMMUNITY ($)	$16,141,106	$21,783,201	$5,642,095	34.95%	$32,366,615	$16,225,509	100.52%	$32,366,615	$16,225,509	100.52%	$28,703,128	$12,562,022	77.83%
EMPLOYMENT (FTE)	645	871	226	34.95%	1,294	649	100.52%	1,294	649	100.52%	1,147	502	77.83%
INSTATE IMPACTS													
INCOME ($)	$8,797,944	$11,858,928	$3,060,984	34.79%	$17,600,705	$8,802,761	100.05%	$17,600,705	$8,802,761	100.05%	$15,613,167	$6,815,223	77.46%
TOTAL COMMUNITY ($)	$18,199,896	$23,679,858	$5,479,962	30.11%	$33,959,140	$15,759,244	86.59%	$33,959,140	$15,759,244	86.59%	$30,400,929	$12,201,033	67.04%
EMPLOYMENT (FTE)	619	805	186	30.11%	1,154	536	86.59%	1,154	536	86.59%	1,033	415	67.04%
OUTSIDE IMPACTS													
INCOME ($)	$37,939,376	$51,523,179	$13,583,803	35.80%	$77,003,600	$39,064,224	102.96%	$77,003,600	$39,064,224	102.96%	$68,183,454	$30,244,078	79.72%
TOTAL COMMUNITY ($)	$106,091,112	$137,824,126	$31,733,014	29.91%	$197,348,740	$91,257,628	86.02%	$197,348,740	$91,257,628	86.02%	$176,744,072	$70,652,960	66.60%
EMPLOYMENT (FTE)	4,985	6,476	1,491	29.91%	9,273	4,288	86.02%	9,273	4,288	86.02%	8,305	3,320	66.60%
TOTAL U.S. IMPACTS													
INCOME ($)	$56,099,224	$76,791,264	$20,692,040	36.88%	$115,605,273	$59,506,049	106.07%	$115,605,273	$59,506,049	106.07%	$102,169,655	$46,070,431	82.12%
TOTAL COMMUNITY ($)	$253,609,150	$331,788,236	$78,179,086	30.83%	$478,436,115	$224,826,965	88.65%	$478,436,115	$224,826,965	88.65%	$427,673,393	$174,064,243	68.63%
EMPLOYMENT (FTE)	10,468	13,696	3,227	30.83%	19,749	9,280	88.65%	19,749	9,280	88.65%	17,653	7,185	68.63%

2(b). DUTCH HARBOR OFFSHORE

	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$7,413,086	$6,034,285	($1,378,801)	-18.60%	$3,447,936	($3,965,150)	-53.49%	$3,447,936	($3,965,150)	-53.49%	$4,343,211	($3,069,875)	-41.41%
TOTAL COMMUNITY ($)	$15,291,199	$13,017,480	($2,273,719)	-14.87%	$8,752,451	($6,538,748)	-42.76%	$8,752,451	($6,538,748)	-42.76%	$10,228,810	($5,062,389)	-33.11%
EMPLOYMENT (FTE)	611	520	(91)	-14.87%	350	(261)	-42.76%	350	(261)	-42.76%	409	(202)	-33.11%
INSTATE IMPACTS													
INCOME ($)	$9,195,719	$7,400,682	($1,795,037)	-19.52%	$4,033,559	($5,162,160)	-56.14%	$4,033,559	($5,162,160)	-56.14%	$5,199,102	($3,996,617)	-43.46%
TOTAL COMMUNITY ($)	$31,823,734	$27,569,208	($4,254,526)	-13.37%	$19,433,292	($12,390,442)	-38.93%	$19,433,292	($12,390,442)	-38.93%	$22,230,883	($9,592,851)	-30.14%
EMPLOYMENT (FTE)	1,082	937	(145)	-13.37%	660	(421)	-38.93%	660	(421)	-38.93%	756	(326)	-30.14%
OUTSIDE IMPACTS													
INCOME ($)	$111,523,185	$92,544,016	($18,979,169)	-17.02%	$56,942,547	($54,580,638)	-48.94%	$56,942,547	($54,580,638)	-48.94%	$69,266,412	($42,256,773)	-37.89%
TOTAL COMMUNITY ($)	$372,943,646	322,847,563	($50,096,083)	-13.43%	$228,876,736	($144,066,910)	-38.63%	$228,876,736	($144,066,910)	-38.63%	$261,405,632	($111,538,014)	-29.91%
EMPLOYMENT (FTE)	17,523	15,170	(2,354)	-13.43%	10,754	(6,769)	-38.63%	10,754	(6,769)	-38.63%	12,283	(5,241)	-29.91%
TOTAL U.S. IMPACTS													
INCOME ($)	$128,131,990	$105,978,982	($22,153,008)	-17.29%	$64,426,173	($63,705,817)	-49.72%	$64,426,173	($63,705,817)	-49.72%	$78,808,724	($49,323,266)	-38.49%
TOTAL COMMUNITY ($)	$727,746,801	$631,363,362	($96,383,439)	-13.24%	$450,574,446	($277,172,355)	-38.09%	$450,574,446	($277,172,355)	-38.09%	$513,150,844	($214,595,957)	-29.49%
EMPLOYMENT (FTE)	30,040	26,061	(3,979)	-13.24%	18,599	(11,441)	-38.09%	18,599	(11,441)	-38.09%	21,182	(8,858)	-29.49%

Table 3.6 Estima   onomic Impacts of Alternative 3 by Location (Continued)

2(c). TOTAL DUTCH HARBOR/UNALASKA

	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$16,774,991	$19,443,441	$2,668,450	15.91%	$24,448,904	$7,673,913	45.75%	$24,448,904	$7,673,913	45.75%	$22,716,244	$5,941,253	35.42%
TOTAL COMMUNITY ($)	$31,432,305	$34,800,681	$3,368,376	10.72%	$41,119,066	$9,686,761	30.82%	$41,119,066	$9,686,761	30.82%	$38,931,938	$7,499,633	23.86%
EMPLOYMENT (FTE)	1,256	1,391	135	10.72%	1,643	387	30.82%	1,643	387	30.82%	1,556	300	23.86%
INSTATE IMPACTS													
INCOME ($)	$17,993,663	$19,259,610	$1,265,947	7.04%	$21,634,264	$3,640,601	20.23%	$21,634,264	$3,640,601	20.23%	$20,812,269	$2,818,606	15.66%
TOTAL COMMUNITY ($)	$50,023,630	$51,249,066	$1,225,436	2.45%	$53,392,432	$3,368,802	6.73%	$53,392,432	$3,368,802	6.73%	$52,631,812	$2,608,182	5.21%
EMPLOYMENT (FTE)	1,700	1,742	42	2.45%	1,815	114	6.73%	1,815	114	6.73%	1,789	89	5.21%
OUTSIDE IMPACTS													
INCOME ($)	$149,462,561	$144,067,195	($5,395,366)	-3.61%	$133,946,147	($15,516,414)	-10.38%	$133,946,147	($15,516,414)	-10.38%	$137,449,866	($12,012,695)	-8.04%
TOTAL COMMUNITY ($)	$479,034,758	$460,671,689	($18,363,069)	-3.83%	$426,225,476	($52,809,282)	-11.02%	$426,225,476	($52,809,282)	-11.02%	$438,149,704	($40,885,054)	-8.53%
EMPLOYMENT (FTE)	22,508	21,645	(863)	-3.83%	20,027	(2,481)	-11.02%	20,027	(2,481)	-11.02%	20,587	(1,921)	-8.53%
TOTAL U.S. IMPACTS													
INCOME ($)	$184,231,214	$182,770,246	($1,460,968)	-0.79%	$180,031,446	($4,199,768)	-2.28%	$180,031,446	($4,199,768)	-2.28%	$180,978,379	($3,252,835)	-1.77%
TOTAL COMMUNITY ($)	$981,355,951	$963,151,598	($18,204,353)	-1.86%	$929,010,561	($52,345,390)	-5.33%	$929,010,561	($52,345,390)	-5.33%	$940,824,237	($40,531,714)	-4.13%
EMPLOYMENT (FTE)	40,508	39,757	(751)	-1.86%	38,348	(2,161)	-5.33%	38,348	(2,161)	-5.33%	38,835	(1,673)	-4.13%

Table 3.6 Estimated Economic Impacts of Alternative 3 by Location (Continued)

3. TOTAL SAND POINT	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$5,792,843	$5,800,424	$7,581	0.13%	$5,653,653	($139,190)	-2.40%	$5,653,653	($139,190)	-2.40%	$5,609,621	($183,222)	-3.16%
TOTAL COMMUNITY ($)	$7,313,481	$7,322,915	$9,434	0.13%	$7,140,245	($173,236)	-2.37%	$7,140,245	($173,236)	-2.37%	$7,085,445	($228,036)	-3.12%
EMPLOYMENT (FTE)	311	312	0	0.13%	304	(7)	-2.37%	304	(7)	-2.37%	301	(10)	-3.12%
INSTATE IMPACTS													
INCOME ($)	$1,220,608	$1,223,698	$3,090	0.25%	$1,163,859	($56,749)	-4.65%	$1,163,859	($56,749)	-4.65%	$1,145,907	($74,701)	-6.12%
TOTAL COMMUNITY ($)	$2,684,279	$2,689,846	$5,567	0.21%	$2,582,033	($102,246)	-3.81%	$2,582,033	($102,246)	-3.81%	$2,549,686	($134,593)	-5.01%
EMPLOYMENT (FTE)	91	91	0	0.21%	88	(3)	-3.81%	88	(3)	-3.81%	87	(5)	-5.01%
OUTSIDE IMPACTS													
INCOME ($)	$5,082,867	$5,098,395	$15,528	0.31%	$4,797,740	($285,127)	-5.61%	$4,797,740	($285,127)	-5.61%	$4,707,543	($375,324)	-7.38%
TOTAL COMMUNITY ($)	$14,490,652	$14,525,869	$35,217	0.24%	$13,844,064	($646,588)	-4.46%	$13,844,064	($646,588)	-4.46%	$13,639,517	($851,135)	-5.87%
EMPLOYMENT (FTE)	681	683	2	0.24%	650	(30)	-4.46%	650	(30)	-4.46%	641	(40)	-5.87%
TOTAL U.S. IMPACTS													
INCOME ($)	$12,096,318	$12,122,518	$26,200	0.22%	$11,615,252	($481,066)	-3.98%	$11,615,252	($481,066)	-3.98%	$11,463,072	($633,246)	-5.24%
TOTAL COMMUNITY ($)	$44,886,698	$44,973,554	$86,856	0.19%	$43,291,966	($1,594,732)	-3.55%	$43,291,966	($1,594,732)	-3.55%	$42,787,488	($2,099,210)	-4.68%
EMPLOYMENT (FTE)	1,853	1,856	4	0.19%	1,787	(66)	-3.55%	1,787	(66)	-3.55%	1,766	(87)	-4.68%

4. TOTAL AKUTAN	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$1,017,902	$1,550,921	$533,019	52.36%	$2,550,755	$1,532,853	150.59%	$2,550,755	$1,532,853	150.59%	$2,204,659	$1,186,757	116.59%
TOTAL COMMUNITY ($)	$1,442,692	$2,114,901	$672,209	46.59%	$3,375,839	$1,933,147	134.00%	$3,375,839	$1,933,147	134.00%	$2,939,361	$1,496,669	103.74%
EMPLOYMENT (FTE)	61	90	29	46.59%	144	82	134.00%	144	82	134.00%	125	64	103.74%
INSTATE IMPACTS													
INCOME ($)	$2,840,655	$4,027,084	$1,186,429	41.77%	$6,252,581	$3,411,926	120.11%	$6,252,581	$3,411,926	120.11%	$5,482,217	$2,641,562	92.99%
TOTAL COMMUNITY ($)	$6,535,684	$8,987,044	$2,451,360	37.51%	$13,585,288	$7,049,604	107.86%	$13,585,288	$7,049,604	107.86%	$11,993,587	$5,457,903	83.51%
EMPLOYMENT (FTE)	222	305	83	37.51%	462	240	107.86%	462	240	107.86%	408	185	83.51%
OUTSIDE IMPACTS													
INCOME ($)	$10,942,622	$16,311,042	$5,368,420	49.06%	$26,381,095	$15,438,473	141.09%	$26,381,095	$15,438,473	141.09%	$22,895,307	$11,952,685	109.23%
TOTAL COMMUNITY ($)	$28,509,557	$40,176,241	$11,666,684	40.92%	$62,060,549	$33,550,992	117.68%	$62,060,549	$33,550,992	117.68%	$54,485,209	$25,975,652	91.11%
EMPLOYMENT (FTE)	1,340	1,888	548	40.92%	2,916	1,576	117.68%	2,916	1,576	117.68%	2,560	1,221	91.11%
TOTAL U.S. IMPACTS													
INCOME ($)	$14,801,180	$21,889,048	$7,087,868	47.89%	$35,184,432	$20,383,252	137.71%	$35,184,432	$20,383,252	137.71%	$30,582,184	$15,781,004	106.62%
TOTAL COMMUNITY ($)	$59,455,948	$83,583,830	$24,127,882	40.58%	$128,842,777	$69,386,829	116.70%	$128,842,777	$69,386,829	116.70%	$113,176,217	$53,720,269	90.35%
EMPLOYMENT (FTE)	2,454	3,450	996	40.58%	5,318	2,864	116.70%	5,318	2,864	116.70%	4,672	2,217	90.35%

Table 3.6 Estimat nomic Impacts of Alternative 3 by Location (Continued)

5. TOTAL KING COVE/CHIGNIK

	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$4,702,775	$4,709,657	$6,882	0.15%	$4,576,404	($126,371)	-2.69%	$4,576,404	($126,371)	-2.69%	$4,536,428	($166,347)	-3.54%
TOTAL COMMUNITY ($)	$5,915,376	$5,923,867	$8,491	0.14%	$5,759,387	($155,989)	-2.64%	$5,759,387	($155,989)	-2.64%	$5,710,041	($205,335)	-3.47%
EMPLOYMENT (FTE)	252	252	0	0.14%	245	(7)	-2.64%	245	(7)	-2.64%	243	(9)	-3.47%
INSTATE IMPACTS													
INCOME ($)	$1,037,224	$1,040,063	$2,839	0.27%	$985,095	($52,129)	-5.03%	$985,095	($52,129)	-5.03%	$968,605	($68,619)	-6.62%
TOTAL COMMUNITY ($)	$2,529,584	$2,534,843	$5,259	0.21%	$2,432,938	($96,646)	-3.82%	$2,432,938	($96,646)	-3.82%	$2,402,363	($127,221)	-5.03%
EMPLOYMENT (FTE)	86	86	0	0.21%	83	(3)	-3.82%	83	(3)	-3.82%	82	(4)	-5.03%
OUTSIDE IMPACTS													
INCOME ($)	$3,221,692	$3,231,490	$9,798	0.30%	$3,041,792	($179,900)	-5.58%	$3,041,792	($179,900)	-5.58%	$2,984,883	($236,809)	-7.35%
TOTAL COMMUNITY ($)	$10,309,509	$10,332,404	$22,895	0.22%	$9,889,046	($420,463)	-4.08%	$9,889,046	($420,463)	-4.08%	$9,756,034	($553,475)	-5.37%
EMPLOYMENT (FTE)	484	485	1	0.22%	465	(20)	-4.08%	465	(20)	-4.08%	458	(26)	-5.37%
TOTAL U.S. IMPACTS													
INCOME ($)	$8,961,692	$8,981,211	$19,519	0.22%	$8,603,292	($358,400)	-4.00%	$8,603,292	($358,400)	-4.00%	$8,489,916	($471,776)	-5.26%
TOTAL COMMUNITY ($)	$35,458,071	$35,524,927	$66,856	0.19%	$34,230,505	($1,227,566)	-3.46%	$34,230,505	($1,227,566)	-3.46%	$33,842,178	($1,615,893)	-4.56%
EMPLOYMENT (FTE)	1,464	1,466	3	0.19%	1,413	(51)	-3.46%	1,413	(51)	-3.46%	1,397	(67)	-4.56%

Table 3.6 Estimated Economic Impacts of Alternative 3 by Location (Continued)

6. TOTAL IMPACTS; COMBINED PORT ACTIVITY

	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$69,814,702	$73,072,273	$3,257,571	4.67%	$80,283,182	$10,468,480	14.99%	$81,069,930	$11,255,228	16.12%	$80,936,184	$11,121,482	15.93%
TOTAL COMMUNITY ($)	$114,562,331	$118,679,711	$4,117,380	3.59%	$127,951,444	$13,389,113	11.69%	$129,042,886	$14,480,555	12.64%	$129,123,519	$14,561,188	12.71%
EMPLOYMENT (FTE)	4,328	4,494	166	3.84%	4,858	530	12.26%	4,897	569	13.16%	4,887	559	12.93%
INSTATE IMPACTS													
INCOME ($)	$30,342,657	$32,800,719	$2,458,062	8.10%	$37,467,484	$7,124,827	23.48%	$37,528,036	$7,185,379	23.68%	$36,077,876	$5,735,219	18.90%
TOTAL COMMUNITY ($)	$83,166,676	$86,852,538	$3,685,862	4.43%	$93,636,147	$10,469,471	12.59%	$93,710,777	$10,544,101	12.68%	$91,521,604	$8,354,928	10.05%
EMPLOYMENT (FTE)	2,826	2,952	125	4.43%	3,182	356	12.59%	3,185	358	12.68%	3,110	284	10.05%
OUTSIDE IMPACTS													
INCOME ($)	$187,197,316	$187,124,909	($72,407)	-0.04%	$186,634,048	($563,268)	-0.30%	$186,180,982	($1,016,334)	-0.54%	$185,155,159	($2,042,157)	-1.09%
TOTAL COMMUNITY ($)	$596,886,437	$590,076,445	($6,809,992)	-1.14%	$575,422,698	($21,463,739)	-3.60%	$573,949,839	($22,936,598)	-3.84%	$574,707,025	($22,179,412)	-3.72%
EMPLOYMENT (FTE)	28,046	27,726	(320)	-1.14%	27,037	(1,009)	-3.60%	26,968	(1,078)	-3.84%	27,004	(1,042)	-3.72%
TOTAL U.S. IMPACTS													
INCOME ($)	$287,354,677	$292,997,904	$5,643,227	1.96%	$304,386,848	$17,032,171	5.93%	$304,781,199	$17,426,522	6.06%	$302,169,220	$14,814,543	5.16%
TOTAL COMMUNITY ($)	$1,427,261,214	$1,433,203,487	$5,942,273	0.42%	$1,444,142,176	$16,880,962	1.18%	$1,444,205,765	$16,944,551	1.19%	$1,440,427,089	$13,165,875	0.92%
EMPLOYMENT (FTE)	58,914	59,160	245	0.42%	59,611	697	1.18%	59,614	699	1.19%	59,458	543	0.92%

Table 3.6 Estim onomic Impacts of Alternative 3 by Location (Continued)

7. TOTAL GULF OF ALASKA ACTIVITY

	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$52,021,809	$52,077,911	$56,102	0.11%	$53,283,523	$1,261,714	2.43%	$54,070,271	$2,048,462	3.94%	$56,015,281	$3,993,472	7.68%
TOTAL COMMUNITY ($)	$81,687,334	$81,764,129	$76,795	0.09%	$83,456,539	$1,769,205	2.17%	$84,547,981	$2,860,647	3.50%	$87,252,220	$5,564,886	6.81%
EMPLOYMENT (FTE)	3,010	3,013	3	0.10%	3,071	61	2.03%	3,110	100	3.32%	3,206	196	6.51%
INSTATE IMPACTS													
INCOME ($)	$9,508,339	$9,514,025	$5,686	0.06%	$9,580,639	$72,300	0.76%	$9,641,191	$132,852	1.40%	$9,783,390	$275,051	2.89%
TOTAL COMMUNITY ($)	$26,607,362	$26,616,428	$9,066	0.03%	$26,658,427	$51,065	0.19%	$26,733,057	$125,695	0.47%	$26,896,205	$288,843	1.09%
EMPLOYMENT (FTE)	904	905	0	0.03%	906	2	0.19%	909	4	0.47%	914	10	1.09%
OUTSIDE IMPACTS													
INCOME ($)	$26,792,133	$26,746,672	($45,461)	-0.17%	$26,306,806	($485,327)	-1.81%	$25,853,740	($938,393)	-3.50%	$24,809,986	($1,982,147)	-7.40%
TOTAL COMMUNITY ($)	$89,342,122	$89,228,515	($113,607)	-0.13%	$87,136,673	($2,205,449)	-2.47%	$85,663,814	($3,678,308)	-4.12%	$82,072,112	($7,270,010)	-8.14%
EMPLOYMENT (FTE)	4,198	4,193	(5)	-0.13%	4,094	(104)	-2.47%	4,025	(173)	-4.12%	3,856	(342)	-8.14%
TOTAL U.S. IMPACTS													
INCOME ($)	$88,322,283	$88,338,610	$16,327	0.02%	$89,170,970	$848,687	0.96%	$89,565,321	$1,243,038	1.41%	$90,608,657	$2,286,374	2.59%
TOTAL COMMUNITY ($)	$386,449,315	$386,468,059	$18,744	0.00%	$386,288,838	($160,477)	-0.04%	$386,352,427	($96,888)	-0.03%	$386,426,635	($22,680)	-0.01%
EMPLOYMENT (FTE)	15,952	15,953	1	0.00%	15,945	(7)	-0.04%	15,948	(4)	-0.03%	15,951	(1)	-0.01%

8. TOTAL BERING SEA ACTIVITY

	BASE	ALTERNATIVE 3.1	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(A)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.2(B)	UNIT CHANGE FROM BASE	% CHANGE FROM BASE	ALTERNATIVE 3.3	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS													
INCOME ($)	$17,792,893	$20,994,362	$3,201,469	17.99%	$26,999,659	$9,206,766	51.74%	$26,999,659	$9,206,766	51.74%	$24,920,903	$7,128,010	40.06%
TOTAL COMMUNITY ($)	$32,874,997	$36,915,582	$4,040,585	12.29%	$44,494,905	$11,619,908	35.35%	$44,494,905	$11,619,908	35.35%	$41,871,299	$8,996,302	27.37%
EMPLOYMENT (FTE)	1,318	1,481	163	12.39%	1,787	469	35.62%	1,787	469	35.62%	1,681	363	27.58%
INSTATE IMPACTS													
INCOME ($)	$20,834,318	$23,286,694	$2,452,376	11.77%	$27,886,845	$7,052,527	33.85%	$27,886,845	$7,052,527	33.85%	$26,294,486	$5,460,168	26.21%
TOTAL COMMUNITY ($)	$56,559,314	$60,236,110	$3,676,796	6.50%	$66,977,720	$10,418,406	18.42%	$66,977,720	$10,418,406	18.42%	$64,625,399	$8,066,085	14.26%
EMPLOYMENT (FTE)	1,922	2,047	125	6.50%	2,276	354	18.42%	2,276	354	18.42%	2,196	274	14.26%
OUTSIDE IMPACTS													
INCOME ($)	$160,405,183	$160,378,237	($26,946)	-0.02%	$160,327,242	($77,941)	-0.05%	$160,327,242	($77,941)	-0.05%	$160,345,173	($60,010)	-0.04%
TOTAL COMMUNITY ($)	$507,544,315	$500,847,930	($6,696,385)	-1.32%	$488,286,025	($19,258,290)	-3.79%	$488,286,025	($19,258,290)	-3.79%	$492,634,913	($14,909,402)	-2.94%
EMPLOYMENT (FTE)	23,848	23,533	(315)	-1.32%	22,943	(905)	-3.79%	22,943	(905)	-3.79%	23,147	(701)	-2.94%
TOTAL U.S. IMPACTS													
INCOME ($)	$199,032,394	$204,659,294	$5,626,900	2.83%	$215,215,878	$16,183,484	8.13%	$215,215,878	$16,183,484	8.13%	$211,560,563	$12,528,169	6.29%
TOTAL COMMUNITY ($)	$1,040,811,899	$1,046,735,428	$5,923,529	0.57%	$1,057,853,338	$17,041,439	1.64%	$1,057,853,338	$17,041,439	1.64%	$1,054,000,454	$13,188,555	1.27%
EMPLOYMENT (FTE)	42,963	43,207	245	0.57%	43,666	703	1.64%	43,666	703	1.64%	43,507	544	1.27%

Table 3.6 Estimated Economic Impacts of Alternative 3 by Location (Continued)

Because the allocations prescribed for the GOA are very similar to the base case, economic impacts of Alternative 3.1 are minor if not insignificant for GOA locations (Table 3.6, items 1(a) & (b)). The changes in tonnage created by the classification of freezer longliners as inshore would not be expected to significantly alter economic impacts, since this is a definitional rather than allocative change. The calculated economic changes under 3.1, although minor, reflect the sensitive nature of the model to initial harvest/product mixes, rather than a changed resource allocations among the various industry components. This suggests that the confidence level of any impact estimates are likely at least as great as the suggested values calculated for the GOA ports in this alternative.

While the GOA economic effects are minor, the impacts in the BSAI are significant under option 1 (items 2(a) & (b)). The 138,000 ton increase in the relative share to inshore components, and corresponding decrease in offshore allocation, represent $21 and $44 million dollars worth of product at the exvessel and processor level, respectively (Table 3.5). The local and instate inshore gains to Dutch Harbor (Table 3.6, item 2(a)) and Akutan (item 4) are considerably above the apparent declines to the Dutch Harbor offshore segment (item 2(b)). The PNW level (Washington/Oregon) economic impacts are positive for the inshore component because much of the incomes and expenditures accrue there, as well as throughout the rest of the United States. The trade off necessary to achieve the inshore benefits comes at the expense of the offshore component. The most dramatic impacts on the offshore fleet occur as declines in economic income and activity in the PNW, the frequent home port to the factory trawler fleet. The aggregated income declines in the PNW are not as large as those arising from reduced economic activity, probably the result of offsetting income gains flowing into the PNW from the Dutch Harbor inshore segment.

This tradeoff between local Alaska increases, and PNW declines, is characteristic of many of the preferential inshore allocations. A simple aggregation of these two contrary effects, such as in the combined Dutch Harbor or BSAI results, overlooks complex transaction relationships. That is, a $100,000 increase, or 5 jobs gain in one location may not offset an equivalent corresponding decline in another location. One may not be a perfect substitute for the other in terms of the welfare of the individuals involved due to resource mobility, job alternatives available, and the level of resource utilization. Thus, the input-output results provide insightful estimates of the magnitude of the economic impacts involved at each location, but do not thoroughly account for the economic welfare consequences of the implied net effects.

3.3.3.4 <u>Alternative 3.2</u>

Whereas Alternative 3.1 relied upon 1989 as a reference for processing activity, Alternative 3.2a draws upon the historical record between 1986 and 1989. The premise is to recognize those with a past history of processing in these fisheries. The effect does not apply to specific firms, however, only to the collective average representing inshore and offshore interests. A variation of this option, Alternative 3.2b, prescribes the allocation of GOA pollock to be based on the historical processing record from 1986 to 1988. This reflects the specific concern that 1989 was the year in which the preemption problem erupted in the GOA, hence, it is not an appropriate year to include in a historical reference. Allocations of Pacific cod in the GOA, and BSAI pollock are the same as under 3.2a.

Alternative 3.2 would result in a significant reallocation of pollock processing activity in both the GOA and BSAI. Based on the simplifying assumption that individual firm operations remain unchanged except for shifts in pollock tonnage, the Bering Sea ports experience economic consequences nearly double (188%) the impacts resulting from Alternative 3.1.

The magnitude of the economic gains at the Dutch Harbor local port level approaches $12 million in direct income, and $16 million in total activity. Most of the benefits are direct income, and would show up in the local economy in the short run. The indicated employment increase of 500 to 600 full time equivalent jobs both in Dutch Harbor/Unalaska and the rest of Alaska would likely be spread over a larger number of part time employment, much of it in the inshore processing industry. Even larger economic benefits are projected for that portion of the PNW economy tied to the BSAI inshore sector which gains from the increased allocation.

The offshore component of the BSAI processing industry incurs moderate losses in the local Alaska level, but considerably less than the corresponding gains in the inshore component. Conversely, the adverse economic consequences are most acute at the PNW home port location, with losses exceeding by nearly $15 million the PNW gains from the increased inshore allocation.

These projected impacts would be realized only if the processing shares stipulated in the alternative actually occurred, that is, inshore BSAI inshore processors would have needed to more than double their pollock tonnage in 1989, achieving essentially the same efficiency and returns as achieved in the base case. It is possible to extrapolate some changes based on the estimates provided here, given the linear nature of the algorithm used to make projections in the input-output model. That is, increasing the inshore allocation to 40% of the BASI pollock TAC can be extrapolated from the results of Options 3.1 and 3.2. However, changes in the operating environment--labor constraints, economies of scale, or lower product prices--could alter the economic impacts, particularly for large percentage changes in share allocations.

The variations in Alternative 3.2 apply only to the Gulf of Alaska. The relative (percent) and absolute (tonnage) *changes* offered under either 3.2a and 3.2b are significantly less than those for the Bering Sea, and the aggregate economic impacts are less, accordingly. In aggregate comparisons at the national level, there is only minor difference between these two suboptions (Table 3.6, item 6). Using the 1986-89 processing record (option 3.2a) as an allocation base provides an 8% increase to the inshore pollock allocation relative to the 1986-88 record. While relatively minor in comparison to the tonnages represented in the Bering Sea, even 8% translates into substantial economic impacts at the local port level (Kodiak), again, primarily traded off between benefits to the local Alaska port and costs to the PNW. This option, particularly the 3.2b version, represents an allocation of pollock to the Kodiak inshore processors that may best approximate the "pre-preemption" distribution of economic benefits from the resource in the GOA.

The allocation of GOA Pacific cod is much different than for pollock. While inshore allocations of pollock steadily increase from option 3.1 to 3.3, the inshore allocation of Pacific cod is slightly decreased. It is unclear whether or not this was intended by framers of the alternatives or not. For the Kodiak "B" inshore processor, as well as the Western Gulf processing plants (Sand Point, King Cove, and Chignik), Pacific cod--not pollock--was the principle processed species in 1989. Moreover, information obtained from catcher vessels in this fishery stressed the strategic importance of Pacific cod as critical to economic survival in the future, given declining shares of halibut and sablefish.

The overall allocation of Pacific cod in the Gulf of Alaska is not a dramatic shift of resources in option 3.2, or any other options under consideration in Alternative 3. The economic impacts in a cod-dependent port location such as Sand Point appear very minor[21], although the impacts of even $100,000 of economic activity are likely to be more evident in a relatively isolated community. This does not mean that $100,000 is any "less valuable" in a large community than in a small community. Economic impacts are measures of what becomes of the $100,000 in either location.

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[21]Recall that the precision and accuracy of the input-output model estimates is questionable at values of this magnitude, given the data available and assumptions necessary to frame the analysis.

3.3.3.5 Alternative 3.3

This alternative establishes an allocation for pollock and Pacific cod in the Bering Sea and Gulf of Alaska without direct indication of a base period, use pattern, or similar reference. The appeal of this option is the generality of the percentage allocations selected; split pollock 50-50 in the Bering Sea, but allocate all (100%) of the pollock, and 80% of the Pacific cod to the GOA inshore segment. The most noteworthy difference in actual percentages prescribed by this allocation made is the exclusive inshore use granted to GOA pollock processors.

Allocating all of the GOA pollock to inshore processors represents a change of roughly 40,000 tons from the 1989 base. This is less than the annual tonnage processed by a single surimi factory trawler, although this needs to be viewed from the perspective that the estimated value of this tonnage at the processor level exceeds $12 million. The economic importance of this tonnage was likely even more significant when expressed in the value of the roe available from 40,000 tons if processed during the roe season, but that is no longer an option under current regulations.

The comparison of local port economic gains--direct income as well as total activity and employment--may represent a complex trade off for the Gulf of Alaska communities under this option. The increased benefits accruing to the pollock processing activity are accompanied by a proportional decline in activity from Pacific cod. Although the actual dollar values are larger from the increased pollock allocation, the percentage increase is comparable to the percentage decline faced by the inshore Pacific cod processors. This is further complicated by the underlying concerns about preemption. How can the potential gains to one inshore sector be weighed against losses to another, if they are both facing potential preemption by still another sector? The decision rests in how the trade off in any allocations is weighed in the context of social welfare, property rights, and economic efficiency. The relative magnitude of the economic gains or losses from a given allocation provides some insight, but does not provide a unique solution.

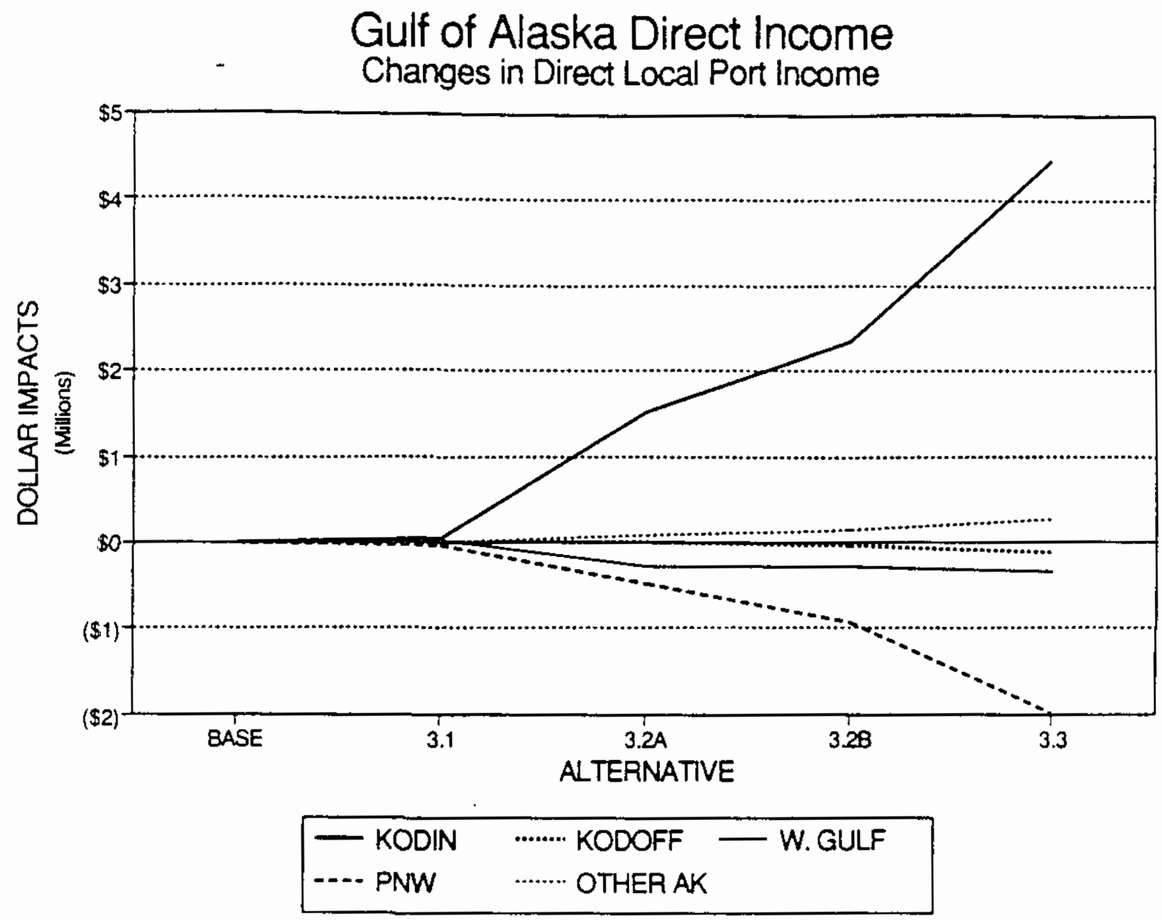
The 50-50 split of the pollock allocation proposed for the BSAI is an intuitive bench mark for an allocation. From the perspective of economic impacts, the results of option 3.3 in the BSAI fall between 3.1 and 3.2, although closer to 3.2 in the magnitude of effects relative to the 1989 base. The result would provide for significant expansion of the inshore processing component, and require a moderate to major offsetting contraction in processing activity by the offshore fleet. At stake is direct income of $30 to $40 million, and total economic activity of perhaps twice that amount. Several hundred jobs would likely be added to the local Bering Sea ports, while thousands of workers ultimately would be affected in the Seattle and the Pacific Northwest.

3.3.3.6 Overall Economic Impacts of Alternative 3

Interpreting the aggregated impacts calculated for the options under Alternative 3 calls for guarded judgement. The simple summing of local effects into aggregated values may not adequately address the substitutability of impacts in one location for those in another. Furthermore, the tendency of the input-output procedure used to calculate economic benefits based on production cost, rather than market demand, could bias aggregated results towards more costly, less efficient operations.

The above analysis provides information about the relative distribution of effects and their magnitudes. The estimates illustrate the economic trade offs that must be made in incomes and jobs between industry segments associated with the proposed allocation percentages. Figures 3.6a through 3.6c portray the relative changes in direct income and employment at the local BSAI and GOA port levels for the options proposed in Alternative 3. These graphics illustrate the relative magnitude of economic changes projected in the analysis, as well as the comparative impacts between the proposed options.

Figure 3.6a GOA Economic Impacts



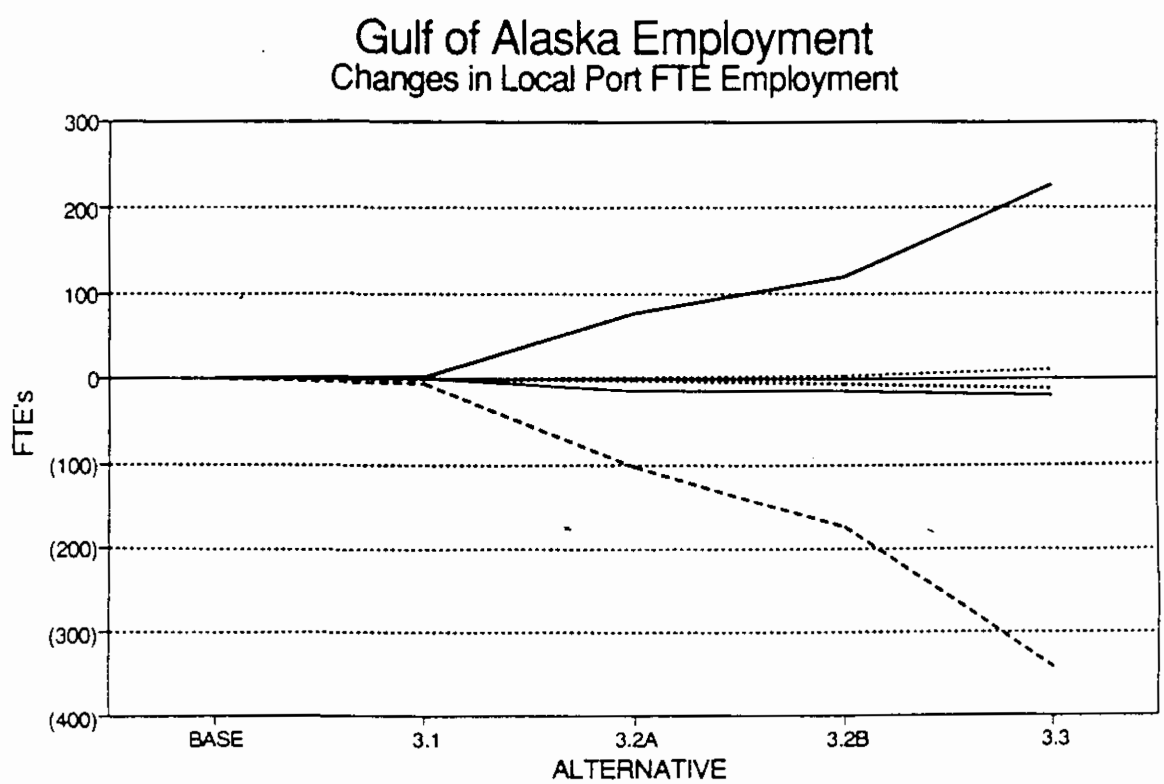
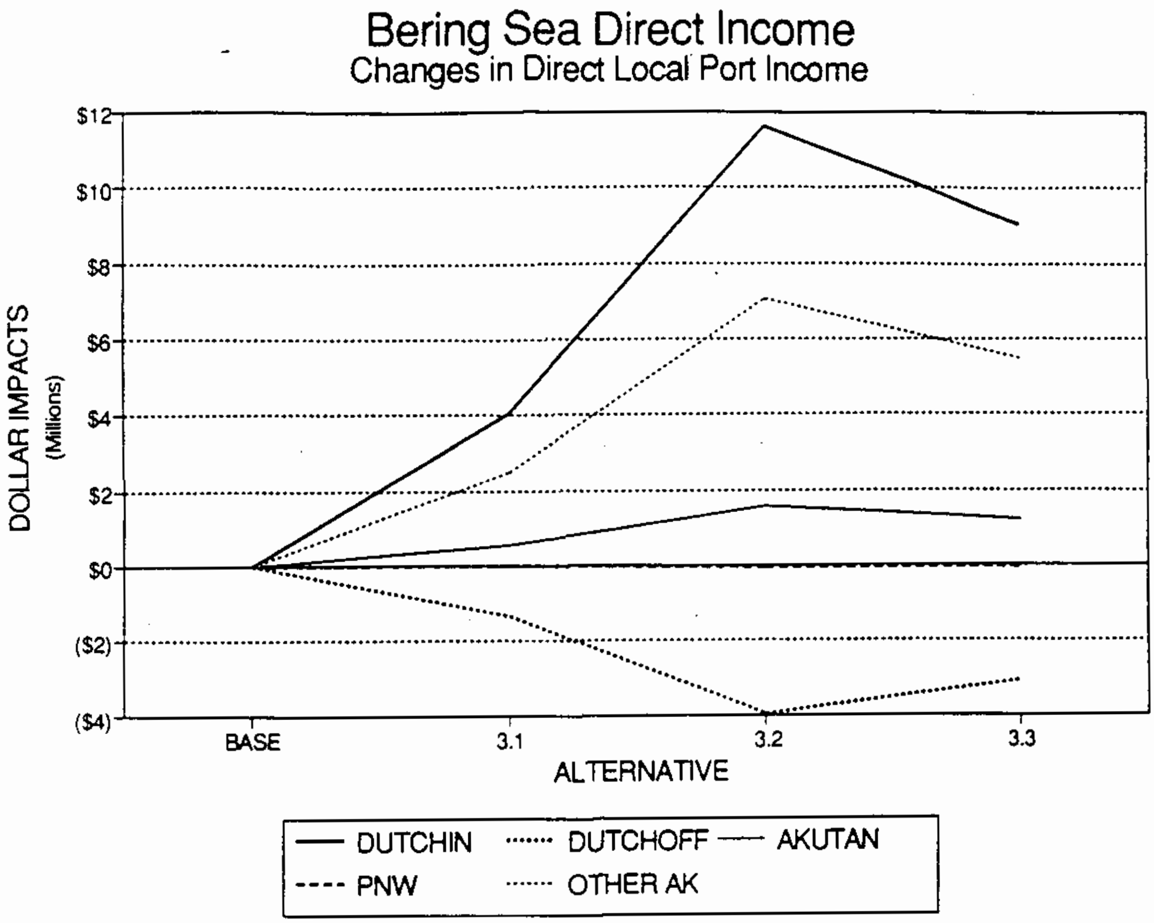


Figure 3.6b BSAI Economic Impacts



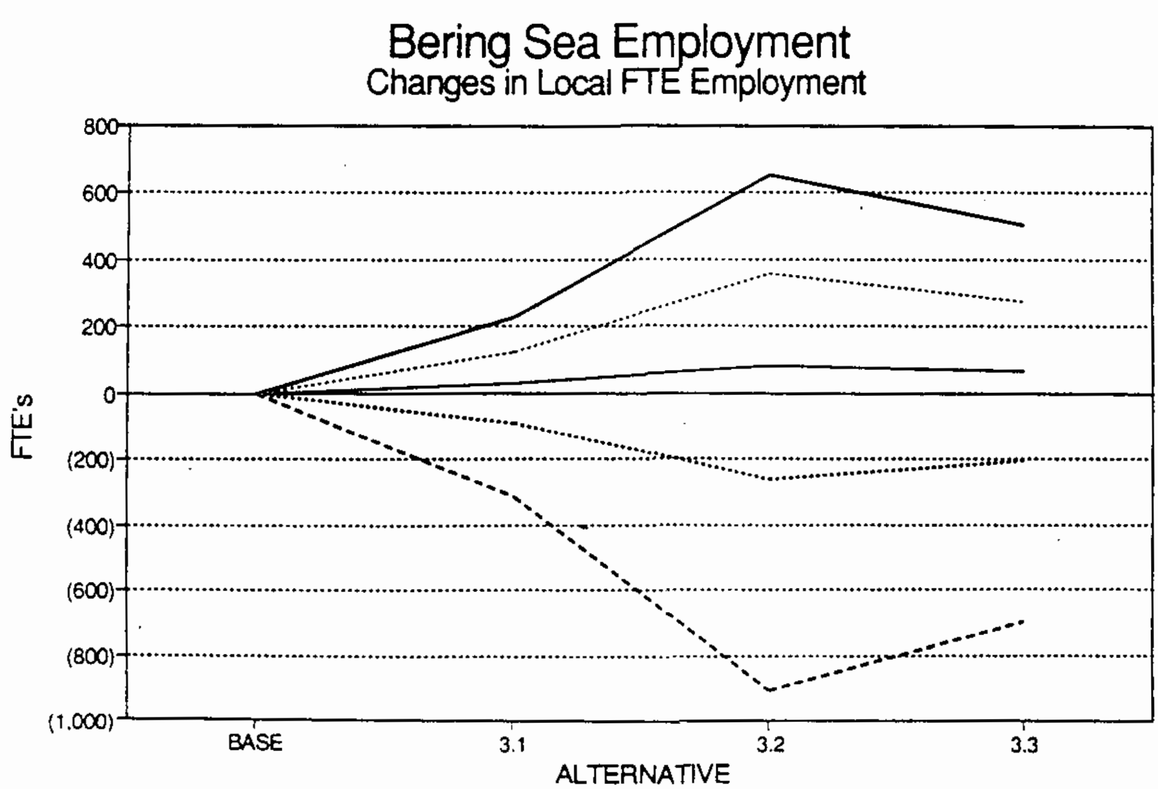
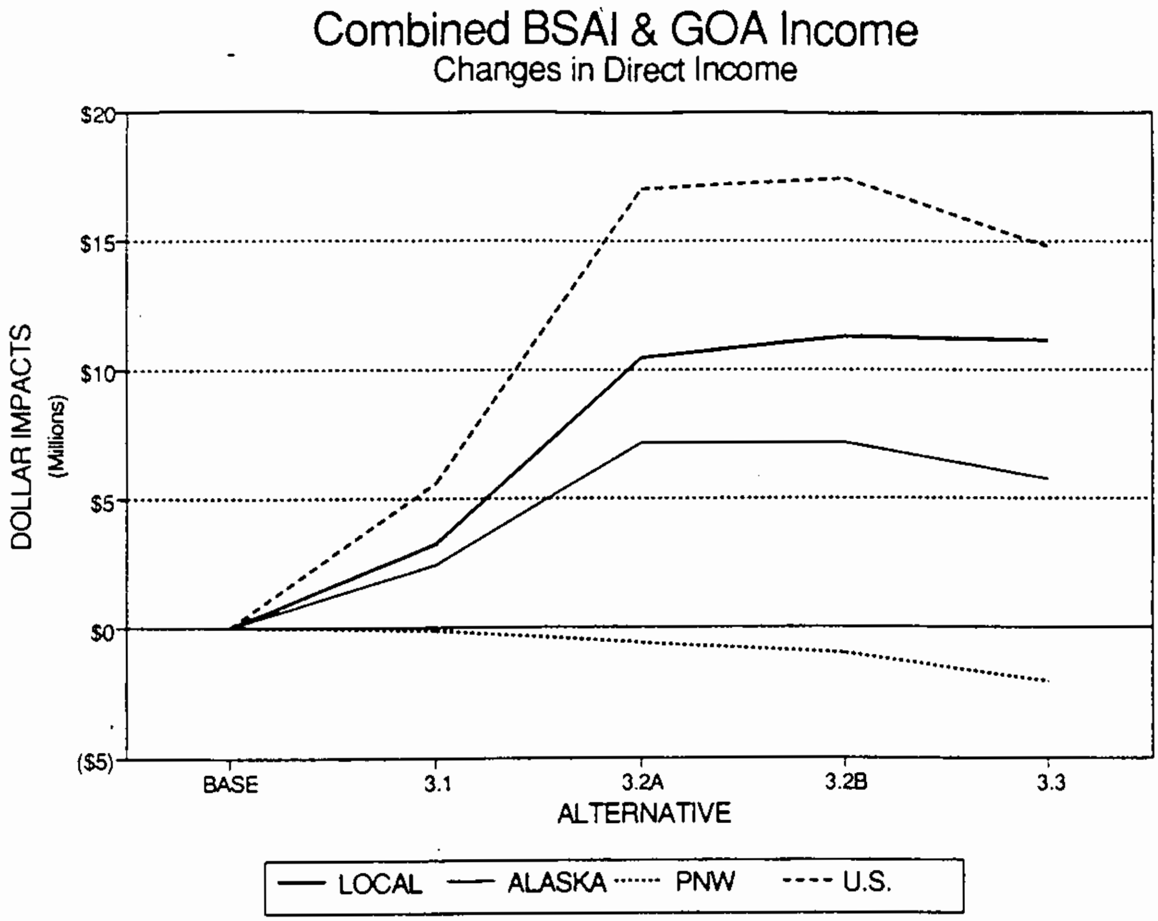
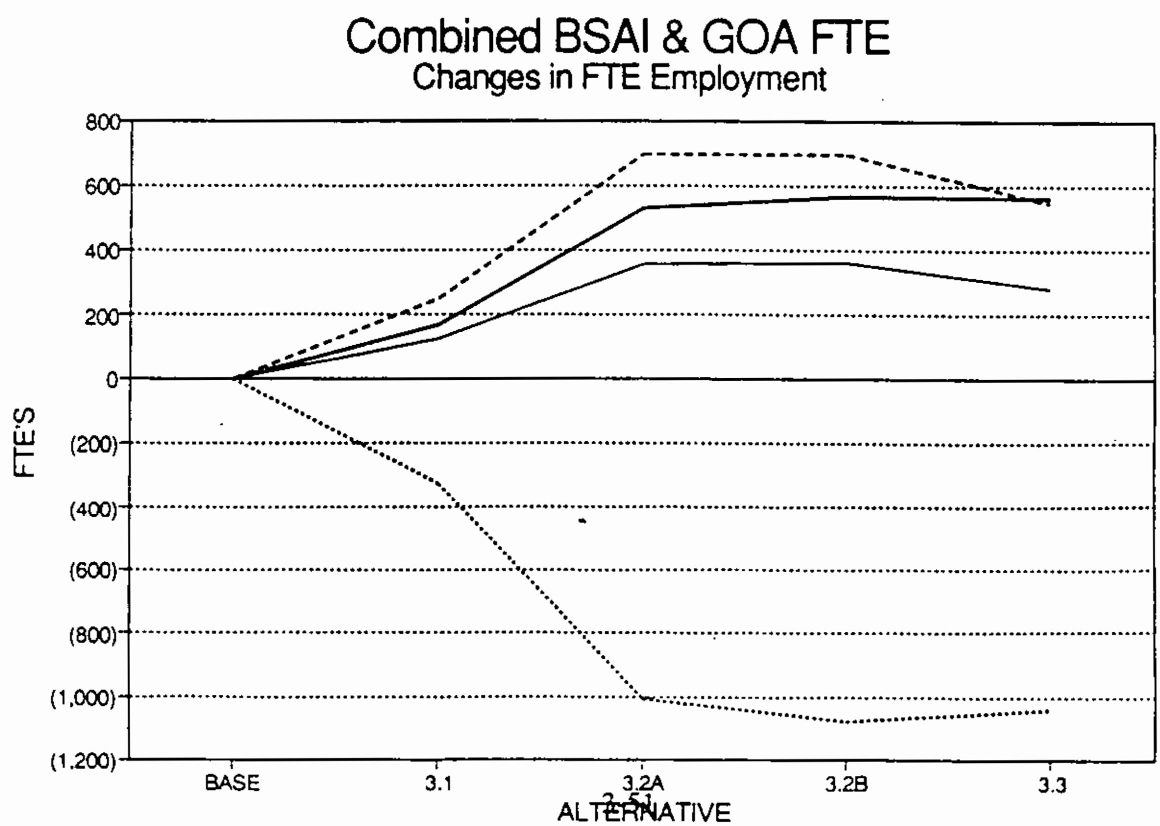


Figure 3.6c Combined GOA & BSAI Economic Impacts





Gulf of Alaska

For Gulf of Alaska, Figure 3.6a reveals that the impacts on direct income increase steadily moving from option 3.1 to 3.3. Option 3.1 results in no significant economic impacts, since it only captures the effect of reclassifying freezer longliners as inshore. Across options 3.2 and 3.3, the income effects are consistently greatest for the Kodiak inshore economy, moderately important in the PNW, but relatively minor for the other specified locations. As discussed in the preceding narrative, the impacts can be characterized as a trade off between the gains to Kodiak and declines in the PNW. Theses income effects are largely due to preferential allocations of pollock to the inshore segment. The small indicated losses accruing in the Western Gulf locations--Sand Point, King Cove and Chignik--reflect the slight reductions in the allocation of Pacific cod available to these ports.

The projected GOA employment impacts in these same port locations also are shown in Figure 3.6a.[22] The same general trends exist as for the direct income effects. The most significant changes are the indicated increase in Kodiak inshore-related FTE's, and corresponding loss in the PNW. Employment consequences in the other locations are very minor.

Referencing both Figures 3.6a and 3.6b, it can be generalized that the apparent direct income gains to the Kodiak inshore location are accompanied by relatively large declines in PNW employment. This implies that the critical economic trade off between the inshore (Kodiak) and offshore (PNW) local port impacts is an increase in direct income at the expense of employment. This is not an uncommon trade off in economic allocations in general.

Bering Sea/Aleutian Islands

The actual tonnage of BSAI pollock at issue in the proposed allocation options is much greater than in the GOA, so the nominal economic impacts are proportionately larger for both income and employment. As illustrated in Figure 3.6b, the relative impacts of the options are different in the BSAI than in the GOA. Option 3.1 projects a significant change from the base, 3.2 a much more dramatic change in economic impacts, and 3.3 falls in between these two. Consistently, the greatest increase in direct income develops in the Dutch Harbor inshore-related economy, and the greatest decline occurs in the offshore Dutch Harbor segment.

The projected economic impact on both Akutan and other Alaskan ports is an increase in income, although the consequences in Akutan are relatively smaller. This reflects the expenditure patterns of the dollar incomes generated in Akutan, where significant leakage to other areas, including the PNW, Dutch Harbor, and other Alaskan ports, is expected.

The apparent net change in direct income in the PNW is neutral, but this may not account for the process of adjustment in this segment. The direct income impacts from each of the BSAI processing segments on the PNW are in the millions of dollars. This confirms that the Seattle/PNW economy is an integral part of the BSAI pollock processing industry, whether inshore or offshore.

Analysis of Figure 3.6b, changes in BSAI local employment, reveals a similar relationship in economic impacts upon port locations with one very important exception. The PNW, which was estimated to incur

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[22]As explained previously, calculations of employment are made directly from the model's estimates of total economic impacts, combining direct, indirect and induced effects. Thus, the employment figures can also be interpreted as a proxy for relative changes in total economic activity.

a neutral impact from changes in direct incomes, accumulates a significant decline in employment under the options proposed. This relationship indicates that the total economic activity associated with pollock processing includes more than the income effects, and that these two impacts can accrue in different locations.

As in the discussion of GOA economic impacts, there is a distinct trade off between income gains to the inshore BSAI locations, and employment declines to the offshore segment. To further explore this issue, some consideration of the time related development of the two key variables--income and employment--is necessary. It was noted previously that the consequences of direct income tend to be relatively short term, while the impacts associated with indirect and induced effects may be longer term and more diffuse in developing. This characterization applies to the observations concerning direct income and employment, respectively. The employment projections in all cases certainly include the industry-specific jobs in fishing, processing, and support services, but it is the employment created by induced economic activity that becomes a more important factor in these relationships, particularly in the PNW. The indicated employment losses, derived from estimates of total economic activity, do not represent a single massive layoff of 800 or 1000 workers, although some short term loss of direct employment is likely. Rather, the estimated employment losses are likely to occur more gradually, spread over the larger economic community, and extending over several years.

Projected National Impacts; A Cautionary Note

This analysis examined the U.S. level economic impacts generated by the input-output model as well, in an effort to understand the consequences of the tonnage allocations on the national economy. The estimated economic benefits and costs listed in Table 3.6 are based on port specific activity, measured at the national, rather than local or regional level. The national analysis also allowed the "leakage" of foreign expenditures from the model, which could not be done with the local port models.

The economic impacts of the Alternative 3 proposals from the BSAI and GOA combined are shown in Figure 3.6c. Indicated changes in net income and employment are illustrated for the previously estimated local, "other" Alaska, and PNW, along with the U.S. national economy. The results follow the implications drawn for the individual locations; there are increases in direct income associated with increasing the allocation of the processing rights to the inshore segments, but these benefits come at the expense of employment losses in the offshore segment.

Despite the conceptual appeal of such estimates, several inherent difficulties noted with both the model and the data restrict the usefulness of the national level results, particularly in comparing the composite inshore and offshore impacts. One of the cautions in using the national model, which applies to a lesser extent in the local models, is the "leverage" created by extrapolating the impact of even small changes in per unit values (i.e., per pound processing costs) across an enormous volume (3 billion pounds) of pollock. The input-output coefficients at the national level are significantly larger than those at the local level, so the implied economic impacts of change under any of the options are much larger. Secondly, the projections made with the input-output model do not comprehensively address possible price or market changes that may occur as a result of shifts in allocation of these resources. Direct income categories such as returns to ownership, or crew shares will be directly affected by changes in market price, and price changes may occur as a result of the allocations.

The nature of the national model, in aggregating firm level impacts, will magnify errors or discrepancies which may appear insignificant at the local level. This is more of a concern when making comparisons *between* the inshore and offshore segments, to the extent that apparent differences in economic impacts between the two do not necessarily convey national economic welfare. Certain tests of the sensitivity of the model were performed in order to frame the confidence intervals of the data used. Even minor changes in underlying price assumptions dramatically influence conclusions regarding net national costs and benefits.

The exvessel and processed product price estimates used in the analysis were derived from the OMB survey and cross referenced, where possible, with market reports. The prices were available ex post, so these values are mostly a matter of record. Under the options proposed in Alternative 3, however, the large shifts in the allocation of the pollock resources from one segment to another may create changes in market conditions, as well, relating to timing of sales, product form, quality, or market access. The market consequences of such a shift in resources would likely change the price received, to the extent the product produced and sold by the inshore processor is not a perfect substitute for the offshore product, particularly in the case of pollock surimi. Generally, to dramatically increase the volume of a product flowing through a given market will result in or require a lower price. This recognizes the inverse relationship between prices and consumer demand.

This market scenario was tested by simulating a reduction in the price of inshore surimi by 10%, and a corresponding 10% decrease in the exvessel price. Conversely, a 10% price increase was applied to the offshore surimi price, representing the market effect of a reduction in supply.[23] The resulting price levels were applied to the BSAI pollock allocation scenarios from Alternative 3, leaving the rest of the model unchanged. While a 10% change in the $.08/lb exvessel price of pollock may appear minor ($.008/lb), applying that same impact across the entire 877 million pounds represented by the allocation shift in option 3.2 represents over $7 million in foregone income at the exvessel level, alone. The processing sector reduction amounts to another $12.5 million in lost revenues. Reducing the direct income component of the inshore segment by nearly $20 million leads to even further indirect and induced economic impacts.

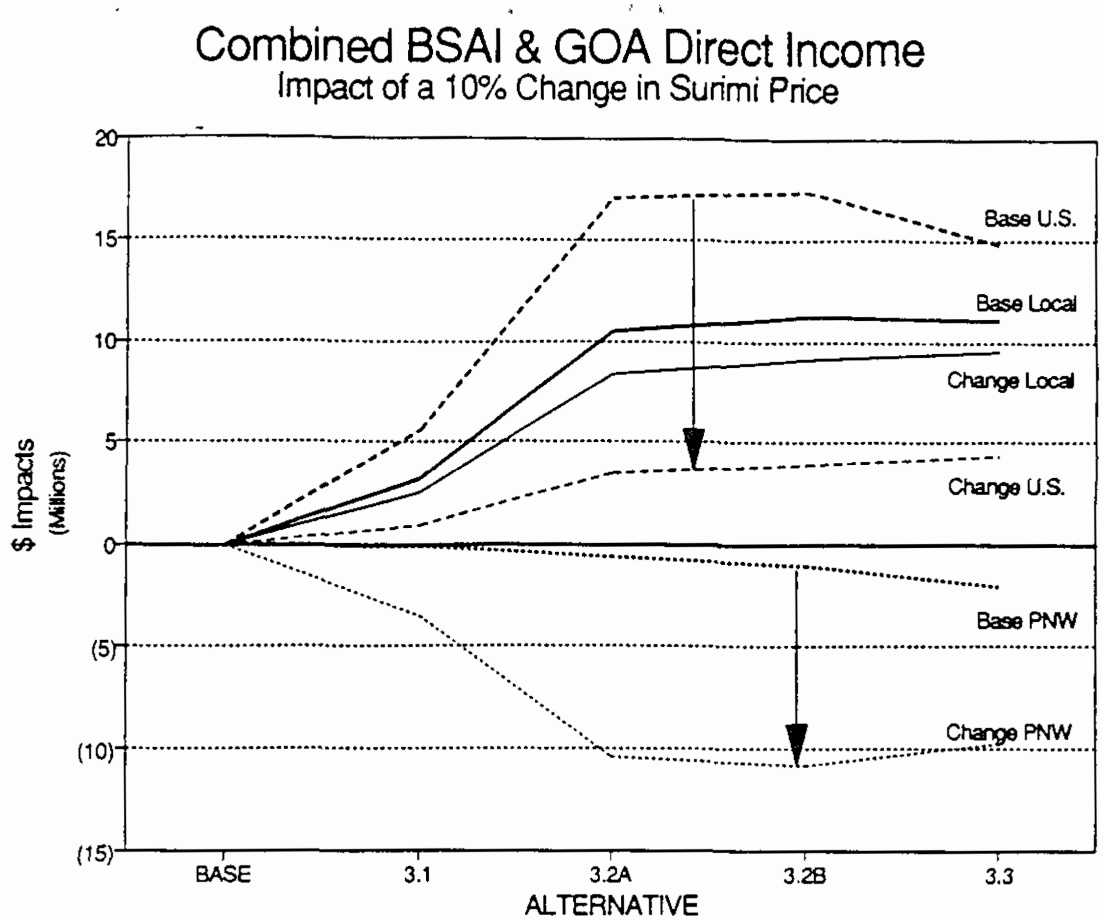
The price sensitivity tests of the model, when applied through option 3.2, were revealing in this regard. Direct incomes to the Dutch Harbor inshore location declined by 12 percent, and employment also fell by 12 percent. These are clearly significant changes in the economic impacts to the local economy, emphasizing the sensitivity of the estimated economic impacts to relatively small changes in market conditions. When these reductions are aggregated at the national level (thus incorporating the impact of simulated market adjustment to the input-output model) the apparent net impacts on the U.S. economy also change, as illustrated in Figure 3.7. With these indicated price adjustments, the change in net national income resulting from the allocation in option 2b declines by nearly 70%, from $17 million to less than $5 million. Net changes in employment become negative, indicating a net loss in aggregate economic activity.

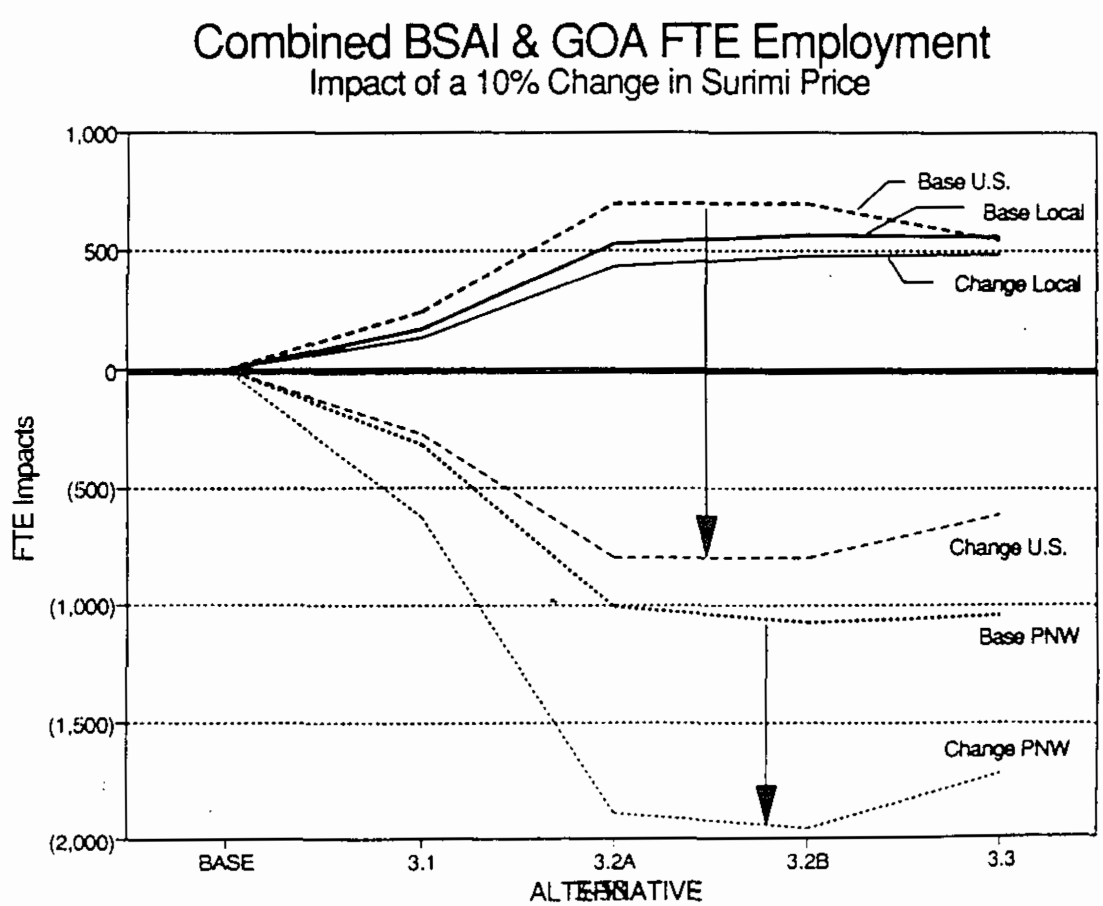
3.3.3.7 Effectiveness of Alternative 3 in Resolving the Preemption Problem

Alternative 3 prescribes various percentage allocations of the pollock and Pacific cod resources between the inshore and offshore components as a solution to the preemption problem. The four prescribed percentage share allocations proposed are based on different historical or apportioned usage patterns. This

[23]The responsiveness of demand to changes in price is called the elasticity of demand. The response need not be symmetrical; that is, a small percentage change in price may create a very large change in quantity demanded for some products (the implied case here), while for other products even a large price change may lead to only minor changes in demand. The exact relationship depends upon the demand characteristics for a given product. Very little information is available concerning the nature of world demand for surimi, although Atkinson provides some insights in Johnstons's "The Role of Pacific Groundfish in International Groundfish Trade."

Figure 3.7 Price Sensitivity Test on Aggregated Economic Impacts





effectively reduces the primary preemption issue to one of appropriate allocations between the two components of the groundfish industry. The allocations inshore and offshore, as well as the criteria under which different industry segments are categorized as inshore or offshore, constitute pivotal variables in the design of this alternative.

The greater the allocation made to the inshore segment, the greater the protection afforded from preemption by the offshore sector. Such allocations, however, come at the expense of the offshore component. Gains in direct income to the inshore component are largely offset by losses in FTE employment incurred by the offshore sector. Considerations of equity, historical use, and efficiency need to be balanced against concerns over the social and economic consequences of preemption. The allocation of the TAC between the inshore and offshore components of the industry does not, in Alternative 3, address the longer term concerns regarding overcapitalization; thus, the solution may be only temporary. Also, the relief afforded through the various percentage allocations is somewhat uneven between species and management areas. BSAI inshore pollock allocations--particularly under options 3.2 and 3.3--afford significantly more remedy to preemption than may be necessary, while overlooking the status of inshore Pacific cod operations in the GOA. Lastly, the designation of all fixed gear catcher processors as belonging to the inshore component may invite unintended preemptive pressures from within the inshore sector, to the extent expansion of the fixed gear catcher-processor component encroaches upon the traditional shore based processing operations.

The use of prescribed allocations to designated segments of the groundfish industry offers a direct means of managing the preemptive pressures on inshore processors raised under the proposed alternative. Such allocations provide economic benefits to the inshore component, but at the expense of the offshore industry. Thus, the consensus of the Council is that such allocations have merit in solving the problem, but that careful consideration of equity and efficiency may require fine-tuning of both the percentage shares and the allocation criteria in order to effect a more balanced solution than that contained in Alternative 3, above.

3.3.4 Alternative 4: "Allocate TAC on basis of species (as specified in Alternative 3) and vessel length. For example, partition the BSAI TAC 50-50 between vessels over 150 feet, and those less than 150 feet. A threshold for the GOA might be 125 feet."

Alternative 4 proposes allocating TACs of pollock in the Bering Sea & Aleutian Islands (BSAI) and pollock and Pacific cod in the Gulf of Alaska (GOA) between large and small vessels. Large vessels in the GOA are defined as those vessels 125 feet and longer. Large vessels in the BSAI are defined as those vessels 150 feet and longer. Four sub-options specify the allocations between large and small vessels. These are based on the following: (1) a snapshot of 1989, (2) 50-50 split of the TAC, (3) the average catch between 1986 and 1989, or (4) the average catch between 1986 and 1988. Catch by joint venture vessels, (i.e. where U.S. harvesting vessels deliver to foreign processing ships), will be included in each suboption explicitly. The resulting allocations are described in Table 3.7.

Table 3.7 Allocation Options Under Alternative 4

BERING SEA POLLOCK	SMALL	LARGE
SNAPSHOT OF 1989	38%	62%
50-50 SPLIT OF THE TAC	50%	50%
1986-89 AVERAGE	76%	24%
1986-88 AVERAGE	91%	9%
GULF OF ALASKA POLLOCK	**SMALL**	**LARGE**
SNAPSHOT OF 1989	41%	59%
50-50 SPLIT OF THE TAC	50%	50%
1986-89 AVERAGE	65%	35%
1986-88 AVERAGE	74%	26%
GULF OF ALASKA Pacific cod	**SMALL**	**LARGE**
SNAPSHOT OF 1989	90%	10%
50-50 SPLIT OF THE TAC	50%	50%
1986-89 AVERAGE	86%	14%
1986-88 AVERAGE	83%	17%

This Alternative is designed to resolve preemption problems by allocating pollock and Pacific cod based on harvester criteria (vessel length), rather than processor criteria as used in Alternative 3. Since concerns over preemption relate to conflicts over access to fish on the grounds, the problem may be more directly managed by allocating to the harvest vessels involved. Alternative 4 may alleviate preemption of the onshore sector to the extent that vessel length is consistently related to inshore and offshore designations, i.e., smaller vessels serve inshore processors and larger vessels are associated with offshore processing operations.

The groundfish fishery in the North Pacific since the inception of the Council management system, has evolved from foreign harvesting and processing (TALFF), through American harvesting and foreign processing (JV), to harvesting and processing solely by domestic vessels and processors (DAP). Joint venture harvesting in the North Pacific grew rapidly from 1985 and peaked in 1987 when over 1.37[24] million mt of groundfish were harvested in the North Pacific. In that year over 98%[25] of the BSAI JV pollock was harvested by vessels less than 150 feet. In 1988 larger American harvest vessels and catcher/processors made significant landings, and in 1989 vessels longer than 150 feet harvested over 62% of the BSAI pollock.

In the Gulf, JV pollock harvests peaked in 1985 when over 237,000 mt were harvested. In 1986, as domestic processing began coming on line, the Gulf pollock TAC and harvest fell considerably, totaling only 83,903 mt with 78% harvested by vessels less than 125 feet. Pollock harvest continued to decline in the Gulf in 1987 and 1988, but in 1989 approached the 1986 level at 72,356 mt. In 1989 however, only 59% of the Gulf pollock harvest was by vessels longer than 125 feet.

[24]PacFin 16 March 1988, Report# 210, "NPFMC JOINT-VENTURE PERIOD REPORT"

[25]Unless otherwise noted catch totals and percentages are derived from ADFG/NMFS fish-tickets, Joint-Venture Reports, and Weekly Processor Reports.

Unlike pollock, the harvest of Pacific cod in the Gulf by small vessels has been increasing both in total tons harvested and in a relative sense when compared with the harvest by large vessels. In 1986 71% of the 9,200 mt of Gulf Pacific cod were harvested by vessels less than 125 feet. By 1989 over 41,000 mt were harvested, 90% of which went to small vessels. It is not clear whether the increase in Pacific cod harvest by small vessels indicates more interest in the species in general, or if it is simply a result of the displacement of small vessels from the Bering Sea & Aleutian Islands.

Figures 3.8a - 3.8c summarize the harvest of pollock in the Bering Sea & Aleutian Islands and Pacific cod and pollock in the Gulf of Alaska. The solid lines represent the actual harvest by small and large vessels, while dotted and dashed lines represent what would have been the harvest had the specified alternative allocations been implemented. In the Gulf, small vessels are defined as those *less than 125 feet*, and in the BSAI a small vessel is *less than 150 feet*.

The alternative allocations represent dramatic changes from the 1989 harvests. It should be noted, however, that the 1989 pollock harvest in both the Gulf and the BSAI represented a major shift in relative terms from 1988. The proposed allocations for pollock would all increase the harvest by small vessels compared to 1989, and in all but the 50-50 split would increase harvests from the 1988 level. This is not the case for the proposed allocation of Pacific cod, which favors larger vessels over small ones.

Preemption and Alternative 4

The allocation between large and small vessels is a step toward exclusive rights to harvest the resource. Rather than a single open access fishery for all vessels there would now be two; one for small vessels, one for large. As a class, the catch of smaller vessels would be guaranteed, however nothing would prevent an influx of many more smaller vessels which would erode the amount of resource available to earlier entrants. Similarly, the catch of larger vessels as a class would be stabilized, but the amount of resource available to an individual vessel would be anything but certain.

Alternative 4 would result in a shift in resource allocation between vessel size categories. From 1988 to 1989, as shown in Table 3.8, the share of BSAI pollock harvested by small vessels dropped from 83% to 38%, a decrease of 52% in tons harvested. Allocating 50% of the pollock harvest to small vessels would mitigate the magnitude of the decrease. Using the average catch from 1986-1989 would essentially put small and large vessels back to 1988 harvest levels, while using 1986-1988 would allocate more tons of BSAI pollock to small vessels than they had ever caught.

Alternative 4 does nothing explicitly to reduce harvesting capacity, although the imposition of the alternative conceivably could force vessels out of the fishery through failure and bankruptcy. It is also possible that vessels would be forced out of the fishery in the absence of regulatory changes.

In 1987 the pollock harvest by small vessels in the BSAI peaked at 1.1 million mt. In 1989, large vessels harvested over 817,000 mt. At a minimum, then, the harvest capacity can be said to exceed 1.9 million tons of pollock. The 1989 TAC for BSAI pollock was over 1.3 million mt. It is evident there is more than enough harvesting capacity.

Economic Impact Analysis of Alternative 4

The economic analysis of Alternative 4 measures the impacts of imposing allocative quotas on the harvest of pollock and/or Pacific cod between small and large vessels. Economic impacts are defined as changes in income, direct expenditures, indirect expenditures, induced effects, and the resultant changes in

Figure 3.8a HISTORICAL CATCH BY VESSEL SIZE OF BERING SEA POLLOCK
(with alternative allocations for 1989)

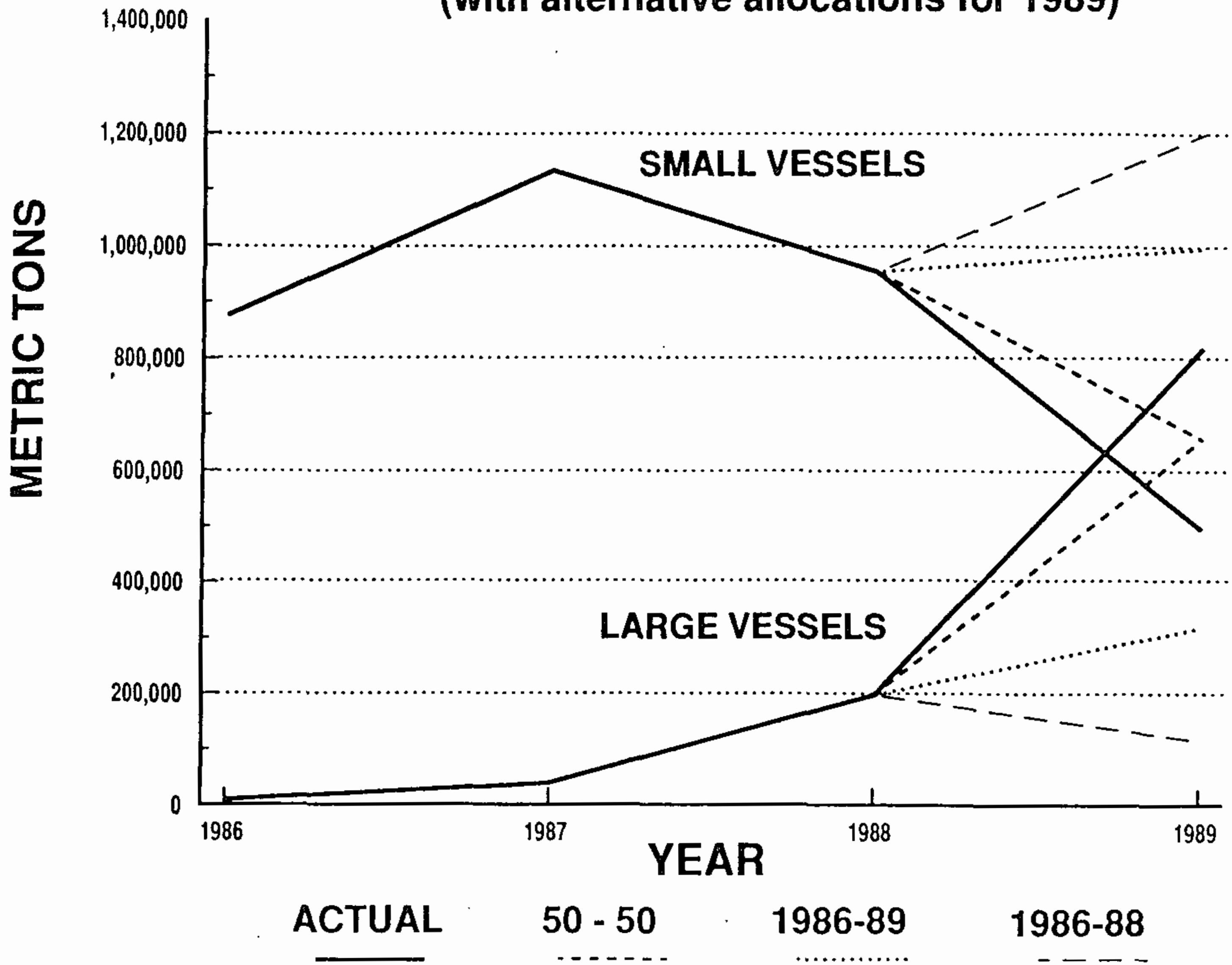


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Figure 3.8b HISTORICAL CATCH BY VESSEL SIZE OF GULF OF ALASKA POLLOCK (with alternative allocations for 1989)

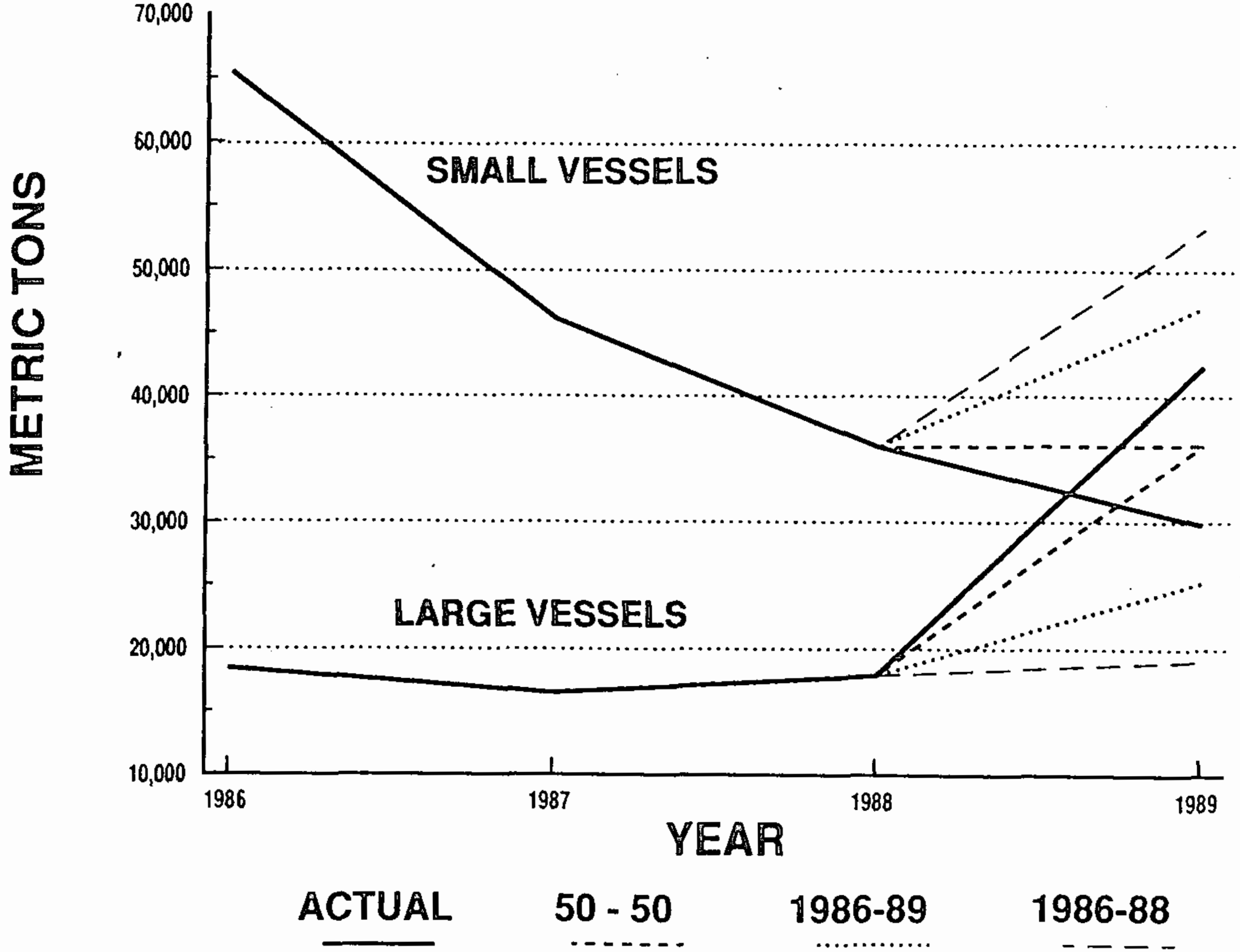

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Figure 3.8c HISTORICAL CATCH BY VESSEL SIZE OF GULF OF ALASKA PACIFIC COD (with alternative allocations for 1989)

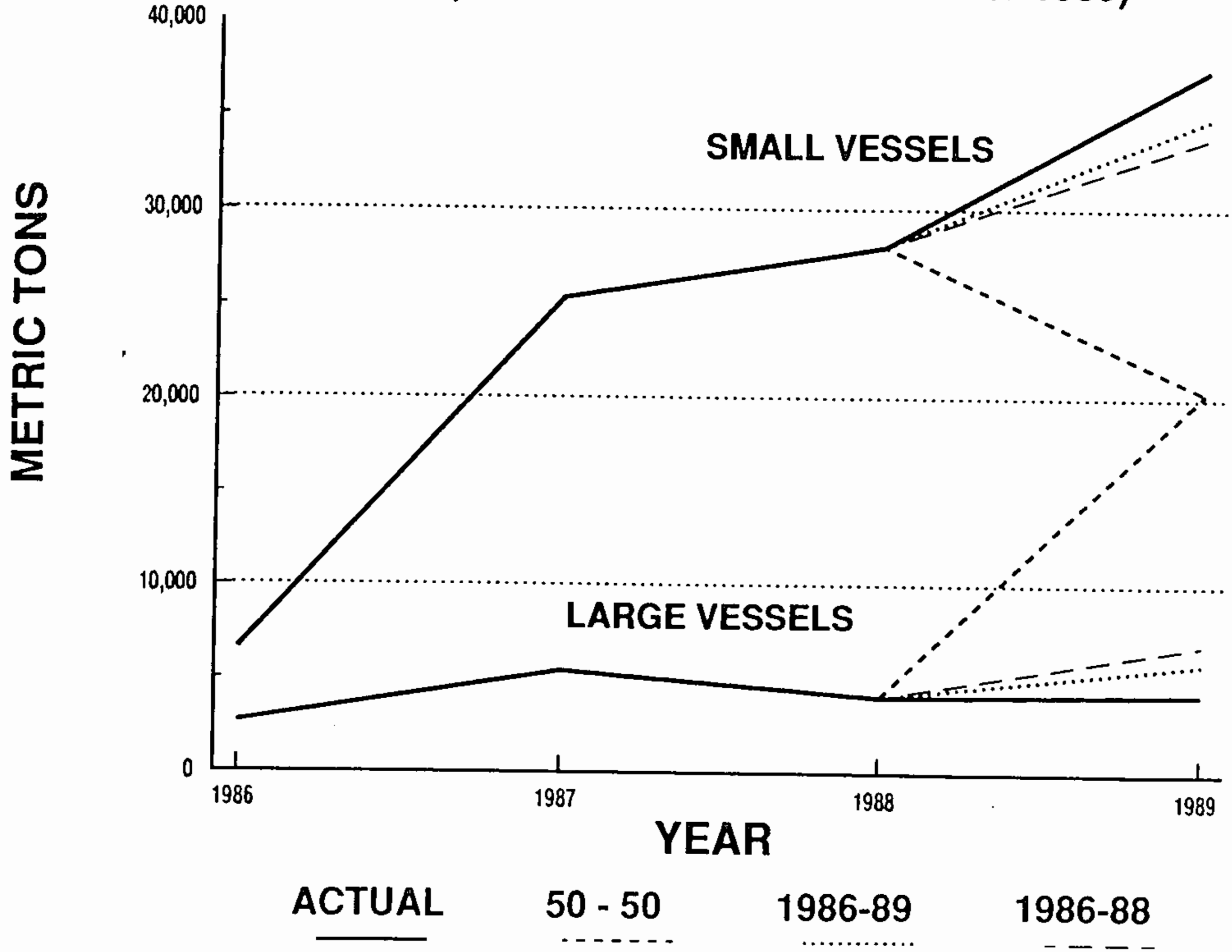

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TABLE 3.8 Historical and Average Catch in Metric Tons by Vessel Length

	BSAI POLLOCK		GOA POLLOCK		GOA PACIFIC COD	
YEAR	SMALL	LARGE	SMALL	LARGE	SMALL	LARGE
1986	876,137	9,519	65,486	18,417	6,602	2,676
1986 %	99%	1%	78%	22%	71%	29%
1987	1,132,694	38,054	46,149	16,529	25,341	5,409
1987 %	97%	3%	74%	26%	82%	18%
1988	953,267	196,773	36,041	17,885	28,079	4,065
1988 %	83%	17%	67%	33%	87%	13%
1989	494,505	817,904	29,894	42,462	37,419	4,262
1989 %	**38%**	**62%**	**41%**	**59%**	**90%**	**10%**
1986-1989	864,151	275,562	44,392	23,823	24,360	4,103
AVERAGE	**75.82%**	**24.18%**	**65.08%**	**34.92%**	**85.59%**	**14.41%**
1986-1988	987,366	81,449	49,225	17,610	20,007	4,050
AVERAGE	**91.24%**	**8.76%**	**73.65%**	**26.35%**	**83.17%**	**16.83%**
50-50 SPLIT	656,204	656,204	36,178	36,178	20,840	20,840
	50.00%	**50.00%**	**50.00%**	**50.00%**	**50.00%**	**50.00%**

* Shaded cells represent the four allocation scenarios

employment. As discussed in Section 3.2.1, broad-based economic activity models, referred to as input-output models, have been developed for use in evaluating the affected fisheries. This model will be employed in conjunction with our understanding of the groundfish harvesting industry to estimate the economic impacts of Alternative 4.

Assumptions

The analysis of Alternative 4 makes the following assumptions:

1. Vessels harvesting groundfish may be characterized by a finite set of vessel classes.
2. All vessels in a given vessel class are assumed to have equivalent costs, revenues and operating characteristics.
3. All vessel types are assumed to have linear variable cost functions. In other words, for a given vessel type, the cost of harvesting an additional fish is constant, regardless of whether the vessel harvests 1 ton or 1,000 tons.
4. The operations of vessels in catcher/processors classes can be divided into two separate accounts, catching and processing.

The fourth assumption is central, in that it allows the analysis to examine only the harvesting sector of the groundfish industry. Alternative 3 assumes catcher/processors operate as single profit centers; the harvesting portion of catcher/processors need not necessarily be profitable so long as the bottom line of the entire operation is profitable. The fourth assumption in the analysis of Alternative 4 states that catching operations are separable from processing operations. This assumption implies that the processing operation will be willing to purchase fish from the harvester offering delivered fish at the lowest price. This presumption then allows the analysis to focus entirely on the harvesting sector, with the further assumption that:

5. The amount of groundfish processed by any processor remains unchanged from the base in each case.

These simplifying assumptions are necessary because Alternative 4 makes no explicit account of processing activity. Allocating to vessel categories means the product could be delivered either inshore or offshore. The first five assumptions could have been imposed on any analysis which examines only the harvesting of groundfish, with the explicit omission of the processing sector. More specific assumptions were made to tailor the model to the specific criteria mandated by the Alternative 4 itself.

6. Vessels were assumed to fish the entire year in only one of the two study areas, the Gulf of Alaska or the Bering Sea & Aleutian Islands.
7. A given vessel class may have different operating characteristics in the two different areas.
8. The distribution of expenditures between Alaska and the Pacific Northwest is constant for all vessels fishing of a size class in a given area, but varies across size class and between the Bering Sea & Aleutian Islands and the Gulf of Alaska. (See Table 1 in Appendix 3a.)
9. A single vessel type may be defined as belonging to one or both size classes, and the operating characteristics and variable costs differ as appropriate.
10. Allocated species will be harvested in the same relative proportion among vessels in a size class in each of the four allocative options. For example, if shoreside trawlers harvested 30% of the small vessel harvest of pollock in the base case (1989), then small shoreside trawlers will continue to harvest 30% of the pollock allocated to that class under the apportionments.

11. A vessel type which harvest species other than those specifically allocated, e.g. rockfish, sablefish, salmon, or crab, will continue to harvest those species at the same absolute rate, regardless of its allocation of pollock or Pacific cod. For example, a purse seiner catching 20,000 lbs of salmon, continues to catch 20,000 lbs. of salmon, even though its harvest of pollock may have doubled.
12. No vessels either leave the fishery or enter the fishery after the imposition of the alternative.

Economic Impacts

The input-output model was used to analyze the economic impacts of the four allocative options in Alternative 4. The model was modified from its application in the analysis of Alternative 3 in three areas; (1) somewhat different definitions were used to account for vessel length, (2) only the harvesting sector is examined, and only those vessel types which harvested significant amount of allocated species are included, and (3) economic activities are examined only at the regional level.

The first and second of these modifications are laid out in Tables 3.9a-3.9d. Note that dedicated crabbers and traditional longliners are omitted entirely from the analysis, as are purse seiners in the BSAI. None of these types of vessels harvested significant amounts of pollock. Purse seiner vessels harvested 10% of the small vessel GOA total of Pacific cod and were included in the GOA. Note, also that no motherships are defined, nor shoreside processors since neither possess harvesting capability. Definitions of harvest only vessel types used length, gear, and delivery location as criteria.

Purse seiners were defined as vessels less than 50 feet, while limit seiners defined as all vessels between 50 and 60 feet. A vessel over 60 feet which used only longline gear throughout the year was defined as a traditional longliner. Those vessels which used more than one type of gear were classified as combination boat. Vessels 60 feet and greater, and which used only trawl gear, were defined as either at-sea trawlers or shoreside trawlers depending on the location of the majority of its deliveries. Obviously no purse seiners or limit seiners could be classified as large vessels, but other vessel types, could be defined either large or small depending solely on length and plan area: large vessels in the GOA were those longer than 125', and in the BSAI longer than 150'.

This analysis assumes that catcher/processor's harvesting and processing operations were completely separable. This was necessary because the allocation options to be analyzed under Alternative 4 dictate only the apportionment of harvest privileges. It is not possible to say where fish harvested under this alternative will be processed. That is, harvest vessels are not limited in terms of where they deliver their catch. This was, in part, the intent of the proposers of the alternative. Vessels which made weekly processor reports were classified by the type of processing as defined in Alternative 3. Although processing is not specifically examined, the processing capacity of a vessel is a determinant in many of the operating costs incurred.

The assumption that processing is separable and that the amount of groundfish processed by any given processor remains constant, limits comparisons to the State level between Alaska and the PNW. These results are normative projections of economic changes arising from the harvesting sector under the simulated allocations of Alternative 4. As such, the estimates are guidelines for interpreting the relative magnitude of economic impacts. Potential effects at the national level are not estimated, due to uncertainties over aggregated market impacts from processing activity associated with these allocations.

Table 3.9a Metric Tons and Percentage of All Species Assigned to Large Vessel Categories in the B.S.A.I.

Vessel Category	Units	Pollock	Pacific Cod	Flatfish	Rockfish	Atka Mck.	Turbots
Shoreside Trawl Baseline	2	71,674	139	109	18		
% of Lg. Boat Lbs.		8.77%	0.24%	0.21%	0.32%		
At Sea Trawl Baseline	9	31,581	8,107	16,333	301		
% of Lg. Boat Lbs.		3.86%	13.78%	31.30%	5.42%		
H & G F.Trawl Baseline	7	3,563	5,462	6,154	3,275	2,844	3,729
% of Lg. Boat Lbs.		0.44%	9.28%	11.79%	58.92%	33.23%	42.24%
Filet F.Trawl Baseline	17	219,921	34,837	28,006	1,944	5,714	5,100
% of Lg. Boat Lbs.		26.90%	59.21%	53.66%	34.97%	66.77%	57.76%
Surimi F.Trawl Baseline	12	490,951	10,295	1,586	20		
% of Lg. Boat Lbs.		60.04%	17.50%	3.04%	0.36%		
Large Vessel Baseline	47	817,690	58,841	52,188	5,559	8,558	8,829
% of Total BSAI Harvest		62.48%	42.07%	22.91%	64.28%	50.17%	70.28%
Large Using 50-50 Split	47	656,204	No	No	No	No	No
% of Total BSAI Harvest		50.00%	Change	Change	Change	Change	Change
Large Using 1986-89 Avg.	47	275,562	No	No	No	No	No
% of Total BSAI Harvest		24.18%	Change	Change	Change	Change	Change
Larger Using 1986-88 Avg	47	81,449	No	No	No	No	No
% of Total BSAI Harvest		8.76%	Change	Change	Change	Change	Change
Total BSAI Harvest	**212**	**1,308,670**	**139,871**	**227,822**	**8,648**	**17,058**	**12,562**

Table 3.9b Metric Tons and Percentage of All Species Assigned to Large Vessel Categories in the B.S.A.I.

Vessel Category	Units	Pollock	Pacific Cod	Flatfish	Rockfish	Atka Mck.	Turbots	Sablefish
Limit Seine Baseline	2	1,014	1,159	4,336	1			
% of Sm. Boat Lbs.		0.21%	1.43%	2.47%	0.04%			
Combo. Trawler Baseline	78	105,428	35,238	101,440	486	4,741	330	533
% of Sm. Boat Lbs.		21.47%	43.49%	57.76%	15.73%	55.78%	8.84%	53.78%
Shoreside Trawl Baseline	12	107,446	8,618	512	24			
% of Sm. Boat Lbs.		21.88%	10.64%	0.29%	0.78%			
At Sea Trawler Baseline	60	253,118	25,877	62,283	326			
% of Sm. Boat Lbs.		51.55%	31.93%	35.46%	10.55%			
H & G F. Trawl Baseline	9	18,735	2,834	4,572	308	1,889	3,248	442
% of Sm. Boat Lbs.		3.82%	3.50%	2.60%	9.97%	22.22%	87.01%	44.60%
Filet F.Trawl Baseline	4	5,239	7,305	2,491	1,944	1,870	155	16
% of Sm. Boat Lbs.		1.07%	9.02%	1.42%	62.93%	22.00%	4.15%	1.61%
Small Vessel Baseline	165	490,980	81,031	175,634	3,089	8,500	3,733	991
% of Total BSAI Harvest		37.52%	57.93%	77.09%	35.72%	49.83%	29.72%	100.00%
Small Using 50-50 Split	165	656,204	No	No	No	No	No	No
% of Total BSAI Harvest		50.00%	Change	Change	Change	Change	Change	Change
Small Using 1986-89 Avg.	165	864,151	No	No	No	No	No	No
% of Total BSAI Harvest		75.82%	Change	Change	Change	Change	Change	Change
Small Using 1986-88 Avg.	165	987,366	No	No	No	No	No	No
% of Total BSAI Harvest		91.24%	Change	Change	Change	Change	Change	Change
Total BSAI Harvest	212	1,308,670	139,871	227,822	8,648	17,058	12,562	991

Table 3.9c Metric Tons and Percentage of All Species Assigned to Large Vessel Categories in the G.O.A.

Vessel Category	Units	Pollock	Pacific Cod	Flatfish	Rockfish	Turbots	Sablefish
Shoreside Trawler	4	6,904	685				
% of Lg. Boat Lbs.		16.26%	16.08%				
Freezer Longliner	9		677				784
% of Lg. Boat Lbs.			15.89%				20.25%
H & G Factory Trawler	10	8,337	113	629	9,589	1,700	1,141
% of Lg. Boat Lbs.		19.63%	2.65%	37.87%	47.41%	29.62%	29.48%
Filet Factory Trawler	11	9,408	2,785	985	10,055	3,830	1,679
% of Lg. Boat Lbs.		22.16%	65.38%	59.30%	49.72%	66.72%	43.37%
Surimi Factory Trawler	3	17,811		47	580	210	267
% of Lg. Boat Lbs.		41.95%		2.83%	2.87%	3.66%	6.90%
Large Vessel Baseline	37	42,460	4,260	1,661	20,224	5,740	3,871
% of Total GOA Harvest		58.56%	10.24%	32.51%	91.79%	90.71%	19.00%
Large Using 50-50 Split	37	36,251	20,799	No	No	No	No
% of Total GOA Harvest		50.00%	50.00%	Change	Change	Change	Change
Large using 1986-89 Avg.	37	17,045	5,994	No	No	No	No
% of Total GOA Harvest		23.51%	14.41%	Change	Change	Change	Change
Large Using 1986-88 Avg.	37	5,184	7,001	No	No	No	No
% of Total GOA Harvest		7.15%	16.83%	Change	Change	Change	Change
Total GOA Harvest	**329**	**72,501**	**41,597**	**5,109**	**22,032**	**6,328**	**20,370**

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Table 3.9d Metric Tons and Percentage of All Species Assigned to Small Vessel Categories in the G.O.A.

Vessel Category	Units	Pacific Cod	Pollock	Flatfish	Rockfish	Turbots	Sablefish	D. Crab	Opilio	Bairdi	Halibut	Salmon	K. Crab
Purse Seine	200	4,023	158	34	652	13	8,238				150	385	
% of Sm. Boat Lbs.		10.77%	0.53%	0.99%	36.06%	2.21%	49.93%				33.00%	85.00%	
Limit Seine	34	5,676	668	51	191	7	5,819				150	68	
% of Sm. Boat Lbs.		15.20%	2.22%	1.48%	10.56%	1.19%	35.27%				33.00%	15.00%	
Combination Trawler	36	21,722	24,294	3,105	361	465	619	195	40	249	150		62
% of Sm. Boat Lbs.		58.18%	80.87%	90.05%	19.97%	79.08%	3.75%	100.00%	100.00%	100.00%	33.00%		100.00%
Shoreside Trawler	10	4,237	3,990	185	13	36	0						
% of Sm. Boat Lbs.		11.35%	13.28%	5.37%	0.72%	6.12%	0.00%						
Freezer Longliner	10	1,679	169	31	167	22	1,694				5		
% of Sm. Boat Lbs.		4.50%	0.56%	0.90%	9.24%	3.74%	10.27%				0.01		
H & G Factory Trawler	2	0	762	42	424	45	129						
% of Sm. Boat Lbs.		0.00%	2.54%	1.22%	23.45%	7.65%	0.78%						
Small Vessel Baseline	292	37,337	30,041	3,448	1,808	588	16,499	195	40	249	454	454	62
% of Total GOA Harvest		89.76%	41.44%	67.49%	8.21%	9.29%	81.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Small Using 50-50 Split	292	20,799	36,251	No	No	No	No	No	No	No	No	No	No
% of Total GOA Harvest		50.00%	50.00%	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change
Small Using 1986-89 Avg	292	35,603	55,456	No	No	No	No	No	No	No	No	No	No
% of Total GOA Harvest		85.59%	76.49%	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change
Small Using 1986-88 Avg	292	34,596	67,317	No	No	No	No	No	No	No	No	No	No
% of Total GOA Harvest		83.17%	92.85%	Change	Change	Change	Change	Change	Change	Change	Change	Change	Change
Total GOA Harvest	329	41,597	72,501	5,109	22,032	6,328	20,370	195	40	249	454	454	62

Results of BSAI Pollock Allocation Model

The economic impacts of the proposed allocations of pollock in the BSAI among small and large vessels are summarized in Tables 3.10a - 3.10e. The tons of pollock assigned to each vessel class for each of the four model runs are shown Table 2a-2d in Appendix 3a. Table 3.10a illustrates the economic impacts of the baseline case, to which other scenarios are compared. Note that the baseline case is also one of the proposed allocations, ie, to freeze the pollock harvest between large and small vessels in the BSAI at 1989 levels. These tables list the amount of pollock assigned to small and large vessels, but show the resulting direct income flows to Alaska and to the PNW of all of the species listed in Table 3.13a (pollock, Pacific cod, flatfish, rockfish, Salmon, King crab, etc.). The "Total" column adds small and large vessels, while the "Total Income" row tallies direct income by vessel class over Alaska and the PNW.

The total economic impacts are the sum of direct income, indirect, and induced effects in each region. The total effects are additive only when examining the numbers of full-time equivalent (FTE) employment figures. These are derived by dividing the average income for the region into the total economic impacts. Average income in Alaska is prepared to be $29,428 and $21,282 in the PNW. Full-time equivalent jobs are compiled in the final row of the table. The results estimate that 3,379 FTE are generated in Alaska as a result of the modelled harvest in the BSAI, and 12,409 FTE are generated in the PNW for a total of 15,788 full-time equivalent jobs. It should be emphasized that these numbers represent estimates of the baseline model run with all of inherent assumptions. These numbers should be used only for comparisons with the results from the three other allocation options in Tables 3.10b-3.10d.

The economic impacts of groundfish harvesting in the Bering Sea are estimated to be much greater in the PNW than in Alaska. Large vessels have a greater impact in the PNW than do smaller vessels. In Alaska, smaller vessels have a greater impact than larger vessels. This indicates that an allocation to harvest vessels based on vessel length involves tradeoffs between Alaska and the PNW, and between small and large vessel owners within each region (this is borne out when examining the results of the other allocative options). For example, large vessels account for 36% of the total economic impacts derived in Alaska from harvesting. Similarly, small vessel harvests result in 42% of the total impact to the PNW. Allocating in favor of small vessels will have some negative effect as well as positive.

Table 3.10b shows the estimated amount of change which would occur if pollock were allocated 50-50 between small vessels and large vessels in the BSAI. This allocation scheme involves shifting the harvest of 163,335 tons of pollock to small vessels from large vessels. The reallocation results in an increase of approximately 18% in income to both regions from small vessels increases. In Alaska, the gain in income is partially offset by a loss of income from large vessels. In the PNW the loss of income to large vessels is greater than the gain from small vessels. The net income effect over both regions is a decrease in direct income of 0.90% from harvesting pollock in the BSAI. As income effects multiply through the regional economies, the number of full time equivalent employees could be expected to increase 4.9% from the baseline case in Alaska and decrease 2.1% in the PNW Overall a 50-50 split of pollock in the BSAI can be expected to result in a total decrease of FTE employment of 1.2%.

Tables 3.10c and 3.10d show the change in economic impacts of using the average pollock landings in 1986-89 and 1986-88, respectively, to allocate between small and large vessels in the BSAI. The average 1986-89 landings would result in a increase of 104% from 1989 levels to small vessels. If 1986-88 average landings were used the change to small vessels would have been 146%. The decrease in landings by small vessels from 1988 to 1989 represented a change of -92%, using 1989 as the base. As Tables 3.10c and 3.10d show, the changes in economic impacts using either of the two averages are dramatic.

Table 3.10a Economic Impacts of Bering Sea/Aleutian Islands Pollock Harvesting a/

	Base Case		
	Small Vessels	Large Vessels	Total
Harvest of Allocated Species			
Pollock (mt)	490,980	817,690	1,308,670
Change %	--	--	--
Direct Income From Harvesting b/			
Alaska	$19,962,842	$6,987,621	$26,950,463
Change %	--	--	--
Pacific Northwest	$45,949,965	$62,888,592	$108,838,557
Change %	--	--	--
Total Direct Income	$65,912,807	$69,876,213	$135,789,020
Change %	--	--	--
Total Economic Impact c/			
Alaska	$63,976,853	$35,448,287	$99,425,140
Change %	--	--	--
Pacific Northwest	$132,378,015	$182,091,076	$314,469,091
Change %	--	--	--
Full Time Equivalent Employment d/			
Alaska	2,174	1,205	3,379
Change %	--	--	--
Pacific Northwest	6,220	6,189	12,409
Change %	--	--	--
Total F.T.E. Employment	8,394	7,394	15,788
Change %	--	--	--

a/ All numbers represent our estimates of the model runs. These numbers should be used only for comparisons with the results from the other allocation options in Tables 4a-4d.

b/ Income is based on all fish harvested, i.e. pollock, Pacific cod, rockfish, Atka Mackerel, etc.

c/ Total economic impacts include income, indirect and induced effects

d/ Assumes an average income in Alaska of $29,428 and in Pacific Northwest of $21,283.

Table 3.10b Economic Impacts of Bering Sea/Aleutian Islands Pollock Harvesting a/

	Difference if 50-50 Split		
	Small Vessels	Large Vessels	Total
Harvest of Allocated Species			
Pollock (mt)	163,355	(163,355)	0
Change %	33.27%	-19.98%	--
Direct Income From Harvesting			
Alaska	$3,548,993	($1,304,997)	$2,243,996
Change %	17.78%	-18.68%	8.33%
Pacific Northwest	$8,280,983	($11,744,969)	($3,463,986)
Change %	18.02%	-18.68%	-3.18%
Total Direct Income	$11,829,976	($13,049,966)	($1,219,990)
Change %	17.95%	-18.68%	-0.90%
Total Economic Impact b/			
Alaska	$10,459,878	($5,586,404)	$4,873,474
Change %	16.35%	-15.76%	4.90%
Pacific Northwest	$18,821,596	($26,241,634)	($7,420,038)
Change %	14.22%	-14.41%	-2.36%
Full Time Equivalent Employment c/			
Alaska	355	(190)	165
Change %	16.33%	-15.77%	4.88%
Pacific Northwest	884	(1,233)	(349)
Change %	14.21%	-19.92%	-2.81%
Total F.T.E. Employment	1,239	(1,423)	(184)
Change %	14.76%	-19.25%	-1.17%

a/ All numbers represent our estimates of the change from the baseline case using the 1986-89 average to allocate pollock. All changes in impacts are due entirely to the shift in pollock harvesting from large to small vessels.

b/ Total economic impacts include income, indirect and induced effects

c/ Assumes an average income in Alaska of $29,428 and in Pacific Northwest of $21,283.

Table 3.10c Economic Impacts of Bering Sea/Aleutian Islands Pollock Harvesting a/

	Difference if 1986-1989 Average Used		
	Small Vessels	Large Vessels	Total
Harvest of Allocated Species			
Pollock (mt)	510,022	(510,022)	0
Change %	103.88%	-62.37%	--
Direct Income From Harvesting			
Alaska	$11,080,550	($4,074,418)	$7,006,132
Change %	55.51%	-58.31%	26.00%
Pacific Northwest	$25,854,616	($36,669,761)	($10,815,145)
Change %	56.27%	-58.31%	-9.94%
Total Direct Income	$36,935,166	($40,744,179)	($3,809,013)
Change %	56.04%	-58.31%	-2.81%
Total Economic Impact b/			
Alaska	$32,657,488	($17,441,692)	$15,215,796
Change %	51.05%	-49.20%	15.30%
Pacific Northwest	$58,764,176	($81,930,778)	($23,166,602)
Change %	44.39%	-44.99%	-7.37%
Full Time Equivalent Employment c/			
Alaska	1,110	(593)	517
Change %	51.06%	-49.21%	15.30%
Pacific Northwest	2,761	(3,850)	(1,089)
Change %	44.39%	-62.21%	-8.78%
Total F.T.E. Employment	3,871	(4,443)	(572)
Change %	46.12%	-60.09%	-3.62%

a/ All numbers represent our estimates of the change from the baseline case using the 1986-88 average to allocate pollock. All changes in impacts are due entirely to the shift in pollock harvesting from large to small vessels.

b/ Total economic impacts include income, indirect and induced effects

c/ Assumes an average income in Alaska of $29,428 and in Pacific Northwest of $21,283.

Table 3.10d Economic Impacts of Bering Sea/Aleutian Islands Pollock Harvesting a/

	Difference if 1986-1988 Average Used		
	Small Vessels	Large Vessels	Total
Harvest of Allocated Species			
Pollock (mt)	717,969	(717,969)	0
Change %	146.23%	-87.80%	--
Direct Income From Harvesting			
Alaska	$15,598,347	($5,735,652)	$9,862,695
Change %	78.14%	-82.08%	36.60%
Pacific Northwest	$36,396,142	($51,620,872)	($15,224,730)
Change %	79.21%	-82.08%	-13.99%
Total Direct Income	$51,994,489	($57,356,524)	($5,362,035)
Change %	78.88%	-82.08%	-3.95%
Total Economic Impact b/			
Alaska	$45,972,700	($24,533,078)	$21,439,622
Change %	71.86%	-69.21%	21.56%
Pacific Northwest	$82,723,692	($115,335,853)	($32,612,161)
Change %	62.49%	-63.34%	-10.37%
Full Time Equivalent Employment c/			
Alaska	1,562	(834)	728
Change %	71.85%	-69.21%	21.54%
Pacific Northwest	3,887	(5,419)	(1,532)
Change %	62.49%	-87.56%	-12.35%
Total F.T.E. Employment	5,449	(6,253)	(804)
Change %	64.92%	-84.57%	-5.09%

a/ All numbers represent our estimates of the change from the baseline case using the 50 - 50 split to allocate pollock. All changes in impacts are due entirely to the shift in pollock harvesting from large to small vessels.

b/ Total economic impacts include income, indirect and induced effects

c/ Assumes an average income in Alaska of $29,428 and in Pacific Northwest of $21,283.

Table 3.10e Economic Impacts of Bering Sea/Aleutian Islands Pollock Harvesting a/

	Baseline	Change If 50-50	Change If 1986-1989	Change If 1986-1988
Harvest of Allocated Species				
Pollock (mt)	1,308,670	0	0	0
Change %	--	--	--	--
Direct Income From Harvesting				
Alaska	$26,950,463	$2,243,996	$7,006,132	$9,862,695
Change %	--	8.33%	26.00%	36.60%
Pacific Northwest	$108,838,557	($3,463,986)	($10,815,145)	($15,224,730)
Change %	--	-3.18%	-9.94%	-13.99%
Total Direct Income	$135,789,020	($1,219,990)	($3,809,013)	($5,362,035)
Change %	--	-0.90%	-2.81%	-3.95%
Total Economic Impact b/				
Alaska	$99,425,140	$4,873,474	$15,215,796	$21,439,622
Change %	--	4.90%	15.30%	21.56%
Pacific Northwest	$314,469,091	($7,420,038)	($23,166,602)	($32,612,161)
Change %	--	-2.36%	-7.37%	-10.37%
Full Time Equivalent Employment c/				
Alaska	3,379	165	517	728
Change %	--	4.88%	15.30%	21.54%
Pacific Northwest	12,409	(349)	(1,089)	(1,532)
Change %	--	-2.81%	-8.78%	-12.35%
Total F.T.E. Employment	15,788	(184)	(572)	(804)
Change %	--	-1.17%	-3.62%	-5.09%

a/ Estimates compare the changes from the total impacts baseline case with the total impacts of using the three different options to allocate pollock. All changes are due entirely to the shift in pollock harvesting from large to small vessels.

b/ Total economic impacts include income, indirect and induced effects

c/ Assumes an average income in Alaska of $29,428 and in Pacific Northwest of $21,283.

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Using the 1986-88 average to allocate BSAI pollock total would increase FTE employment from small vessels 65% from the base case, while decreasing the base case employment by 85% from the large vessels.

Results of GOA Pollock and Pacific Cod Allocation Model

In the Gulf of Alaska the specified allocations do not move in consistent directions. Each of the specified allocations of Pacific cod represent decreases from 1989 harvest levels for small vessels. On the other hand, each of the allocations of pollock represent increases to small vessels. Imposing any of the allocation schemes would mean tradeoffs between Alaska and the PNW, between small and large vessel operators, and between pollock and Pacific cod fishermen. Tables 3.11a-3.11e show the estimated economic impacts of allocating pollock and Pacific cod in the GOA. The allocations tend to trade off increases to large cod and small pollock vessels with declines to small cod and large pollock vessels to the net economic impacts appear unchanged. Table 3.11e shows that the net change in FTE employment in Alaska and the PNW combined will decrease by only 0.5% from 4,942 jobs when using the using the most drastic of the measures.

Reliability of Estimates

Given these conclusions from the model runs, it is necessary to step back and assess the reliability of the results. The numbers in the tables above are not absolute; the model can at best depict the expected direction of the changes in economic impacts. One also needs to consider the simplifying assumptions which made the calculation of impacts possible.

Assumptions 1, 2, and 3, discussed previously simplified the groundfish fishery into a manageable number of parts all simplified linear cost functions. In reality, vessels and their operations are not easily placed into definable categories. Fishermen and fishing vessels are highly variable, and for the most part adaptable to different situations. As limiting as these assumptions appear they do not appear to bias[26] the results in a given direction. In other words, it is not clear whether defining many more exact vessel classes or examining each vessel individually would change the results in a known direction.

However, it is not clear if assumption 4, declaring the separability of harvesting and processing, is an unbiased assumption. Catcher/processors are in fact highly integrated operations. It is uncertain whether either the harvest operation or the processing operation would be viable in the absence of the other. It may be reasonable to expect that some catcher/processors would fail when confronted with an 88% reduction in available pollock (as when using the 1986-88 average for pollock allocations in the BSAI). Thus, the effects of imposing the assumption of separable operations for catcher/processors likely is biased in that it tends to underestimate the negative impacts of the proposed regulations.

Model assumptions 10 and 11 ensured that vessels would harvest the same amount of all non-allocated species regardless of the proposed alternatives. Clearly, a fillet factory trawler would attempt to make up decreases in pollock by increasing its harvest of Pacific cod or rockfish. Therefore, these assumptions would tend to overestimate the negative impacts to filet catcher/processors. Surimi vessels have no apparent alternative to pollock and it is doubtful whether these vessels would continue to harvest the relatively unprofitable (for surimi) Pacific cod at the same level. Similarly, vessels which are only partially dependent on pollock or Pacific cod such as the seine vessels and the combination boats would be likely to change the relative proportions of their catch of other species.

[26]Bias in reference to assumptions and estimators as used in statistical, economic, and other analyses, implies a tendency of the assumption or the estimator to produce results that are known to be incorrect in a known direction.

Table 3.11a Economic Impacts of Gulf of Alaska Pacific Cod & Pollock Harvesting a/

	Small Vessels	Base Case Large Vessels	Total
Harvest of Allocated Species			
Pacific Cod (mt)	37,337	4,260	37,339
Change %	--	--	--
Pollock (mt)	30,041	42,460	30,060
Change %	--	--	--
Direct Income From Harvesting b/			
Alaska	$30,573,706	$13,032,695	$43,606,401
Change %	--	--	--
Pacific Northwest	$13,103,017	$5,585,441	$18,688,458
Change %	--	--	--
Total Direct Income	$43,676,723	$18,618,136	$62,294,859
Change %	--	--	--
Total Economic Impact c/			
Alaska	$57,924,161	$27,916,349	$85,840,510
Change %	--	--	--
Pacific Northwest	$37,616,357	$21,961,829	$59,578,186
Change %	--	--	--
Full Time Equivalent Employment d/			
Alaska	1,969	949	2,918
Change %	--	--	--
Pacific Northwest	1,278	746	2,024
Change %	--	--	--
Total F.T.E. Employment	3,247	1,695	4,942
Change %	--	--	--

a/ All numbers represent our estimates of the model runs. These numbers should be used only for comparisons with the results from the other allocation options in Tables 4a-4d.

b/ Income is based on all fish harvested, i.e. pollock, Pacific cod, rockfish, Atka Mackerel, etc.

c/ Total economic impacts include income, indirect and induced effects

d/ Assumes an average income in Alaska of $29,428 and in Pacific Northwest of $21,283.

Table 3.11b Economic Impacts of Gulf of Alaska Pacific Cod & Pollock Harvesting a/

	Difference if 50-50 Split		
	Small Vessels	Large Vessels	Total
Harvest of Allocated Species			
Pacific Cod (mt)	(16,538)	16,539	0
Change %	-44.30%	388.23%	0.00%
Pollock (mt)	6,210	(6,209)	0
Change %	20.67%	-14.62%	0.00%
Direct Income From Harvesting b/			
Alaska	($1,595,629)	$1,591,253	($4,376)
Change %	-5.22%	12.21%	-0.01%
Pacific Northwest	($683,841)	$681,965	($1,876)
Change %	-5.22%	12.21%	-0.01%
Total Direct Income	($2,279,470)	$2,273,218	($6,252)
Change %	-5.22%	12.21%	-0.01%
Total Economic Impact c/			
Alaska	($3,351,916)	$3,326,554	($25,362)
Change %	-5.79%	11.92%	-0.03%
Pacific Northwest	($1,824,717)	$1,792,991	($31,726)
Change %	-4.85%	8.16%	-0.05%
Full Time Equivalent Employment d/			
Alaska	(114)	113	(1)
Change %	-5.79%	11.91%	-0.03%
Pacific Northwest	(62)	61	(1)
Change %	-4.85%	8.18%	-0.05%
Total F.T.E. Employment	(176)	174	(2)
Change %	-5.42%	10.27%	-0.04%

a/ All numbers represent our estimates of the change from the baseline case using a 50-50 split to allocate Pacific cod and pollock. All changes in impacts are due entirely to the shift in Pacific cod and pollock harvesting from large to small vessels.

b/ Total economic impacts include income, indirect and induced effects

c/ Assumes an average income in Alaska of $29,428 and in Pacific Northwest of $21,283.

Table 3.11c Economic Impacts of Gulf of Alaska Pacific Cod & Pollock Harvesting a/

	Difference if 1986-1989 Average Used		
	Small Vessels	Large Vessels	Total
Harvest of Allocated Species			
Pacific Cod (mt)	(1,734)	1,734	0
Change %	-4.64%	40.71%	0.00%
Pollock (mt)	25,415	(25,415)	0
Change %	84.60%	-59.86%	0.00%
Direct Income From Harvesting b/			
Alaska	$214,350	($615,654)	($401,304)
Change %	0.70%	-4.72%	-0.92%
Pacific Northwest	$91,864	($263,852)	($171,988)
Change %	0.70%	-4.72%	-0.92%
Total Direct Income	$306,214	($879,506)	($573,292)
Change %	0.70%	-4.72%	-0.92%
Total Economic Impact c/			
Alaska	$1,419,229	($1,779,200)	($359,971)
Change %	2.45%	-6.37%	-0.42%
Pacific Northwest	$931,950	($1,134,859)	($202,909)
Change %	2.48%	-5.17%	-0.34%
Full Time Equivalent Employment d/			
Alaska	48	(60)	(12)
Change %	2.44%	-6.32%	-0.41%
Pacific Northwest	32	(39)	(7)
Change %	2.50%	-5.23%	-0.35%
Total F.T.E. Employment	80	(99)	(19)
Change %	2.46%	-5.84%	-0.38%

a/ All numbers represent our estimates of the change from the baseline case using the 1986-89 average to allocate Pacific cod and pollock. All changes in impacts are due entirely to the shift in Pacific cod and pollock harvesting from large to small vessels.

b/ Total economic impacts include income, indirect and induced effects

c/ Assumes an average income in Alaska of $29,428 and in Pacific Northwest of $21,283.

Table 3.11d Economic Impacts of Gulf of Alaska Pacific Cod & Pollock Harvesting a/

	Difference if 1986-1988 Average Used		
	Small Vessels	Large Vessels	Total
Harvest of Allocated Species			
Pacific Cod (mt)	(2,741)	2,741	0
Change %	-7.34%	64.34%	0.00%
Pollock (mt)	37,276	(37,276)	0
Change %	124.08%	-87.79%	0.00%
Direct Income From Harvesting b/			
Alaska	$294,206	($881,652)	($587,446)
Change %	0.96%	-6.76%	-1.35%
Pacific Northwest	$126,088	($377,851)	($251,763)
Change %	0.96%	-6.76%	-1.35%
Total Direct Income	$420,294	($1,259,503)	($839,209)
Change %	0.96%	-6.76%	-1.35%
Total Economic Impact c/			
Alaska	$2,036,287	($2,563,494)	($527,207)
Change %	3.52%	-9.18%	-0.61%
Pacific Northwest	$1,341,758	($1,639,143)	($297,385)
Change %	3.57%	-7.46%	-0.50%
Full Time Equivalent Employment d/			
Alaska	69	(87)	(18)
Change %	3.50%	-9.17%	-0.62%
Pacific Northwest	46	(56)	(10)
Change %	3.60%	-7.51%	-0.49%
Total F.T.E. Employment	115	(143)	(28)
Change %	3.54%	-8.44%	-0.57%

a/ All numbers represent our estimates of the change from the baseline case using the 1986-88 average to allocate Pacific cod and pollock. All changes in impacts are due entirely to the shift in Pacific cod and pollock harvesting from large to small vessels.

b/ Total economic impacts include income, indirect and induced effects

c/ Assumes an average income in Alaska of $29,428 and in Pacific Northwest of $21,283.

Table 3.11e Economic Impacts of Gulf of Alaska Pacific Cod & Pollock Harvesting a/

	Baseline	Change If 50-50	Change If 1986-1989	Change If 1986-1988
Harvest of Allocated Species				
Pacific Cod (mt)	37,339	0	0	0
Change %	--	0.00%	0.00%	0.00%
Pollock (mt)	30,060	0	0	0
Change %	--	0.00%	0.00%	0.00%
Direct Income From Harvesting b/				
Alaska	$43,606,401	($4,376)	($401,304)	($587,446)
Change %	--	-0.01%	-0.92%	-1.35%
Pacific Northwest	$18,688,458	($1,876)	($171,988)	($251,763)
Change %	--	-0.01%	-0.92%	-1.35%
Total Direct Income	$62,294,859	($6,252)	($573,292)	($839,209)
Change %	--	-0.01%	-0.92%	-1.35%
Total Economic Impact c/				
Alaska	$85,840,510	($25,362)	($359,971)	($527,207)
Change %	--	-0.03%	-0.42%	-0.61%
Pacific Northwest	$59,578,186	($31,726)	($202,909)	($297,385)
Change %	--	-0.05%	-0.34%	-0.50%
Full Time Equivalent Employment d/				
Alaska	2,918	(1)	(12)	(18)
Change %	--	-0.03%	-0.41%	-0.62%
Pacific Northwest	2,024	(1)	(7)	(10)
Change %	--	-0.05%	-0.35%	-0.49%
Total F.T.E. Employment	4,942	(2)	(19)	(28)
Change %	--	-0.04%	-0.38%	-0.57%

a/ Estimates compare the changes from the total impacts baseline case with the total impacts of using the three different options to allocate Pacific cod and pollock. All changes are due entirely to the shift in Pacific cod and pollock harvesting from large to small vessels.

b/ Total economic impacts include income, indirect and induced effects

c/ Assumes an average income in Alaska of $29,428 and in Pacific Northwest of $21,283.

The implications of assumptions 10 and 11 as discussed above imply that assumption 12, which held the number and type of vessels constant, would be violated. That is, there would tend to be large vessels leaving the fishery due to bankruptcy, or perhaps to fish in other areas, and there would tend to be small vessels entering to fill the voids. Large vessels specializing in pollock, especially those with heavy debt loads, could face bankruptcy. Vessels leaving because of bankruptcy would tend to increase the negative impacts to large vessels. If small vessels entered the fishery because of the greater availability of fish to harvest, then total costs of small vessels would increase, diminishing the positive impacts of the alternative. Thus, loosening the assumption which kept the number of vessels constant would increase the negative impacts and diminish the positive impacts, thereby biasing the results.

3.3.4.1 Effectiveness of Alternative 4 in Resolving the Preemption Problem

The assignment of harvest rights to vessels based on boat length is an indirect procedure for settling the inshore/offshore allocation problem. This alternative would have significant economic impacts in the BSAI, and moderate impacts in the GOA. In general, Alternative 4 increased benefits to small vessels offset by costs incurred by the large vessel fleet. It is arguable that this plan would rectify the preemption of small catcher vessels that has occurred during the late 1980's, particularly under the options that base allocations on historical use patterns. Because vessel length is not a uniform descriptor of gear type, target fishery, or port affiliation, designations under Alternative 4 do not result in consistent allocations among similar groups. The criteria would require tradeoffs between small and large vessels within Alaska and within the Pacific northwest, as well as between the two regions. Given the inherent limitations of the data available, the economic impacts estimated by the model likely understate the overall negative impacts to large vessel owners, particularly under the allocations represented using the 1986-88 average harvest. Moreover, economic impacts on the inshore and offshore processing sectors is uncertain, since no specific allocation to processors is prescribed, and restructuring of the catcher fleet could result in different delivery patterns.

Fundamentally, Alternative 4 offers an ambiguous method for resolving the inshore/offshore preemption problem: while this scheme establishes allocation rights for harvest vessels based on length, it does not explicitly provide inshore operations protection from preemption. Under this alternative, harvest vessels deliver to processors according to open market incentives. Thus, in order to ensure adequate supplies, inshore operations would have to outbid offshore processors for deliveries. The historical use allocation schemes examined would result in a major reallocation away from the larger vessels associated with the offshore component, but with uncertain effects on inshore processors. The inability of vessel length criteria to consistently distinguish between inshore and offshore processing activity further limits the ability of this alternative to provide relief from preemption of the inshore sector. In order to address preemption directly, Alternative 4 would require that shore-based delivery vessels fit a vessel length criteria in order to ensure prescribed inshore allocations, and this is not necessarily consistent with the current configuration of the shorebased catcher fleet.

While further refinement of this alternative may allow for more concise application of harvest vessel allocations, the criteria employed offer only an indirect procedure for resolving the preemption problem. The Fishery Planning Committee of the NPFMC expressed some misgivings over Alternative 4 in this regard during discussion of the preliminary SEIS analysis in March 1991. The Council ultimately declined the adoption of Alternative 4 in favor of a more focused approach to the inshore/offshore issue.

3.3.5 Alternative 5: **"Use a combination of the following measures: ban pollock roe-stripping everywhere, delay opening of GOA pollock season until after roe season, split pollock into roe, non-roe seasonal quotas, and divide GOA pollock area into separate districts."**

Alternative 5 was included in the inshore-offshore amendment proposal, in large part, as "insurance" against the possibility that Amendments 19 and 14 to the Fishery Management Plans for Groundfish of the Bering Sea/Aleutian Islands and Gulf of Alaska, would not be approved in 1990. A comparison of the proposed alternative and these amendments reveals that, with minor exceptions (cited below), Alternative 5 includes virtually identical provisions to the key components of Amendments 19 and 14. Had the Secretary, for whatever reason, disapproved the Amendment 19/14 package, Alternative 5 in the current amendment package would have assured reconsideration of management strategies advocated by some sectors of the domestic industry, within the context of the inshore/offshore allocation issue.

The Amendment 19/14 package (generally referred to as the "Roe Stripping" Amendment) was, however, adopted by the Council, approved by the Secretary, and implemented effective January 1, 1991 (56 FR 492). The ban on pollock roe-stripping was originally enacted in 1990 via Emergency Rule (55 FR 6396).

The principal effect of implementation of Amendments 19 and 14 was to, "ban pollock roe-stripping everywhere."[27] This suggests that, at least in the case of the roe-stripping ban provision, Alternative 5 is, effectively, the "regulatory status quo" condition in the fishery, making adoption of this regulatory element, under the Inshore-Offshore amendment, unnecessary.

Amendment 19/14 also examined the biological and economic implications of various strategies to, "delay opening of the GOA pollock season until after the roe season" and "split pollock into roe, non-roe seasonal quotas". Detailed analysis of a range of "seasonal allocation" and "openings" schedules is contained in the Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR) for Amendment 19 to the Fishery Management Plan for Groundfish of the Gulf of Alaska and Amendment 14 to the Fishery Management Plan for Groundfish of the Bering Sea/Aleutian Islands, pages 29 through 34..

With specific reference to splitting pollock into roe and non-roe quotas, Amendment 14 exercised this regulatory authority when the pollock TAC in the Bering Sea was divided into two components, one explicitly made available for harvest during the roe season, the other to be available during the non-roe bearing season.

Similarly, Amendment 19 provided for four divisions of the pollock TAC in the Gulf of Alaska. At present, the Council and Secretary have chosen to provide for four equal divisions, each made available for harvest at the beginning of the calendar quarter. By default, the effect of this quarterly split is to set some GOA pollock TAC aside for periods when roe is not present, while providing quota during the period when it is. (For a detailed analysis of the biological, economic, and socioeconomic impacts of these regulatory measures see the EA/RIR for Amendment 19 to the Fishery Management Plan for Groundfish of the Gulf of Alaska and Amendment 14 to the Fishery Management Plan for Groundfish of the Bering Sea/Aleutian Islands).

As in the case of a "ban on roe-stripping...", the provision in Alternative 5 to "split pollock into roe and non-roe seasonal quotas", is, de facto, part of the effective regulatory status quo given approval of Amendment 19/14 in 1990. Therefore, adoption of this regulatory element, as part of Alternative 5, would be an unnecessary duplication of existing FMP regulations.

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[27]For a detailed analysis of the biological, economic, and socioeconomic impacts of these regulatory measures, see the EA/RIR for Amendment 19 to the Fishery Management Plan for Groundfish of the Gulf of Alaska, and Amendment 14 to the Fishery Management Plan for Groundfish of the Bering Sea/Aleutian Islands.

The only provision of Alternative 5 which was not explicitly analyzed as part of Amendment 19/14, pertains to division of the GOA pollock management areas into separate, smaller districts. In this case, however, the Council has extensive historical experience with this management tool. The Gulf of Alaska has long been divided, for fishery management purposes, into separate management areas or districts, each with its own TAC.

More recently, the Council established a pollock district when, through adoption and implementation of Amendment 18 to the Gulf Groundfish Management Plan, the Shelikof Strait District was formally created, (54 FR 50386). The EA/RIR for Amendment 18 to the Fishery Management Plan for Groundfish of the Gulf of Alaska contains an analysis of the economic implications of this action. In still another example, the Secretary moved in December, 1990, through an emergency rule, to establish a pollock management district near Bogoslof Island, to more closely manage catches in that Bering Sea subarea. A formal plan amendment to permanently define the Bogoslof District is currently under consideration.

3.3.5.1 Effectiveness of Alternative 5 in Resolving the Preemption Problem

With respect to the proposed Inshore-Offshore Amendment, the Council has defined the problem as one of resource allocation, wherein one industry sector faces the risk of preemption by another. The Amendment 19/14 "Roe-Stripping" package, likewise, identified sector preemption as a primary reason for undertaking an amendment of the FMPs. As suggested by the foregoing review, regulatory provisions in Alternative 5 are virtually identical to those contained in the Amendment 19/14 analysis (and Amendment 18 with respect to area divisions). A careful reading of the supporting analytical documents for 19/14 demonstrates that these particular management measures cannot be expected to resolve the sectoral preemption problem.

For example, the Amendment 19/14 analysis concluded that, while a ban on roe-stripping "will tend to reduce the pace of the roe fishery" by eliminating some operations, it does not follow "that such a ban will reduce (total) catch during the roe season"... "In 1990 and beyond, the anticipated increases in harvesting and processing capacity make it even less likely that a ban on roe-stripping would be sufficient to assure that the total Gulf of Alaska TAC is not taken by the end of the roe fishery"... "In the GOA where the harvesting and processing capacity of the factory/trawler and mothership fleet during the roe season greatly exceeds the pollock TAC, a ban on roe-stripping would be expected to increase the amount of pollock that is delivered to shoreside plants for processing during the roe season, but not later in the year [emphasis added]. It would not provide shoreside plants with as much pollock as they expected to have in 1989."

In the BSAI, the analysis predicts that, "... a decrease in pollock catch for at-sea processing during the roe season will not necessarily lead to an increase in catch for shoreside plants later in the year." Thus the ban on stripping does not resolve the preemption problem.

In consideration of the proposal to establish "seasonal allocations", (whether "roe/non-roe or quarterly releases of quota) the Amendment 19/14 analysis suggests that, "... the advantage to shoreside plants of seasonal allowances is expected to decrease (from 1989 levels) as domestic harvesting and processing capacity continue to grow relative to the pollock TACs in the GOA and BSAI." The threat of sectoral preemption is not resolved by these seasonal allocation schemes, so long as entry, whether inshore or offshore; harvesting or processing, is unconstrained.

The same conclusion obtained from the Amendment 19/14 analysis must be drawn with respect to the provisions of Alternative 5.

As described above, a ban on roe-stripping, split roe and non-roe seasons, and GOA pollock area districting, constitute the effective "regulatory status quo" in the present pollock fisheries of the Gulf and Bering Sea (as distinguished from the "base year status quo" employed in this EA/RIR). Despite the fact that, at a minimum, three of the four the key regulatory provisions in Alternative 5 have been employed in the management of these pollock fisheries during the 1991 season, acute concern about "preemption of one industry sector by another" remains.

Evidence of this can be found in the 1991 proposed Emergency Rule to delay the opening of the second quarter GOA pollock fishery until June 1, 1991. Ostensibly this emergency action is necessary to prevent idled offshore capacity in the Bering Sea groundfish trawl fisheries from moving into the Gulf to compete for the GOA second quarter pollock quota (and any remaining balance carried over from the first quarter), scheduled for release April 1. Gulf of Alaska inshore interests appealed to the Council and Secretary for emergency regulatory relief on the grounds of competitive preemption.

Whether or not the emergency action is ultimately undertaken, and competitive relief granted to the inshore sector in the Gulf of Alaska, the perceived need for such emergency action in the 1991 pollock fishery demonstrates that the management provisions contained in Alternative 5 do not provide an effective regulatory solution to the Council's identified inshore/offshore problem of excess capacity and sectoral preemption. Ongoing refinement or micro management of the regulation would likely be required. That is, adoption of Alternative 5 would not meet the objectives, set out by the Council, for the Inshore/Offshore Allocation Amendment.

In addition, Alternative 5 apparently fails to meet the administrative requirements of the National Standards. National Standard 7, in particular, requires that, "Conservation and management measures shall, ... avoid unnecessary duplication." As documented above, the principal regulatory provisions of Alternative 5 are already incorporated within existing FMP amendments, making adoption of this alternative in the proposed Inshore-Offshore Amendment unnecessarily duplicative. (Source: MFCMA, as amended.)

3.3.6 Alternative 6: **"The allocation of pollock and Pacific Cod will be at the vessel level, categorized by vessels that catch and process aboard, and vessels that catch and deliver either at sea or to shoreside processors. A reserve is set aside with first priority for catchers that deliver shoreside."**

The practical effect of this proposal is to allocate the fishery resources to catcher vessels, with a clear distinction between vessels that catch and process on board, and catcher vessels that do not process on board. Further, portions of the allocation are reserved for vessels that deliver shoreside. Indirectly, this addresses the allocation between inshore and offshore components of the industry, with established allocations to both segments, as well as a portion that might be delivered to either.

A specific allocation scheme was prescribed for this alternative as follows. For the BSAI, 30 percent of the pollock TAC would be allocated to vessels that catch and process, and 70 percent allocated to vessel that catch and do not process, of which 60 percent shall be reserved with first priority to vessels delivering shoreside. For the GOA, 100 percent of the pollock and Pacific cod TAC would be allocated to vessels that catch and do not process, all of which shall be reserved with first priority to vessel delivering shoreside. Vessel that catch and process would receive a zero percent allocation of pollock and Pacific cod in the Gulf.

The inferred inshore/offshore shares can be deduced from the above specifications. For the BSAI, 30 percent is available to offshore catcher-processors, and 46 percent (60 percent of 70 percent) is reserved for delivery shoreside. The balance--28 percent--is available to either inshore or offshore processors, although the allocation is to catcher vessels who do not process on board. Thus, motherships, factory trawlers, or inshore processors could vie for the remaining 28 percent with the ultimate allocation determined presumably by market forces.

Figure 3.9 illustrates representative shares available to inshore and offshore segments under different scenarios. For comparison, the historical inshore/offshore shares of the BSAI DAP pollock TAC are also shown. The basic Alternative 6 is depicted with specified inshore and offshore shares, as well as the 28 percent portion that might go either way. If all of this 28 percent were to be delivered inshore, the resulting shares would look like option 6.1 in Figure 3.9. Conversely, if the unspecified 28 percent went to offshore processors, the shares resemble 6.3. For purposes of discussion, an assumed 80/20 percent split of the unspecified 28 percent between inshore and offshore, respectively, was simulated in option 6.2. It should be emphasized that this alternative does not prescribe any given split of the unspecified 28 percent; only that the harvest rights are assigned to the broad category of harvest vessels that catch and do no process on board. The pie diagram in Figure 3.9 shows a possible distribution of processing shares under option 6.2.

While there is some uncertainty regarding the resulting allocations inshore and offshore for BSAI pollock, the allocation is the GOA are clear; all of the TAC's for the affected fisheries go to catch-only vessels, and 100 percent of this catch is reserved for vessels delivering inshore. Thus, the offshore processor segment would be excluded from the Gulf of Alaska for pollock and Pacific cod.

To the extent that the resulting processing activity represented by an allocation such as 6.2 can be categorized as accruing to inshore and offshore components, the economic impacts of such an allocation can be modeled using the same procedure employed in Alternative 3. The impacts of option 6.2 assumed for this alternative were estimated based on the input-output model, and compared to the actual 1989 performance of the industry. These results are compiled in Table 3.12, tabulated by location, level of impacts, and category of impact. The interpretation and caveats applied to Table 3.6 regarding Alternative 3 apply to Table 3.12, as well. There is only one option (6.2, described above) simulated under Alternative 6, although numerous other allocations are feasible. For reference, the economic impacts under option 6.2 are nearly identical to those under Alternative 3.2 in the BSAI. For the GOA, option 6.2 is comparable to Alternative 3.3 although providing greater benefits inshore--and losses offshore--due to the exclusion of offshore processors from the Pacific cod TAC.

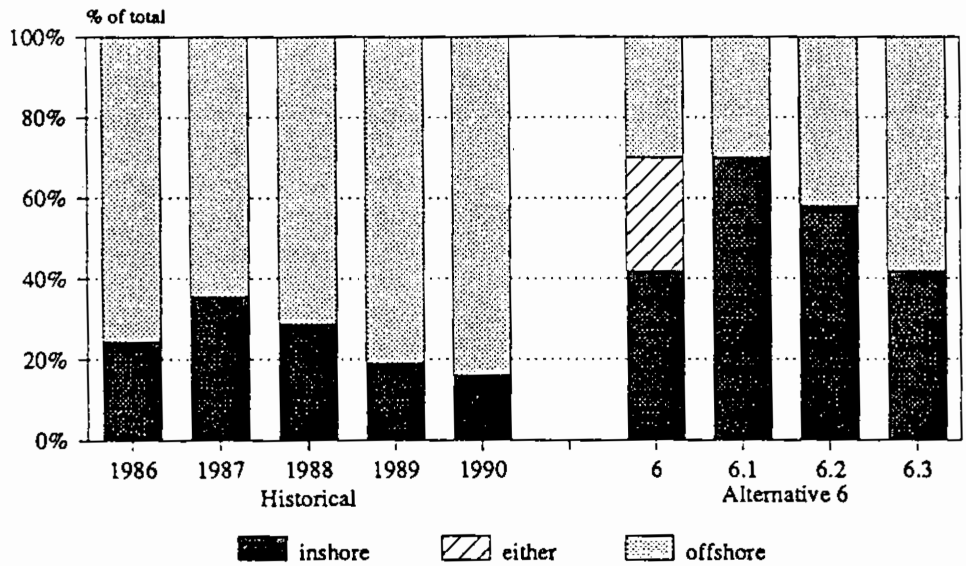
The gains and losses projected for the Gulf of Alaska under the modeled version of Alternative 6 are portrayed in Figure 3.10a. Significant increases in direct income accrue to the Kodiak inshore segment, with corresponding, though somewhat smaller losses absorbed in the Pacific northwest. The estimated impacts to the Western Gulf inshore processing locations are positive, though minor, reflecting the increase in Pacific cod available from the displaced offshore processors' shares.

Employment impacts in the GOA illustrate, again, the apparent trade off between gains in local Alaska incomes and employment losses in Seattle and the Pacific northwest. The proportional losses in PNW employment are greater than the apparent gains in Kodiak, while the gains in Kodiak direct income are proportionately larger than the decline in the PNW.

The projected economic impacts for the BSAI under option 6.2 in Figure 3.10b are nearly identical to those estimated for option 3.2 in Alternative 3 (see Figure 3.6b). The offshore component of the Dutch Harbor local economy experiences most of the declines in direct income, offset by gains to the local Alaska inshore ports. The apparent net effect in the PNW reflects the importance of Seattle and other PNW locations to both the inshore and offshore components of the groundfish industry. That is, gains to the inshore interests located in the PNW are nearly identical to the losses incurred by the offshore segment. The adverse employment impacts are much more dramatic for the PNW than direct income.

Figure 3.9 Alternative 6 BSAI Pollock

Historical Trends and Possible Shares



BSAI Pollock Allocations Modeled under
Alternative 6.2 Assumptions

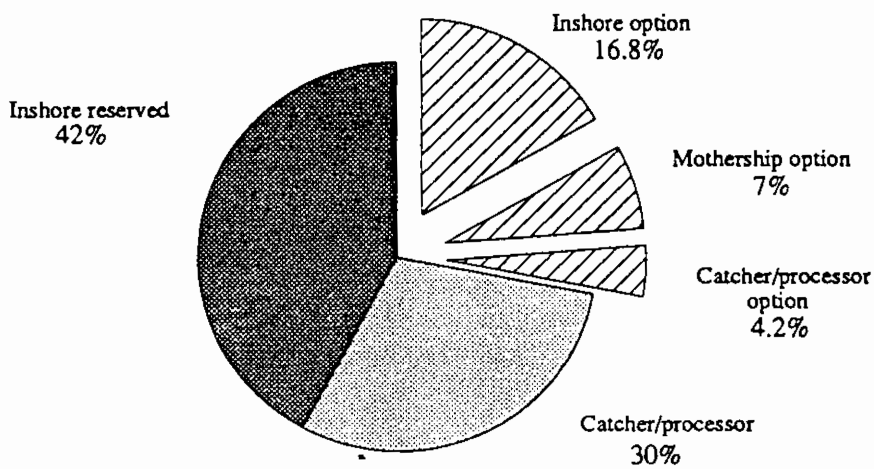


Table 3.12 Estimated Economic Impacts of Alternative 6

1(a). KODIAK INSHORE	1989 BASE	ALTERNATIVE 6	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS				
INCOME ($)	$38,968,151	$45,821,191	$6,853,040	17.59%
TOTAL COMMUNITY ($)	$61,992,702	$71,689,183	$9,696,481	15.64%
EMPLOYMENT (FTE)	2,216	2,563	347	15.64%
INSTATE IMPACTS				
INCOME ($)	$6,226,943	$7,135,791	$908,848	14.60%
TOTAL COMMUNITY ($)	$16,863,469	$18,788,552	$1,925,083	11.42%
EMPLOYMENT (FTE)	573	639	65	11.42%
OUTSIDE IMPACTS				
INCOME ($)	$7,874,284	$9,357,597	$1,483,313	18.84%
TOTAL COMMUNITY ($)	$27,806,446	$31,855,259	$4,048,813	14.56%
EMPLOYMENT (FTE)	1,307	1,497	190	14.56%
TOTAL U.S. IMPACTS				
INCOME ($)	$53,069,378	$62,314,579	$9,245,201	17.42%
TOTAL COMMUNITY ($)	$219,642,834	$253,461,597	$33,818,763	15.40%
EMPLOYMENT (FTE)	9,066	10,462	1,396	15.40%
1(b). KODIAK OFFSHORE				
LOCAL IMPACTS				
INCOME ($)	$973,451	$605,323	($368,128)	-37.82%
TOTAL COMMUNITY ($)	$2,394,941	$1,494,544	($900,397)	-37.60%
EMPLOYMENT (FTE)	86	53	(32)	-37.60%
INSTATE IMPACTS				
INCOME ($)	$1,009,014	$568,534	($440,480)	-43.65%
TOTAL COMMUNITY ($)	$3,413,537	$2,005,013	($1,408,524)	-41.26%
EMPLOYMENT (FTE)	116	68	(48)	-41.26%
OUTSIDE IMPACTS				
INCOME ($)	$12,738,482	$7,335,428	($5,403,054)	-42.42%
TOTAL COMMUNITY ($)	$43,736,859	$27,008,302	($16,728,557)	-38.25%
EMPLOYMENT (FTE)	2,055	1,269	(786)	-38.25%
TOTAL U.S. IMPACTS				
INCOME ($)	$14,720,947	$8,509,285	($6,211,662)	-42.20%
TOTAL COMMUNITY ($)	$85,524,296	$50,438,104	($35,086,192)	-41.02%
EMPLOYMENT (FTE)	3,530	2,082	(1,448)	-41.02%
1(c). TOTAL KODIAK				
LOCAL IMPACTS				
INCOME ($)	$39,941,602	$46,426,514	$6,484,912	16.24%
TOTAL COMMUNITY ($)	$64,387,643	$73,183,727	$8,796,084	13.66%
EMPLOYMENT (FTE)	2,302	2,616	314	13.66%
INSTATE IMPACTS				
INCOME ($)	$7,235,957	$7,704,325	$468,368	6.47%
TOTAL COMMUNITY ($)	$20,277,006	$20,793,565	$516,559	2.55%
EMPLOYMENT (FTE)	689	707	18	2.55%
OUTSIDE IMPACTS				
INCOME ($)	$20,612,766	$16,693,025	($3,919,741)	-19.02%
TOTAL COMMUNITY ($)	$71,543,305	$58,863,561	($12,679,744)	-17.72%
EMPLOYMENT (FTE)	3,362	2,766	(596)	-17.72%
TOTAL U.S. IMPACTS				
INCOME ($)	$67,790,325	$70,823,864	$3,033,539	4.47%
TOTAL COMMUNITY ($)	$305,167,130	$303,899,701	($1,267,429)	-0.42%
EMPLOYMENT (FTE)	12,597	12,544	(52)	-0.42%

Table 3.12 Estimated Economic Impacts of Alternative 6 (continued)

2(a). DUTCH HARBOR INSHORE	1989 BASE	ALTERNATIVE 6	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS				
INCOME ($)	$8,239,085	$19,819,045	$11,579,960	140.55%
TOTAL COMMUNITY ($)	$13,720,056	$29,863,131	$16,143,075	117.66%
EMPLOYMENT (FTE)	548	1,194	645	117.66%
INSTATE IMPACTS				
INCOME ($)	$8,024,629	$16,782,615	$8,757,986	109.14%
TOTAL COMMUNITY ($)	$16,183,143	$31,862,215	$15,679,072	96.89%
EMPLOYMENT (FTE)	550	1,083	533	96.89%
OUTSIDE IMPACTS				
INCOME ($)	$33,712,951	$72,578,444	$38,865,493	115.28%
TOTAL COMMUNITY ($)	$92,123,302	$182,916,671	$90,793,369	98.56%
EMPLOYMENT (FTE)	4,329	8,595	4,266	98.56%
TOTAL U.S. IMPACTS				
INCOME ($)	$49,976,665	$109,180,104	$59,203,439	118.46%
TOTAL COMMUNITY ($)	$220,242,512	$443,925,796	$223,683,284	101.56%
EMPLOYMENT (FTE)	9,091	18,324	9,233	101.56%
2(b). DUTCH HARBOR OFFSHORE				
LOCAL IMPACTS				
INCOME ($)	$7,413,045	$3,469,019	($3,944,026)	-53.20%
TOTAL COMMUNITY ($)	$15,291,139	$8,793,279	($6,497,860)	-42.49%
EMPLOYMENT (FTE)	611	351	(260)	-42.49%
INSTATE IMPACTS				
INCOME ($)	$9,195,674	$4,104,830	($5,090,844)	-55.36%
TOTAL COMMUNITY ($)	$31,823,629	$19,545,951	($12,277,678)	-38.58%
EMPLOYMENT (FTE)	1,082	664	(417)	-38.58%
OUTSIDE IMPACTS				
INCOME ($)	$111,522,601	$57,360,112	($54,162,489)	-48.57%
TOTAL COMMUNITY ($)	$372,942,152	229,819,712	($143,122,440)	-38.38%
EMPLOYMENT (FTE)	17,523	10,798	(6,725)	-38.38%
TOTAL U.S. IMPACTS				
INCOME ($)	$128,131,321	$64,933,961	($63,197,360)	-49.32%
TOTAL COMMUNITY ($)	$727,751,592	$452,342,397	($275,409,195)	-37.84%
EMPLOYMENT (FTE)	30,040	18,672	(11,368)	-37.84%
2(c). TOTAL DUTCH HARBOR/UNALASKA				
LOCAL IMPACTS				
INCOME ($)	$15,652,130	$23,288,064	$7,635,934	48.79%
TOTAL COMMUNITY ($)	$29,011,195	$38,656,410	$9,645,215	33.25%
EMPLOYMENT (FTE)	1,160	1,545	386	33.25%
INSTATE IMPACTS				
INCOME ($)	$17,220,303	$20,887,445	$3,667,142	21.30%
TOTAL COMMUNITY ($)	$48,006,772	$51,408,166	$3,401,394	7.09%
EMPLOYMENT (FTE)	1,632	1,747	116	7.09%
OUTSIDE IMPACTS				
INCOME ($)	$145,235,552	$129,938,556	($15,296,996)	-10.53%
TOTAL COMMUNITY ($)	$465,065,454	$412,736,383	($52,329,071)	-11.25%
EMPLOYMENT (FTE)	21,852	19,393	(2,459)	-11.25%
TOTAL U.S. IMPACTS				
INCOME ($)	$178,107,986	$174,114,065	($3,993,921)	-2.24%
TOTAL COMMUNITY ($)	$947,994,104	$896,268,193	($51,725,911)	-5.46%
EMPLOYMENT (FTE)	39,131	36,996	(2,135)	-5.46%

Table 3.12 Estimated Economic Impacts of Alternative 6 (continued)

3. TOTAL SAND POINT	1989 BASE	ALTERNATIVE 6	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS				
INCOME ($)	$5,718,896	$5,903,024	$184,128	3.22%
TOTAL COMMUNITY ($)	$7,221,446	$7,450,604	$229,158	3.17%
EMPLOYMENT (FTE)	307	317	10	3.17%
INSTATE IMPACTS				
INCOME ($)	$1,190,459	$1,265,529	$75,070	6.31%
TOTAL COMMUNITY ($)	$2,629,956	$2,765,217	$135,261	5.14%
EMPLOYMENT (FTE)	89	94	5	5.14%
OUTSIDE IMPACTS				
INCOME ($)	$4,931,389	$5,308,568	$377,179	7.65%
TOTAL COMMUNITY ($)	$14,147,139	$15,002,491	$855,352	6.05%
EMPLOYMENT (FTE)	665	705	40	6.05%
TOTAL U.S. IMPACTS				
INCOME ($)	$11,840,745	$12,477,121	$636,376	5.37%
TOTAL COMMUNITY ($)	$44,039,476	$46,149,065	$2,109,589	4.79%
EMPLOYMENT (FTE)	1,818	1,905	87	4.79%
4. TOTAL AKUTAN				
LOCAL IMPACTS				
INCOME ($)	$1,006,475	$2,507,864	$1,501,389	149.17%
TOTAL COMMUNITY ($)	$1,429,045	$3,324,105	$1,895,060	132.61%
EMPLOYMENT (FTE)	61	141	81	132.61%
INSTATE IMPACTS				
INCOME ($)	$2,830,762	$6,204,860	$3,374,098	119.19%
TOTAL COMMUNITY ($)	$6,516,850	$13,491,621	$6,974,771	107.03%
EMPLOYMENT (FTE)	221	459	237	107.03%
OUTSIDE IMPACTS				
INCOME ($)	$10,865,093	$26,064,510	$15,199,417	139.89%
TOTAL COMMUNITY ($)	$28,350,404	$61,401,210	$33,050,806	116.58%
EMPLOYMENT (FTE)	1,332	2,885	1,553	116.58%
TOTAL U.S. IMPACTS				
INCOME ($)	$14,702,330	$34,777,234	$20,074,904	136.54%
TOTAL COMMUNITY ($)	$59,156,133	$127,569,327	$68,413,194	115.65%
EMPLOYMENT (FTE)	2,442	5,266	2,824	115.65%
5. TOTAL KING COVE/CHIGNIK				
LOCAL IMPACTS				
INCOME ($)	$4,636,062	$4,803,293	$167,231	3.61%
TOTAL COMMUNITY ($)	$5,833,028	$6,039,451	$206,423	3.54%
EMPLOYMENT (FTE)	248	257	9	3.54%
INSTATE IMPACTS				
INCOME ($)	$1,009,705	$1,078,688	$68,983	6.83%
TOTAL COMMUNITY ($)	$2,478,562	$2,606,452	$127,890	5.16%
EMPLOYMENT (FTE)	84	89	4	5.16%
OUTSIDE IMPACTS				
INCOME ($)	$3,126,721	$3,364,788	$238,067	7.61%
TOTAL COMMUNITY ($)	$10,087,604	$10,643,954	$556,350	5.52%
EMPLOYMENT (FTE)	474	500	26	5.52%
TOTAL U.S. IMPACTS				
INCOME ($)	$8,772,488	$9,246,769	$474,281	5.41%
TOTAL COMMUNITY ($)	$34,810,021	$36,434,492	$1,624,471	4.67%
EMPLOYMENT (FTE)	1,437	1,504	67	4.67%

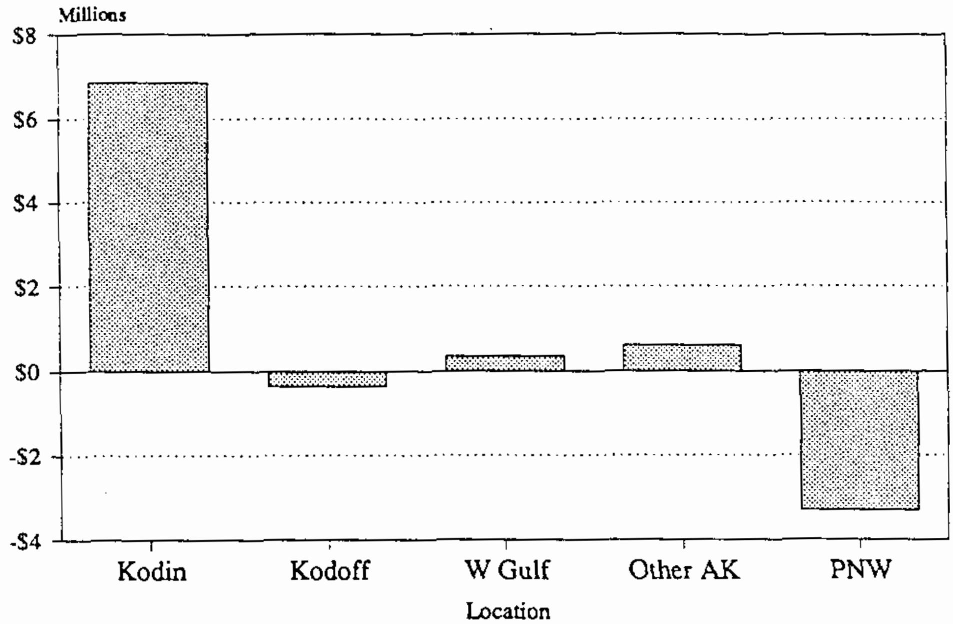
Table 3.12 Estimated Economic Impacts of Alternative 6 (continued)

6. TOTAL GULF OF ALASKA ACTIVITY	BASE	ALTERNATIVE 6	UNIT CHANGE FROM BASE	% CHANGE FROM BASE
LOCAL IMPACTS				
INCOME ($)	$50,296,560	$57,132,831	$6,836,271	13.59%
TOTAL COMMUNITY ($)	$77,442,117	$86,673,782	$9,231,665	11.92%
EMPLOYMENT (FTE)	2,857	3,190	333	11.65%
INSTATE IMPACTS				
INCOME ($)	$9,436,121	$10,048,542	$612,421	6.49%
TOTAL COMMUNITY ($)	$25,385,524	$26,165,234	$779,710	3.07%
EMPLOYMENT (FTE)	863	889	26	3.07%
OUTSIDE IMPACTS				
INCOME ($)	$28,670,876	$25,366,381	($3,304,495)	-11.53%
TOTAL COMMUNITY ($)	$95,778,048	$84,510,006	($11,268,042)	-11.76%
EMPLOYMENT (FTE)	4,500	3,971	(529)	-11.76%
TOTAL U.S. IMPACTS				
INCOME ($)	$88,403,558	$92,547,754	$4,144,196	4.69%
TOTAL COMMUNITY ($)	$384,016,627	$386,483,258	$2,466,631	0.64%
EMPLOYMENT (FTE)	15,851	15,953	102	0.64%
7. TOTAL BERING SEA ACTIVITY				
LOCAL IMPACTS				
INCOME ($)	$16,658,605	$25,795,928	$9,137,323	54.85%
TOTAL COMMUNITY ($)	$30,440,240	$41,980,515	$11,540,275	37.91%
EMPLOYMENT (FTE)	1,220	1,686	466	38.20%
INSTATE IMPACTS				
INCOME ($)	$20,051,065	$27,092,305	$7,041,240	35.12%
TOTAL COMMUNITY ($)	$54,523,622	$64,899,787	$10,376,165	19.03%
EMPLOYMENT (FTE)	1,853	2,206	353	19.03%
OUTSIDE IMPACTS				
INCOME ($)	$156,100,645	$156,003,066	($97,579)	-0.06%
TOTAL COMMUNITY ($)	$493,415,858	$474,137,593	($19,278,265)	-3.91%
EMPLOYMENT (FTE)	23,184	22,278	(906)	-3.91%
TOTAL U.S. IMPACTS				
INCOME ($)	$192,810,316	$208,891,299	$16,080,983	8.34%
TOTAL COMMUNITY ($)	$1,007,150,237	$1,023,837,520	$16,687,283	1.66%
EMPLOYMENT (FTE)	41,573	42,262	689	1.66%
8. TOTAL IMPACTS; ALL PORTS COMBINED				
LOCAL IMPACTS				
INCOME ($)	$66,955,165	$82,928,759	$15,973,594	23.86%
TOTAL COMMUNITY ($)	$107,882,357	$128,654,297	$20,771,940	19.25%
EMPLOYMENT (FTE)	4,077	4,877	799	19.60%
INSTATE IMPACTS				
INCOME ($)	$29,487,186	$37,140,847	$7,653,661	25.96%
TOTAL COMMUNITY ($)	$79,909,146	$91,065,021	$11,155,875	13.96%
EMPLOYMENT (FTE)	2,716	3,095	379	13.96%
OUTSIDE IMPACTS				
INCOME ($)	$184,771,521	$181,369,447	($3,402,074)	-1.84%
TOTAL COMMUNITY ($)	$589,193,906	$558,647,599	($30,546,307)	-5.18%
EMPLOYMENT (FTE)	27,684	26,249	(1,435)	-5.18%
TOTAL U.S. IMPACTS				
INCOME ($)	$281,213,874	$301,439,053	$20,225,179	7.19%
TOTAL COMMUNITY ($)	$1,391,166,864	$1,410,320,778	$19,153,914	1.38%
EMPLOYMENT (FTE)	57,425	58,215	791	1.38%

Table 3.12 Estimated Economic Impacts of Alternative 6 (continued)

Figure 3.10a Alternative 6 Impacts; GOA

Changes in Direct Income



Changes in Total FTE Employment

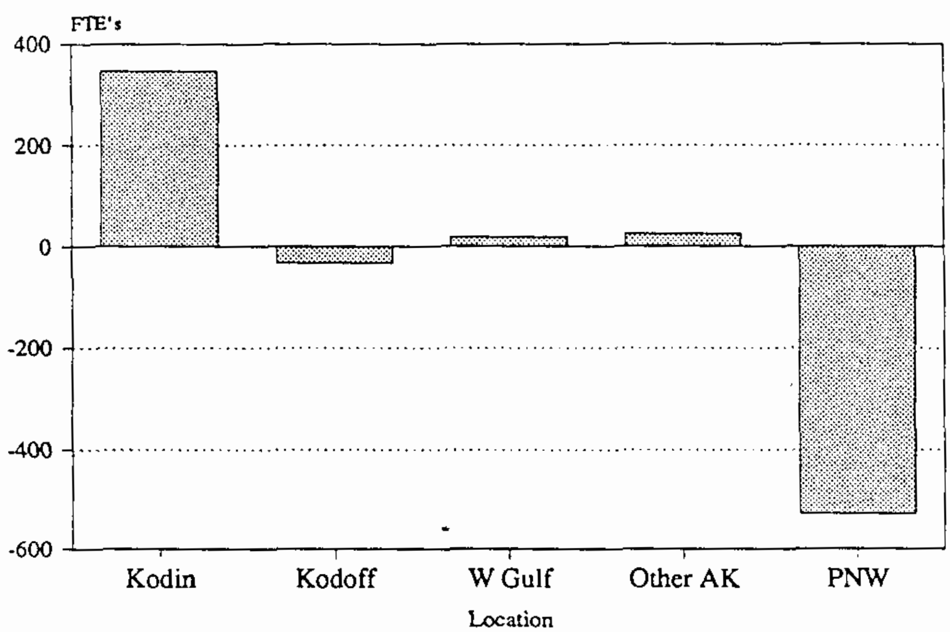
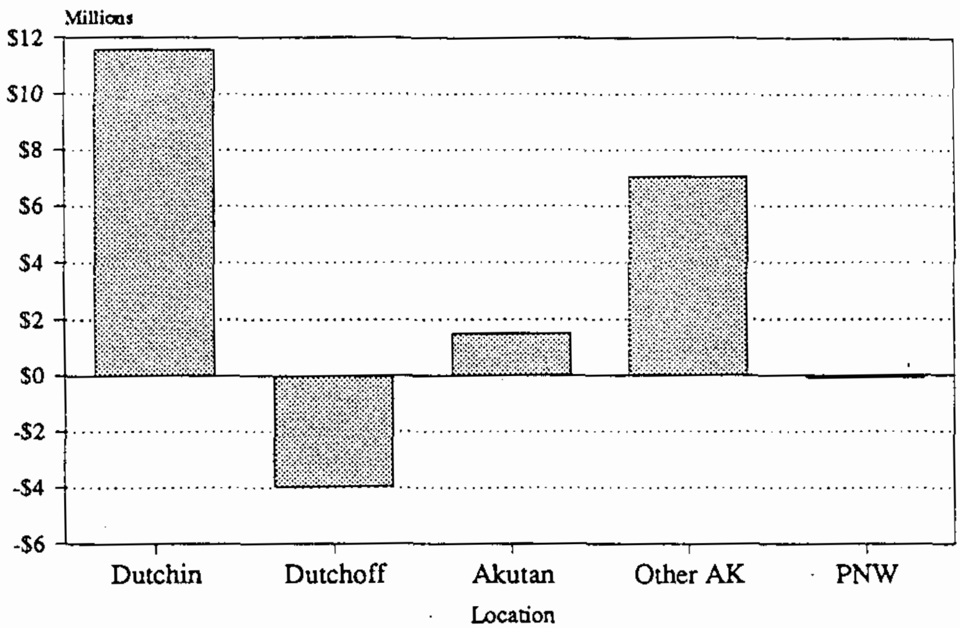


Figure 3.10b Alternative 6 Impacts; BSAI

Changes in Dirct Income



Changes in Total FTE Employment

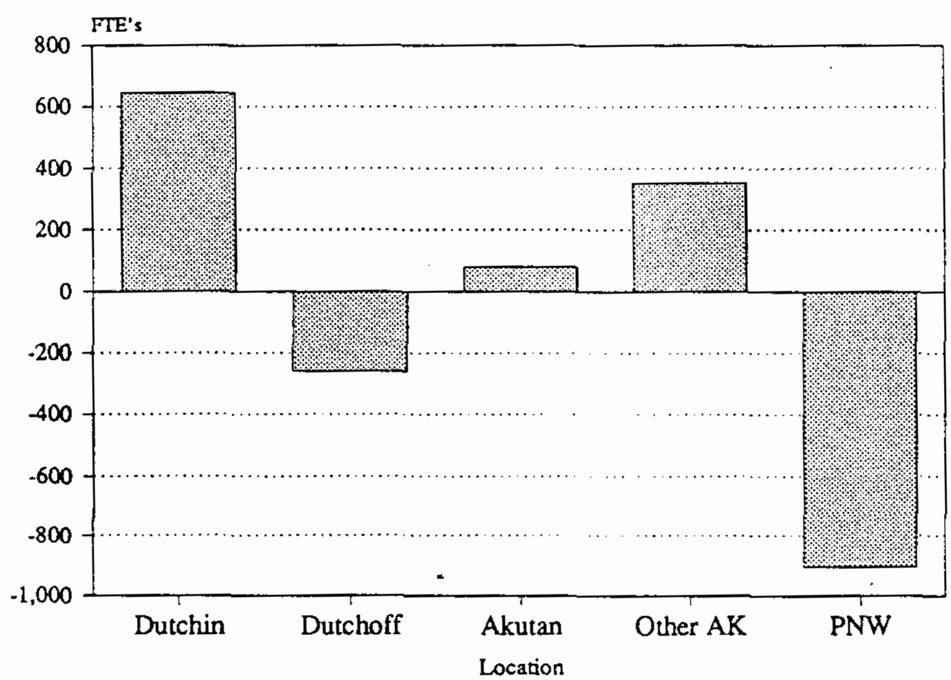
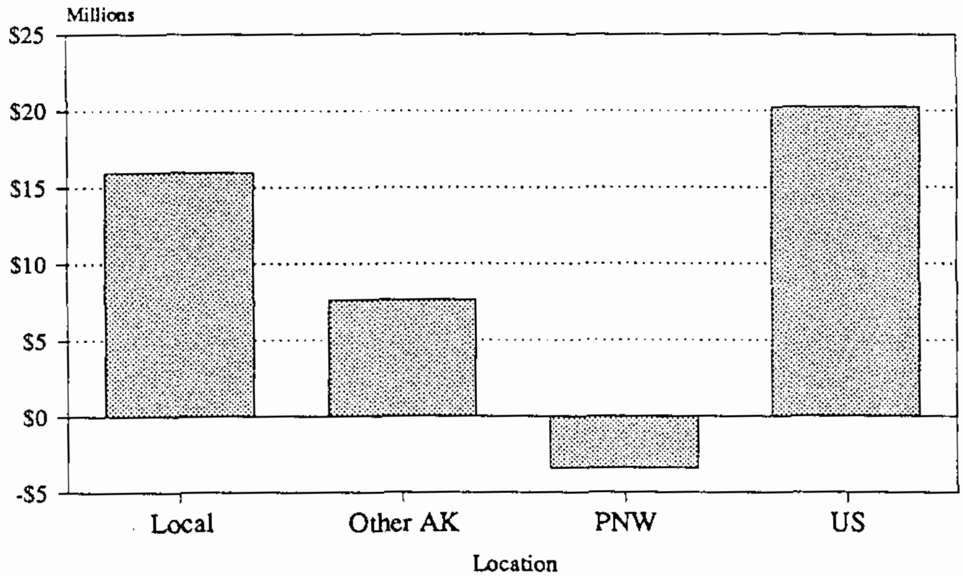
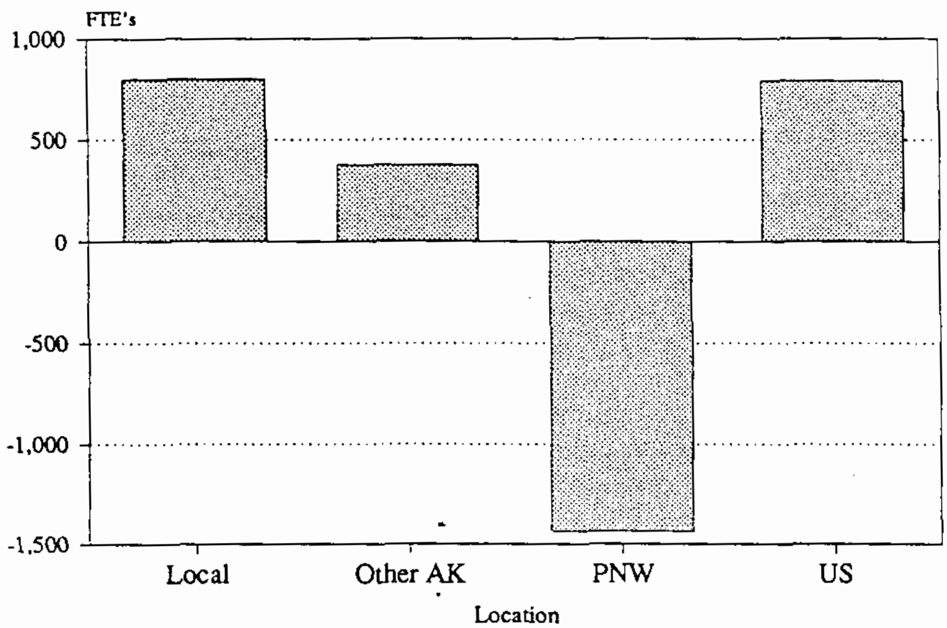


Figure 3.10c Alternative 6 Impacts; Combined GOA and BSAI

Changes in Direct Income



Changes in Total FTE Employment



Combining the economic impacts of both the BSAI and GOA reinforces earlier observations concerning the trade off occurring between direct income gains for local Alaska ports and employment losses incurred by the PNW (Figure 3.10c). The aggregated net national impacts suggest a modest gains in income and employment under this proposed alternatives, but these results must be carefully qualified by the previously discussed weakness of the input-output model in projecting national impacts when allocations vary significantly from the base case. Moreover, the sensitivity of the net national results to minor changes in underlying variables casts the conclusiveness of the aggregated impacts in doubt.

This version of Alternative 6 produces economic impacts somewhere in between the extremes possible given apportionments of the unspecified 28 percent of the BSAI pollock TAC. If the offshore sector were to capture a higher proportion of the unspecified 28 percent allocated to catch-only vessels, the adverse economic impacts to this segment might be lessened. Such a conclusion would also depend upon the resulting exvessel price negotiated with catcher vessels, and the process-only costs incurred by catcher processors. The results presented here are intended as references against which other scenarios can be considered.

3.3.6.1 Effectiveness of Alternative 6 in Resolving the Preemption Problem

Like Alternative 3, Alternative 6 prescribes designated share allocations to the inshore and offshore components of the industry as a means of alleviating preemption. In addition, Alternative 6 makes the allocation directly to harvest vessels, with the conditional requirement that deliveries be made to inshore, offshore, or either sectors. The specific allocations analyzed resulted in economic impacts comparable to Alternative 3.2 in the BSAI, and 3.3 in the GOA. These allocations provide a clearly preferential apportionment of the pollock and Pacific cod resources to the inshore component, and would be expected to afford significant relief from offshore preemption of shore-based processors. Notwithstanding, offshore operations stand to lose economically from such allocations, and the benefits gained through controlling preemption need to be weighed against such costs.

Alternative 6 excludes all offshore processors from the pollock and Pacific cod fisheries in the GOA, and this may penalize local fleet Alaskan catcher-processors who are associated with the inshore economies. Such vessels are linked economically to both the inshore and offshore sectors, and their status in the inshore/offshore allocation problem is not clear. As with Alternative 3, these allocations may offer some relief for inshore processors from the threat of preemption by the offshore component. However, there are no explicit provisions to manage intrasectoral preemption by other inshore operations.

This alternative is essentially a variation of TAC allocation percentages between inshore and offshore components of the industry, with the exception of that unassigned portion of the harvest-only vessel share of BSAI pollock. In this regard, the percentage allocation to inshore processors appears to be high relative to historical use, especially in the BSAI. Moreover, entirely prohibiting offshore operations from targeting pollock and Pacific cod in the GOA may go beyond the bounds of the perceived preemption problem.

In aggregate, Alternative 6 offers a procedural approach to manage preemption directly through set allocations, but the resource shares in this proposal may unduly restrict harvest and processing operations by the offshore sector. The Council elected to reject this alternative in favor a more balanced allocation scheme.

3.3.7 Alternative 7: **"Ten percent of the shoreside allocation available in the Bering Sea would be available to be delivered to shorebased plants north of 56 N and west of 164 W."**

Under any allocation scheme, the proposed amendment calls for the analysis of a provision for community development. Alternative 7 establishes a specific allocation available to shorebased plants in the portion of the Bering Sea largely encompassing communities not presently active in the commercial processing of pollock. Geographically, the designated area includes the Pribilof Islands and Nunivak Island, as well as many other rural Alaska communities along the Bering Sea in Western Alaska.

St. Paul, Pribilof Islands, was identified as one of the test port locations for the purpose of analyzing the community development consequences of the proposed alternatives. As reported in the community profiles of the social impact assessment, St. Paul has initiated several economic ventures designed to capture the economic benefits associated with the Bering Sea fishery resources. In 1989, the base reference year for the allocation schemes proposed in Alternative 3, there was no reported groundfish processing activity in St. Paul, although 2,700 tons of Pacific cod were processed in 1990. The community and other investors have begun work on a large scale surimi processing facility, but it is not operational, and its future is uncertain. A major roadblock to completion or further development of the processing capabilities in St. Paul is the uncertainty surrounding the future availability of pollock resources to any processing industry that may develop in that community.

Alternative 7 provides the framework for a preferential allocation to communities such as St. Paul, recognizing that the proposal is cast in terms of what might happen, rather than what presently exists. Given the irregular success of groundfish processing in St. Paul, direct comparisons of the economic impacts with the other BSAI and GOA ports is inappropriate for purposes of this analysis. As a result, a separate examination of the economic consequences of groundfish processing in St. Paul was undertaken, using the same methodology employed for Alternative 3. A representative pollock surimi processing facility, based on comparable plants in the BSAI was simulated for St. Paul, receiving 10 percent of the proposed BSAI inshore pollock allocations under Alternative 3. In addition, a projected volume of crab, Pacific cod, and halibut was included in plant processing volume, similar to the species mix reported for other BSAI inshore processing plants.

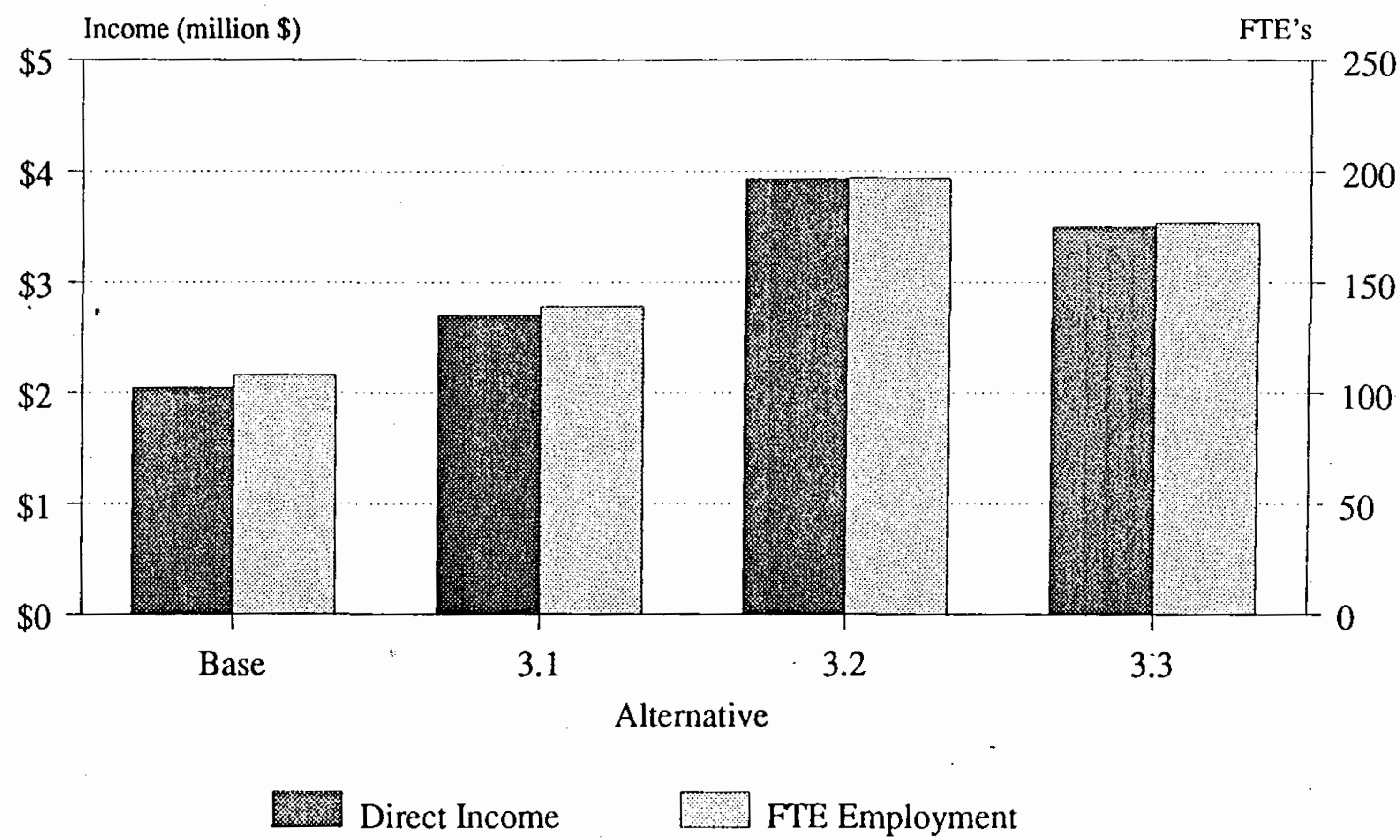
The estimated economic impacts of Alternative 7 given the assumptions noted above are displayed in Figure 3.11. In this case, the impacts are illustrated for the local St. Paul economy only, in the context of possible community development impacts. Increases in direct income arising from wages, salaries and returns to owners are measured on the left hand axis, and employment impacts relate to the right hand axis. The proportional effects are very similar for both local direct income and local employment. Direct income in the local economy is projected to increase to between $2 and $4 million, and full time equivalent employment from 100 to 200 FTE's. The magnitude of these effects is related to the underlying BSAI inshore allocation, described in Table 3.4 (Section 3.3.3).

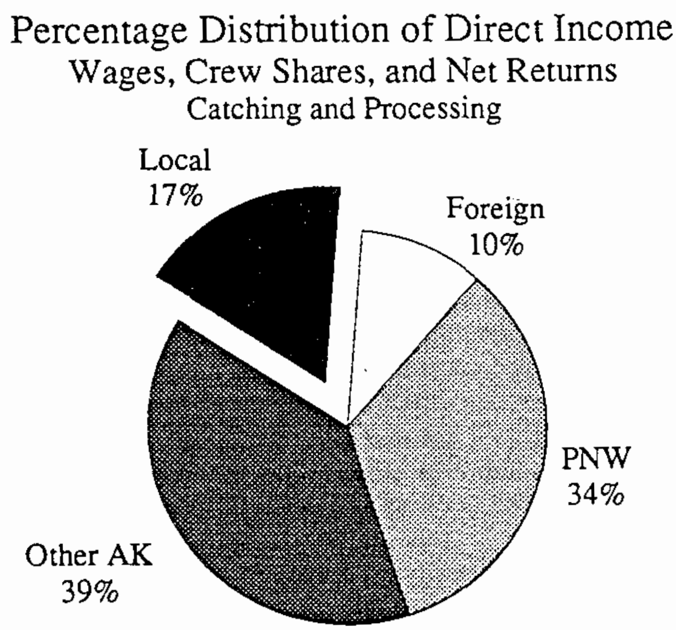
The total economic impacts are much greater than those that accrue just in St. Paul. The relative proportion of the total impacts is illustrated in Figure 3.12, which depicts the estimated percentage distribution of direct income and employment for catching and processing activity in St. Paul. The distributions noted in Figure 3.12 are somewhat speculative, based on reasonable assumptions about the nature of investment, labor, and services that would be available for a facility of this magnitude.

The St. Paul local port economy will derive economic benefits from preferential allocation of BSAI pollock as allowed under Alternative 7. The degree to which the simulated economic benefits noted in Figure 3.11 can be achieved or expanded will depend upon the extent to which the direct income and respending can be captured by the local economy. This, in turn, will be influenced by the investment base, labor force, and infrastructure of the village. A dedicated allocation of pollock to a community such as St. Paul will create processing activity in this location, but the magnitude and distribution of the resulting economic impacts in the local economy are less certain.

Figure 3.11 Alternative 7; Simulated Economic Impacts on St. Paul

Local Direct Income and Employment





St Paul, Pribilof Islands

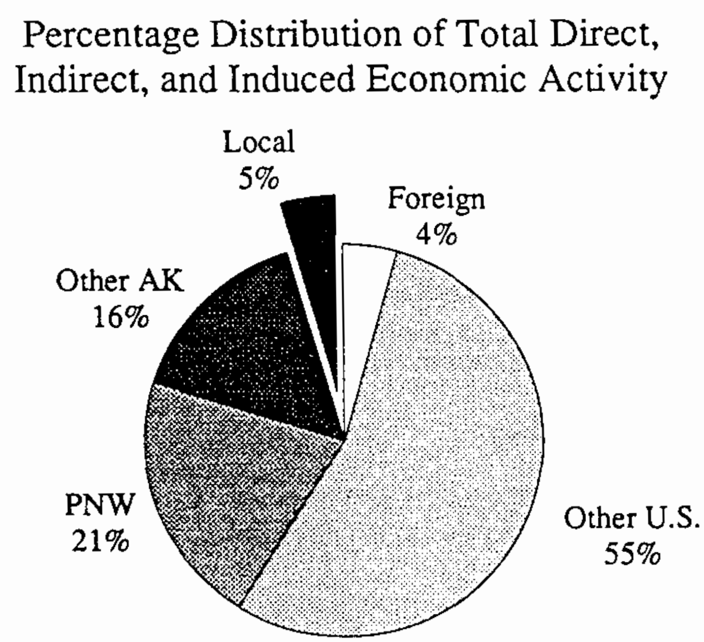


Figure 3.12 Distribution of Economic Impacts, St. Paul

3.3.7.1 Effectiveness of Alternative 7 in Resolving the Preemption Problem

Alternative 7 is not a comprehensive solution to the inshore/offshore allocation problem. Rather, this option is a suggested component of the solution, intended to rectify the specific allocation problems faced by remote communities in Western Alaska along the Bering Sea. By setting aside a prescribed portion of the BSAI pollock TAC for community development allocations, these local economies will have available fishery resources needed to attract groundfish catching and processing industry as a vehicle for economic growth. Lacking such a preferential allocation, such communities are likely to face continued preemption by the established groundfish industry, particularly given the overcapitalization that has characterized pollock catching and processing in Alaska.

The provisions of this proposal make the pollock resources available to communities in the designated area, but do not guarantee the associated catching and processing industry, nor can this proposal ensure economic development. To the extent that Alternative 7 makes a ten percent allocation available from the unspecified "shoreside allocation," this scheme is linked to a larger inshore/offshore apportionment plan. This ten percent has to come from the TAC, however, and the economic implications of the opportunity costs (benefits foregone) must be explicitly considered in this allocation.

3.3.8. Alternative 8: **Preferred Alternative "A Comprehensive Fishery Rationalization Program for the Groundfish and Crab Resources of the Gulf of Alaska and the Bering Sea and Aleutian Islands."**

The North Pacific Fishery Management Council developed a preferred alternative for the Proposed Inshore/Offshore Allocation Amendment 18/23 during their June 24-29, 1991 Council meeting in Anchorage. The preferred alternative was identified following consideration of the SEIS/RIR/RFA prepared for the proposed amendment, written and oral comment submitted by the public, as well as lengthy discussion by the Council, the Advisory Panel, and the Scientific and Statistical Committee.

The preferred alternative identified by the Council consists of five components, incorporating management features drawn from several of the seven options analyzed in the SEIS. The wording and provisions of Alternative 8 are listed in Section 1.3.8.

In scope, the preferred alternative prescribes set percentage inshore and offshore processing allocations for pollock in the BSAI, and pollock and Pacific cod in the GOA. These allocations reflect historical and anticipated fishery resource use by the inshore and offshore components, and address the problems and consequences of preemption of one sector by another. Key features of the preferred alternative developed in recognition of the pervasive conflicts that accompany this problem include:

1. A call for the expedited development of a moratorium program.

2. The establishment of unique allocations for the BSAI and GOA FMP's, carefully delineating terms, definitions, and rules applicable to the allocation scheme.

3. The designation of "small" catcher-processor vessels as components of the inshore segment for purposes of the resource allocation shares.

4. Specific percentage allocations between the inshore and offshore segments of the industry. Allocations are "phased-in" for the BSAI over a three year period in order to reduce the adverse impacts and allow for the anticipated growth in capacity for the shoreside processing facilities.

5. Designation of a Bering Sea Harvesting Vessel Operational Area, restricting the activities of catcher-processors in a specified area north of Dutch Harbor.

6. The creation of a Western Alaska Community Quota program, whereby up to 50 percent of the BSAI pollock reserve will be made available to qualifying communities for purposes of economic development.

7. The development of a comprehensive set of alternative procedures to manage the rationalization of all groundfish and crab fisheries under the BSAI and GOA FMPs, to commence immediately in recognition that the scheme and allocations designated under the preferred alternative are interim measures only that will expire December 31, 1995.

3.3.8.1 Discussion of Key Features

Moratorium. The SEIS cites the weakness of any of the original seven inshore/offshore alternatives to address the underlying problems of overcapitalization in the groundfish industry. The Council originally included consideration of a moratorium on new entrants as a part of the inshore/offshore amendment, but subsequently elected to pursue the moratorium issue as a separate matter. The crucial role of a moratorium in restricting further overcapitalization or preemption is recognized, and linked to the concerns of the inshore/offshore amendment proposal. Future Council action to implement a moratorium will enhance the ability of the inshore/offshore amendment to solve the preemption problem in the longer term.

Definitions and Rules. The preferred alternative prescribes set allocations of the pollock and Pacific cod resources. Clear interpretation of the intent of this management policy requires a corresponding set of definitions and rules governing the allocation. Fundamentally, these criteria are used to establish inshore and offshore status, and the terms under which pollock and Pacific cod can be processed by these two components. The preferred alternative draws upon the terminology contained in the SEIS, with some modifications adopted to resolve ambiguities, as noted below.

Designation of Small Catcher-Processors as "Inshore". Under Alternative 3 the SEIS originally categorized all fixed gear catcher-processors (freezer longliners and freezer pot boats) as belonging to the "inshore" component. Subsequent discussion of this issue and the impact on preemption problems focused Council concerns on vessel size and capacity, rather than gear type. As a result, all *small* catcher-processors (fixed gear and trawl) were included in the inshore definition. The criteria for qualifying as a small catcher-processor includes product equivalent of less than 18 metric tons round weight per day, and vessel length less than 125 feet.[28] Based on the vessel size categorizations established under Alternative 4, there were two trawl and ten fixed gear catcher-processors meeting this length criteria in 1989 (Table 3.9c & d). Combined, these 12 vessels accounted for roughly 1.3 percent of the GOA pollock TAC, and 4 percent of the Pacific cod TAC.

Inshore/Offshore Percentage Allocations. For the GOA, 100 percent of the pollock, and ninety percent of the Pacific cod TAC are allocated to harvesting vessels which deliver their catch to the inshore component. The offshore component is allocated ten percent of the Pacific Cod TAC. Trawl catcher-

[28]The original basis for the weight limitation was conceived as 10 metric tons of *finished product*. Due to anticipated problems with the interpretation and enforcement of a finished product weight limit, a roundweight criterion was chosen, instead. Assuming an average product recovery rate for Pacific cod of 55 percent, the roundweight equivalent of 10 mt finished product is 18 mt.

processors will be able to take pollock incidentally as bycatch.[29] This allotment resembles the percentage allocations evaluated in Alternatives 3.3 and 6 of the SEIS. The vast majority of the GOA pollock and Pacific cod TAC is allocated to the inshore component based on past harvest shares as well as recurring problems with preemption in this fishery management.

The allocation of BSAI pollock between the inshore and offshore components is phased-in over a three year period. In the first year (presumably 1992), the inshore component receives 35 percent of the pollock TAC, with the remaining 65 percent going to the offshore component. In years two and three, the inshore share increases by five percent annually, to 40 and 45 percent, respectively, with corresponding declines in the offshore share allocations. If the preferred alternative were adopted beginning in 1992, percentage allocations in the fourth year (1995) would be maintained at 45 percent inshore and 55 percent offshore. The year 1 BSAI pollock apportionment (35 percent inshore, 65 percent offshore) closely resembles that prescribed in Alternative 3.1 of the SEIS, with years 2 and 3 falling between the allocation shares analyzed in Alternatives 3.1 and 3.3.

The perceived preemption problem in the BSAI is different than in the GOA, and the phase-in of share allocations made in the preferred alternative address future concerns. The inshore component has accounted for between 16 to 36 percent of the BSAI DAP pollock since 1986 (see Figure 3.5c), and likely has the potential to process in excess of 50 percent of the TAC by 1992. There are no precise figures to document actual processing capacity by either inshore or offshore component of the industry. The annual NMFS preseason DAP survey of processors provides an estimate of capacity for reference purposes, but the responses may be biased upwards. The 1990 preseason DAP survey reported shoreside processor requests for 624,000 metric tons of pollock; potentially 45 percent of the TAC in 1990. The offshore component, including motherships and floating processors, requested 2,310,000 tons, 167 percent of the BSAI TAC. The 1991 preseason DAP survey reported requests for pollock of 2,527,000 mt from offshore processors, and 564,000 mt from shoreside processors. In the first six months of 1991, the inshore component of the industry accounted for 27 percent of BSAI pollock TAC. Thus, the phase-in allocation scheme allows for the gradual increase over three years in capacity utilization by the inshore segment, up to the processing potential thought to exist in late 1989 at the time of the 1990 preseason DAP survey.

Viewed from an area-wide perspective, Alternative 8 provides an equitable, allocative balance of pollock and Pacific cod between inshore and offshore interests, phased in over three years. Table 3.13 shows the changes in cod and pollock tonnages over the period 1992 to 1994. The Western Alaska Community Quota is assumed to accrue to the inshore sector, and to be implemented initially in 1993. Pollock and Pacific cod TACs used in this illustration are those set for 1991. With these assumptions, inshore allocations increase from 39 percent of the pollock TAC in 1992 to 52 percent in 1994. Pacific cod allocations remain at 38 percent inshore and 62 percent offshore all three years. Summing cod and pollock, inshore allocations increase from 39 percent in 1992 to 50 percent in 1994, with commensurate decreases in the offshore share. Based on industry demographics presented in Tables 3.2a and 3.2b, the allocations to the inshore sector directly impact approximately 20 shore-based processors, and 225 catcher vessels. The affected offshore sector includes about 60 factory trawlers, 5 motherships, 30 freezer longliners, and 20 affiliated catcher vessels.

Bering Sea Harvesting Vessel Operational Area. Recognizing the dependence of the BSAI inshore processing sector's upon nearby waters for pollock resources, the area inside 168 through 163 West longitude, and 56 North latitude, south to the Aleutian Islands was established in the preferred alternative for use only by harvesting vessels who do not process on board. This does not give inshore processors exclusive access to pollock in this area, since harvest vessels may elect to deliver to either inshore or

[29]Using the current interpretation of bycatch, this would allow for pollock retention by the offshore component of less than 20 percent by weight of other species retained.

Table 3.13 Alternative 8 Projected Tonnage Allocations of Pollock and Pacific Cod to Inshore and Offshore Components; 1992-94

	Area/Species	Year	Inshore Metric Tons	Inshore % Total	Offshore Metric Tons	Offshore % Total
1.	GOA Pollock					
	TAC = 100,000 mt	(1992-94)	100,000	(100%)	0	(0%)
2.	BASI Pollock					
	TAC = 1,385,000 mt	(1992)	485,000	(35%)	900,000	(65%)
		(1993)	554,000	(40%)	831,000	(60%)
		(1994)	623,000	(45%)	762,000	(55%)
3.	Combined GOA/BSAI Pollock					
	a) Balance without Community Quota Reserve a\ removed:					
		(1992)	585,000	(39%)	900,000	(61%)
		(1993)	654,000	(44%)	831,000	(56%)
		(1994)	723,000	(49%)	762,000	(51%)
	b) Balance with Community Quota Reserve used in 1993 and 1994, assuming all quota accrues to inshore sector:					
		(1992)	585,000	(39%)	900,000	(61%)
		(1993)	716,000	(48%)	769,000	(52%)
		(1994)	780,000	(52%)	705,000	(48%)
4.	GOA Pacific Cod	(1992-94)	70,110	(90%)	7,900	(10%)
	BSAI Pacific Cod b\	(1992-94)	45,800	(20%)	183,200	(80%)
			116,000	(38%)	191,100	(62%)
5.	Overall Pacific Cod/Pollock combined, with Community Quota used in 1993/1994:					
		(1992)	701,000	(39%)	1,091,000	(61%)
		(1993)	832,000	(46%)	960,000	(54%)
		(1994)	896,000	(50%)	896,000	(50%)

a\ The Western Alaska Community Quota is 50% of the BSAI Pollock TAC Reserve, about 104,000 mt in 1991.

b\ BSAI Pacific Cod is not allocated under the proposed amendment. The 80/20 split severely reflects performance in 1989 and 1990.

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offshore processors. In recognition of the high economic value of the roe obtainable primarily from at-sea processors, up to sixty-five percent of the at-sea "A" season pollock allocation available to the offshore segment may be taken in the operational area. The 65% allowable take is based on recent 1989-1990 reported harvest by the offshore sector in this operational area during the first quarter. Establishing the operational area may adversely impact harvesting operations by catcher-processors who have also depended upon this area for pollock supplies later in the year, as documented in the SEIS. Features such as allowing at sea deliveries by harvesting vessels, and providing for limited catcher-processor harvest during the roe season are expected to lessen these adverse effects.

Western Alaska Community Quota Program. The preferred alternative adopts elements of Alternative 7 in terms of retaining a portion of the BSAI pollock TAC for application to qualifying community development projects in Western Alaska. Fifty percent of the BSAI pollock reserve will be placed in this program. Eligibility and criteria for qualification in the program will be established by the Governor of the State of Alaska in consultation with the NPFMC, although the actual allocations would be released by the Secretary of Commerce. At the end of the third quarter, any remaining unused quota would be released as called for in the BSAI FMP, according to the inshore/offshore allocation shares.

The rationale for this community development program is expressed in the Council's Comprehensive Fishery Management Goals, adopted in 1984. Goal 3 calls for the promotion of economic stability, growth and self-sufficiency in maritime communities, including the consideration that improving the opportunities for maritime communities to enhance their self-sufficiency will benefit the region and the nation.

Other Management Alternatives for Consideration by the Council. The inshore/offshore allocations identified under the preferred alternative are applicable only for a specified period of time, and will expire at the end of 1995. The Council intends to undertake a comprehensive examination of all alternatives that may be applicable in the management of the GOA and BSAI groundfish and crab fisheries. Several alternatives are specified, including: 1) individual transferable quotas; 2) license limitations; 3) auction; 4) traditional management tools; 5) continuation of inshore/offshore allocations; 6) community development quotas; and 7) no action.

If the Council and Secretary of Commerce have not approved a replacement management plan by December 31, 1995, the allocations and community development quota system shall cease to be a part of the FMPs, and the affected fisheries shall revert to the olympic, open access system. The designation of a four-year expiration of the preferred alternative is in recognition of two critical considerations: 1) the need for immediate attention to the preemption problem in the pollock and Pacific cod fisheries; and 2) the long term solution to this dilemma may require a much more comprehensive management policy for the entire Alaska groundfish industry requiring significant further program design and analysis.

The provision of a "sunset clause" on the duration of the preferred alternative serves as an incentive for timely completion of the further analysis deemed necessary prior to adopting a long term comprehensive solution. This also raises the possibility that--in the absence of a prescribed remedy--the affected fisheries would revert to the olympic system at the end of 1995. This provision is not intended or expected to force a return to the untenable economic conditions that spawned the initial problem to begin with. Rather, the designation of the olympic system is cited as the "default" alternative, serving as a known reference for industry operation and performance, though an inadequate solution in the current economic environment. Clearly, the expectation of the Council is that an effective, longer term solution to the preemption problem can be developed over the next four years, and that a solution can be incorporated into the management and regulatory process. Since this long term comprehensive solution is not yet established, the olympic system is designated only as a default condition for operation of the fisheries.

3.3.8.2 Relationship of the Preferred Alternative to the Seven Original SEIS Alternatives

The preferred alternative (Alternative 8) is basically a variation of Alternative 3 from the SEIS, incorporating aspects of Alternatives 2, 6, and 7, as well. The percentage allocations for inshore and offshore components become a focal variable in discussion of any of the management alternatives under consideration, and the prescribed shares under the preferred alternative fall well within the extremes of those considered in the SEIS. Changes to the original Alternative 3 made in the preferred alternative reflect concerns raised during the review of the SEIS and accompanying public comment period. Notable in this regard are: 1) the designation of all *small catcher-processors*--rather than all *fixed gear catcher-processors*--as part of the inshore component. 2) a phase-in of allocation shares in the BSAI, recognizing differences in operations and the extent of the preemptive conditions between the GOA and BSAI; 3) limited catcher-processor operations in the Bering Sea Harvesting Vessel Operational Area to facilitate utilization of the high value pollock roe during the "A" season; 4) an expanded community development quota system, applicable to all communities on the Bering Sea Coast; and 5) a "sunset" clause that rescinds the amendment package at the end of 1995 in the event a comprehensive management plan has not been adopted by that time.

Economic impacts of the preferred alternative can be developed from Tables 3.6 and 3.16, referencing Alternatives 3.1 and 3.3 for the BSAI, and Alternatives 3.3 and 6 for the GOA. The inshore percentage shares analyzed for allocating pollock in the BSAI (33 percent for Alternative 3.1 and 50 percent for Alternative 3.3) effectively bracket the 35 to 45 percent range specified in the preferred alternative. Because the estimated effects are based on linear relationships among the economic variables involved, the anticipated economic impacts for the preferred alternative allocations can be extrapolated from the results presented in Table 3.6. The allocation prescribed in the preferred alternative for the GOA is different in two regards from that analyzed in Alternative 3.3; the inshore allocation of Pacific cod is increased from 80 to 90 percent in the preferred alternative, and the "inshore" categorization of fixed gear catcher-processors is redefined. Alternative 6 as analyzed in the SEIS estimates economic impacts of a 100 percent allocation of both species inshore, and therefore provides a upper boundary on expectations under the preferred alternative. Thus, for purposes of estimation, the expected economic impacts of the preferred alternative in the GOA lie between those projected for Alternatives 3.3 and 6. These calculations are all based on the 1989 reference year, as explained in Section 3.3.3.1.

The economic effects arising from Alternative 8 are likely to be most visible at the local level for the Alaska and Pacific northwest (PNW) economies. These impacts are projected to consist of moderate increases in direct income and employment relative to the 1989 base year for the inshore component of the catching and processing sectors. The inshore gains will be offset largely by decreases to the offshore sector, primarily in the PNW, but also affecting the offshore component in Alaskan communities--primarily Dutch Harbor. In the GOA, an increase of 275 to 300 full time equivalent (FTE) jobs, and $5.5 to $6 million in direct income is projected for the Alaska economy. The BSAI allocation in year one would result in a coincidental similar increase of 275 to 300 FTEs and $5.5 to $6 million in direct income for the Alaska economy. The BSAI impacts are slightly more than doubled by the end of year three due to the phased-in increase to the inshore allocation. For the combined BSAI/GOA in year 1, an offsetting regional loss in direct income ($2.5-3 million) and employment (700 to 800 FTEs) will be concentrated in the Seattle area and the Pacific northwest.

The projected PNW regional losses combine the gains from the inshore sector with the losses accruing to the offshore component. The PNW region (Washington and Oregon) economic losses incurred by the offshore sector are significantly larger. For example, the projected offshore loss in direct income in the PNW amounts to roughly $18.5 million in year 1 (data is obtained directly from Table 3.6). Offsetting this offshore loss, however, is a projected $18.3 million gain in PNW regional direct income by the inshore sector, which has its economic base in the PNW, as well. Thus, the net impact is much smaller than the individual gains and losses to the respective inshore and offshore components.

Combining the inshore and offshore regional impacts yields a net gain in direct income in year one of $8.5 to 9 million, and a loss of 175 to 200 FTEs. In years 2 and 3, the net gain in direct income increases to $12.3 and $15.7 million, respectively, while employment net losses climb slightly to 200 and 220 FTEs. The reliability of the projected economic impacts in years 2 and 3 is reduced, given the possibility of industry and market reorganization in response to the shift in market shares. The projections serve as estimates for illustrative purposes.

The employment losses in the Alaska-PNW region are projected to be slightly greater than the job gains, but associated increases in economic activity in the rest of the nation result in a modest gain in FTE employment nationwide. Also, FTE numbers are not perfect substitutes between Alaska and the PNW. Average wages are significantly higher in Alaska compared to Washington State; the same expenditure on wages accounts for only 73 percent of the FTEs in Alaska as in Seattle.[30] The regional net gain in direct income is a function of the more labor intensive operations of the inshore sector, rather than any inherent advantage in economic efficiency. Qualitative estimates suggest that the net national effects of the preferred alternative will be positive under normative assumptions. These are discussed in Section 3.4.

Establishing the Western Alaska Community Quota program may affect the economic impacts for the inshore and offshore components, to the extent that up to 7.5 percent of the BSAI pollock TAC is reserved for this program. This 7.5 percent allocation reduces the shares available to the established inshore and offshore sectors. The specific percentage allocations available to the offshore component will be reduced potentially by 4.875 percent in year one, 4.5 percent in year two, and 4.125 percent in year three. Reductions to the inshore component are potentially 2.625 percent, 3 percent, and 3.375 percent in years one, two and three, respectively. The economic impacts of this program on the target communities can be estimated by extrapolating the projections developed under Alternative 7. The Community Development Quota program developed as part of the preferred alternative allocates potentially 103,875 metric tons of BSAI pollock to this purpose[31], compared to allocations of from 19 to 59 thousand metric tons under the different options examined under Alternative 7. Recognizing that both the analysis of Alternative 7 and the preferred alternative address *potential* utilization of the prescribed allocation, the preferred alternative is expected to result in community development impacts roughly twice the magnitude of those projected under the maximum allocation (3.2) of Alternative 7. This translates into local community direct income of $8 million, and employment of 400 FTEs. In addition, the economic impacts under the preferred alternative may be spread over multiple communities, whereas the analysis of Alternative 7 focused on St. Paul, Pribilof Islands.

This Community Quota program redistributes the pollock resource with the objective of economic and community development, and may impose some net national costs, initially, to the extent efficient inshore and offshore operating capacity is displaced by new start-up plants. The program is granted an initial life of just 4 years (through 1995), after which allocation could conceivably--though not necessarily by

[30]Full time equivalent employment is based on the normal 8-hour day, 40-hour work week. Work shifts vary among different industries, but can be converted to FTEs based on hours worked per week or month, including overtime. The use of FTEs allows for the standard comparison of labor effort, but does not standardize wage rates.

[31]The BSAI pollock reserve is presently 15 percent of the TAC. Fifty percent of 15 percent, or 7.5 percent of the 1991 pollock reserve would amount to 103,875 mt [(50%)X(15%)X(1,385,000 mt)]. Each percent of the BSAI pollock TAC is 13,850 mt, representing an exvessel value of $2.4 million at a price of $176/mt.

preference--revert to the olympic system. This establishes a moderate period of adjustment by qualifying communities to become competitive, while under the protection of the development quota program, but does not grant indefinite rights. The economic and community development gains are expected to accrue to the affected communities over time in much the same pattern as other preferential inshore allocations. The losses, to both the offshore and established inshore operations, will reflect reduced harvest shares and higher costs of operation parallel to that examined in Section 3.3.1.

Certain limitations of the seven original proposed amendments as analyzed in the SEIS are addressed in the design and wording of the preferred alternative. Expedited work on a moratorium is reemphasized as a component of the inshore/offshore amendment, noting the pivotal influence of continued open access in fueling overcapitalization problems. The preferred alternative prescribes an interim solution to the stated preemption problem, but recognizes that a long term resolution to the conflicts over access and use of the pollock and Pacific cod resources may require still further refinements in fishery management.

3.3.8.3 Effectiveness of the Preferred Alternative in Resolving the Preemption Problem

The situation and problem as described in the SEIS focus on an overcapitalization dilemma for which there is no apparent simple solution. Even under the "no action" option (Alternative 1), the affected fisheries and communities face a gradually worsening situation.[32] The understanding of preemption is obscured by differences in semantic interpretations bridging economic, sociological, and biological concerns. Written and oral testimony establishes the perception of preemption of the inshore sector by the offshore sector. The absence of recognizable property rights in the affected fisheries, fueled by conditions of open access under the olympic system have created conditions of overcapitalization and excess capacity. This situation threatens to evolve into a destructively competitive environment, jeopardizing the economic and biological stability of the fishery resources involved.

The SEIS has documented the inability of any of the original seven alternatives alone to remedy effectively the underlying problems of overcapitalization, to the extent preemption and its associated impacts are exacerbated by excess harvesting and processing capacity that has developed in recent years. The preferred alternative represents an interim solution to the immediate preemption concerns, while charting a course for a more comprehensive solution to managing these fisheries in the future. This solution establishes specific shares of the pollock and Pacific cod resources for the carefully defined inshore and offshore components of the groundfish industry. These apportionments are based on current, historical, and anticipated use patterns, granting preferential allocations to the inshore segment in recognition of the actual and potential preemption that exists in these fisheries.

Alternative 8 seeks to limit the adverse preemptive pressures felt by the inshore sector, without causing undue impairment to the economic status of the offshore component. The specific percentage allocations do not create a situation whereby exclusive control of the pollock and Pacific cod resources off Alaska would be vested in the hands of any specific entity or individual. The phase-in feature of the BSAI pollock allocations is designed to ease the adjustments necessary for both inshore and offshore operations, as well as the impacted communities and fishery resources.

The Gulf of Alaska is treated separately from the Bering Sea/Aleutian Islands, based on the different impacts of preemption in these two fishery management areas. Owing to the smaller TAC and historically

[32] As discussed in Section 3.3.1., catching and processing pressures are mounting in response to the rapid "Americanization" of the groundfish industry in the EEZ.

greater percentage utilization of pollock and Pacific cod fisheries in the GOA by the inshore sector[33], the allocations direct all of the GOA pollock TAC, and 90 percent of the GOA Pacific cod TAC to the inshore component. In an effort to reduce preemptive pressures during 1990, the offshore sector did not target pollock in the GOA, and the preferred alternative affirms this precedent. Offshore processors are allowed to take pollock incidentally as bycatch in the GOA, however, thereby minimizing unnecessary discard of pollock bycatch. The allocation of TAC to the inshore sector is expected to provide relief to shorebased catcher and processors from actual or threatened preemption by the offshore component of the industry. Such allocations do not address preemption from *within* the inshore component (one shorebased processor preempting the activities of another shorebased processor), but the inshore industry expressed much less concern over such intra-sector competition.

The role of preemption in the BSAI pollock fishery is somewhat different than the situation that developed in the GOA. BSAI inshore groundfish processing has been concentrated in the neighborhood of Dutch Harbor, and the fishing grounds are largely within a 100 to 150 mile radius of the shore-based processors located in this area. Offshore processors are able to conduct catching and harvesting operations throughout the EEZ, much of which is not accessible to shore based catchers and processors due to the logistics of delivery. Thus, there are logical roles for both the inshore and offshore components in the BSAI, based on the large geographical area, TACs, and logistical restraints on operations by shore-based processors. It is within the traditional shore-based harvesting area around Dutch Harbor/Akutan that conflicts between the inshore and offshore sectors have developed, and over which preemption concerns exist. These are highly productive fishing grounds, used by both the inshore and offshore components, but an area of growing conflict due to the increasing harvest pressure brought on by the entry of new operations. Concerns have been voiced by the inshore component, citing both existing and potential examples of preemption on the fishing grounds by the offshore sector. Conversely, offshore representatives cite the rapid expansion of inshore processing capacity during 1990 as contrary to allegations of preemption.

The preferred alternative addresses the BSAI inshore/offshore allocation problem in two regards: 1) a set percentage allocation of the pollock TAC between the inshore and offshore components; and 2) restrictions on catcher-processor operations in a designated harvesting vessel operational area in the fishing grounds to the north of the shore-based processors in Dutch Harbor/Akutan. As in the GOA, the preferred alternative establishes a preferential allocation to the inshore component, but still apportions over half of the pollock resource to offshore processors, who have historically accounted for the majority of the BSAI pollock DAP (see Figure 3.5c). Related features established in the preferred alternative are designed to reduce the adverse impacts on the offshore component. These include: 1) a three year phase-in of the allocation scheme, increasing the inshore share of the pollock TAC from 35 percent in year one to 45 percent by the third year; 2) a provision allowing offshore catcher-processors partial access to pollock in the harvest vessel operational area during the high-valued "A" roe season; 3) criteria by which offshore processors can operate in an inshore status; and 4) a provision for releasing unused pollock TAC from one component to the other, in the event that one component is unable to process its allocated share.

The Western Alaska Community Development Quota program established in the preferred alternative addresses an issue rooted in the same overcapitalization dilemma that has given rise to the preemption problem. In the absence of a preferential allotment, it is unlikely that the western Alaska communities located on the Bering Sea will capture any of the economic or development benefits from utilization of the pollock resources off their shores, given the potential for preemption by a mobile offshore fleet. These communities have a traditional reliance upon the resources of the Bering Sea for both subsistence and economic development. In addition, some communities may be able to access pollock stocks otherwise unavailable to existing inshore processors due to logistical considerations of delivery. The highly

[33]Figures 3.5a & 3.5b illustrate the historical harvest shares of pollock and Pacific cod in the GOA by the inshore and offshore components.

uncertain nature of pollock availability impedes the commitment of capital investment necessary for local development of the resource. The establishment of a quota set aside for community development will provide some certainty to the planning necessary to effectively utilize the resources available in the EEZ. Screening criteria for eligibility and use will be developed in cooperation with the State of Alaska. In the event the Development Quota is not fully subscribed, any unused quota would be released through the inshore/offshore allocation formula. While the Community Development Quota program provides an initial 4-year guaranteed access to the BSAI pollock resources, it is not necessarily an indefinite allocation; qualifying communities eventually would have to achieve a level of efficiency competitive with other shore-based processors.

The rapid "Americanization" of the Alaska groundfish industry during the mid-1980s has created resource use conflicts unforseen even three years ago The dynamic complexity of the evolving fisheries aggravates already complex issues such as optimum yield, bycatch, ownership rights, and capitalization. By itself, the preferred alternative does not solve the overcapitalization dilemma that is thought to underlie the preemption problem. The actions in this proposed amendment do initiate steps, however, to address the overcapitalization issue through expedited work on a moratorium for new vessels entering the Alaska groundfish industry, as well as a comprehensive, longer term analysis of management alternatives for these fisheries. In the interim, definitive actions are proposed to remedy the immediate preemption problem facing the industry. American consumers in general are likely to be unaffected by the proposed amendment. Regional impacts on the affected fishing industry are estimated to benefit the inshore segment and affected local communities, at the cost of offshore operations. In aggregate, the preferred alternative provides an interim solution to the economic and social problems arising from preemption. These actions are expected to create positive national benefits by: 1) maintaining a balance in the social and economic opportunities associated with the pollock and Pacific cod fisheries; 2) helping insure that the fishery resources are available to provide private and community benefits to all parties; and 3) reducing the uncertainty and operational instability caused by the threat of preemption. It is intended that the pollock and Pacific cod allocations made for the GOA and BSAI are in the best interest of resource management and the nation at large. As was shown in Table 3.13, the preferred alternative provides for an equitable balance of pollock and Pacific cod allocations between the inshore and offshore sectors on an EEZ-wide basis.

3.4 Other Economic Issues Related to the Proposed Alternatives

The analyses of inshore/offshore allocations under Alternatives 3, 4, 6, and 8 examined the distribution of economic impacts associated with percentage allocations of pollock and Pacific cod. These analyses developed an extensive data base and sectoral model of the affected fishery industry, ultimately projecting economic impacts associated with the various proposed allocations. Seven additional matters are examined in this section: 1) a sensitivity analysis of the model estimates to changes in key variables; 2) the relative economic efficiency of the catching and processing sectors represented; 3) an examination of the impact of foreign influence on economic effects; 4) a discussion of the consequences of and alternatives to displaced offshore processors; 5) bycatch implication; 6) potential effects of designating an inshore operational area within the BSAI management area; and 7) provisions for community development.

The issues identified in these alternatives raise numerous questions concerning possible economic consequences, and the analysis has only limited information on the existing industry, much less future developments. This uncertainty is magnified by the dynamic change that has characterized this industry during the past five years. Lacking empirical data, or a proven historical record, the economic analysis of such issues can only explore the economic concerns, identify key variables, and assess possible alternative outcomes in a qualitative context.

3.4.1 Sensitivity Analysis

The sensitivity of the estimates generated by the input-output model to changes in the underlying variables and assumptions provides some measure of the confidence limits over which the results can be applied. In the foregoing discussion of impacts, several areas were cited where either accuracy of the data, or durability of the underlying assumptions called for some reservation in interpreting the results. In addition to the examination of costs and prices presented earlier and briefly summarized below, the sensitivity of results to the assumed expenditure distribution patterns within the affected communities is examined.

Costs and Returns: Detailed budgets were compiled for the affected catcher and processing operations based on the financial budgets and operating characteristics gathered as a part of the analysis. As presented in Section 3.3.1, the sensitivity of overall costs and financial returns to changes in both cost levels and capacity utilization was modeled for representative inshore and offshore components of the groundfish industry. These findings revealed that the configuration and degree of specialization embodied in the representative operations have an important impact on sensitivity to costs. Such features as labor intensiveness, product utilization, or relative dependency on a given fish species create financial differences among operations, both between and among the respective inshore and offshore sectors. Further examination of differences in costs and returns between inshore and offshore operations is contained in Section 3.4.2.

Despite the differences in some costs categories, per unit net returns generated from pollock and Pacific cod were calculated to be relatively low in all cases, such that even small changes in cost levels or capacity utilization can lead to significant changes in net returns. The more dependent a particular catching or processing operation is upon a specific fishery resource, the more dramatic the financial impact arising from changes in capacity utilization. The sensitivity of estimated economic impacts to variations in costs can be generalized to the extent that such changes lead to corresponding direct impacts on net returns, as depicted in Table 3.3. It is not routinely apparent how the respective inshore and offshore segments might respond to changes in costs or resource allocations in order to better manage costs and returns, but the sensitivity of economic results to such changes could be significant. The discussion of options available to displaced catcher and processor operations in Section 3.4.4. provides some insight into potential economic impacts on costs and returns.

Product Prices: The economic impact estimates related to specific allocations are directly influenced by the revenues generated through exvessel and finished product sales. As a result, increases or decreases in price levels will have a direct, significant impact on projected impacts, as illustrated in Section 3.3.3.6. While price levels in the 1989 base period are largely a matter of record, it is likely that future prices will exhibit considerable variation, in reaction to changing supply and demand conditions. As noted in the analysis of Alternative 3, scenarios that significantly alter the allocation of pollock and Pacific cod between industry components may lead to changes in market price, since product form and quality could be affected. Contemporary studies of market supply and demand relationships are not available to accurately predict the price impacts from changes in fishery allocations, but qualitative judgements, or generalized relationships such as illustrated in Figure 3.7 document the sensitivity of economic impacts to changes in underlying price levels that may occur.

Expenditure Distribution Pattern: The degree to which economic impacts accumulate at the various geographic levels within the economy depends upon the expenditure pattern associated with the representative activities. The input-output model used in this analysis requires an assignment of the share of expenditures by expense category, by the level at which they accrue. The distribution patterns for income and employment in the inshore and offshore segments of the Kodiak and Dutch Harbor Ports are shown in Figures 3.13a and 3.13b.

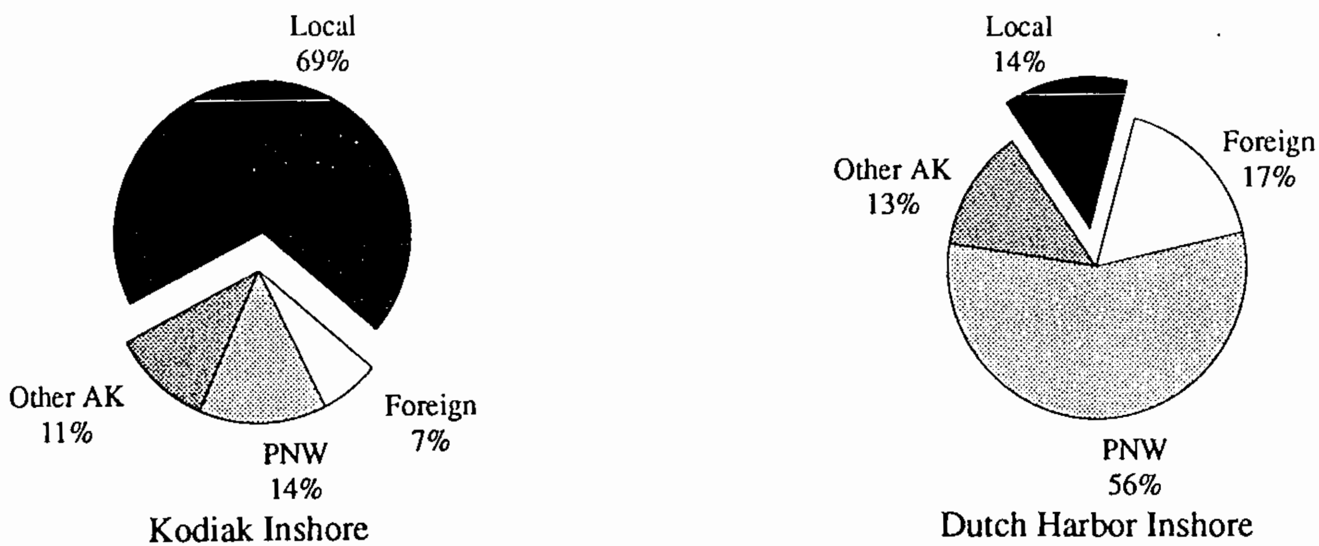
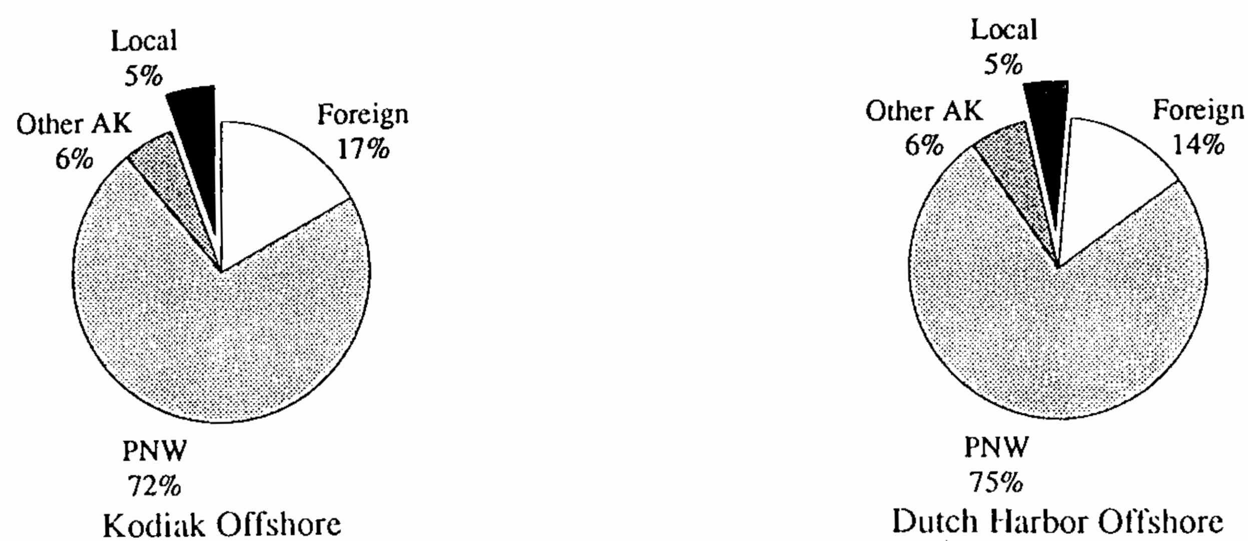


Figure 3.13a Distribution of Direct Income, by Location



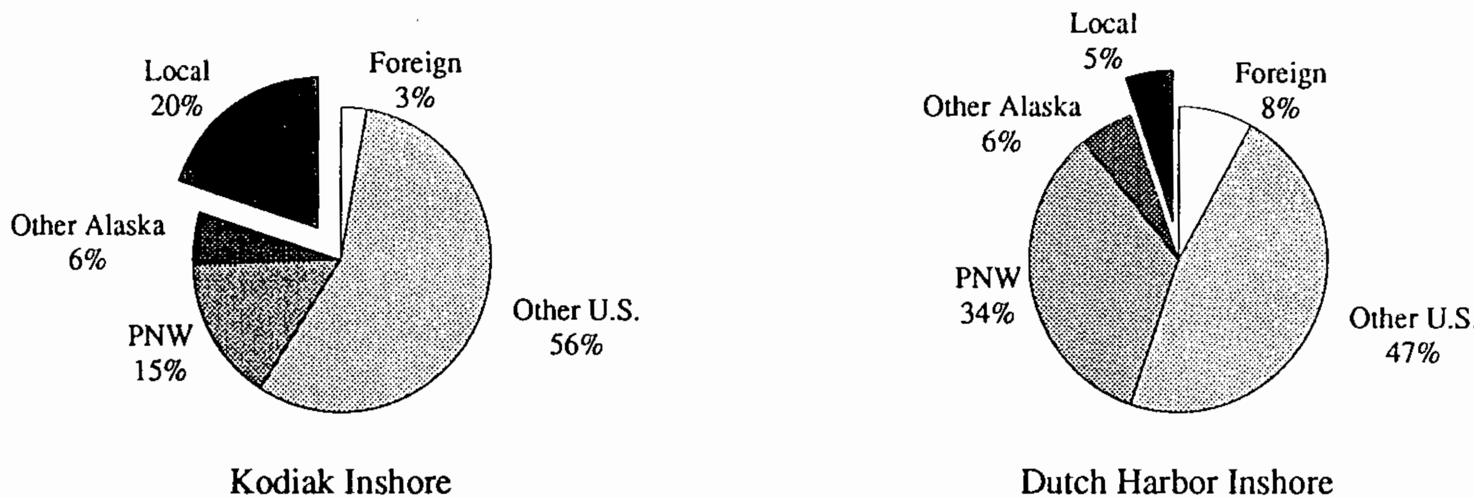
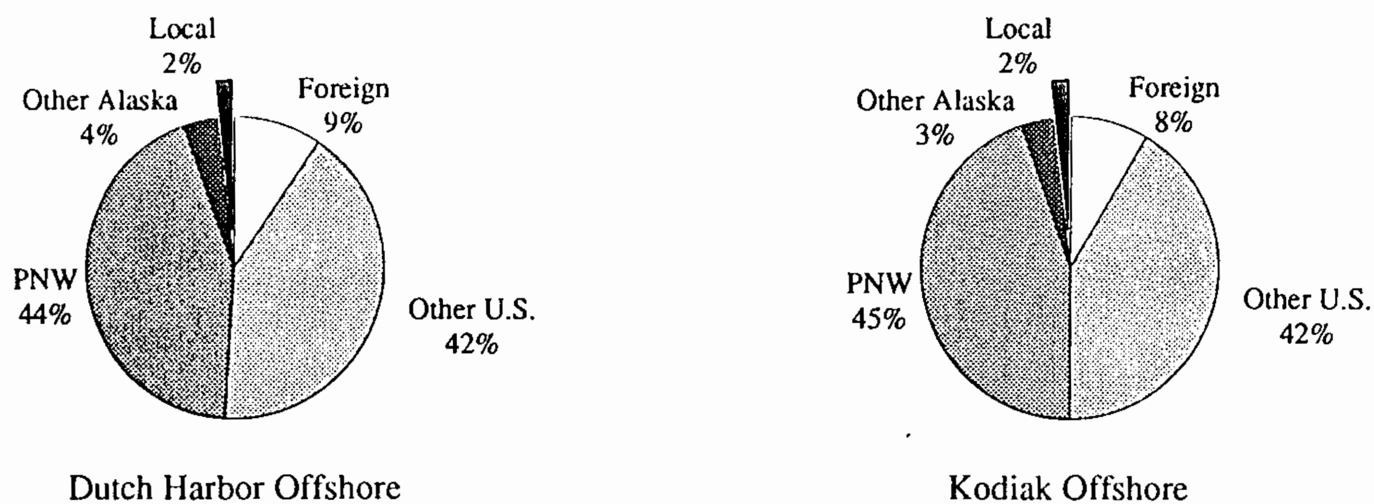


Figure 3.13b Distribution of Total Employment, by Location



The assignment procedure, discussed in Section 3.1.3, is inexact due to lack of a comprehensive empirical data base covering expenditure patterns. Moreover, the level of expenditures must reflect 1989 conditions rather than the present. Although some studies are available to provide guidelines, many of the apportionments made are generalities, and might easily stray 10% from the true but unobserved value. The estimated impacts and their relationship to expenditure distribution pattern are further explored here using sensitivity testing.

The base-case expenditure distribution pattern for each of the ports was varied by a factor of 10%, and the model rerun for two locations--Kodiak and Dutch Harbor--to allow for a comparison of results. The effects of a change in the distribution of expenditures and economic activities are uneven across ports. This is because the input-output multiplier associated with each expenditure category is different as is the distribution pattern.

For Kodiak, a 10% increase in the distribution of expenditures locally increased local income and employment by slightly more than 10% in the inshore sector, and slightly more than 11% for the offshore sector. A 10% decline in local expenditures created a 9.4% drop in inshore economic impacts, and an 11.3% decline offshore. The Dutch Harbor results were generally comparable to the Kodiak findings at the local inshore level. The Dutch Harbor offshore sector exhibited more volatility in response to changes in the distribution of expenditures, with economic impacts rising by 15% and declining by 13.5% given the 10% increase and decrease, respectively, in expenditures at the local level.

Economic impacts at the PNW level are less consistent than at the local port level, ranging from a 1.3% change (increase and decrease) for 10% variations in the expenditure allocation for offshore Dutch Harbor, to a roughly 20% change for the Kodiak inshore location. These results are directly related to the initial level of economic activity that occurs at each level in each port. Thus, if there is very little initial economic impact at a given level, even a 10% change in the expenditures allocated there will have proportionately large impacts, and vice versa. This makes comparisons in the sensitivity analysis difficult, since the conclusions are not consistent from port to port, or level to level.

The sensitivity tests of expenditure distributions did reveal a fundamental relationship in the level of impacts. Increasing the distribution at the local Alaska port level results in net *decreases* in total economic activity at the aggregate level, and decreases in the proportion of expenditures at the local port level *increases* total economic activity. This paradoxical effect is explained by the nature of economic activity captured by input-output models. Generally, smaller, more remote locations have lower economic multipliers than do larger, more integrated locations. This implies that $1,000 in average economic expenditures made in, say Dutch Harbor, will generate less economic impacts for the overall U.S. economy than if the same $1,000 were spent in the same industry in Seattle.

The rationale behind this is that a greater proportion of the expenditures made in Seattle will be respent in labor-related industries, such as manufacturing or financial services, while a higher proportion of the Dutch Harbor expenditures accrue to "cost of living" factors such as fuel or transportation costs. The input-output multiplier for fuel expenses (not refining) is among the lowest of major expenditures in the fishery industry, while the multipliers for repairs or accounting services are among the highest. Thus, there is greater leakage and less respending from a more remote Alaska community than from a developed, strategically situated one.[34] In some cases, maintaining activities in remote locations involves an economic trade off between community development and cost efficiency.

3.4.2 Cost and Efficiency of Operations

The original problem area identified in this proposed amendment cites the threat of one segment of the industry preempting the operations of another. The mobility of the offshore processor, and potential for intentional or unintentional disruption of shore-based processor operations is fundamental to this concern. A related but somewhat different issue concerns the inherent economic efficiency and implied competitiveness that exists between the inshore and offshore segment. That is, competitive advantages, created by greater efficiency, may lead naturally to preemption.

The cost comparison is complicated by considerations of product form and quality. Despite the homogeneous nature of the pollock and Pacific cod resources, the resulting processed products can be significantly different. For example, the economics of Pacific cod processed only into head and gut form will be considerably different than for the same fish processed into IQF (individual quick frozen) fillets. In order to make useful comparisons of efficiency, comparable processed products from both the inshore and offshore sector are necessary.

For the purposes of further analysis, similar pollock and Pacific cod processing operations were identified, and used as a basis for comparison of cost efficiency. The cost and return budgets developed from the OMB survey provided the basis for examining the cost and efficiency characteristics of the representative inshore and offshore operations. These cost estimates include both the catching and processing components, with the cost and return estimates allocated according to species handled.[35] For fixed cost items such as insurance or maintenance, costs were allocated according to the revenues generated by the respective species. The resulting cost categorizations and relative magnitudes are illustrated in Figures 3.14a and 3.14b, for inshore and offshore components, respectively.

The product mix from pollock was very similar for both of the processors, based on the data reported in the surveys. For the inshore plant, processed pollock products consisted of surimi (79.6%), meal (18.9%), and roe (1.5%). The offshore operation product mix was surimi (76.6%), meal (20.5%), and roe (2.9). Pacific cod was processed entirely into IQF fillets in both segments.

A significant difference between the inshore and offshore components modeled is the total expenditure levels, and the proportion of direct incomes included in these expenditures. As calculated, the offshore segments have lower overall costs of operation and higher returns to ownership. Practically, the total expenditure figure is set by the price received; the difference between costs and revenues is the net return. The inshore operations generate lower net returns but higher direct income, primarily due to greater returns to labor. To prevent misunderstanding, it should be emphasized that the illustrations depict relative cost percentages on a roundweight basis, rather than the absolute dollar costs.

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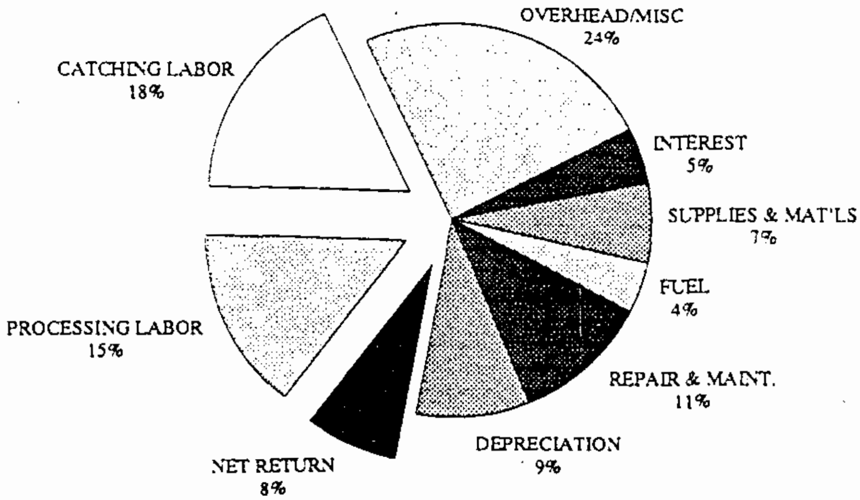
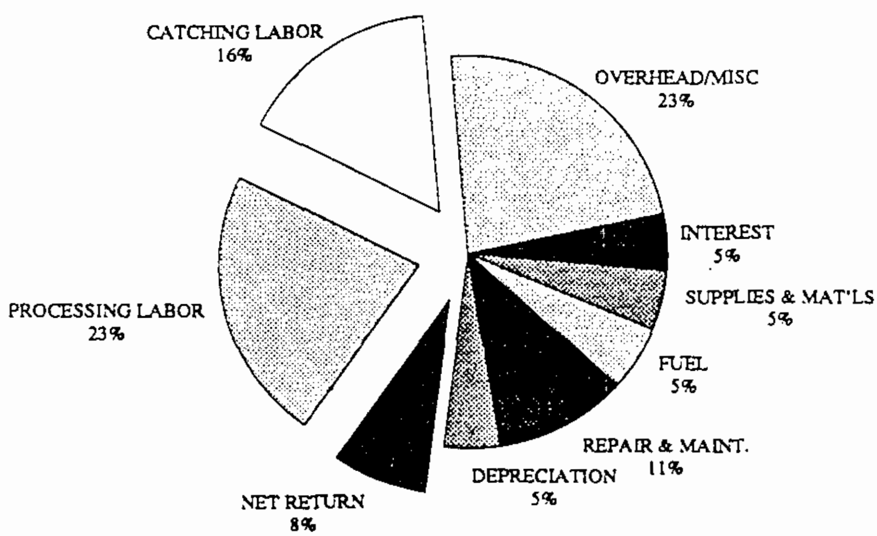
[34]While localized access to natural resources can be an economic advantage, the existence of natural transportation routes, distances between production area and consumer markets, as well as access to and cost of transportation are key elements governing the pattern of economic development [Gosh and Rushton].

[35]The offshore costs represent operations of the surimi and fillet factory trawler for pollock and cod, respectively. The inshore costs combine the Bering Sea SS1 processor with a shorebased trawler for pollock, and the Kodiak SS3 processor with the "combo" catcher vessel for Pacific cod. More detailed descriptions of these operations are contained in tables 3.2a and 3.2b. The cost estimates do not reflect the operation of any single firm, and should be regarded as representative group averages.

Figure 3.14a Costs and Expenditures; Inshore Catching and Processing Activity



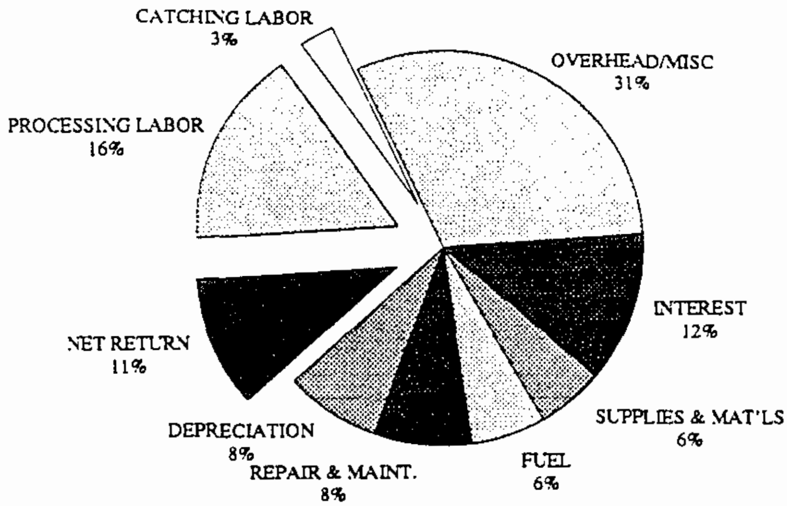
Pollock
Surimi plus Roe and Byproducts
Total Costs = $335/mt
Total Expenditures = $361/mt
(roundweight basis)



Pacific Cod
IQF Filets

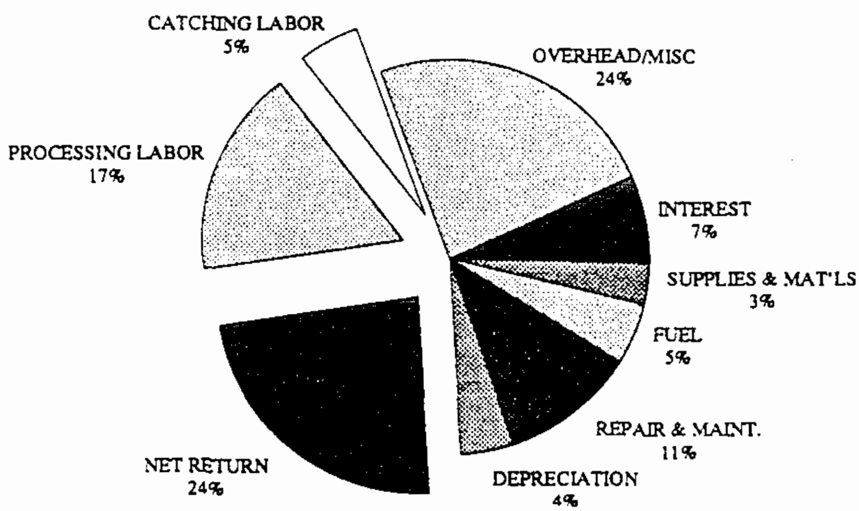
Total Costs = $748/mt
Total Expenditures = $812/mt
(roundweight basis)

Figure 3.14b Costs and Expenditures; Offshore Catching & Processing Activity



Pollock
Surimi plus Roe and Byproducts

Total Costs = $307/mt
Total Expenditures = $345/mt
(roundweight basis)



Pacific Cod
IQF Filets

Total Costs = $638/mt
Total Expenditures = $835/mt
(roundweight basis)

With respect to the two species involved, the relative expenditures on Pacific cod are very similar across the inshore and offshore operations. The main difference appears to be a higher return to catching labor for the inshore segment, and a higher net return (return to ownership) for the offshore firm. The differences are more significant in the two respective pollock cost budgets. Inshore pollock costs (primarily surimi) contain a higher proportion of direct labor costs, and the offshore costs have relatively greater fixed and overhead costs. This may represent a substitution between labor and capital in the two different segments, with the inshore utilizing more labor, and the offshore more capital. The relative use of capital and labor in catching and processing activities is a matter of technical feasibility and cost efficiency. Higher proportional use of labor is not inherently "better" from the perspective of economic efficiency.

Cost comparisons are clouded by possible quality differences between the offshore and inshore products, as well as different product recovery rates in the processing activity. The data reported in the OMB survey cites higher price levels for offshore surimi (average $1.03/lb) compared with inshore surimi (average $.80/lb)[36], but the offshore recovery rate for surimi averaged 14%, compared to 18% for the inshore plants. There is an acknowledged trade off between recovery rate and quality [Riley]. However, the trade off between cost and recovery rate cannot be established based on the survey data available. That is, the analysis was unable to determine if higher recovery rates are directly linked to the higher costs calculated for the inshore processors.

There is controversy within this industry over which mode of processing is more efficient, and the arguments reflect attitudes toward conservation ethics and product recovery, as well as cost of production. An accounting of the product mix and value derived from raw pollock by inshore and offshore operations (as portrayed in Figures 3.14a and 3.14b) estimates that one ton of pollock produces 355 pounds of finished product based on the represented offshore surimi factory trawler operation, costing $307 per ton, valued at $345 per ton, resulting in net returns of $37 per ton. The inshore operation produces 498 pounds of finished product from a ton of pollock, costing $335, valued at $361, and netting $26.

The cost budgets shown in figure 3.15 for the offshore catcher processors document that the fish catching activities of factory trawlers impose very real costs of operation. The fish are not "free" to the offshore processor, although accounting procedures may not distinguish between catching and processing expenses. The calculated costs of harvesting activities for the surimi factory trawler summed to $93/ton, $62/ton of which were variable operating costs such as fuel, repairs, and labor. Comparative total costs for the shorebased trawler were $147/ton, of which $111/ton were variable. Because there is a significant, explicit cost associated with catching fish, the offshore processor has an economic incentive to utilize the fish in an efficient manner. The lower the recovery rate, the higher the effective cost per pound of the input.

The foregoing analysis provides insight into the cost characteristics of the inshore and offshore processing sectors. From a competitive perspective, the lower cost operation would appear to have an advantage in terms of pricing, net returns, and acquiring market share.[37] Such attributes conceivably would also benefit consumers if the competitive forces were applied to consumer prices, product innovation, or new technology. Conversely, inshore processing results in a higher recovery of surimi from the pollock

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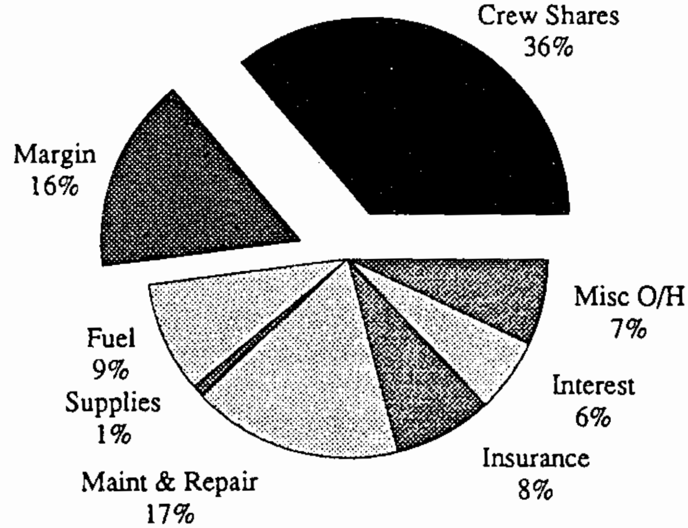
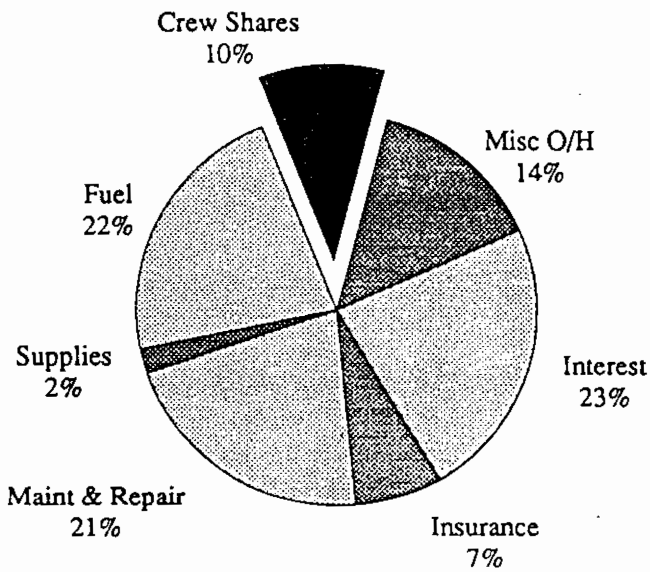
[36]This price differential is considerably less that the average 55 percent difference between "sea based top grade", and "land based grade 2" surimi reported by Vondruska for the Tokyo Central Wholesale Market between 1984-88.

[37]There is more to establishing a competitive advantage than having low costs. But, as Porter points out in *Competitive Strategy*, overall cost leadership is one of the most effective competitive positions for survival in an industry such as raw product processing.

Figure 3.15 Cost Comparison of Harvest Operations
Distribution of Costs



Shore-Based Trawl Catcher Vessel



Surimi Factory Trawler Fishing Activity

resource, producing a greater overall output to the consumer, although at a lower quality and price. The ambiguity concerning pollock utilization efficiency arises because of differences in the two respective processes and products.

A simple, one-dimensional comparison of the economic efficiency of the two respective processing operations based on either per unit cost or recovery rate may be inappropriate in view of the apparent differences in product form, price, quality, and plant operations. The foregoing analysis indicates that there is a trade-off between surimi quality and total output, with attendant ramifications for product cost and price to consumers. Relatively little technical information is available concerning the nature of consumer demand for surimi products, much of which occurs overseas. The assessment of overall resource use efficiency arising from the preferred alternative--including consideration of both production (supply) and consumption (demand) variables--is discussed further in Section 3.5.

Changes in Revenues, Costs, and Returns To Operators. Change in the regulatory environment in fisheries of the North Pacific will create costs and benefits, not only to individuals and firms but also to the local, regional and national economies. Generally, cost-benefit analysis is an important tool for measuring the economic effects of change. Krutilla and Eckstein [1969] note that the "concept of benefit cost analysis requires that a scarce resource be committed up to the point at which added benefits just compensate for the added costs." Despite the simplicity of the criteria, there are considerable analytical difficulties involved in measuring the appropriate benefits and costs or the incremental changes in these variables associated with the proposed alternatives. Some insight is provided by examining the direct, indirect, and induced incomes generated from a given change, as discussed in Section 3.1. Another common technique is to evaluate the aggregated benefits and costs incurred by consumers and producers that might result from a proposed change.[38]

A lack of data and information concerning consumer demand restricts a statistically reliable, quantitative estimation of consumer costs and benefits, but the financial data gathered in modelling the Alaska groundfish industry can be brought to bear on the analysis of producer (catcher and processor) effects. Changes in revenues, costs, and returns to operators were projected, based on an incremental change in the amount of pollock allocated either inshore or offshore. Income statements were estimated from the baseline model for each type of processor and harvest vessel in the GOA and BSAI. Revenues, costs, and returns to operators were calculated, where returns to operators equal gross revenue less cost for both catching and processing activities. All labor expenditures were included as costs, but depreciation was included as a return to the operator, rather than as an explicit cost. Thus, the difference between "returns to operators" and "direct income" as used in the economic impact analysis is the exclusion of all payments to labor in the former.

Once returns were calculated for the baseline case, the amount of pollock allocated inshore in the GOA and in the BSAI was increased by 10 tons in each area. Similarly, the amount of pollock allocated offshore was decreased by 10 tons. The incremental change was apportioned among the various harvesting and processing category as represented in the base case. For example, 8.8 mt. of the 10 mt. directed away from GOA offshore processors came from fillet factory trawlers and the remaining 1.2 mt. from head and gut factory trawlers. Table 3.14 shows the results of the calculation on a *per ton* basis.

[38]The NOAA Technical Report NMFS 94 by Edwards explains the theoretical logic of using consumer and producer surplus in examining net national benefits.

Table 3.14. Changes in Revenue, Cost, and Returns to Operators, Including Vessel Owners, From an Additional Ton of Pollock

	GOA Offshore	GOA Inshore	BSAI Offshore	BSAI Inshore
Change in Revenue	$386	$519	$374	$553
Change in Cost	$286	$430	$272	$429
Change in Returns	$100	$ 89	$102	$124

These estimates indicate that in the BSAI, an additional ton of offshore harvesting and processing generates lower costs and lower returns than for comparable inshore operations.[39] The opposite appears to hold in the GOA, where the incremental ton off pollock generates greater returns for the offshore sector. Since the BSAI allocation exceeds the GOA, it appears that net returns to operators, based on incremental change from the baseline case, would increase with an allocation to shoreside processors. Such interpretation of these estimates must be qualified to the extent that the activities of both catching and processing activities are aggregated in the calculation of impacts. Moreover, the net returns are influenced by the product mix handled by each representative operation, since fixed costs are borne proportional to the dollar volume of all species handled. The listed economic impacts only include the private costs and returns incurred by the operations involved, ignoring possible economic impacts on the public or other firms affected by specific allocations or fishing operations.

From the consumers' point of view, the most benefits are derived from low cost, efficient production of seafood products, to the extent such costs are passed on to the consumer as lower prices. For example, if more pollock production from the onshore sector were available due to a higher recovery rate relative to offshore operations, consumers might have more product available at the same or lower price, leading to an increase in consumer benefits. Conversely, the data from Table 3.14 indicate that offshore operations are capable of producing finished product at a lower cost than their inshore counterparts, which might allow them to pass these lower costs along to consumers in the form of lower prices.

Measures of net consumer benefits from alternative allocations of pollock or Pacific cod products are very difficult to estimate, since there are no comprehensive demand analyses available that would allow for a statistically reliable quantification of the impacts suggested above. Estimating demand for any product is a highly complex analytical undertaking, and the demand for pollock products is complicated because: 1) product quality and product mixes vary greatly from inshore to offshore; 2) the market for pollock products is international with multiple complex product substitute relationships; 3) U.S. based demand for pollock products is relatively new and growing, and is virtually unstudied [Johnston], and (4) the market has changed rapidly with extended fisheries jurisdiction and technological innovations. As a result, estimates of net consumer benefits are qualitatively analyzed.[40]

3.4.3 Foreign Ownership and Involvement in the GOA and BSAI Fishery.

Foreign exploitation of the groundfish fishery off the coast of Alaska predates the "Americanization" of this industry following the Magnuson Act in 1976. The distant water fleets of countries such as Japan, Norway, the Soviet Union and the United Kingdom have a long history of involvement in international fisheries that includes supporting vessel manufacturing and product processing industries at home.

[39]This point estimate of changes in costs and revenues results from a very small change in the amount of pollock from baseline levels of harvesting and processing in 1989. These estimates may not apply to larger changes in pollock allocations.

[40]Consumer benefits and net national impacts are discussed further in more detail in Section 3.5.

Following worldwide extended fisheries jurisdiction (EFJ) in the early 1980s, the U.S. groundfish fleet has expanded dramatically, but not totally independent of foreign influence.

In the context of the distribution of economic impacts associated with the management alternatives examined here, the lingering ties of foreign involvement in the Alaska fishery, along with growing internationalization of the world economy, have created a significant foreign presence in the affected pollock and Pacific cod fisheries. This foreign presence potentially involves: (1) outright ownership of vessels and plants; (2) direct control or influence over catching and processing operations through parent-subsidiary company structures; (3) financing; (4) subsidized vessel or plant construction; (5) the provision of goods and services to the production process; and (6) concentrated market buying power (oligopsony).

The degree of foreign ownership and other involvement in the affected pollock and Pacific cod fisheries has been the subject of controversy over preferential allocation of these two species.[41] The concern is whether or not an increase in the allocation to inshore processors will either weaken or strengthen the foreign influence over this industry, given the intent of the Magnuson Act to "Americanize" this industry.

The assignment of expenditure distribution percentages to different economic components, in the analysis presented here, explicitly recognizes a foreign interest. As with the general allocation problem, empirical data is not available to make comprehensive foreign apportionments for all expenditures or all locations. The distribution of economic impacts developed for this analysis among the four levels of economic activity is summarized in Table 3.15. The accrual of economic benefits at the foreign level consists of proportionately more direct income than general economic activity. These estimates do not include the effects of subsidized initial capital investment. The nominal (total dollar) values associated with the percentages in Table 3.15 convey a much greater foreign influence in the Bering Sea compared to the Gulf of Alaska, due to the respective magnitude of the resources allocated in these two areas, as well as the foreign ownership patterns. The Kodiak inshore location, for example, exhibits a much lower level of foreign ownership than Dutch Harbor or the offshore components. Akutan, Sand Point, and Chignik have relatively lower foreign influence, and King Cove a moderate attachment.

Table 3.15 aggregates the distribution of economic benefits to foreign interests across catching and processing activities. The pattern of influence is probably uniform for the offshore catcher-processor, but not for inshore activities. Foreign influence--primarily ownership and manufacturing labor--is a significant influence in certain inshore locations, but is much less of factor for the shoreside catcher vessel fleet, where most of the economic impacts are domestic. As a result, the distribution of economic impacts with preferential inshore allocations will create economic gains for foreign interests that cannot be easily modified given the present form of the proposals under consideration in any of the alternatives.

3.4.4 Alternatives Available to Displaced Catching and Processing Firms

The proposed alternatives are designed to prevent or remedy preemption of one segment of the industry by another. Given the worsening overcapacity conditions, preventing preemption may adversely affect economic and financial conditions for the offshore fleet. Even the "no action" Alternative 1 is expected to lead ultimately to some reorganization of the Alaska groundfish industry, given overcapitalization and shrinking resource shares for individual operations. The consequences of preemption, and potential impacts on shorebased processors under Alternative 1 are discussed in Section 3.3.1. As noted in the discussion of Alternatives 3, 4, 6, and 8, the supposition of the model used to make projections is that the offshore components will continue to operate "normally", but with various reductions in the allocation of

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[41]Gray compiled a detailed list of foreign ownership of Alaska fish processing facilities in a Legislative Research report to the Alaska State Legislature in 1990, summarizing that at least 23 percent of these processors has some foreign ownership.

Table 3.15 Percentage Distribution of Economic Impacts by Location for Selected Ports /a

Location	Local	Alaska	PNW	Other U.S.	Foreign
1. Kodiak Inshore					
Direct Income	68.7%	10.9%	13.9%		6.5%
Employment /b	19.8%	5.6%	15.3%	56.6%	2.7%
2. Kodiak Offshore					
Direct Income	5.4%	5.5%	72.2%		16.9%
Employment	2.0%	3.4%	44.7%	41.5%	8.4%
3. Dutch Inshore					
Direct Income	13.8%	13.0%	55.9%		17.3%
Employment	5.2%	5.8%	33.9%	47.1%	8.0%
4. Dutch Offshore					
Direct Income	5.0%	6.2%	75.2%		13.6%
Employment	1.8%	3.7%	43.6%	41.5%	9.4%

a/ The input-output model allocates direct incomes (wages, crew shares, and net returns) only to local, other Alaska, PNW, or foreign economies. The total direct, indirect and induced economic activities include significant leakage to other U.S. locations, which is included as the "other U.S." employment share. Rows sum horizontally to 100 percent

b/ Estimates of employment accruing to foreign interests are based on the foregone employment possible from an equivalent level of economic activity in the PNW.

pollock and Pacific cod. "Normally" implies that harvesters and processors do not, under the proposed alternatives, change their mode of operation, i.e., they continue to harvest and process the same species and products in the same proportions as in the base case. This is a simplistic assumption, and does not address the other choices available to these firms. Operational changes likely would be undertaken if they reduced some of the negative impacts of the proposed alternatives. Thus, the projected economic impacts may represent a pessimistic scenario.[42]

In the early phases of the inshore-offshore analysis, it was recognized that firms would not operate in the same manner before and after the imposition of allocations to processing sectors. To the extent that firms could change their behavior to take advantage (or to mitigate the effects) of the allocation impacts, changes would be expected. In an attempt to examine these behavioral/operational changes, development of a simulation model of the North Pacific groundfish fisheries was initiated. The model was based on linear programming assumptions and examined the operations of the various processors types, delineated in Table 3.2a, under the constraints of TAC and PSC limits, catch rates, species availability, labor, productivity, and product and species processing capacities. The model was especially suited to simulate open access fisheries, as it explicitly assumed that operators make their processing decisions without regard to harvesting and processing opportunities which may become available at a later point in time, and that they ignore the effect their actions have on other firms. That is, the model assumed that all operators will harvest and process the species and products that generate the highest net returns during a given period. Unfortunately, the complexity of the fishery, along with the time and resource constraints placed on the analysis, did not allow the model to be completed and implemented in time for inclusion in this document. However, the process of building the model, and developing the necessary data inputs and constraints led to a better understanding of the decision making processes at the firm level and provided some insights into the implications and ramifications of the proposed allocations.

The simulation model clearly depicted the relationship between catch rates, processing capacity, and product prices in the decision to harvest and process one species over another during a given time period. For example, a H&G factory trawler may be able to generate a higher return per ton on rockfish compared to Pacific cod. However, if the catch rate for rockfish compared to cod is not proportionately high enough then Pacific cod will be targeted and processed rather than rockfish. Similarly, these relationships clarify the observed changes in targeting of diverse species by fillet factory trawlers and by diversified shoreside plants.

The simulation model also demonstrates the implications of open access management. Each firm will process the most profitable species and product available at a given time, without regard to species and product which may be available at a later date. For example, pollock processors will begin working on the first day of the fishing season and will process at the highest capacity possible, even though delaying may allow them to increase their net returns by processing higher valued roe bearing pollock. If a firm naively assumes that it can delay pollock processing until later in the year, then it may find itself without any pollock to process at all. In the course of this analysis, numerous alternatives have been identified that may affect the operations of these displaced offshore processing vessels. These alternatives, and the likely consequence on economic impacts, are discussed below.[43]

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[42]It also is conceivable that if massive failure and economic disruption in the offshore sector results, then the negative economic impacts to the offshore fleet would have been understated.

[43]Addendum II to this document provides a more detailed examination of the alternatives discussed in this section.

Increase the Proportion of Roe Processing Relative to Other Pollock Products. The economic impacts of groundfish harvesting and processing presented in the previous analysis of alternatives assumed a set proportion of products from each species processed by the different processors. For example, surimi factory trawlers were assumed to process pollock into surimi and roe at a ratio of 9 to 1. Alternatively, H&G factory trawlers were assumed to target pollock only during the roe season and therefore roe was their only product from pollock. The specific allocations under Alternatives 3, 4, 6, or 8 variously reduce the amount of pollock that would be available to the offshore sector. As a result, offshore operations might elect to increase their relative share of the higher valued roe in the products produced from pollock. Table 3.16 provides estimates of the economic impacts that would result by shifting all production from pollock by Dutch Harbor offshore processors into roe[44] under a 50% - 50% inshore/offshore split as proposed in Alternative 3.3. The table is analogous to Table 3.6 part 2(b) and demonstrates that some of the negative impacts of the alternative upon the offshore sector would be reduced if this production shift were undertaken. If only roe were processed in offshore sectors then the reduction in direct income coming into Dutch Harbor is expected to be $1 million less than if Alternative 3.3 with no changes in product mix. Similarly direct, indirect and induced economic impacts in the rest of Alaska would decrease to a lesser extent if roe was the sole product offshore. In the PNW the negative impacts of Alternative 3.3 would lessen dramatically. The loss in direct income would be $11.5 million less than estimated for Alternative 3.3, if surimi, fillets, and roe were produced in the same ratio as in the base case.

Although the assumption that all production from pollock offshore would go into roe is unrealistic, this scenario does demonstrate pressures to change product mix which could be anticipated as offshore processors adjust their operations under a more restrictive allocation of pollock TAC.

Shift Operations to Other Fisheries in the North Pacific Management Area. The development of the Alaska fishing and processing industry is a history of diversity and change. When species become over subscribed, or uneconomic, innovative segments of the industry find new resources to develop. Diversity of operations is one of the most common risk management tools available to operators. The ability of the offshore fleet to shift to other species is limited somewhat by the existing configuration of the fleet. That is, a large specialized vessel such as the surimi factory trawler is unlikely to make a smooth or financially viable shift to a diversified, low volume fishery such as H&G rockfish. This could be an option for a more flexible, smaller vessel, however. One of the limitations to this option is that most fisheries in the GOA and BSAI are already at or approaching full utilization, such that other fisheries--atka mackerel or rockfish, for example--would be able to absorb only a small number of additional vessels without leading to subsequent rounds of preemption. Shifting effort to the more abundant flatfish resources may also intensify bycatch problems.

The possibility also exists that additional fisheries may develop in this region, making use of currently underdeveloped species such as arrowtooth flounder. This type of shift will require a parallel solution to the technological and or market impediments that presently restrict development of these fisheries. The potential for further business and technological advances that open new opportunities is an alluring possibility, but one that is largely unpredictable in terms of its ability to absorb existing excess catching and harvesting capacity.

Shift Operations to Other Regions. Displaced offshore vessels might also shift to existing or developing fisheries in other regions. Radtke has documented the Alaskan offshore fleet's interest in the Pacific whiting stocks off the coast of Oregon and Washington, a convenient and logical extension of operations for portions of the fleet. Rumored opportunities for international joint ventures, orange roughy in the

[44]For purposes of demonstration, this ignores the prohibition on roe stripping as enacted in Amendments 19 and 14 to the Fishery Management Plans for Groundfish of the Bering Sea & Aleutian Islands and the Gulf of Alaska which went into effect in 1990.

Table 3.16 Simulation of Changes in Economic Impacts from Baseline and Alternative 3.3 if All Pollock is Processed for Roe

Dutch Harbor Offshore	Base	Alternative 3.3	Unit Change From Base	% Change From Base	Alternative 3.3 (Roe)	Unit Change From Base	% Change From Base
Local Impacts							
Income ($)	$7,413,086	$4,343,211	($3,069,875)	-41.41%	$5,343,743	($2,069,343)	-27.91%
Total Community ($)	$15,291,199	$10,228,810	($5,062,389)	-33.11%	$11,623,130	($3,668,069)	-23.99%
Employment (FTE)	611	409	(202)	-33.11%	465	(146)	-23.92%
Instate Impacts							
Income ($)	$9,195,719	$5,199,102	($3,996,617)	-43.46%	$5,852,702	($3,343,017)	-36.35%
Total Community ($)	$31,823,734	$22,230,883	($9,592,851)	-30.14%	$23,588,672	($8,235,062)	-25.88%
Employment (FTE)	1,082	756	(326)	-30.14%	943	(139)	-12.81%
Outside Impacts							
Income ($)	$111,523,185	$69,266,412	($42,256,773)	-37.89%	$80,639,645	($30,883,540)	-27.69%
Total Community ($)	$372,943,646	$261,405,632	($111,538,014)	-29.91%	$279,490,261	($93,453,385)	-25.06%
Employment (FTE)	17,523	12,283	(5,241)	-29.91%	13,132	(4,391)	-25.06%
Total U.S. Impacts							
Income ($)	$128,131,990	$78,808,724	($49,323,266)	-38.49%	$91,836,089	($36,295,901)	-28.33%
Total Community ($)	$727,746,801	$513,150,844	($214,595,957)	-29.49%	$547,212,580	($180,534,221)	-24.81%
Employment (FTE)	30,040	21,182	(8,858)	-29.49%	22,588	(7,452)	-24.81%

South Pacific, new species off the coast of South America, or the North Pacific doughnut hole may draw the more adventurous firms that can afford the risk. Still other alternatives beyond these likely exist, and may be able to absorb some portion of the displaced capacity. However, the fact that the affected offshore fleet has chosen to operate in the North Pacific fishery management area suggests that it currently represents the preferred alternative. Existing competition, switching costs, uncertainly, and technological infeasibility place restrictions even on these highly mobile operations.

Convert to Inshore Operating Status. The wording of Alternatives 3 and 8 also presents the opportunity for offshore operations to seek "inshore" status by limiting operation to that of essentially moored floating processors within the territorial sea. The economic feasibility of this type of reconfiguration is questionable, since it would likely involve significant changes to operations by at-sea processors. Prior investments in fishing capability would restrict efficiency, and the advantages of mobility and immediate access to fish would be lost. The option also raises questions concerning the resulting competitive behavior that would develop between the newly configured "inshore" component of the industry and the existing land-based processors. The potential for interception of catcher vessels, predatory pricing, or other similar behavior could reopen the preemption concern.

The above discussion notwithstanding, the potential under Alternatives 3 and 8 for offshore processing facilities to "anchor up" and become "inshore" processors was examined. Appendix A in Section II of this document examines the catch and processing by foreign and JV vessels. It is apparent that significant catches (by assumption, pollock stocks) occurred in the area of St. Matthew Island and around the Pribilof Islands. These areas are currently without established land-based processors and would seem to have the greatest possibilities for these kinds of conversions. Other potential sites might include Cold Bay, and the area around Atka Island. Lacking empirical evidence, it is not clear whether or not this would be an economically feasible alternative.

The potential returns to operators were simulated for surimi motherships and factory trawlers if they were to convert to inshore processors and process the same amount of pollock as they had under the baseline case. These projections are shown in Table 3.17. It was assumed that both types of processors would

Table 3.17 Estimated Returns to Operators of Surimi Motherships[a/] and Factory Trawlers in Based Inshore

Total Returns to Processors if Inshore	($38,098,120)
Total Returns to Harvesters if Inshore	$16,491,366
Total Returns to Harvester & Processors	($22,236,350)
Total Returns From the Baseline Case	$28,713,424
Change in Return From Baseline to Inshore	($50,949,774)
% Change in Return From Baseline to Inshore	-177%

[a/]Inshore exvessel prices are paid for pollock and P.cod, and surimi factory trawler variable harvest costs are eliminated. 75 harvest vessels would be employed.

be able to purchase pollock at no less than the "inshore" exvessel price. For surimi factory trawlers, it was assumed that all variable harvest expenses were eliminated. Otherwise, all cost and operational characteristics were assumed to remain the same.[45] Increased returns to shoreside trawlers were also included, and all returns to at-sea trawlers were eliminated. Table 3.17 projects that "anchoring up," as

[45]Other changes in costs and operational characteristics would likely occur (lower fuel costs, lower product prices, lower repair and maintenance costs); however, the biggest impact is assumed to be the higher cost raw product, which was the only change examined.

simulated, would not be an attractive alternative. However, the results imply that the alternative may not be any worse than continued at sea operations under the more dramatic allocation options proposed in Alternative 3. This simulation does not address all conversion options open to vessels wishing to achieve inshore status. Nonetheless, it appears that simply moving inshore without significant changes in operating characteristics would not be financially attractive for offshore processors.

Failure of Individual Firms. In each of the above possible alternatives for catchers and processors there is the presumption of continued operations. Another more ominous outcome is economic failure, applicable to both inshore and offshore segments. The consequences of failure are focused on owners, creditors, and employees, as well as those who depend upon them for business. Those firms exiting the industry would convey a one time loss in direct incomes, accompanied by a lingering decline associated with lost economic activity. The consequence of failure can also be to improve the outlook for survivors. The financially weakest firms--though not necessarily the least efficient--make way for the more economically competitive, and the reduction of processing capacity may increase shares available to the remaining offshore fleet. These conditions could lead to a reversal of economic declines for the surviving firms.

The process of industry decapitalization described above might continue following a reduction in resource allocation until the collective catching and processing capacity is efficiently realigned with available supply. Along the way however, the idled resources--vessels, equipment, labor--may become available at a lower cost, as owners seek to liquidate salvaged assets. This can lead to subsequent rounds of attrition among the reorganized industry as cost and efficiency adjust to availability of assets and resources liquidated by failing firms. The end result is uncertain, ranging from an efficiently reorganized industry to one of lingering instability and cutthroat competition.

In aggregate, there are several possible alternatives available to offshore processors, but the economic feasibility of these options is unclear. It is unlikely that any single option would account for the collective excess capacity of the displaced offshore fleet. Rather, individual niches would be carved out, each absorbing a share of the unused capacity. The inherent mobility of the offshore fleet may provide that sector more ready access to some of these alternatives than is afforded inshore processors, which relates to the underlying dilemma creating preemption problems.

3.4.5 Bycatch

Bycatch is the incidental catch of a secondary, or nontarget species during the harvest of a target species. The ramifications of bycatch can be complicated, depending upon factors such as the bycatch species encountered, the bycatch harvest rate, the gear type used in the target fishery, the relative economic values of the species involved, and the management plans governing the target and bycatch species. In some cases, unwanted, or low value bycatch--such as arrowtooth flounder--is simply discarded by the harvest vessel, particularly if the bycatch species is not constrained by a TAC, or is underutilized relative to its TAC. The problems associated with bycatch become more apparent when the bycatch species is fully utilized, with a significant economic value, and a constraining TAC or PSC (Prohibited Species Catch) limit. In such instances, the bycatch of a species may threaten to exceed the ABC or TAC, leading to a closure of the target, bycatch, and other related fisheries. Such closures may impose costs on the industry in terms of the foregone opportunity to harvest available TAC. To remove the economic incentives of indirectly targeting bycatch species, bycatch must be discarded in certain fisheries, which may result in a significant net loss of the resource if bycatch mortality is high.

Suggested remedies to these dilemmas include more selective fishing practices, gear and area restrictions, time-area closures, catch limits or "caps" placed on the bycatch allowed for certain important species, as well as incentives to reward vessels with low bycatch and penalize those with high bycatch rates. Because bycatch is a complicated issue, the management of affected fisheries becomes complicated. Consideration of the bycatch implications of the proposed inshore/offshore amendment is therefore an important input to the design and implementation of this policy measure.

The underlying concern of the Council in the Inshore/Offshore Amendment is one of separating the inshore and offshore components of the industry, such that the offshore sector does not unduly preempt the harvesting and processing activities of the inshore component. The remedy prescribed in the preferred alternative designates specific percentage share allocations of the TACs to the inshore and offshore components, and preferential inshore access to certain fishing grounds, as a means of resolving this conflict.

Potential Changes in Fishing Effort Caused by the Proposed Amendment

The analysis of the biological impacts (see Section 2.3.4 of the SEIS) concludes that the efforts to apportion the pollock and Pacific cod TACs between the two industry components may impact bycatch activity in several fisheries. Changes in bycatch might arise from adjustments in fishing effort and location by the inshore and offshore fleets such as: 1) a decrease in offshore allocation of pollock and Pacific cod that results in an increase in the offshore fleet's efforts on other species or fishing grounds; and, 2) an increase in fishing effort by the inshore component pressuring localized stocks in order to harvest their share of the TAC.

The stimulus for changes in fishing activity arises directly from the regulatory measures proposed in Amendment 18/23, but the bycatch impacts are largely conjectural, based on projection of just how the respective inshore and offshore components will react to the new management regime. Rather than speculate on discrete industry actions and bycatch impacts, it may be more constructive first to examine the fundamental incentives created by Amendment 18/23 as they apply to bycatch. Five basic area/species provisions of the Amendment's preferred alternative are considered in this regard; 1) GOA pollock; 2) GOA Pacific cod; 3) BSAI pollock; 4) the BSAI harvest vessel operational area; and 5) the BSAI Western Alaska Community Quota scheme.

GOA Pollock. In the GOA pollock fishery, the offshore component will be prevented from taking pollock, except as bycatch. Historically, the offshore component has accounted for about 18 (1988) to 50 (1989) percent of the GOA pollock DAP, accounting for 8,000 (1988) to 33,000 (1989) tons round weight, including bycatch. The initial expectation is that this action will not seriously impact the overall offshore segment, so long as the bycatch provision is allowed. GOA pollock has been targeted by smaller factory trawlers (H&G and small Filet boats) in the past. There is some question as to designation of allowable pollock bycatch rates that would apply to this provision. Under the 1991 interpretation, up to 20 percent pollock bycatch would be allowed. It is possible that this may create an incentive for offshore harvest vessels to increase pollock bycatch up to the 20 percent maximum. Actual bycatch rates, presumed to be somewhat lower that the 20 percent bench mark, might be a more appropriate standard for allowable pollock bycatch.

GOA Pacific cod. The GOA Pacific cod fishery will be split 90 percent inshore, 10 percent offshore. The inshore segment has increased its utilization of cod in recent years, accounting for 80 to 90 percent of the DAP (55-60,000 tons). Offshore operations are also targeting cod, accounting for around 15,000 tons in 1990. Both inshore and offshore operations have shifted effort to Pacific cod owing to its availability and significantly higher market prices since 1990. Eliminating the target pollock fishery, and restricting the Pacific cod TAC is therefore expected to force a component of the offshore fleet elsewhere, or into other GOA fisheries. Increased offshore harvest pressure on rockfish or deep water flatfish could increase bycatch of halibut and salmon based on current bycatch rates in these fisheries.

BSAI Pollock. In the BSAI, the allocation of pollock will be "phased in" over a three-year period. In mid-1991, the harvest split between inshore and offshore components was approximately 27/73 percent, respectively. Over the past three years, the split has been closer to 20/80, but the recent expansion of the inshore processing industry in Dutch Harbor has significantly increased shore-based processing capacity. The phase-in calls for a 35/65 percent split (inshore/offshore) the first year, increasing to 45/55 percent by the end of the third year. Even small reallocations of the BSAI pollock TAC translate into large tonnages. The implied shift from a 27/73 allocation to 35/65 is 110,000 tons of pollock. One consideration is whether the inshore component will be able to harvest their share of the BSAI pollock TAC without aggravating bycatch on the fishing grounds accessible to shore based catcher vessels.

A second and more serious bycatch concern is the potential of displaced offshore harvest vessels to utilize their excess catching and processing capacity by turning to other fishing grounds or other species. Such vessels may shift from relatively low-bycatch pelagic trawl pollock to higher-bycatch bottom trawl for other groundfish. While there is underutilized TAC of various flatfish in the BSAI, both economic feasibility and halibut bycatch concerns will influence whether these will become viable alternatives for the offshore component. Existing bottom trawl fisheries, such as Pacific cod, Greenland turbot, and rockfish have relatively high halibut bycatch rates. Increasing effort in any of these fisheries might increase halibut bycatch, leading to earlier attainment of the PSC caps, and closure of the affected fisheries.

For both the BSAI and GOA, provisions of the inshore/offshore amendment allow for offshore processors to achieve "inshore" status by restricting operations throughout the year to one location within the territorial sea. Thus, some reconfiguration of the existing offshore fleet is possible that would permit continued pollock operations as part of the inshore sector.

Harvest Vessel Operational Area. The proposed amendment also calls for a "harvest vessel operational area" in the waters adjacent to Dutch Harbor. This provision will restrict offshore catching and processing in these productive grounds. The area is 168 through 163 West and 56 North, south to the Aleutian Islands, covering portions of Areas 517, 511, and 515.

Catch records from 1989 show that the inshore segment is entirely dependent upon the proposed harvest vessel operational area for pollock, and offshore processors took 55 percent of their pollock tonnage from within these boundaries. Offshore processors are permitted to harvest up to 65 percent of the A season allocation within the prescribed zone, and it is possible that harvest vessels may be able to deliver to catcher-processors under this proposed rules. Nonetheless, the restrictions will limit offshore processor's access to this important fishing area. In order to harvest the prescribed share of the TAC (65 percent in year 1), the offshore component will be forced into other areas--possibly north and west along the continental shelf break--with potentially different bycatch rates.

The bycatch ramifications of the harvest vessel operational area are further clouded by uncertainty as how the offshore fleet might split operations between the "A" and "B" seasons, and therefore their presence in the operational zone. Bycatch during the "A" season using pelagic trawl gear is expected to be relatively lower than that achieved later in the year during the "B" season.

Western Alaska Community Quotas. The last scenario applies to the issuance of Western Alaska Community Quotas (WACQ) for pollock. The proposed amendment allows for up to 7.5 percent of the BSAI pollock TAC to be utilized by qualifying Bering Sea communities to support community development. The Pribilof Islands, and possibly other communities in the Western Aleutians, have been mentioned as possibilities. Seven and one-half percent of the BSAI TAC is a significant fishery resource--104,000 tons--and shifting catching effort to unspecified shore-based fishing grounds has uncertain bycatch implications. If the offshore fleet is denied access to the harvest vessel operational area, it is possible that the fishing grounds adjacent to other Bering Sea communities might receive more fishing pressure, and lead to competition with the shore-based fleets from the WACQ processors.

Bycatch-Related Impacts

The potential changes in fishing behavior related to the proposed inshore/offshore Amendment as discussed above lead to some general conclusions regarding bycatch. To the extent offshore harvest vessels redirect fishing effort in areas or fisheries with higher bycatch rates, overall bycatch may increase. Similarly, if shore-based catcher vessels intensify efforts on localized fishing grounds as a result of increased TAC shares, bycatch may be magnified. Increasing bycatch triggers both economic and regulatory actions in those affected fisheries, particularly for designated species such as halibut, crab, herring, salmon, and rockfish. The implied shifts in fishing effort by area also may require changes in the PSC apportionment among groups, even if overall bycatch levels remain the same.

An obvious impact of bycatch is the removal of tonnage against the TAC of the fisheries involved. An overall increase in bycatch may deny the economic value of these species to the associated producing and consuming interests, particularly where the bycatch is discarded. Ultimately, increased bycatch may lead to closures of the affected fisheries, as a regulatory measure to protect certain species involved. For example, high bycatch of crab or halibut has lead to closures of bottom trawl fisheries in general. High bycatch by only a few vessels may lead to closures that affect the entire industry.

In the context of the inshore/offshore allocation of TAC, it is possible that increased bycatch by one sector might lead to closures that affect the other sector's ability to take its share of the TAC. It is conceivable that one sector might negligently or intentionally increase bycatch in order to affect the directed fishery of another group, in the absence of regulatory measures to limit such impacts.

The preferred alternative conceivably might also lead to a reduction of bycatch related problems in certain situations. For example, if Amendment 18/23 results in a shorter pollock "B" season for the offshore component, this may reduce the high herring bycatch problems in the fall on the herring wintering grounds north and west of the Pribilof Islands. Second, to the extent the inshore allocation extends the "B" season for shorebased operations, herring bycatch may be reduced by avoiding a concentrated pulse of fishing effort during the mid-summer period when herring are present in the proximity of inshore processors.

Efforts to manage bycatch-related impacts are complicated by the timeliness and accuracy of catch data, as well as the complex interactions among the fishery resources and the harvesting/processing industry. The harvest vessel operational area, for example, overlaps three different management areas (517, 511, and 515), as well as parts of summer herring savings areas 1 and 2 (see Figure 3.16). Currently, it is not feasible to accurately report bycatch exclusively for the harvest vessel operational area, since bycatch is reported by management area, while the operational area and savings areas are defined by unique longitude/latitude designations. The effective reporting of catch and bycatch through observer coverage may be affected by the proposed amendment. The preferential inshore allocation of TAC may result in smaller, shorebased catcher vessels with 30 percent coverage taking the place of larger vessels who reported 100 percent coverage.

Fisheries in the GOA and BSAI are already constrained by bycatch. To the extent the Alaska groundfish industry is overcapitalized in both fishing and processing capacity, it is inevitable that pressure on the fishery resources will build, and increased bycatch problems are an unavoidable consequence of this stress. This exists regardless of actions taken to manage the preemption problem that exists between the inshore and offshore components of the industry. Of specific concern in the proposed Amendment 18/23 is whether: 1) bycatch implications could undermine the Council's efforts to resolve inshore/offshore

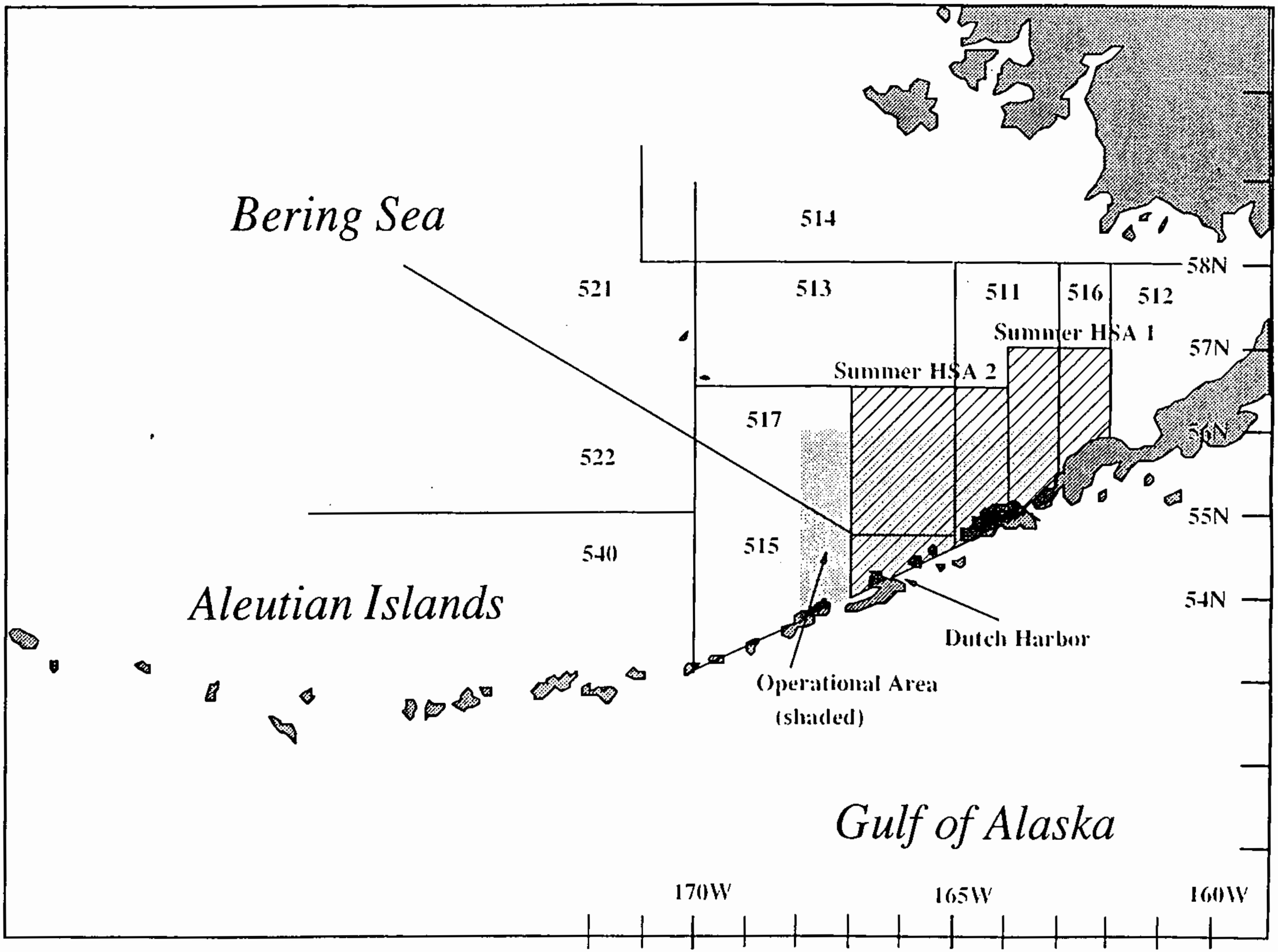

Figure 3.16 Bering Sea Harvesting Vessel Operational Area

preemption with separate TAC allocations; and 2) the provisions of this amendment might unduly add to bycatch problems in these fisheries.

The answer to both of these questions rests in part on the bycatch management policies adopted by the Council. With significant biological and economic concerns at stake, fisheries management has increased its attention on bycatch issues, exemplified in the adoption of BSAI Amendments 16 and 16a, along with GOA Amendment 21. These measures establish PSC limits to control the bycatch of BSAI crab and halibut, and GOA halibut fisheries. Attainment of a PSC limit triggers fishery closures that are intended to limit further bycatch amounts of prohibited species. Amendment 16a also specifies the herring PSC limit, and a series of timed area closures that are triggered by the attainment of the herring PSC limit. Amendments 16 and 16a also establish procedures to apportion PSC limits to specified trawl categories as prohibited species bycatch allowances, and the results can be allocative in their own right. Apportioning bycatch tonnage to specific industry segments, such as the assignment of PSC halibut limits, may effectively allocate access to target fisheries.

Current inseason management authority provides blunt, short term measures for addressing bycatch issues as they arise. This has created a demanding task for the regulatory agencies in "micro-managing" the myriad of bycatch-related problems that arise over the course of a year. In some instances, the situation has been deemed unacceptable by the Council. As a result, a longer term, comprehensive bycatch amendment is also under development, one that would expand the incentives for efficient bycatch management within the industry.

In the absence of any explicit short term provision to apportion bycatch between the inshore and offshore sectors, bycatch complications might limit the ability of Amendment 18/23 to contain the preemptive pressures between these two industry components. However, the existing mechanism for apportioning PSC limits among various industry segments might be used to address this problem. That is, existing bycatch regulatory measures can be applied to problems arising from the inshore offshore allocation.

The potential exists for aggravated bycatch problems as a result of Amendment 18/23, but such potential applies equally to many of the emerging issues in the Alaska groundfish industry. Bycatch is not a unique result of the inshore/offshore allocation of the pollock and Pacific cod TACs. Moreover, bycatch problems are likely to be an inevitable consequence of overcapitalization regardless of the action taken. An effective remedy to the types of bycatch issues raised by the inshore/offshore allocation will require an integrated fishery management process extending well beyond the scope of Amendment 18/23.

3.4.6 BSAI Inshore Operational Area

The designation of the operational area specified in Alternatives 3 and 8 covers a very productive fishing grounds in the BSAI pollock fishery. The proposed operational area is defined as those waters inside 168 through 163 W longitude, and 56 N latitude south to the Aleutian Islands, illustrated in Figure 3.16. An examination of 1989 fish-tickets[46] shows that 100 percent of shoreside deliveries came from within the proposed operational zone. The area contained in the proposed operational zone is also important to offshore processors, who took 55% of their 1989 pollock from within its boundaries.

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[46]Statistics based on fish ticket reports warrant some qualification. Fish tickets report catch in $1\frac{1}{2}$ by 1° statistical areas. As such, they are the only method of tracking catch in areas such as the proposed inshore operational area which are more detailed than the 3 digit reporting zones. However, fish-tickets from at-sea processors are known to contain errors; perhaps as much as 50,000 mt of the 854,000 mt. reported by offshore processors in fish-tickets (six percent) is in error.

Using a simple accounting of the sources of pollock processed by the inshore and offshore sectors, the apparent availability of stocks outside of the operational area can be compared to offshore shares. Denying offshore processors access to the pollock resources in the defined operational area would have prevented the offshore fleet from obtaining their actual 1989 tonnage by a shortage of 30%. Under the proposed Alternative 3 options, the offshore share of the BSAI pollock TAC is effectively reduced, such that offshore processors are less dependent upon supplies from the designated operational area. Under option 3.1, offshore processors still would fall 17% short of processing tonnage requirements. In options 3.2 and 3.3, the allocation to offshore processors is reduced to the point where sufficient pollock resources are available outside the operational area.

The preferred alternative is not as unilaterally restrictive as Alternative 3 regarding offshore operations in the designated "Bering Sea Harvest Vessel Operational Area." Offshore processors are allowed to take up to 65 percent of their allocated share of the pollock "A" roe season. For 1991, the Bering Sea roe season allocation was 441,500 tons. Allowing for harvest of 65 percent of the allocated offshore share of this tonnage in year 1 would amount to 186,534 tons from the zone[47]; approximately 13.5 percent of the BSAI TAC. In addition, the preferred alternative permits delivery to offshore processors by designated harvest only vessels, which presumably allows motherships to operate in the zone. Any delivery to offshore processors by harvest vessels would count towards the offshore allocation. Motherships currently account for about 12 percent of the BSAI pollock DAP.

Based on these assumptions, the offshore component might take conceivably up to 25 percent of the BSAI pollock TAC (353,000 tons) from within the zone under Alternative 8 in the first year. This compares to the reported 375,760 tons DAP taken from the zone by offshore processors in 1989 under open access; 55 percent of BSAI TAC in that year. Although the processed tonnage is comparable between the two years, offshore processors will likely find access to the zone more restrictive than the numbers suggest, considering that the tonnage taken by offshore processors in the BSAI has increased since 1989.[48] As a result, limiting offshore operations in the zone is expected to result in a shift of some at-sea processing--perhaps as much as 200,000 tons--to other BSAI fishing grounds if necessary to harvest this sectors' entire pollock TAC allocation.

The apparent dependence of both inshore and offshore processors on the operational area based on past catch statistics is a simplification of the economic environment that might actually allocate BSAI pollock under these alternatives examined. It is questionable whether pollock from other zones in the BSAI management area would be a costless substitute for fish from the designated operational area. To the extent expenses of catching or processing increase when other stocks are pursued, the economic costs to the offshore sector increase. There are also concerns over possible bycatch problems as the offshore fleet is forced into more intensive harvesting in other areas.

3.4.7 Community Development

Under any allocation scheme, the proposed amendment calls for the analysis of a provision for community development. The relationship between economic activity and community development is an integral part of the measurement of economic impacts reported in the analyses of specific port locations. Elements of this issue also are addressed in the sociological impact assessment contained in Section 4.0.

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[47]The 441,500 ton TAC, multiplied by the 65 percent offshore share, multiplied times the 65 percent of the "A" season harvest allowed within the zone, equals 186,534 tons.

[48]There was a 287,000 ton BSAI JV fishery in 1989, as well, that has since been absorbed by the inshore and offshore DAP.

St. Paul, Pribilof Islands was identified as one of the test port locations for the purpose of analyzing the community development consequences of the proposed alternatives. As reported in the community profiles of the social impact assessment, St. Paul has initiated several economic ventures designed to capture the economic benefits associated with the Bering Sea fishery resources. In 1989, the base reference year for the allocation schemes evaluated, there was no reported groundfish processing activity in St. Paul, although 2,700 tons of Pacific cod were processed in 1990.

Alternatives 7 and 8 both specify that an explicit allocation of pollock stocks be made available to communities in the Bering Sea. An examination of the economic impacts such an allocation might have on St. Paul is included in the analysis of these two alternatives.

3.5 Summarization of Economic Costs and Benefits to the Nation

Efforts to value the aggregate national costs and benefits arising from the eight alternatives under consideration in the Amendment have been limited in this analysis by the availability of statistically reliable, quantitative measures of the economic relationships involved. Precise quantitative dollar measurement of net national economic impacts has proven beyond the capabilities of this analysis due to: 1) the unavailability of information concerning aggregate consumer demand relationships; and 2) uncertain impacts on markets, production levels, and costs that might arise from large scale changes in resource allocation. In the absence of empirical, statistically reliable quantitative estimates, it is still possible to qualitatively assess costs and benefits based on available evidence and theoretical expectations. The following is a summary evaluation of the likely economic costs and benefits to both consumers and producers based on analysis of the proposed amendment.

Consumer Benefits and Costs

Consideration of consumer benefits and costs is intended to evaluate impacts on consumer surplus. Consumer surplus is the net economic value from consumption. In an economic context, consumer surplus is the difference between the maximum consumers would be willing to pay for a product, and what is actually spent. When a consumer is able to purchase something for less than he or she would have been willing to pay for it, the difference is consumer surplus. In order to quantitatively measure national consumer benefits, it is necessary to have an accurate estimate of consumer demand at all price and quantity combinations. This enumerates the consumer's "willingness to pay". Generally, impacts on consumer surplus arising from changes in the availability of a commodity are more dramatic when consumer demand is insensitive to changes in price (inelastic demand). Conversely, consumer impacts are less noticeable when demand is responsive to price changes, such as when abundant substitutes or alternatives are available to the buyer (elastic demand).[49] In all such considerations of net national (U.S.) consumer benefits, measurement is further complicated by the need to separate out the likely impacts of foreign consumers on product mix and price levels, since much of the product output is destined for overseas markets.

For the options examined under the proposed amendment--particularly the explicit allocations considered in Alternatives 3, 4, 6, and 8--it may be argued that the net national consumer benefits would be unchanged to the extent that aggregate demand is relatively elastic, and there is competition among

[49]The responsiveness of consumer demand for a product to changes in its price is called the price elasticity of demand. This measure can be interpreted as the percentage change in quantity demanded arising from a given percentage change in its price. If the responsiveness of demand is greater than the change in price, the demand is said to be elastic; or inelastic if the change in quantity demanded is greater than the change in price.

processors. This conclusion draws upon the expectation that conditions of open access *within* each segment are maintained in the affected fisheries, and that the catcher/processor operations will respond to the price and product quality signals expressed through the market. Moreover, it is reasoned that consumers have a wide array of seafood or other food sources available as substitutes, such that demand will be relatively responsive to changes in price. The proposed allocations do not change the harvest quota (total allowable catch) or consumer demand; rather, it is the identity of the harvesting and/or processing operations involved that are affected by specific allocations of the TAC.

The product mix[50] reported by the various industry components during the study period (1989-90) varied among and between the inshore and offshore segments, reflecting different processing configurations, product quality, and business strategy (see Table 3.2a). Evidence from 1990 and early 1991 indicates that changes in the world supply and demand for groundfish also create shifts in product form and mix, influenced by price and market conditions. Changes in relative prices indicative of consumer demand will induce processors to shift to higher valued product forms over time, as illustrated by ongoing changes in the product mix for both inshore and offshore processors between 1989 and 1991. That is, if the price of pollock fillets increases relative to the price of surimi, both inshore and offshore processors will respond by shifting production towards fillets; both segments possess some flexibility in adapting to changes in consumer demand.

Less obvious is the impact a change in allocation might have on consumers as a result of changes in product volume, quality, and price. Depending upon the elasticity of demand, consumers might gain some increase in benefits (consumer surplus) to the extent that an allocation resulted in an increase in the total available product, at constant or lower prices, for the same quality product. The analysis indicates that product recovery rates (finished product recovered from raw product) are somewhat higher for inshore processing, relative to offshore, suggesting that an increase in the inshore allocation would lead to an increase in total product available to consumers. Conversely, the offshore segment operates at lower private cost per pound of output, achieving higher quality and receiving commensurate higher prices for some products. The implication in the latter case might be that offshore processors have the *capability* to produce and deliver the finished product to consumers at a lower price than inshore processors. The analysis of the proposed amendment explores the trade-off in catching/processing efficiency with price levels and product mix, but must remain hypothetical in its conclusions regarding total consumer benefits. This is due to uncertainty over the nature of aggregate demand for pollock and Pacific cod products, including social valuation associated with differing levels of product recovery and utilization.

Consumer and even broader social benefits also are associated with a fishery management scheme that resolves the instability created by the conditions of preemption enumerated in the proposed amendment. Although unintentional, preemption of the inshore component by the offshore component creates economic and social disruptions within the effected inshore communities, as documented in the Social Impact Assessment presented in Chapter 4. Such costs may not be reflected in the market place for the fish products. Resolving or limiting the preemptive conditions helps balance social and economic opportunities, provides a more egalitarian access to the fishery resources, reduces the uncertainty and operational instability caused by the threat of preemption, yet maintains the competitive environment necessary for an efficient allocation to consumers.

Competitiveness

There are conditions under which the U.S. consumer might be adversely affected by an inshore/offshore allocation, particularly if a state of "imperfect competition" were to develop, and a segment of the industry

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[50]Product mix in this case refers to the volume and proportion of the various finished product forms manufactured from a given roundweight of pollock or Pacific cod; i.e., fillets, surimi, roe, meal, etc.

sought to exploit such conditions. Such a situation might arise if the overall access to total pollock or Pacific cod were to be concentrated in the hands of a few firms who then sought to extract monopoly profits by restricting supply and increasing consumer prices.[51] None of the proposed options, however, would appear to vest such *complete* control of the resource to a chosen few. In the pollock and Pacific cod processing sector there are about 100 total processing operations,[52] roughly 80 percent of which are offshore processors who accounted for a proportional 80 percent of the processing activity in 1989 and 1990. The preferential inshore allocations considered under Alternatives 3, 6, and 8 increase the resource share of the BSAI inshore processors--ranging from 19 percent (the baseline case) up to 58 percent--but such allocations do not monopolize the entire TAC for either segment.

Alternative 8 (the preferred alternative) apportions a maximum of 45 percent of the BSAI pollock TAC to inshore processors by the end of the third year.[53] The relatively small number of BSAI inshore processors results in a concentration of *shoreside* market share, but this does not give inshore processors control of the majority 55 percent of the pollock TAC allocated to offshore competitors. Moreover, the availability of substitute products (other seafood or alternative protein sources such as poultry) further limits the ability of such monopoly or cartel actions.

Such conclusions do not address market structure or behavior of secondary processors, or wholesale/retail distributors of the pollock and Pacific cod products. Nor does this deal with the nature of competition that might arise among small and large inshore processors. Industry behavior and performance at these and other important levels of the marketing chain also would have to be competitive in order to transmit the implied market efficiency on to the consumer.

Assuming open access and competition among and between the inshore and offshore components, it is expected that both sectors would adapt to the most efficient and profitable level of product utilization consistent with the underlying operating efficiency and consumer demand. Year-to-year variability in prices, product and quality are expected, but it does not appear that consumer demand inherently favors one mode of processing over another that would be adversely affected by the alternatives considered in the analysis.

Producer Benefits and Costs

National benefits to producers (producer surplus) can be expressed as total revenues minus total economic costs. The consideration of costs warrants special examination, because economic costs also recognize the opportunity costs and externalities associated with the use of all resources. This calculation of producer benefits differs from the more conventional measure of financial profits in this regard. Economic

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[51]Technically, this form of market structure--where a few firms effectively control the supply of a product--is termed an *oligopoly*, or a *cartel*. If a single firm or entity maintains such control it is termed a *monopoly*. Addendum I to this RIR explores the structure of the pollock processing industry in this regard.

[52]Table 3.2a enumerates 110 processors in the affected pollock and Pacific cod fisheries, combining inshore and offshore components. Thirty of these are freezer longliners, however, which are not normally considered to be pollock processing operations. Thus, the total number of firms with processing capability likely overstates the number actively processing a particular species such as pollock or Pacific cod.

[53]GOA apportionments result in a higher percentage allocation to inshore processors, but the tonnage involved--and potential market control--is much smaller in comparison to the overall supplies available. Alternative 8 allocations to inshore GOA processors represent only 5 percent of the Pollock, and 26 percent of the Pacific cod TACs in Alaska.

costs include the opportunity costs of invested capital or labor (what these resources might earn in their best alternative use), as well as the externalities (non market costs and benefits) associated with factors such as bycatch or impacts on marine mammals. These are considerations not included in traditional calculations of financial profit.

The economic impacts of the proposed alternatives on producer benefits and costs are expected to occur primarily in the regional Alaska and Pacific Northwest (PNW) economies that support the affected groundfish catching and processing activity. The residences and geographic attachments of both inshore and offshore components of the groundfish industry are centered in Alaska and PNW. Whereas the fishing, processing, and direct service support operations for both inshore and offshore components occur in Alaska, the strategic and logistical base for activity is the PNW, primarily Seattle. To the extent that economic benefits are earned proportional to the volume of fishery resources utilized, increased allocations of pollock or Pacific cod to the inshore segment raise the producer benefits to this component of the industry both in Alaska and the PNW, at the expense of the offshore component, primarily in the PNW and offshore service centers such as Dutch Harbor. More of the inshore producer benefits are captured by local ports in Alaska, since the economic activity originates in these locations. Offshore processors utilize the Alaska ports, particularly Dutch Harbor, but are less dependent upon these communities, so the relative proportion of producer benefits accruing in Alaska is less for this segment. The effects are not entirely regional, however; certain industry aspects including corporate ownership, finance, insurance, and shipbuilding are national or international in scope.

Economic impacts estimated using the input-output methodology focused on direct income and employment, based on direct, indirect, and induced economic activity. These effects are likely more diverse geographically than the strict interpretation of producer surplus.[54] Figures 3.13a and b illustrate the estimated distribution of these impacts for Kodiak and Dutch Harbor.

The financial profitability calculated for the affected catching and processing sectors is illustrated and summarized in Section 3.4.2. These financial measures of net returns are likely greater than the true producer economic benefits, in that measures of opportunity cost of the inputs (capital and labor) are excluded. To allow for such opportunity costs requires basic assumptions about alternatives available to capital and labor, by location. Generally, the opportunity costs of equity capital--debt capital has an explicit interest cost--can be factored in as the market rate of return (ten to 15 percent) which has the effect of increasing costs and decreasing producer benefits. Such adjustments are similar for both inshore and offshore segments of the industry, but the magnitude of the opportunity cost will depend upon the relative capital intensity of the operation and the proportion of equity capital involved.

The opportunity cost of labor is addressed to some extent in the Social Impact Assessment (Chapter 4 of the SEIS). Generally, the opportunity costs of labor are greater where there are viable employment alternatives. These costs vary from location to location, depending upon the relative utilization and mobility of the labor resource. Where opportunity costs of labor are low, the prospect of employment loss carries the entire wage foregone due to unemployment. Fishing or fish processing jobs lost in remote Alaskan communities, where there are no other employment opportunities, will impose a prominent economic cost. Where labor opportunity costs are higher, the costs of job loss are lessened to the extent that other employment can be obtained, in which case the economic cost is the wage differential between the old and the new job.

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[54]Economic activity, including the income and employment impacts estimated in the analysis, is a much broader but less exact concept than producer surplus. Direct income is a proxy for profitability, but also includes wage and salary incomes which are considered economic costs rather than net producer benefits. Thus, the estimates of direct income reported in this analysis doubtless overstate net producer benefits.

Measuring non market costs and benefits is especially difficult since the implied economic valuations are not generated in a conventional market environment. This creates the potential for misallocation, in the sense that the costs (or benefits) to individuals may be different than those borne by the public, or society in general. Where economic valuation proves impractical, a careful inventory of suspected non market effects is undertaken, though recognizing that such measures may not be comparable to dollar-based assessments. In the inshore/offshore Amendment analysis, the description of biological impacts--including bycatch--in Chapter 2 and Section 3.4.5, along with the assessment of endangered species in Section 5.8 provide graphic examinations of potential non market costs and benefits.

The "point estimates" (reflecting the singular performance observed in 1989) of catcher and processor costs and benefits available from the empirical data used in the analysis do not allow for a comprehensive estimation of the complete individual or industry supply functions that would be necessary for an accurate assessment of producer gains and losses. The resource allocations available to particular sectors change significantly under the various options, and it is not clear how the operations of the affected catchers and processors would change under a different allocation scheme. The "point estimates" based on 1989 operations suggest that the inshore segment generates a greater producer benefit--in terms of direct income --from the proposed preferential allocations, but such conclusions are qualified by the restrictive assumptions that no significant change in fixed plant operations are undertaken with the alternative allocations. As noted in the assessment of the overall model results, the economic impacts are very sensitive to changes in the operations of catchers and processors, as well as market impacts that might result from changes in product form or mix. Overall, changes in direct income (as a proxy for net producer benefits) is judged to be unchanged (not significantly different than zero) under the allocations analyzed in Alternative 3, 6, and 8.

Addendum II to the RIR explores alternatives available to displaced catchers and processors that might mitigate or increase the economic costs and returns calculated in the simulation of specific percentage allocations under Alternative 3, 4, 6, and 8. The overcapitalization dilemma that underlies the inshore/offshore allocation problem extends beyond the pollock and Pacific cod fisheries; the opportunities for uncomplicated shifts into other Alaskan groundfish species are limited by small TACs, poor markets, and bycatch problems. Nonetheless, experience in the first six months of 1991 has documented the fleet's ability to reorganize around several diverse alternatives. To the extent that displaced offshore operations are able to reduce the operational losses projected under the decreased allocations of pollock and Pacific cod, the losses incurred by this sector will be lessened from those estimated in the economic analysis.

Net Benefits to Society

Justification for adopting the proposed Amendment 18/23 requires that potential benefits to society from the regulation outweigh potential costs to society. While a statistically reliable, quantitative dollar measurement of potential costs and benefits is difficult to achieve given the breadth of the issues involved, it is possible to summarize the anticipated impacts of the preferred alternative and draw qualitative conclusions.

The most direct economic impacts are expected to occur in the respective inshore and offshore components of the Alaska groundfish industry. Analysis of estimated changes in employment and direct income borne by these two components indicates that the net effects on catchers and processors will be unchanged, or of minor significance. Employment and income will shift from the offshore segment to the inshore segment. Offshore operations will not be compensated for this transfer, and the loss to this component of the industry will not be trivial. The greater the percentage allocation shift from the offshore to the inshore component, the greater the implied economic impacts on the respective sectors. Thus, the benefits associated with reducing preemption need to be weighed against the losses to the offshore component caused by such reallocations. There are some alternatives available for the displaced offshore catcher and processor operations that may reduce the losses incurred by this sector, but such options are limited. There are even fewer alternative available to the inshore sector, should preemption continue or worsen.

The inshore and offshore allocations prescribed under the preferred alternative seek to establish access to the pollock and Pacific cod resources in the BSAI and GOA consistent with the established and anticipated growth in catching and processing capacity by this industry. The apportionments between the two sectors attempt to balance equity, economic opportunity, and the health of the resource base. Such decisions are not new in the allocation of the America's natural resources. Nearly 200 years ago, Thomas Jefferson and Alexander Hamilton debated whether to allocate this new Nation's land among the population, or to the highest bidder. The view that prevailed at that time has come to be characterized as Jeffersonian Democracy--one that recognizes egalitarian access and distribution as well as economic efficiency.

In this context, the actions to rectify the economic and social problems arising from preemption are expected to create positive social gains, to the extent the policy measures effectively remedy the dilemma. While the net dollar impacts of reallocating the fishery resources may be neutral on consumers or the direct catching and processing operations involved, there are national benefits associated with maintaining a balance in the social and economic opportunities inherent in these fisheries. Restricting or managing preemption helps insure that the fishery resources are available to provide benefits to all parties, without unduly obstructing the competitive element of the marketplace. The assignment of set harvest shares or allocations is expected to reduce the uncertainty and operational instability caused by the actual or perceived threat of preemption.

3.6 Summary of Alternatives

The eight alternatives analyzed in the proposed inshore/offshore amendment represent a wide range of managerial approaches for resolving the preemption problem. The variations in procedure and philosophy inherent in these alternatives preclude a systematic comparison of program features, but it is possible to draw general conclusions regarding the likely economic consequences as they relate to the problem under consideration. As defined by the Council, the underlying problem is one of resource allocation, where one industry sector faces preemption by another. The procedures suggested in each of the eight alternatives reflect differences in the interpretation of the scope, magnitude, and appropriate resolution of this problem. Table 3.18 qualitatively summarizes the relative impacts projected under each alternative for selected economic considerations. This summary follows directly from the conclusions drawn in the analysis for each of the eight alternatives.

Alternatives 3, 6, and 8 provide direct settlement of the preemption dilemma through the assignment of specific allocations of the pollock and Pacific cod TACs to respective inshore and offshore components. Differences among these three options relate to the respective inshore and offshore definitions and percentage allocations. In addition, Alternative 6 establishes a limited unspecified allocation to catcher vessels available to processors through the marketplace.

Alternative 4 also prescribes an allocation of the TACs, but the apportionment is to harvest vessels based on vessel length. Any resolution of inshore/offshore preemption occurs indirectly through the marketplace, with inshore processors acquiring needed fish from catcher vessels in competition with offshore processors.

Alternative 5 specifies the combined use of several management tools--short of a direct TAC allocation--to remedy the inshore/offshore preemption problem. This approach balances seasonal and area-specific regulations to indirectly lessen the preemptive pressures on shorebased operations. Alternative 2 represents a similar concept, considering the "generic" application of traditional management tools as a means of "micro-managing" preemption conflicts. Consideration of past experience with these tools in Alaska fisheries indicates that their effectiveness in resolving the preemption problem is likely to be

Table 3.18 Summary Comparison; Economic Features of the Eight Proposed Inshore/Offshore Alternatives

ALTERNATIVE	Effect On Inshore Offshore Preemption: Magnitude/Level	Primary Allocation Feature(s)	Projected Benefits Accrue To	Projected Costs Accrue To	Allocative Impact
1	None/problem intensifies	Marketplace	Flexible, mobile operations; financially strongest	Less flexible, least mobile operations; financially weakest	Indeterminate
2	Indeterminate/indirect	Traditional management tools	Indeterminate	Indeterminate	Indeterminate
3	Major/direct	Allocate TAC based on processor categorization	Inshore sector	Offshore sector	Significant
4	Moderate/indirect	Allocate TAC based on vessel length; marketplace	Small vessels; financially strongest processors	Large vessels; financially weakest processors	Significant
5	Minor/indirect	Product recovery; seasons; district designations; marketplace	Inshore sector	Certain offshore operations	Minor to moderate
6	Major/direct	Allocate TAC based on harvest vessel category; marketplace	Harvest vessels; inshore sector	Offshore sector	Significant
7	Minor/direct	Preferential TAC allocation for community development	Designated Bering Sea communities	Existing inshore and offshore operations	Minor to moderate
8	Major/direct	Allocate TAC based on processor categorization	Inshore sector	Offshore sector	Significant

indirect and limited. Moreover, traditional measures likely would require continual adjustment, thus delaying their effectiveness in addressing the immediacy of the inshore-offshore preemption problem.

The provision for a community development quota program in Alternative 7 is a focused approach to one particular issue in the overall preemption problem. By providing a specific TAC allocation to designated communities, the preemptive threat perceived by such locations can be reduced, thus allowing for economic development of local groundfish resources. This approach does not, however, directly address the inshore/offshore dispute that exists between established components of the industry.

The "status quo" option--Alternative 1--is somewhat ambiguous, in that the status quo regulatory regime has changed significantly between when the alternative was specified, and the present. From the perspective of resolving preemption, Alternative 1 offers no protective cure, other than that already reflected in existing regulations. In the absence of regulatory action, preemptive conditions are projected to intensify, with uncertain, but ominous implications for economic conditions both inshore and offshore operations. The competitive forces enlivened by a "do nothing" stance may encourage efficiency and innovation in the Alaska groundfish industry, but at a questionable cost to community and economic balance, as well as long run stability of the industry.

Rationale for Selection of the Preferred Alternative

Alternative 8, the designated preferred alternative, was developed as a part of Council deliberation over the SEIS for Amendment 18/23 during the North Pacific Fishery Management Council meeting held in June 1991. As such, this proposed strategy represents the Council's consensus that a direct allocation of pollock and/or Pacific cod TACs in the GOA and BSAI was the most appropriate means of offering a timely--though perhaps interim--solution to the inshore/offshore preemption problem. Key variables that directly influenced selection of the preferred alternative include:

1. the reasons for and areas of resource use conflict between inshore and offshore components of the Alaska groundfish industry,

2. the biological impacts on the affected fisheries and other natural resources,

3. historical, present, and future dependencies of various components of the industry on the designated fisheries,

4. sociological and economic impacts on the communities involved,

5. the magnitude and distribution of the costs and benefits accruing from a proposed change in regulations,

6. the types of incentives that have led to the present configuration of the Alaska groundfish industry, and

7. the degree to which the chosen policy will complement the existing and contemplated management of these fisheries.

Balancing these considerations with the perceived potential, merits, and shortcomings of all eight alternatives, the general consensus of the Council was that a direct allocation of the fishery resources offered the most expedient, explicit, and predictable means of resolving the preemption concerns raised in the proposed amendment. This criteria was grounds for rejecting Alternatives 1, 2, 4, 5, and 7, in that these offered only indirect, or adaptive solutions to the problem.

Differences among the remaining Alternatives 3, 6, and 8 are relatively moderate. Alternative 6 allocates explicitly to catcher vessels, and provides an "unspecified" allocation available to either inshore or offshore operations through the marketplace. While Alternative 6 was not rejected out of hand, the relatively small BSAI allocation (30 percent) guaranteed to offshore processors, and complete exclusion of offshore operations in the GOA may have resulted in an unnecessarily large cost to the offshore component.

Alternative 8 represents a revised version of the original Alternative 3, more so than a separate philosophical approach. Compared to Alternative 3, the preferred alternative provides a more adaptive compromise between inshore and offshore resource use demands, adopting a phased-in, mid-range inshore/offshore allocation formula. Alternative 8 also incorporates the community development quota concerns inherent in Alternative 7, as well as an operational zone around Dutch Harbor to provide some guaranteed access to pollock stocks by the inshore sector in the BSAI. Overall, Alternative 8 combines features of several different proposals into a single preferred alternative.

None of the alternatives directly address the underlying overcapitalization dilemma that is believed to underlie the preemption problem. An important feature added by Alternative 8, however, is the recognition that an inshore/offshore allocation may be only an interim solution to the long term rationalization of comprehensive fishery management in this region. Alternative 8 places a finite expiration date (December 31, 1995) on the regulatory provisions, initiates a research plan for additional long range analysis of problems in the fishery, and directs expedited action on a vessel moratorium. These actions serve as a bridge linking timely action on the immediate preemption problem to a more comprehensive, long term management regime.

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Appendix IIIa

Distribution of Expenditures

for Ports Analyzed in Alternatives 3 & 4

Appendix IIIa Table 1

Distribution of Expenditures for Ports Analyzed in Alternative 3

For any given port location, expenditures can be made locally, in state or in other locations outside of the state. The following set of tables (a - n) list the distribution of expenditures in each of the modelled ports used in the analysis of Alternative 3, categorized by suppliers (fishing activity) and manufactures (processing activities). Inshore expenditure distributions are different than offshore, requiring distributions for both in the case of Kodiak and Dutch Harbor. For each port location table, "Local" is the percent of expenditures made in the local community, "In State" is expenditures at other Alaskan locations, and "Other" is expenditures at the Pacific Northwest ports in Washington and Oregon. For the "TEST PORT LOCATIONS" (suffix 15), representing economic impacts in the national model, "Local" is the U.S. economy, "In State" is not used, and "Other" is foreign leakage. The following distribution tables are included as identifed by the "Comment" at the top of each table.

	Comment	Distribution
a)	Comment : KODIN	Kodiak inshore expenditures
b)	Comment : KODIN15	Kodiak inshore impacts in the national model
c)	Comment : KODOFF	Kodiak offshore expenditures
d)	Comment : KODOFF15	Kodiak offshore impacts in the national model
e)	Comment : DUTCHIN	Dutch Harbor inshore expenditures
f)	Comment : DUTCHIN15	Dutch Harbor inshore impacts in the national model
g)	Comment : DUTCHOFF	Dutch Harbor offshore expenditures
h)	Comment : DUTCHOFF15	Dutch Harbor offshore impacts in the national model
i)	Comment : SANDP	Sand Point inshore expenditures
j)	Comment : SANDP15	Sand Point inshore impacts in the national model
k)	Comment : AKUTAN	Akutan inshore expenditures
l)	Comment : AKUTAN15	Akutan inshore impacts in the national model
m)	Comment : KINGCOVE	King Cove inshore expenditures
n)	Comment : KINGCOVE15	King Cove inshore impacts in the national model

Appendix IIIa Table 1a. Kodiak Inshore Expenditures

Comment : KODIN
State : Alaska
Location: Kodiak

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	65.0	20.0	15.0
Gear Repair/Replace	(222)	70.0	10.0	20.0
Fuel & Lubricants	(000)	85.0	10.0	5.0
Food & Supplies	(544)	90.0	10.0	0.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	50.0	0.0	50.0
Transportation	(000)	60.0	10.0	30.0
Miscellaneous	(000)	70.0	10.0	20.0
Crew Shares	(110)	65.0	15.0	20.0
Fixed Expenses :				
Insurance	(000)	35.0	35.0	30.0
Moorage	(000)	80.0	15.0	5.0
Interest Expense	(000)	35.0	35.0	30.0
Licenses	(141)	0.0	100.0	0.0
Miscellaneous	(000)	70.0	10.0	20.0
Operating Income		75.0	10.0	15.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	75.0	5.0	20.0
Direct Materials Cost	(699)	0.0	0.0	100.0
Manufacturing Overhead	(333)	60.0	20.0	20.0
Fish Taxes	(899)	50.0	50.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	80.0	5.0	15.0
Maint. & Repairs	(222)	70.0	5.0	25.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	10.0	30.0	60.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	50.0	10.0	40.0
Misc. Administr.	(000)	0.0	0.0	100.0
Interest Expense	(000)	5.0	15.0	80.0
Operating Income		50.0	5.0	45.0

Comment : KODIN15
State : Alaska
Location: TEST PORT LOCATION

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	100.0	0.0	0.0
Gear Repair/Replace	(222)	100.0	0.0	0.0
Fuel & Lubricants	(000)	100.0	0.0	0.0
Food & Supplies	(544)	100.0	0.0	0.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	100.0	0.0	0.0
Transportation	(000)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Crew Shares	(110)	95.0	0.0	5.0
Fixed Expenses :				
Insurance	(000)	100.0	0.0	0.0
Moorage	(000)	100.0	0.0	0.0
Interest Expense	(000)	98.0	0.0	2.0
Licenses	(141)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Operating Income		98.0	0.0	2.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	90.0	0.0	10.0
Direct Materials Cost	(699)	100.0	0.0	0.0
Manufacturing Overhead	(333)	100.0	0.0	0.0
Fish Taxes	(899)	100.0	0.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	100.0	0.0	0.0
Maint. & Repairs	(222)	100.0	0.0	0.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	100.0	0.0	0.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	100.0	0.0	0.0
Misc. Administr.	(000)	10.0	0.0	90.0
Interest Expense	(000)	70.0	0.0	30.0
Operating Income		75.0	0.0	25.0

Appendix IIIa Table 1c. Kodiak Offshore Expenditures

Comment : KODOFF
State : Alaska
Location: Kodiak

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	10.0	5.0	85.0
Gear Repair/Replace	(222)	10.0	10.0	80.0
Fuel & Lubricants	(000)	70.0	20.0	10.0
Food & Supplies	(544)	10.0	5.0	85.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	0.0	0.0	100.0
Transportation	(000)	10.0	30.0	60.0
Miscellaneous	(000)	10.0	10.0	80.0
Crew Shares	(110)	10.0	10.0	80.0
Fixed Expenses :				
Insurance	(000)	0.0	0.0	100.0
Moorage	(000)	30.0	20.0	50.0
Interest Expense	(000)	0.0	5.0	95.0
Licenses	(141)	0.0	100.0	0.0
Miscellaneous	(000)	5.0	15.0	80.0
Operating Income		10.0	5.0	85.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	5.0	5.0	90.0
Direct Materials Cost	(699)	0.0	0.0	100.0
Manufacturing Overhead	(333)	5.0	10.0	85.0
Fish Taxes	(899)	50.0	50.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	5.0	5.0	90.0
Maint. & Repairs	(222)	10.0	5.0	85.0
Utilities	(333)	5.0	0.0	95.0
Telephone	(444)	5.0	5.0	90.0
Insurance	(000)	0.0	0.0	100.0
Bus./Prop. Taxes	(000)	5.0	0.0	95.0
Admin. Supplies	(000)	5.0	10.0	85.0
Misc. Administr.	(000)	0.0	0.0	100.0
Interest Expense	(000)	0.0	5.0	95.0
Operating Income		5.0	5.0	90.0

Comment : KODOFF15
State : Alaska
Location: TEST PORT LOCATION

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	100.0	0.0	0.0
Gear Repair/Replace	(222)	100.0	0.0	0.0
Fuel & Lubricants	(000)	100.0	0.0	0.0
Food & Supplies	(544)	100.0	0.0	0.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	100.0	0.0	0.0
Transportation	(000)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Crew Shares	(110)	95.0	0.0	5.0
Fixed Expenses :				
Insurance	(000)	25.0	0.0	75.0
Moorage	(000)	100.0	0.0	0.0
Interest Expense	(000)	98.0	0.0	2.0
Licenses	(141)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Operating Income		98.0	0.0	2.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	90.0	0.0	10.0
Direct Materials Cost	(699)	100.0	0.0	0.0
Manufacturing Overhead	(333)	100.0	0.0	0.0
Fish Taxes	(899)	100.0	0.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	100.0	0.0	0.0
Maint. & Repairs	(222)	100.0	0.0	0.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	25.0	0.0	75.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	100.0	0.0	0.0
Misc. Administr.	(000)	10.0	0.0	90.0
Interest Expense	(000)	45.0	0.0	55.0
Operating Income		75.0	0.0	25.0

Appendix IIIa Table 1e. Dutch Harbor Inshore Expenditures

Comment : DUTCHIN
State : Alaska
Location: Dutch Harbor

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	70.0	10.0	20.0
Gear Repair/Replace	(222)	75.0	5.0	20.0
Fuel & Lubricants	(000)	85.0	10.0	5.0
Food & Supplies	(544)	75.0	20.0	5.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	0.0	0.0	100.0
Transportation	(000)	30.0	30.0	40.0
Miscellaneous	(000)	10.0	10.0	80.0
Crew Shares	(110)	10.0	20.0	70.0
Fixed Expenses :				
Insurance	(000)	5.0	20.0	75.0
Moorage	(000)	30.0	25.0	45.0
Interest Expense	(000)	2.0	13.0	85.0
Licenses	(141)	0.0	100.0	0.0
Miscellaneous	(000)	5.0	15.0	80.0
Operating Income		20.0	10.0	70.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	15.0	10.0	75.0
Direct Materials Cost	(699)	0.0	0.0	100.0
Manufacturing Overhead	(333)	10.0	10.0	80.0
Fish Taxes	(899)	50.0	50.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	20.0	5.0	75.0
Maint. & Repairs	(222)	15.0	5.0	80.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	5.0	15.0	80.0
Bus./Prop. Taxes	(000)	75.0	0.0	25.0
Admin. Supplies	(000)	10.0	10.0	80.0
Misc. Administr.	(000)	0.0	0.0	100.0
Interest Expense	(000)	0.0	5.0	95.0
Operating Income		15.0	5.0	80.0

Comment : DUTCHIN15
State : Alaska
Location: TEST PORT LOCATION

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	100.0	0.0	0.0
Gear Repair/Replace	(222)	100.0	0.0	0.0
Fuel & Lubricants	(000)	100.0	0.0	0.0
Food & Supplies	(544)	100.0	0.0	0.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	100.0	0.0	0.0
Transportation	(000)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Crew Shares	(110)	95.0	0.0	5.0
Fixed Expenses :				
Insurance	(000)	100.0	0.0	0.0
Moorage	(000)	100.0	0.0	0.0
Interest Expense	(000)	95.0	0.0	5.0
Licenses	(141)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Operating Income		95.0	0.0	5.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	90.0	0.0	10.0
Direct Materials Cost	(699)	100.0	0.0	0.0
Manufacturing Overhead	(333)	100.0	0.0	0.0
Fish Taxes	(899)	100.0	0.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	100.0	0.0	0.0
Maint. & Repairs	(222)	100.0	0.0	0.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	100.0	0.0	0.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	100.0	0.0	0.0
Misc. Administr.	(000)	10.0	0.0	90.0
Interest Expenso	(000)	70.0	0.0	30.0
Operating Income		35.0	0.0	65.0

Appendix IIIa Table 1g. Dutch Harbor Offshore Expenditures

Comment : DUTCHOFF
State : Alaska
Location: Dutch Harbor

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	10.0	5.0	85.0
Gear Repair/Replace	(222)	10.0	10.0	80.0
Fuel & Lubricants	(000)	70.0	20.0	10.0
Food & Supplies	(544)	10.0	5.0	85.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	0.0	0.0	100.0
Transportation	(000)	10.0	30.0	60.0
Miscellaneous	(000)	10.0	10.0	80.0
Crew Shares	(110)	5.0	15.0	80.0
Fixed Expenses :				
Insurance	(000)	0.0	5.0	95.0
Moorage	(000)	30.0	25.0	45.0
Interest Expense	(000)	0.0	5.0	95.0
Licenses	(141)	0.0	100.0	0.0
Miscellaneous	(000)	5.0	15.0	80.0
Operating Income		5.0	10.0	85.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	5.0	5.0	90.0
Direct Materials Cost	(699)	0.0	0.0	100.0
Manufacturing Overhead	(333)	10.0	10.0	80.0
Fish Taxes	(899)	50.0	50.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	5.0	5.0	90.0
Maint. & Repairs	(222)	10.0	5.0	85.0
Utilities	(333)	5.0	0.0	95.0
Telephone	(444)	5.0	5.0	90.0
Insurance	(000)	0.0	10.0	90.0
Bus./Prop. Taxes	(000)	5.0	0.0	95.0
Admin. Supplies	(000)	5.0	10.0	85.0
Misc. Administr.	(000)	0.0	0.0	100.0
Interest Expense	(000)	0.0	5.0	95.0
Operating Income		5.0	5.0	90.0

Appendix IIIa Table 1h. Dutch Harbor Offshore Impacts In The National Model

Comment : DUTCHOFF15
State : Alaska
Location: TEST PORT LOCATION

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	100.0	0.0	0.0
Gear Repair/Replace	(222)	100.0	0.0	0.0
Fuel & Lubricants	(000)	100.0	0.0	0.0
Food & Supplies	(544)	100.0	0.0	0.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	100.0	0.0	0.0
Transportation	(000)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Crew Shares	(110)	95.0	0.0	5.0
Fixed Expenses :				
Insurance	(000)	25.0	0.0	75.0
Moorage	(000)	100.0	0.0	0.0
Interest Expense	(000)	45.0	0.0	55.0
Licenses	(141)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Operating Income		75.0	0.0	25.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	90.0	0.0	10.0
Direct Materials Cost	(699)	100.0	0.0	0.0
Manufacturing Overhead	(333)	100.0	0.0	0.0
Fish Taxes	(899)	100.0	0.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	100.0	0.0	0.0
Maint. & Repairs	(222)	100.0	0.0	0.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	25.0	0.0	75.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	100.0	0.0	0.0
Misc. Administr.	(000)	10.0	0.0	90.0
Interest Expense	(000)	45.0	0.0	55.0
Operating Income		75.0	0.0	25.0

Appendix IIIa Table 1i. Sand Point Inshore Expenditures

Comment : SANDP
State : Alaska
Location: Sand Point

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	5.0	30.0	65.0
Gear Repair/Replace	(222)	10.0	30.0	60.0
Fuel & Lubricants	(000)	80.0	10.0	10.0
Food & Supplies	(544)	50.0	40.0	10.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	0.0	0.0	100.0
Transportation	(000)	30.0	30.0	40.0
Miscellaneous	(000)	10.0	20.0	70.0
Crew Shares	(110)	80.0	5.0	15.0
Fixed Expenses :				
Insurance	(000)	5.0	20.0	75.0
Moorage	(000)	90.0	0.0	10.0
Interest Expense	(000)	5.0	20.0	75.0
Licenses	(141)	0.0	100.0	0.0
Miscellaneous	(000)	5.0	20.0	75.0
Operating Income		60.0	10.0	30.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	2.0	18.0	80.0
Direct Materials Cost	(699)	0.0	0.0	100.0
Manufacturing Overhead	(333)	5.0	5.0	90.0
Fish Taxes	(899)	50.0	50.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	20.0	0.0	80.0
Maint. & Repairs	(222)	5.0	5.0	90.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	0.0	20.0	80.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	5.0	10.0	85.0
Misc. Administr.	(000)	0.0	0.0	100.0
Interest Expense	(000)	0.0	0.0	100.0
Operating Income		5.0	10.0	85.0

Comment : SANDP15
State : Alaska
Location: TEST PORT LOCATION

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	100.0	0.0	0.0
Gear Repair/Replace	(222)	100.0	0.0	0.0
Fuel & Lubricants	(000)	100.0	0.0	0.0
Food & Supplies	(544)	100.0	0.0	0.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	100.0	0.0	0.0
Transportation	(000)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Crew Shares	(110)	95.0	0.0	5.0
Fixed Expenses :				
Insurance	(000)	100.0	0.0	0.0
Moorage	(000)	100.0	0.0	0.0
Interest Expense	(000)	100.0	0.0	0.0
Licenses	(141)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Operating Income		100.0	0.0	0.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	90.0	0.0	10.0
Direct Materials Cost	(699)	100.0	0.0	0.0
Manufacturing Overhead	(333)	100.0	0.0	0.0
Fish Taxes	(899)	100.0	0.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	100.0	0.0	0.0
Maint. & Repairs	(222)	100.0	0.0	0.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	100.0	0.0	0.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	100.0	0.0	0.0
Misc. Administr.	(000)	10.0	0.0	90.0
Interest Expense	(000)	100.0	0.0	0.0
Operating Income		100.0	0.0	0.0

Appendix IIIa Table 1k. Akutan Inshore Expenditures

Comment : AKUTAN
State : Alaska
Location: Akutan

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	5.0	60.0	35.0
Gear Repair/Replace	(222)	10.0	65.0	25.0
Fuel & Lubricants	(000)	40.0	50.0	10.0
Food & Supplies	(544)	5.0	80.0	15.0
Ice & Bait	(000)	20.0	80.0	0.0
Dues & Fees	(000)	0.0	0.0	100.0
Transportation	(000)	10.0	50.0	40.0
Miscellaneous	(000)	10.0	10.0	80.0
Crew Shares	(110)	5.0	25.0	70.0
Fixed Expenses :				
Insurance	(000)	0.0	20.0	80.0
Moorage	(000)	20.0	50.0	30.0
Interest Expense	(000)	0.0	15.0	85.0
Licenses	(141)	0.0	100.0	0.0
Miscellaneous	(000)	5.0	15.0	80.0
Operating Income		5.0	20.0	75.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	5.0	15.0	80.0
Direct Materials Cost	(699)	2.0	3.0	95.0
Manufacturing Overhead	(333)	5.0	20.0	75.0
Fish Taxes	(899)	50.0	50.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	20.0	5.0	75.0
Maint. & Repairs	(222)	5.0	15.0	80.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	0.0	10.0	90.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	5.0	10.0	85.0
Misc. Administr.	(000)	0.0	0.0	100.0
Interest Expense	(000)	0.0	5.0	95.0
Operating Income		15.0	5.0	80.0

Comment : AKUTAN15
State : Alaska
Location: TEST PORT LOCATION

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	100.0	0.0	0.0
Gear Repair/Replace	(222)	100.0	0.0	0.0
Fuel & Lubricants	(000)	100.0	0.0	0.0
Food & Supplies	(544)	100.0	0.0	0.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	100.0	0.0	0.0
Transportation	(000)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Crew Shares	(110)	95.0	0.0	5.0
Fixed Expenses :				
Insurance	(000)	100.0	0.0	0.0
Moorage	(000)	100.0	0.0	0.0
Interest Expense	(000)	95.0	0.0	5.0
Licenses	(141)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Operating Income		95.0	0.0	5.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	90.0	0.0	10.0
Direct Materials Cost	(699)	100.0	0.0	0.0
Manufacturing Overhead	(333)	100.0	0.0	0.0
Fish Taxes	(899)	100.0	0.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	100.0	0.0	0.0
Maint. & Repairs	(222)	100.0	0.0	0.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	100.0	0.0	0.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	100.0	0.0	0.0
Misc. Administr.	(000)	10.0	0.0	90.0
Interest Expense	(000)	100.0	0.0	0.0
Operating Income		100.0	0.0	0.0

Appendix IIIa Table 1m. King Cove Inshore Expenditures

Comment : KINGCOVE
State : Alaska
Location: King Cove

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	0.0	35.0	65.0
Gear Repair/Replace	(222)	10.0	50.0	40.0
Fuel & Lubricants	(000)	80.0	15.0	5.0
Food & Supplies	(544)	50.0	40.0	10.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	0.0	0.0	100.0
Transportation	(000)	30.0	30.0	40.0
Miscellaneous	(000)	10.0	20.0	70.0
Crew Shares	(110)	80.0	5.0	15.0
Fixed Expenses :				
Insurance	(000)	0.0	30.0	70.0
Moorage	(000)	90.0	5.0	5.0
Interest Expense	(000)	5.0	20.0	75.0
Licenses	(141)	0.0	100.0	0.0
Miscellaneous	(000)	5.0	20.0	75.0
Operating Income		60.0	10.0	30.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	5.0	20.0	75.0
Direct Materials Cost	(699)	0.0	0.0	100.0
Manufacturing Overhead	(333)	5.0	5.0	90.0
Fish Taxes	(899)	50.0	50.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	20.0	20.0	60.0
Maint. & Repairs	(222)	5.0	10.0	85.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	0.0	20.0	80.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	5.0	10.0	85.0
Misc. Administr.	(000)	0.0	0.0	100.0
Interest Expense	(000)	0.0	0.0	100.0
Operating Income		5.0	10.0	85.0

Appendix IIIa Table 1n. King Cove Inshore Impacts In The National Model

Comment : KINGCOVE15
State : Alaska
Location: TEST PORT LOCATION

Supplier Distributions

		Local	In State	Other
Variable Expenses :				
Vessel/Engine Repair	(000)	100.0	0.0	0.0
Gear Repair/Replace	(222)	100.0	0.0	0.0
Fuel & Lubricants	(000)	100.0	0.0	0.0
Food & Supplies	(544)	100.0	0.0	0.0
Ice & Bait	(000)	100.0	0.0	0.0
Dues & Fees	(000)	100.0	0.0	0.0
Transportation	(000)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Crew Shares	(110)	95.0	0.0	5.0
Fixed Expenses :				
Insurance	(000)	100.0	0.0	0.0
Moorage	(000)	100.0	0.0	0.0
Interest Expense	(000)	98.0	0.0	2.0
Licenses	(141)	100.0	0.0	0.0
Miscellaneous	(000)	100.0	0.0	0.0
Operating Income		98.0	0.0	2.0

Manufacturer Distributions

		Local	In-State	Other
Variable Expenses :				
Manufacturing Labor Cost	(599)	90.0	0.0	10.0
Direct Materials Cost	(699)	100.0	0.0	0.0
Manufacturing Overhead	(333)	100.0	0.0	0.0
Fish Taxes	(899)	100.0	0.0	0.0
Fixed Expenses :				
Admin Salaries	(000)	100.0	0.0	0.0
Maint. & Repairs	(222)	100.0	0.0	0.0
Utilities	(333)	100.0	0.0	0.0
Telephone	(444)	100.0	0.0	0.0
Insurance	(000)	100.0	0.0	0.0
Bus./Prop. Taxes	(000)	100.0	0.0	0.0
Admin. Supplies	(000)	100.0	0.0	0.0
Misc. Administr.	(000)	10.0	0.0	90.0
Interest Expense	(000)	70.0	0.0	30.0
Operating Income		60.0	0.0	40.0

Appendix IIIa Table 2 Distribution of Expendiutres Alaska and the Pacific Northwest by Harvest Vessels

	Bering Sea & Aleutians Islands				Gulf of Alaska			
	Large Vessel Expenditures		Small Vessel Expenditures		Large Vessel Expenditures		Small Vessel Expenditures	
	Alaska	P. NW.	Alaska	P. NW.	Alaska	P. NW.	Alaska	P. NW.
Variable Expenses :								
Vessel/Engine Repair	40%	60%	60%	40%	50%	50%	50%	50%
Gear Repair/Replace	60%	40%	60%	40%	50%	50%	50%	50%
Fuel & Lubricants	90%	10%	95%	5%	95%	5%	95%	5%
Food & Supplies	90%	10%	95%	5%	95%	5%	95%	5%
Ice & Bait	100%	0%	100%	0%	100%	0%	100%	0%
Dues & Fees	0%	100%	50%	50%	70%	30%	70%	30%
Transportation	20%	80%	40%	60%	70%	30%	70%	30%
Miscellaneous'	5%	95%	30%	70%	70%	30%	70%	30%
Crew Shares	10%	90%	30%	70%	70%	30%	70%	30%
Fixed Expenses :								
Insurance	0%	100%	20%	80%	30%	70%	30%	70%
Moorage	20%	80%	40%	60%	80%	20%	80%	20%
Interest Expense	5%	95%	20%	80%	20%	80%	20%	80%
Licenses	100%	0%	100%	0%	100%	0%	100%	0%
Miscellaneous	5%	95%	30%	70%	70%	30%	70%	30%
Operating Income	10%	90%	30%	70%	70%	30%	70%	30%

Appendix IIIb

Allocations to Vessel Categories Used in the Economic Impact Analysis of Alternative 4

Appendix IIIb Table 1a **Modelled Allocations to Large Vessels in the B.S.A.I.**

Vessel Category	**Units**	**Pollock (mt) to Vessel Type**	**% of Large Pollock**
Shoreside Trawler Baseline	2	71,674	8.77%
Using 50 - 50 Split		57,519	8.77%
Using 1986-89 Average		24,154	8.77%
Using 1986-88 Average		7,139	8.77%
At Sea Trawler Baseline	9	31,581	3.86%
Using 50 - 50 Split		25,344	3.86%
Using 50 - 50 Split		10,643	3.86%
Using 1986-89 Average		3,146	3.86%
H & G F.Trawler Baseline	7	3,563	0.44%
Using 50 - 50 Split		2,859	0.44%
Using 1986-89 Average		1,201	0.44%
Using 1986-88 Average		355	0.44%
Fillet F.Trawler Baseline	17	219,921	26.90%
Using 50 - 50 Split		176,489	26.90%
Using 1986-89 Average		74,114	26.90%
Using 1986-88 Average		21,906	26.90%
Surimi F.Trawler Baseline	12	490,951	60.04%
Using 50 - 50 Split		393,993	60.04%
Using 1986-89 Average		165,451	60.04%
Using 1986-88 Average		48,903	60.04%

Large Vessel Totals	**Units**	**Pollock (mt) to Large Vessels**	**% of BSAI Pollock**
Large Vessels Baseline	47	817,690	62.48%
Using 50 - 50 Split		656,204	50.00%
Using 1986-89 Average		275,562	24.18%
Using 1986-88 Average		81,449	8.76%
Total BSAI Harvest	**329**	**72,501**	**100.00%**

Appendix IIIb Table 1b **Modelled Allocations to Small Vessels in the B.S.A.I.**

Vessel Category	**Units**	**Pollock (mt) to Vessel Type**	**% of Small Pollock**
Limit Seine Baseline	2	1,014	0.21%
Using 50 - 50 Split		1,355	0.21%
Using 1986-89 Average		1,785	0.21%
Using 1986-88 Average		2,039	0.21%
Combination Trawler Baseline	78	105,428	21.47%
Using 50 - 50 Split		140,907	21.47%
Using 1986-89 Average		185,559	21.47%
Using 1986-88 Average		212,017	21.47%
Shoreside Trawler Baseline	12	107,446	21.88%
Using 50 - 50 Split		143,604	21.88%
Using 1986-89 Average		189,111	21.88%
Using 1986-88 Average		216,075	21.88%
At Sea Trawler Baseline	60	253,118	51.55%
Using 50 - 50 Split		338,297	51.55%
Using 1986-89 Average		445,501	51.55%
Using 1986-88 Average		509,023	51.55%
H & G F.Trawler Baseline	9	18,735	3.82%
Using 50 - 50 Split		25,040	3.82%
Using 1986-89 Average		32,975	3.82%
Using 1986-88 Average		37,676	3.82%
Fillet F.Trawler Baseline	4	5,239	1.07%
Using 50 - 50 Split		7,002	1.07%
Using 1986-89 Average		9,221	1.07%
Using 1986-88 Average		10,536	1.07%

Small Vessel Totals	**Units**	**Pollock (mt) to Small Vessels**	**% of BSAI Pollock**
Small Vessel Baseline	165	490,980	37.52%
Using 50 - 50 Split		656,204	50.00%
Using 1986-89 Average		864,151	75.82%
Using 1986-88 Average		987,366	91.24%
Total BSAI Harvest	**212**	**1,308,670**	**100.00%**

Appendix IIIb Table 1c **Modelled Allocations to Large Vessels in the Gulf of Alaska**

Vessel Category	Units	Pollock (mt) to Vessel Type	% of Large Pollock	Pacific Cod (mt) to Vessel Type	% of Large Pacific Cod
Shoreside Trawler Baseline	4	6,904	16.26%	685	16.08%
Using 50 - 50 Split		5,894	16.26%	3,344	16.08%
Using 1986-89 Average		2,772	16.26%	964	16.08%
Using 1986-88 Average		843	16.26%	1,126	16.08%
Freezer Longliner Baseline	9	0	0.00%	677	15.89%
Using 50 - 50 Split		0	0.00%	3,305	15.89%
Using 50 - 50 Split		0	0.00%	953	15.89%
Using 1986-89 Average		0	0.00%	1,113	15.89%
H & G F.Trawler Baseline	10	8,337	19.63%	113	2.65%
Using 50 - 50 Split		7,118	19.63%	552	2.65%
Using 1986-89 Average		3,347	19.63%	159	2.65%
Using 1986-88 Average		1,018	19.63%	186	2.65%
Fillet F.Trawler Baseline	11	9,408	22.16%	2,785	65.38%
Using 50 - 50 Split		8,032	22.16%	13,597	65.38%
Using 1986-89 Average		3,777	22.16%	3,919	65.38%
Using 1986-88 Average		1,149	22.16%	4,577	65.38%
Surimi F.Trawler Baseline	3	17,811	41.95%	0	0.00%
Using 50 - 50 Split		15,206	41.95%	0	0.00%
Using 1986-89 Average		7,150	41.95%	0	0.00%
Using 1986-88 Average		2,174	41.95%	0	0.00%

Large Vessel Totals	**Units**	**Pollock (mt) to Large Vessels**	**% of GOA Pollock**	**Pacific Cod (mt) to Large Vessels**	**% of GOA Pacific Cod**
Large Vessels Baseline	37	42,460	58.56%	4,260	10.24%
Using 50 - 50 Split		36,251	50.00%	20,799	50.00%
Using 1986-89 Average		17,045	23.51%	5,994	14.41%
Using 1986-88 Average		5,184	7.15%	7,001	16.83%
Total GOA Harvest	**329**	**72,501**	**100.00%**	**41,597**	**100.00%**

Appendix IIIb Table 1d **Modelled Allocations to Small Vessels in the Gulf of Alaska**

Vessel Category	Units	Pollock (mt) to Vessel Type	% of Small Pollock	Pacific Cod (mt) to Vessel Type	% of Small Pacific Cod
Purse Seine Baseline	200	158	0.53%	4,023	10.77%
Using 50 - 50 Split		191	0.53%	2,241	10.77%
Using 1986-89 Average		292	0.53%	3,836	10.77%
Using 1986-88 Average		354	0.53%	3,728	10.77%
Limit Seine Baseline	34	668	2.22%	5,676	15.20%
Using 50 - 50 Split		806	2.22%	3,162	15.20%
Using 1986-89 Average		1,233	2.22%	5,412	15.20%
Using 1986-88 Average		1,497	2.22%	5,259	15.20%
Combo. Trawler Baseline	36	24,294	80.87%	21,722	58.18%
Using 50 - 50 Split		29,316	80.87%	12,100	58.18%
Using 1986-89 Average		44,847	80.87%	20,713	58.18%
Using 1986-88 Average		54,439	80.87%	20,127	58.18%
Shoreside Trawler Baseline	10	3,990	13.28%	4,237	11.35%
Using 50 - 50 Split		4,815	13.28%	2,360	11.35%
Using 1986-89 Average		7,366	13.28%	4,040	11.35%
Using 1986-88 Average		8,941	13.28%	3,926	11.35%
Freezer Longliner Baseline	10	169	0.56%	1,679	4.50%
Using 50 - 50 Split		204	0.56%	935	4.50%
Using 1986-89 Average		312	0.56%	1,601	4.50%
Using 1986-88 Average		379	0.56%	1,556	4.50%
H & G F.Trawler Baseline	2	762	2.54%	0	0.00%
Using 50 - 50 Split		920	2.54%	0	0.00%
Using 1986-89 Average		1,407	2.54%	0	0.00%
Using 1986-88 Average		1,708	2.54%	0	0.00%

Small Vessel Totals	**Units**	**Pollock (mt) to Small Vessels**	**% of GOA Pollock**	**Pacific Cod (mt) to Small Vessels**	**% of GOA Pacific Cod**
Small Vessels Baseline	292	30,041	41.44%	37,337	89.76%
Using 50 - 50 Split		36,251	50.00%	20,799	50.00%
Using 1986-89 Average		55,456	76.49%	35,603	85.59%
Using 1986-88 Average		67,317	92.85%	34,596	83.17%
Total GOA Harvest	**329**	**72,501**	**100.00%**	**41,597**	**100.00%**

CHAPTER 4

DESCRIPTION OF SOCIAL ENVIRONMENT AND CONSEQUENCES OF ALTERNATIVES

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4.0 DESCRIPTION OF SOCIAL ENVIRONMENT AND CONSEQUENCES OF ALTERNATIVES

4.1 Social and Cultural Characteristics

The social and cultural characteristics of the study communities have been documented in the community profiles, which appear as an appendix to this volume. These profiles review various aspects of the social environment of the study communities in 1989 and served to contextualize the social impact assessment. Specifically, the profiles look at population characteristics (such as size, ethnic composition, and educational status), the economic and employment structure (such as community infrastructure, the role of fisheries in the overall economy, and local versus nonlocal employment in the fisheries), and sociocultural characteristics of the communities (including local government structure, social services, and sociocultural values).

4.2 Introduction to Social Impact Assessment

4.2.1 Mission Statement

The mission of the economic and social impact assessment technical team, as stated in the plan of work, is to analyze the economic and social implications of the North Pacific Fishery Management Council's (Council) Inshore/Offshore Allocation Amendment to the Fishery Management Plan (FMP) for the groundfish fisheries in the Exclusive Economic Zone (EEZ) off Alaska. Impact Assessment, Inc. (IAI) staff bears primary responsibility for the analysis of the social impacts of proposed Council Inshore-Offshore Amendment alternatives, but worked cooperatively with Council staff economists as an interdisciplinary team to ensure the best possible product.

The method specified by the Council for this analysis was the development of abbreviated case studies for six of the communities now (or potentially) participating in those fisheries. For purposes of analysis, these communities are split into two major groupings. Four of these communities are treated in the Alaskan section of the report (Kodiak and Sand Point in the Gulf of Alaska, and Unalaska and St. Paul in the Bering Sea). The other two communities (Bellingham, Washington, and Newport, Oregon) are found in the Northwest Coast section of the report. Each of these two major sections is preceded by an introduction which discusses commonalities and differences between the included communities, and frames some important issues in more general terms than are found in the individual community discussions that follow. The Northwest Coast section references an included addendum that treats selected issues for Ballard/Seattle. The reasons for the limited inclusion of Ballard/Seattle are more fully developed in the addendum itself.

Three main sources of information were used for the social impact analysis: current published information (a literature review), a short period of primary data collection in each community, and the results of the economic model of groundfish economics developed by NPFMC staff for use in this assessment. The context established by the first two data sources, combined with the employment and income projections ("social drivers" as it were) derived from the economic model, resulted int he social impact assessment.

4.2.2 The Social Impact Assessment Problem

Before beginning the discussion of potential social consequences, it is perhaps appropriate to discuss the limitations of the analysis. First, experience in conducting such socioeconomic assessments has shown that all single variable projections (e.g., the impact of oil development, the impact of a particular regulatory policy, or the growth of a particular fishery industry) grossly underestimate the role of unrelated and unanticipated changes in the social and economic environment. The number of non-regulatory variables, the accelerated pace of social change in general, and the sequence of unpredictable external events affecting these fisheries is extreme. The point being emphasized is that it would be difficult enough to construct a base case analysis that considers all of the known profound variables affecting social change in coastal fishing communities, much less attempt to assess differences between a particular scenario and the multitude of inherently complex alternatives. It would be virtually impossible, for example, to construct an accurate socioeconomic base case for such communities as Kodiak, Sand Point, or other Gulf of Alaska communities just for 1989 given the profound influence of the *Exxon Valdez* oil spill on these local economies. Such a baseline would magnify any distortions in supply and demand that evolved as a result of that single incident. In addition, we know very well that unanticipated future events are very likely to alter the accuracy of our projections in unpredictable ways. Thus, our analysis will need to be viewed, in the future, as being prepared under the conditions of the contract, i.e., as a *ceteris paribus* ("all things being equal") argument.

Second, it should be emphasized that none of the communities selected as "representative" of groundfish-dependent communities relies exclusively on the groundfish industry for their survival (though dependence is already profound and still increasing in many communities, and other communities see this fishery as their future "savior"). Groundfish, where they are important, make up only a portion of the resources harvested or processed in any particular community. The level of social dependence on this particular fishery component ranges from the extreme of places like Akutan, Sand Point, and Unalaska to the more diversified and complex community of Seattle. Moreover, the level of dependence will vary radically depending on the focus of the analysis -- i.e., processor dependence may co-vary in less than direct ways with fisherman income, community employment, or with city or regional revenues. Thus, our analysis must be characterized as reflective of general social conditions, or as ranges of changes likely to result from the proposed alternatives. We cannot, for example, speak to a short-term "social" impact arising out of a change in employment of 5 or 10 jobs in a particular community. Our analysis is focused more broadly to consider systematic long-term consequences evolving over several years and affecting significant percentages of the community.

The proposed alternative regulations themselves (including the "no change" option) deal only with pollock in the Bering Sea and with pollock and Pacific cod in the Gulf of Alaska. The descriptive profiles developed for the six study communities are not limited to documenting the role of those specific fisheries in each of the communities, however, since they are to be used as the starting point for the analysis of community-wide social effects of the regulatory options. Thus, these profiles contain a capsule treatment of the economy, institutions, and social organization of the study communities. The community profiles (presented as an appendix to this volume) represent an explicit compromise between overwhelming detail and the need for brevity, however, and are focussed on the fishing sector and the social issues likely to arise from changes in that sector. Further, pragmatic limitations were imposed by the fact that this analysis was first and foremost conceived and executed as a review of available literature on the specified communities, with very limited additional field data collection (typically three to four working days per community). As noted in the community profiles appendix, the degree of detail (and hence length) of the profiles of the various communities was in large part determined by the availability of recent and relevant published information, not by the size or complexity of the community itself.

Third, the thrust of the proposed regulatory changes to the *status quo* favor the fixed onshore processing sector and its support services at the expense of the offshore sector, at least with respect to the existing distribution pattern. But such an outcome must be viewed from two perspectives. First, it could be argued that these regulatory alternatives redress a radical and unanticipated change in previous distributions, and this position has been voiced by many fishermen and community members. That is, it can be argued that the general trend had been increasing Alaskan community involvement in the Alaska groundfish fishery, a trend that was abruptly reversed in 1989. From another perspective, the proposed distribution would result in fixing, for the foreseeable future, a particular distribution of both economic and social benefits in favor of smaller communities at the expense of a very narrow segment of the industry (the factory trawler component). Representatives of the factory trawler industry argue, on the other hand, that the onshore component lacks existing capacity to even process their proposed allocation. It should also be noted that having an allocation "fixed" has not, in and of itself, historically guaranteed stability with specific fisheries. We cannot, for example, account for other factors which may subsequently serve to destabilize the community-based inshore component, such as continuing (or expanded) competition within the inshore sector, stock reduction, price fluctuation, and expansion of those specific segments of the industry classified as inshore but that are not fixed in one location (such as at-sea processors that designate themselves and operate as inshore processors or at-sea fixed gear catcher/processors), among others.

Fourth, there are a number of issues recognized as *potentially* important but that could be addressed only partially within the current assessment. One such issue is the "community development" mandate. One can readily see the potential beneficial consequence of the proposed alternatives on promoting the development of small Alaskan communities and this is addressed at a certain level in our analysis. A less evident, and little considered, element of community development, perhaps the shadow side of the issue, is community "risk." While it is the mandate of the Council to protect the sustainable properties of the region's fishery resources, it must nevertheless also be acknowledged that current harvest patterns, if allowed to continue, pose a certain risk to the long-term viability of the groundfish fisheries. It must also be recognized that biological trends resulting from past practices, independent of the management alternatives ultimately selected, pose a disproportionate risk to certain future populations, communities, regions, and industries. Thus, it is not merely the immediate socioeconomic impacts but the longer-term questions of social equity (even intergenerational equity) that must also be considered. Given current trends in employment, concentration of harvesting and processing capacity, local dependence, etc., which communities or populations are most at risk in the event current management strategies fail, or more severe across-the-board fishery closures are ultimately required? It is probably appropriate that such longer term potential consequences also be factored into the social impact assessment, but research limitations precluded a full treatment of this topic.

Finally, relative dependence will change from one year to the next; will vary dramatically from community to community, from species to species, from season to season, and even from fishing period to fishing period, depending on the daily cost-benefit analyses of when, where, and why to fish or process particular species. We have not attempted to lay out a formula for such decisions. The importance of these variables can be assessed only in a general way and only on a community-by-community basis.

4.2.3 Technical Objectives

The technical objective of the study is to evaluate the social effects of various alternative management approaches to allocating limited groundfish resources between competing fishery sectors. The five principal action alternatives under consideration are:

1. Retaining the current *status quo* or no action alternative (rely on current unmodified policies);

2. Application of other traditional management tools (trip limits, periodic allocations, super-exclusive registration areas, gear sizes, etc.);

3. Allocation of the Total Allowable Catch (TAC) between inshore and offshore components (on the basis of regional allocation percentages);

4. Allocation of the TAC on basis of species and vessel length (using the allocation percentages specified in 3 above);

5. Initiation of roe harvest seasons, quotas, and districts.

The overall charge from the Council was to characterize the differences among the five alternatives employing the following criteria: (1) gross and net revenues; (2) number, category, and value of displaced capacity (vessels, plants, etc.); (3) local economic activity, including employment (both seasonality and annual full-time-equivalency); (4) indirect effects (impacts on suppliers of goods and services directly to the fishing sectors); (5) price and market effects expected to result from the implementation of each alternative; and (6) induced social effects (community economic stability and diversity, economic/demographic aspects, such as local labor supply, wage rates, and seasonal immigration). IAI's task was to address the last of these issues: the social effects of the proposed alternatives, and to specifically focus on the first (*status quo*) and third (inshore/offshore allocation) alternatives. The objective was to take the economic impact assessment data for each policy alternative (i.e., distribution, capacity, revenues, employment, support sectors, and so on) as provided by Council staff economists, then chart the magnitude of the social impacts on the six communities selected as representative of the range of the potential impacts likely to be sustained by all affected communities. This is a straightforward and logical approach to deriving potential economic and social impacts on local and regional economies.

4.2.4 <u>The Economic Model</u>

The starting point for the social impact analysis was the economic effect of the various alternatives. That is, once the context of each community was developed through the community profiling process, the SIA team utilized the profile information as a baseline against which the economic modelling results were examined in order to develop a community social impact assessment. However, the economic input-output model developed to evaluate the economic effects of the various regulatory alternatives is constrained in that it includes only those factors which can be evaluated in terms of a monetary amount (by definition) and only considers that part of the fishing sector which deals with groundfish (due to limits of time and funding). In some of the study communities where the processors handle both groundfish and other species, the model "captures" a significant amount of nongroundfish; on the other hand, for those communities that feature a number of processors that do not handle groundfish, the model captures relatively less of the overall fisheries economics of the community.

As is discussed in the economic modeling documentation, however, it is the differences between the economic outcomes of the alternatives, and not the absolute values of those outcomes, which is most significant. This point cannot be overemphasized because it is assumed that even if the economic model fails to compute the "real" economic value of groundfish for the base case and the various alternatives, it does so in a consistent fashion so that the differences among the computed values <u>do</u> represent real proportional differences (see Section 3.2.3 for a more detailed discussion). This is important for the analysis of the social effects of the various alternatives because economic differences are used as one of the primary vectors of social change (as interpreted in the light of current trends). Population dynamics are assumed to be closely related to economic effects, and changes in these areas are interpreted in view of the institutional/service capabilities of the communities to make general statements about the likely social effects of various regulatory alternatives.

The level of detail provided in our social impact analysis more or less reflects that present in the economic modeling and the relative size of the communities themselves. Economic model results were generated for the four Alaskan communities, and they are used as part of a reasonably detailed analysis (again a compromise between a comprehensive document and brevity). Bellingham and Newport were not made a part of the economic model. It is assumed that this decision was made on the basis of the difficulty of such a task, the resources available, and the relative lack of participation in these communities in the Alaskan waters offshore groundfish fisheries. Furthermore, there is a lack of good information to allow for the quantitative modeling of what participation there is in the Alaskan fisheries (both offshore and onshore). It was considered feasible to collect adequate information in these communities for the social impact analysis in the limited field time available. Economic modeling has recognized limitations, and the same is true for social impact analysis. Social impact analysis can best deal with trends and orders of magnitude of change, and cannot be expected to make distinctions between finely differentiated alternatives. Given these qualifications, it was possible to develop a social impact analysis for Bellingham and Newport, and to discuss the issues raised in a general Northwest Coast context.

Ballard/Seattle posed a special problem for the research, as it was not modeled by the economists or made one of the study communities for community profile construction. A more detailed history of the treatment of Ballard/Seattle is found in the addendum already noted, but it is sufficient to say here that this was basically a matter of resource availability. (The original study communities were chosen, in part, on the criteria of dependence on the fishery, with 30% being the lower threshold. According to NMFS provided figures, fishing comprises approximately 5% of the overall Seattle economy, with fishing capital accounting for some 1.5% of the overall capital of community, making "noise" a significant problem indeed. Seattle is so large and complex that the time and resource constraints of the study precluded its inclusion on a comparable basis. It should be noted that the economic model does include the economic effects on the Seattle area as the major constituent component of the aggregated "outside" category, and that a brief social impact analysis has been prepared (see the Ballard/Seattle addendum) on the basis of the limited amount of interviewing authorized and funded by the Council. No claim is made that Seattle is treated in the comprehensive way the other study communities were, indeed, such a treatment was not possible. On the other hand, the most salient issues related to Seattle's participation in the Alaskan Exclusive Economic Zone fisheries have been discussed, and the field work devoted to Seattle by the social impact analysis team was comparable to that for the other study communities.

4.2.5 <u>Analytic Objectives</u>

The analytic objectives are considerably more complex than the technical objectives. That is, for each of these five principal alternatives, the number and potential combinations and permutations of options (i.e., four percentage allocation schemes, two vessel length options, and a "with" and "without" moratorium option), the number of evaluation levels (local, regional, national), and two analytic screens (a "community development" mandate and a "least trade restrictive" FTA requirement) place an imposing burden on the required analysis. A complete in-depth analysis of each of these subcategories, and their combinations and permutations (literally hundreds), would not be possible within the time frame and funding available for this project.

The researcher would have to understand current conditions, current level of dependence or reliance on that particular species, be able to calculate how changes in the timing of open periods, species targeting, gear limits, etc., would affect the overall sequence of seasonal alternatives for particular communities and regions. There would also be a need to know the temporal alternatives for each respective fishery component, and the trends of changes in these alternatives. Are some of the alternative fisheries on the decline? Are some increasing in importance? This would be a very complex task, in and of itself, even before the effects of a very narrow and specific set of inputs could be assessed.

Moreover, it should be candidly noted that economic impact assessment methodologies, much less social impact assessment methodologies, can never be expected to be sufficiently sensitive to adequately project effects down to the single digit employment, residence, education, or other effects. Social impact assessments, in particular, must be written with a much broader stroke. A social impact assessment is concerned with social changes likely to occur over several years and can be sensitive, even for the smaller communities investigated under the current study plan, only to changes in employment, income, and other variables that represent significant variance from current trends and conditions. Thus, some simplifying assumptions have been made to enable a meaningful analysis.

4.2.6 Simplifying Assumptions

Experience in previous work reveals that few, if any, field informants, or other sources of information for that matter, can differentially assess the social impacts of potential alternatives that differ more in degree than in kind. Alternative 4, based on species and vessel length and using several different allocation percentages, was more a unitary proposal rather than a set of alternatives to most informants. Most informants had difficulty addressing potential impacts of the differing percentage allocations under consideration for this and the other alternatives. Also, each of the various alternatives, and their combinations and interactions, present the informant (and ultimately the analyst) with the inevitable problem of "weighing." For example, is a fishing job more valuable to a community than a processing job? Are two part-time jobs in Seattle the equivalent of one full-time job in Akutan? Is a lost job in a major city, where abundant alternatives are available, the same as a lost job in St. Paul where virtually no alternatives exist? How economic dependence to be weighted? How is the "community development" mandate to be interpreted? These, and many other questions and judgments would pose insurmountable obstacles to the analysis if certain simplifying assumptions were no extracted.

The principal simplifying assumptions employed in this analysis are: (1) that the negative effects to the inshore component of the groundfish fishery will be greatest under the *status quo* alternative; and (2) that the negative effects to the offshore industry will be greatest under the most restrictive combination of percentage allocations under consideration. It is also tacitly assumed that the obverse will hold true -- that is, that the beneficial consequences for the inshore or offshore component will coincide with the larger allocation of resources. While this assumption has been employed in the analysis, there are situations where such "beneficial" economic consequences have resulted in significant negative social impacts (for instance, highly accelerated population growth, ethnic enclaves, social and cultural conflicts, crime, transient populations are familiar). Consideration of such possibilities has been included in the analysis.

Once the above simplifying assumptions have been adopted, it is then possible to array the alternatives under consideration along a continuum that ranges, for the inshore component, from the "worst case" scenario of the *status quo* to the "best case" scenario in which this segment is allocated the largest fixed percentage of the resource base. This analytic continuum is reversed for the offshore component. Having established this continuum, it is now possible to translate such things as employment and income projections derived from the Council economic modeling and analysis, into the "drivers" of the social impact assessment.

An attempt has been made to (1) identify and systematically describe the current involvement and/or dependence of the different community and subregional economies on the various elements of the groundfish industry; (2) derive some estimate of the overall trends within that particular economic system and the emergent role of the groundfish fishery in these trends; (3) characterize the relative sensitivity of that particular socioeconomic system to changes in local groundfish-related employment, fisherman earnings, changes in support infrastructure, and other factors; and (4) apply the results of the analysis to each of the specified management alternatives where possible (but devoting the most time and effort to Alternatives 1 and 3). Components (1) and (2) are treated in the community profiles appendix, and much information regarding component (3) is found there as well. The social impact assessment highlights component (3) and specifically addresses component (4). It should be noted that the social impact assessment is preliminary and suggestive rather than conclusive. The profiles are useful community descriptions, and should stimulate research, but they are insufficient to provide conclusions about impacts, even when combined with the economic modelling results. As noted elsewhere, the inability to control for subsequent decision-making by industry, continuing competition between and within industry segments, stock reductions, and price fluctuations, among other factors (including those not related to fishing) make projections of future impacts problematic if they are taken beyond the general trend level.

The research goal, then, has been to identify levels of impacts (such as negligible, minor, or major) for the topical areas specified by the community profiles, rather than detailing specific impacts. It should be clear from the outset that the issue is not one of the immediate demise of a particular processing enterprise, industry, or community. None of the alternatives considered is likely to result in such severe short-term consequences. The question is one of relative severity. What seems at issue is which sector or sectors of the industry are to be afforded the greatest short-term protection. Some processing enterprises, some communities, and some regions rely to a greater extent on current and future groundfish harvests than others and the objective of the study effort is to assess what these differences would be across the continuum of alternatives under consideration -- in other words, the distribution, duration and intensity of potential social effects.

4.3 The Alaska Study Communities

The original economic and social impact assessment study design for this project included four coastal Alaskan communities: Unalaska/Dutch Harbor and St. Paul in the Bering Sea and Kodiak and Sand Point in the Gulf of Alaska, and those communities were made the subject of community profiles (an appendix to this volume) and the following community social impact assessment treatments. It was recognized from the start that the Bering Sea and the Gulf of Alaska were greatly different fisheries, but it soon became evident that each of the communities chosen also exhibited unique characteristics. Further, it became clear that while the offshore aspects of the fisheries were essentially captured in their totality by the economic modelling and community studies approach utilized, important aspects of the total onshore component were being left out. This required that at least minimal information be developed for Akutan in the Bering Sea and King Cove/Chignik in the Gulf of Alaska. This then allowed the groundfish fishing sectors of these communities to be modeled in the same way as for the other communities, enabling an assessment of the alternatives on the comparable analytical units of the inshore sector and the offshore sector in the Bering Sea and the Gulf of Alaska as a whole to be made. We have included limited descriptive information (dealing almost exclusively with economy and population) on Akutan as an addendum to the Unalaska section below. Due to pragmatic constraints, similar information was not developed for King Cove/Chignik. The interested reader is referred to the chapter which discusses the economic input-output model (Section 3.3.3) and its results for the numerical economic summaries of these communities.

As might be expected, the specific social impacts of the alternatives differed from one community to another. Certain *commonalities* exist, however, and will be highlighted before the differences are discussed. The current state of affairs, termed the *status quo*, is hardly a stable one. Rather, a set of dynamics presently exists that, in the absence of some action by the Council, will result in increasing the uncertainty of groundfish supply to onshore processing plants. This, in turn, will certainly result in a less stable labor force and, in the most dramatic cases, the possible wholesale economic decline of communities resulting in very high social costs.

A short discussion on the "base year" is pertinent here. The most straightforward explanation for the choice of 1989 as the base year for the evaluation of management alternatives was that this was the most recent year for which fairly complete information was available at the time the decision was made to go forward with the analysis. Since then there have been profound changes in both the offshore and inshore components of the fishing industry, most notably in the Bering Sea but also in the Gulf of Alaska. The most visible of these have been the continued growth of the Bering Sea offshore fleet (pollock was targeted by 56 at-sea trawlers in 1989, 104 in 1990 -- Terry et al. 1990, Table 22), and the expansion of inshore processing facilities in Unalaska, Akutan, and Sand Point. The recent history of Council actions, including quarterly allocations and other traditional management methods, is also pertinent here as these have clearly not been able to address at least some of the fundamental dynamics of the fisheries. In any event, it should be borne in mind that the base year is not a "magically correct" construct, but is merely a rather arbitrarily (and logically) chosen standard for comparison. The choice that the Council finally makes in regard to an inshore/offshore allocation will ultimately rest on the goals the Council wishes to achieve with the decision. We have assessed the direction of change associated with the alternatives specified by the Council. More faith should be placed in our trends analysis and relative rankings of impacts rather than in the precise quantification of absolute values. In this sense, the choice of a base year is immaterial. The very practical considerations of private economic interest and redistribution do, of course, impinge to make the choice of base year and the justification of allocation percentages to consider more of a concern. We have thus attempted to provide the council with at least partial information on how the situation in 1990-91 differs from what it was in 1989.

Dramatic changes have taken place in the groundfish fisheries in Unalaska, Sand Point, and Kodiak since 1989. In 1989 the Unalaska economy was booming with onshore processing plants operating year-round. Since then they have been forced to operate more sporadically due to the seasonal unavailability of fish, this due to the closure of fisheries resulting from catch limitation and pressure from the offshore fleet. In 1989-90, Unalaska was the fastest growing community in Alaska, but without an inshore allocation it is doubtful whether it will be possible to even maintain the current level of onshore activity. The onshore plant in Sand Point has a similar operating history. This plant was in year-round operation in 1988, but is currently limited to seasonal processing due to quota-based closures, attributed by Sand Pointers in turn to the fishing pressure of the offshore fleet. An inshore allocation would relieve this pressure and make the inshore sector much more viable. Similarly, the development options open on St. Paul in the absence of an inshore allocation are much less hopeful than if an inshore allocation is passed. Kodiak processors have had their operations severely disrupted by the unpredictable activities of the factory trawler fleet (most notably, but not exclusively, in the "base year" 1989) and report that concurrent with the "Americanization" of the groundfish fishery they have noticed a decreasing ability on their part to predict how many fish will be available to their plants and at what time. Rational and efficient planning horizons have shrunk, leaving management subject to short term resource fluctuations which are mostly attributed to other (offshore) segments of the industry. In the absence of an inshore allocation they see no way to protect their position in the fisheries from preemption at some point (unpredictable as to the precise timing, but certain as to its eventually happening) by the offshore fleet. This is, ultimately, the uncomfortable position of all coastal Alaskan onshore processors who handle groundfish. Again, however, it should be noted that an inshore allocation, in and of itself, will not be a guarantee of community stability.

All Alaskan study communities stand to gain by an inshore allocation. The degree to which a community will benefit depends of course upon the specific circumstances of that community and the terms of the allocation. It should be stressed that despite the prominent position given to the economic input-output model results, only part of the anticipated positive effects of an inshore allocation can be measured in strict economic terms. The inshore/offshore allocation has at least two important aspects, of which many people only focus on one. By in essence assigning fish to two different user groups and separating them from direct competition with each other, an inshore/offshore allocation may or may not redistribute the economic value associated with these fish (which depends upon the percentage formula used), but it most certainly makes the resource availability more predictable for individual economic units within each of the user groups (and the inshore sector especially). The economic benefits of rational and efficient planning are *not* reflected in the economic model, and the community and social benefits of more year-round plant operation *cannot* be assessed by such a model. Our social impact analysis makes it clear that for all Alaskan study communities the main beneficial social effects derive from the social consequences of a stable labor force employed steadily by a more or less year-round processing sector, and all of the support sector and other derived activities that accompany a stable fundamental economic base. The specific allocations to attain this level of operation, of course, vary from community to community, and the charge was not to determine the optimal allocation (probably a hopelessly complex task in any event) but to assess the effects of a limited number of alternatives formulated by the Council. Some result in a redistribution of resources from one sector to another (depending on one's perspective and time period of concern) while others (most notably Gulf of Alaska Pacific cod) do not redistribute resources so much as they regularize the availability of these resources.

This, then, is the "first cut" difference between the study communities. Unalaska and Kodiak will undoubtedly benefit in a direct economic way from an inshore allocation. They will be "given" more fish. They will also benefit economically in a significant number of less direct ways. Processing plants will be able to once again expand their planning horizons and operate in a more rational and efficient way. The community as a whole will also benefit from the increased economic stream through the community. The social benefits associated with increased economic activity and a stabilized, increased resident, labor force will also become evident.

The analysis of Sand Point and St. Paul would appear different from those of Unalaska and Kodiak, however, in that the economic model actually seems to indicate that Sand Point would be better off without an inshore allocation, and St. Paul cannot even be modeled since it did not participate in the groundfish fishery in the 1989 base year. For Sand Point, the counter-intuitive output of the economic model illustrates the model's inability to take into account the benefits which a predictable supply of fish provides to a processor (it may be possible to build this into the model, but it vastly increases the complexity required). In an open competition for a limited resource, where harvesting and processing capacity exceeds supply because of the offshore component, Sand Point processors have been forced to operate only seasonally. An inshore allocation would at least in principle allow for the year-round harvest of (in this case) Pacific cod without the worry of the vast harvesting capacity of the offshore fleet, thus allowing for a more regular plant operating schedule. There may be an economic tradeoff here, since the allocation alternatives suggested result in a lower inshore allocation than was the case for the base year of 1989. The economic benefits of a more rationalized operation may well offset this "reduction." Furthermore, the social benefits associated with a stable, rather than an uncertain, economic base will more than compensate for this.

St. Paul does not at present participate in the Bering Sea pollock fishery and so can not be modeled at all. An inshore allocation is absolutely essential if this community is to have any hopes of entry into this fishery, and would also be quite beneficial in terms of more general development plans. The viability of St. Paul as a community depends upon the growth of a sustainable economic base centered on its harbor. While it is not clear that an inshore allocation is absolutely essential for the growth of such an economy (it may be possible without it), it has the potential to greatly aid the process.

There are also more specific ways in which the Alaskan communities differ from one another. Unalaska is the main service center for the offshore fleet in the Bering Sea. Thus, even though it could benefit overall from an inshore allocation, there will be some local dislocation and/or displacement effects. Since the net economic result is positive, this should create few substantial problems. The Unalaska fishery is very dependent upon pollock, although crab and other species are also quite important. Most or all of the fleet is composed of boats from "outside," so vessel services will remain at about the same level and income to harvesters will have about the same local distribution. Sand Point's fishery, on the other hand, targets predominately on Pacific cod and salmon and is composed of local boats. Furthermore, the allocation alternatives considered actually reduce the level of resource availability to the inshore sector. The supply is made more predictable, however, and the economic results may be more positive than the economic model suggests. Kodiak is a very diversified fishery, and an inshore allocation were adopted it would receive the benefits of both a higher percentage of the catch than perhaps it has attained historically (due to a relatively low TAC and the vast harvesting capacity of the offshore fleet) and a more stable supply of fish.

4.3.1 Kodiak, Alaska

4.3.1.1 Introduction

The economy of Kodiak is based on a fishery that is complicated, diverse, and interdependent. The "offshore sector" of Kodiak's fishing industry is relatively simple and based on a narrow set of resources. Their catcher/processors, which the Council has defined as the offshore sector, can extract resources rapidly and thus deny them to the shore-based sector if allowed unregulated access. This would disrupt the local economy in unpredictable ways and would not be in either the local or national best interest. The economic input-output model indicates that the most extreme allocative alternative (100% of pollock, 80% of cod allocated to inshore) provides positive benefits at both the local and state levels, negative effects on the "outside" (Washington/Oregon region) level that essentially offset the local and state gains, and a "no net change" at the national level (these results are actually for the Gulf of Alaska as a whole; for Kodiak alone the allocation alternatives have more overall positive results). This social impact assessment corroborates these results and indicates that such an allocation also increases the social and economic stability of Kodiak (and other Gulf of Alaska coastal communities).

4.3.1.2 Population

Size and Composition

Using the most extreme allocation to inshore users (Alternative 3.3), the economic model computes that there would have been 214 more full time equivalents (FTE) in Kodiak than for the base case. 214 FTE's in a community like Kodiak with an average household size of 3.4 individuals would increase the population by 728 individuals. This represents a 11% increase from Kodiak's 1989 population of 6,704. This is a significant change, but one that could be accommodated by present (and/or planned) facilities. It is also important to note that the 214 additional FTEs figure is a *derived* figure and need not represent 214 physical bodies or jobs. It may represent more people at less than full-time employment (part-time or seasonal) or fewer people at above average wages/income. It represents harvesters as well as processors, support, and "spin-off" employment. Housing in Kodiak is in short supply and it is likely that some of these additional FTEs would be absorbed by the current seasonal or part-time labor force already resident in Kodiak. It is likely that additional housing would be required and that the private market would be stimulated to provide this.

The composition of any population increase is difficult to gauge and would depend on the sector(s) gaining and losing support. It is likely that onshore plant employees, primarily Filipinos, would constitute a greater proportion of this increase than they do of the population at large. Some harvesters would also be added. Offshore support positions would decline but may move to inshore support positions (and use same infrastructure and facilities). It is also possible that an inshore allocation will encourage a redistribution of the Kodiak Island Borough population from the outer villages to Kodiak. Current information is not complete or detailed enough to make a definitive statement in this regard.

A very likely effect of an inshore allocation would be to encourage more of the seasonal workers to remain on Kodiak year-round due to steadier employment opportunities. This is especially likely since fish processors state that one of their present problems is operating at less than capacity at various times throughout the year (a "peak and valley" pattern). The steadiness of employment is also supported by Alaska Department of Labor employment and earnings information which suggests that for three-quarters of the year, most fish processor workers work essentially half-time.

The lack of an inshore quota may be expected to have no effect on current population levels in and of itself. However, if current trends continue, the effects of factory trawlers in the Gulf may so disrupt the efficient operation of inshore processors that there could be business and population dislocations. These scenarios have not, as yet, been a regular occurrence, and quarterly pollock allocations in the Gulf of Alaska seem to have worked well to forestall this occurrence in the short-term. Informants still felt that the situation remains too uncertain at present and that the Gulf of Alaska fishery can still be easily disrupted by the Bering Sea fleet. An inshore allocation would ensure that their supply of fish is secure.

Household Size and Composition

If the projected population increase consisted primarily of Filipinos, it can be expected that average household size would increase. This will not be a sudden effect as it is likely that single individual workers will be the first to move to Kodiak in response to new onshore opportunities, rather than established families. This has been the pattern in the past. Because of the established Filipino community already in Kodiak these newcomers may well establish families faster than the first Filipino immigrants did, but it will still not be immediate. On the average, Filipino households contain more members than those of other ethnic groups in Kodiak. The Filipino component of the Kodiak population will remain a relatively small component of the overall population, so that the overall increase in household size would be small. The effect this would have on social services and other facilities is not known, as there is little or no information on the differential use of these services by the Filipino (or other) segments of the Kodiak population.

Educational Status

There will be some additional "load" placed on the public schools of Kodiak. This should not place any undue strain on current and planned facilities.

4.3.1.3 Socioeconomics

Economic Profile

The basic economic profile of Kodiak would not be altered even by the most extreme inshore allocation, since the basic economy is one founded upon access to a diversified, multi-species, fishery and shore-based processing. The economy would be bolstered in measurable ways, since certain fundamental variables of production would be made more predictable for several of Kodiak's major economic firms. The overall effects should be markedly positive at the local level, and at the national level as well. Conversely, the absence of an inshore quota would increase the uncertainty of groundfish supply to onshore processors and would decrease their ability to predict future plant operations for efficient planning. Plant employment will be more sporadic, labor turnover can be expected to be higher, and the overall economic health of the community will be lower than it currently is. The lack of an inshore allocation does not maintain the *status quo*, but is likely to result in a less stable economy due to the increased uncertainty concerning whether catcher/processors will be operating in the Gulf of Alaska or not. An uncertain supply of fish reverberates throughout the economy. The present Kodiak work force is composed primarily of local residents, with a higher economic multiplier effect than if they were non-residents. The lack of an inshore allocation may well result in the devolution of the Kodiak economy where a less stable labor force supports a smaller and less diverse economic support sector.

The Gulf of Alaska Fishery

Under the most extreme scenario, 100% of the pollock and 80% of the cod would be allocated to onshore plants. This may not seem to reflect the historical catch or an onshore processing capacity to handle this volume of fish. Several aspects of this question are best addressed in the next section, but it should be noted here that the onshore utilization of pollock in the Gulf of Alaska has been heavily influenced by the participation of vessels from the Bering Sea fleet. This was especially evident in 1989 when such vessels harvested a significant amount of the TAC in the Gulf in January (the shore processors did a large percentage as well), which resulted in the closure of the pollock fishery in the Gulf for the rest of the year. This idled a large part of the capacity of two of the major processors in Kodiak and severely disrupted the stability of their labor force and ability to efficiently plant operations for the year. These plants report that they can each accommodate up to 40 percent of the pollock allocation from the Gulf when their surimi plants are in operation, and the other major processor can more than make up the rest. Since other processors also run pollock (and cod) there would appear to be more than enough onshore capacity for the TAC of pollock and cod in the Gulf of Alaska (see next section).

Plant Operation and Labor Force

The groundfish processors interviewed claimed that their present groundfish plant capacities were being under-utilized due to the unavailability of fish. Supplies of groundfish have become unpredictable, even though the TAC and quarterly allocations are known well in advance. They attribute this to the relatively short seasons that resulted from the rapid rate of harvest of factory trawlers operating in the Gulf. In the best of years, when the factory trawlers do not operate in the Gulf as much, the shore-based plants can process groundfish for perhaps half the year. In 1989 the major plants said they processed surimi only 90-95 days. If 100% of the pollock were allocated inshore, the managers of these plants claim that they could operate on nearly a year-round basis. They would probably reduce the volume of pollock they process from April through August since the quality of pollock during these months is lower and other, more lucrative species are available to process. Nevertheless, groundfish would provide a more stable operating base for the processing plants than at present. This is important for several reasons. The current quarterly allocations of pollock in the Gulf require that the plants essentially start and stop pollock processing several times a year. This is preferable to a yearly allocation, with catcher/processors taking most of it, since the quarterly allocations do ensure that onshore plants obtain a certain percentage of the overall allocation. Allocating the entire quota to the inshore sector, and eliminating the catcher/processors, would have the effect of lengthening the harvesting period and the period of time that pollock are available to be processed. This will result in increases in plant efficiency from two sources.

First, the plant lines will not have to be shut down and then started up a number of times. Second, and related to this, the plants will be able to maintain a steadier labor force. By having more work available on a predictably year-round basis, the plants will have a more permanent labor force, less turnover, and reduced training (and wastage and accident) expenses. Plant managers were unanimous in their opinion that a processor could operate most efficiently as a steady, year-round, operation. This, of course, depends upon a steady supply of fish and the labor force to process them. The economic benefits to the community of a more permanent as opposed to a more transient labor force are also quite marked. It is likely that at least part of the FTEs "created" in Kodiak by an inshore allocation would be absorbed by seasonal or part-time employees becoming full-time. This would provide substantial economic benefits to Kodiak without imposing a proportional increase on the infrastructure. The impact on housing should be minimal in the short-term, and absorbable in the long-term, while other service-related impacts would be dependent on the numbers of new people who moved to Kodiak and when they actually arrived.

Flexibility was also stressed by these same plant operators as well as most Kodiak fishermen. The importance of this flexibility is also incorporated into the economic input-output model used by the economic analysis team, although this has not been made explicit. All processors in Kodiak, except for the smallest, are multi-species processors who vary their "mix" from year to year based on what is available and markets. The groundfish processors are simply the largest processors (in terms of weight, value, and different number of species processed). They state that it is the "mix" of products available to them that allows them to operate most efficiently from year-to-year and maintain continuity. No fishery is steady, so adjustments have to be made on a constant basis. As the plant operators have year-round operation as a business goal (which supports year-round wage labor employment and fishing activity and contributes to community viability), it is beneficial to have more than one processing option at any given time. A consideration of only groundfish (pollock and cod) with no examination of how they fit into the processing of other (mostly higher valued) species does not represent the economy of Kodiak or the effect of changing the allocation of pollock and cod within that economy. Shore-based plants have certain fixed costs, which have to be covered whether they operate or not. Most plant managers stated that groundfish were most useful as a stabilizing product that could be used to keep the plant in operation while covering costs and making a small profit. Groundfish do not represent a lucrative fishery, but it is a large one that allows for close to full utilization of plant capabilities when the more lucrative, but much shorter, fisheries for halibut, salmon, crab, sablefish, etc. are not on line. Kodiak fishermen also expressed their need to be able to participate in different fisheries for much the same reasons. While few Kodiak-based trawlers were contacted, even they participate in the halibut openings and crabbing in addition to trawling (as reported by other fishermen informants and in the literature). They are said to do so because the economic payoffs for halibut and crab are much higher than for trawling for groundfish during the relatively short periods when these resources can be harvested, while trawling provides a steady income throughout the year and is much more predictable.

Fishery Issues and Characterizations

Bycatch and conservation issues also are part of the inshore allocation question. Kodiak fishermen and onshore processors were all agreed that catcher/processor rates of bycatch are at present basically undocumented and are, they suspect, very much higher than for other harvesters. These informants also report that *all* onshore harvester components have made strong efforts to reduce rates of bycatch and to reduce bycatch mortality, while factory trawlers have not even been willing to address the issue. They see a 100% inshore pollock allocation as one way to increase conservation measures in the Gulf of Alaska because:

(a) Local fishermen and processors are more motivated to reduce bycatch.

(b) Factory trawlers more destructive of the ocean floor than are other harvesters (even local trawlers).

(c) Factory trawlers can target and over-fish sub-populations, especially in an area such as the Gulf of Alaska where such vessels can take the TAC from a relatively limited geographic area in a very short period of time.

Bycatch is not a simple issue, and is one that affects all fisheries and all gear types. Bycatch is not a direct issue of the inshore/offshore allocation deliberation, at least at the present time, because there is little agreement on the measurement of bycatch rates for the various fisheries and gear types. Rather, bycatch has been used as a way to justify favoring "cleaner" fisheries over "dirtier" ones, with the classification of various fisheries depending on the identity of the informant. It is likely that an inshore/offshore allocation, with separate Prohibited Species Caps, would encourage various industry segments to reduce their bycatch rates as much as possible and prevent one gear type from closing the fishery for all. However, the present plan for inshore/offshore does not distinguish between gear types as such. If implemented at present it would certainly separate two clearly different user groups.

Infrastructure

There should be little or no demands placed upon the present and planned infrastructure of Kodiak as a community. There should also be no dislocations caused by the under-utilization of any facilities resulting from reduced activities of catcher/processors in the Gulf of Alaska. The harbor may become somewhat more active due to increased deliveries to shore-based plants. This may create problems since the harbor is at present fully utilized and has periods of being quite full. Much of the increased activity can be expected to take place at processor docks, however, where catcher boats will be able to be accommodated.

The current shore plants do have a problem, or potential problem, with the disposal of their waste. None of the plants have their own fish meal plant, relying on Kodiak Reduction, a processor of fish waste. Currently this facility can handle 200 to 250 tons of raw waste a day, about half of the current need. The summer deadline set by EPA for the termination of dumping waste at sea presents a problem with no short-term solution. Facilities to process all of the area's fish waste are estimated to cost $11,000,000 and could be in operation in perhaps eighteen to twenty four months. This would involve modifying or replacing the current facilities of Kodiak Reduction. A consortium of Kodiak processors is analyzing the options available and is holding discussions with the Environmental Protection Agency.

If current shore plant facilities were not capable of processing the total Gulf of Alaska TAC, there would be problems with increased onshore processing since there is little usable land available in Kodiak for the expansion of processing facilities. However, as discussed above, there is more than adequate shore based capacity to process the entire Gulf of Alaska TAC. An inshore allocation would increase the waste onshore plants generate, and thus increase still further the meal plant capacity locally required. This could probably be accomplished within the constraints of Kodiak Reduction's present site, although no specific feasibility study has been conducted as yet.

4.3.1.4 Sociocultural Profile

Social Organization

For the most part, the effects of the various inshore allocations will be minimal on most formal social organization. The sections below follow the format of the community profiles.

Government

There are no expected changes in this area related to the inshore allocation of pollock and cod.

Quasi-Governmental, Regulatory, and Industry Associations

Given a significant inshore allocation, especially if it is the most extreme option of 100% of the pollock and 80% of the cod, some change can be expected among these institutions. The basic structure of the institutions will remain the same, but the relationships among them may be modified. An inshore allocation may well increase the informal consultation among the different user groups and serve as an effective way to address common problems such as bycatch and gear conflicts.

All inshore allocations, and especially the most extreme alternative, would basically be perceived as an affirmation for local (onshore) as opposed to "outside" use of local resources. If informants are correct in their perceptions, such an allocation would also serve as a stimulus for collaborative efforts to deal with problems in the Gulf fishery. In many ways this could lead to substantial local regulation in the Gulf, given that Kodiak is the principal harbor for those fishing the Gulf of Alaska. Gear conflicts and the reduction of bycatch were two areas where local informants were of the opinion that locals could make significant progress through mutual education, especially if "outside" boats were eliminated from the fishery. All local fishermen -- longliners, pot boats, and trawlers -- are included in this local "coalition" who lay a good number of the fishery's fundamental problems at the keels of the catcher/processors. This is to some degree self-serving, of course, but the fact remains that a greater degree of cooperation and self-regulation can be expected to develop between local fishermen's (and processor's) groups if an inshore allocation is made.

Social Services

As with most small rural Alaskan communities, the provision of social services in Kodiak can be problematic. Kodiak is relatively fortunate in that it has generally adequate medical facilities and a wide array of social services available. These services are not expected to be affected by any inshore allocation or the associated consequences of such an allocation. This is not to say that there is not a need to improve the provision of these services. Rather, an inshore allocation, or the lack of one, is not likely to affect the present level of service either positively or negatively. Those services that are adequate at present will continue to be so, and those that are less than adequate are not likely to be improved because of an inshore allocation. It is likely that the absence of an inshore allocation will have negative effects on social services due to a general weakening of the local economy (and that an inshore allocation may actually improve the situation in terms of the provision of social services).

Informants did maintain that in the past, when trawlers from the Bering Sea fleet did operate in the Gulf and so reduce the supply of fish to the shore processors, that the service load on most social service programs increased. This is difficult to document as a patterned variance that did indeed occur, because of the nature of service provider records. Even if this pattern were established, the causal factors would be difficult, if not impossible, to isolate. Intuitively, it is likely that when fish are less available for processing, income for fish plant workers would be lower, stress would be higher, and the need for social services greater. The labor force would also be expected to become more transient, with an expected increase in the need for public safety and other services. None of this is easily documented, however, although local concerns certainly indicate that informants view this as an all too likely and serious problem that could develop in the absence of an inshore allocation.

Sociocultural Values

Sociocultural values in Kodiak will remain essentially the same regardless of actions on management alternatives. With the implementation of an inshore allocation, however, more unified methods of local expression (as, for example, in the cooperation of local fishermen's and processor's groups discussed above) may emerge.

Religion

No change is anticipated in this area as a result of fishery management allocation decisions.

Views on Resource Management

Local views on resource management are not likely to change as a result of an inshore allocation, but it is possible that their local expression and operational characterization could be altered. In a very real sense the Gulf of Alaska would be made into a local fishery by an inshore allocation and local associations would have the opportunity to succeed or fail in dealing with the perceived problems of the fishery. One of these mentioned above is the issue of rate of bycatch and the rate of bycatch mortality. Local groups are united in the belief that both rates must be lowered for all gear groups and all fisheries, and an inshore allocation would afford them the opportunity to work together toward this goal. Most Kodiak informants are also opposed to any form of limited entry, although they realize that there are few fisheries that are actually completely open access. They wish the Gulf of Alaska pollock and cod fisheries to be essentially restricted to the inshore fleet, for instance. However, within that constraint they wish it to be managed as an open access fishery so the flexibility they perceive as necessary to make a living as a fisherman can be maintained. Kodiak fishermen maintain that any limited entry system, by imposing a capital cost beyond the price of a boat and gear on the entry into a fishery, restricts the ability of most members of the fleet to transfer from one fishery to another in as easy and rapid a way as conditions may require. An inshore allocation would not be expected to alter the local perception that bottom trawlers are detrimental to the Gulf of Alaska, and may in fact solidify this view.

Subsistence

An inshore allocation would have minimal influence on subsistence activities. Most of the population increase in Kodiak would probably consist of non-Natives. Their use of subsistence resources would be related to where they came from and other characteristics. Any population increase will increase the burden on the available stocks of subsistence resources, and it is known that all population segments make use of subsistence resources to one degree or another. This increase is not expected to be substantial, however.

Other Issues

Although not directly related to the inshore/offshore allocation question, several informants in Kodiak spontaneously expressed a concern with the "value added" issue. They agreed with most Alaskan informants that in most cases too much of the economic benefit derived from processing fish caught in Alaskan waters was directed out of state. Informants go beyond the observation that the factory trawler fleet is based predominately in Seattle and that many of the smaller boats delivering to onshore Alaskan plants are based out of state, however, by noting that even those fish landed in Alaska are for the most part only processed in a preliminary way. These partially processed products are then shipped elsewhere to be made into final food items and packaged for sale. This secondary processing site is where much of the value of the product, over and beyond its initial cost as a freshly caught fish, is added. It was the opinion of these informants that this processing could be done in Alaska (most suggested a large central place such as Anchorage), thereby increasing the economic contribution of Alaskan fisheries to Alaska. Most of these informants explicitly stated that such value added operations would probably not be feasible in less central locations such as Kodiak, for a number of reasons (lack of room to expand facilities, little additional local labor, limited cold storage facilities, transportation costs). An inshore allocation would have little direct effect on this issue, especially given the vertical integration of secondary manufacturers in the lower-48 with both offshore and inshore components of the Alaskan groundfish fishery. It does, however, illustrate the Alaskan concern with maximizing the contribution of the fisheries to the state.

4.3.2 Sand Point, Alaska

4.3.2.1 Introduction

Community Overview

Sand Point was founded by a San Francisco fishing company in 1887. The first endeavors were a salmon fishing station, a trading post, and a supply post to support the codfishing industry. This historical continuity of commercial fishing, and especially the relationship to the cod fishery, was stressed by local informants and is important in terms of local community identity. None of the other communities profiled under the terms of this project have such a fundamental historical identification with commercial fishing.

Sand Point differs in other ways from the other research communities in the nature of its involvement with groundfish operations. Besides its early and historical involvement with the catching and processing of Pacific cod, Sand Point is different in that Pacific cod and salmon remain the major species fished. Pollock are not part of the Sand Point fishery, at least in part because of the nature of the Sand Point catcher fleet. Unlike the fleets of the other study communities, the Sand Point fishing fleet is composed almost totally of relatively small vessels which are locally owned and operated and which deliver exclusively to the (one and only) local processor. Few "outside" boats deliver to the Sand Point processor, and no local boat delivers or fishes "outside." This pattern contrasts very sharply with that of Unalaska and only somewhat less so with Kodiak (which has a very diversified fishing sector). The fact that Sand Point (at the time of the compilation of the community profile) has only one local processor is also in marked contrast to both Kodiak and Unalaska.

In terms of ex-vessel value salmon and Pacific cod are the most important species taken by the local catcher fleet, followed halibut, crab, and sablefish. In terms of relative value, assigning the take of sablefish a base unit value of one, crab also has a value of one, halibut of two, Pacific cod has a value somewhat over three, and salmon has a value of well over seven. These figures underestimate the value of Pacific cod to the local economy, however, because of the differences in the processing of the different species. Examining the value added by processing by species, rather than ex-vessel value, Pacific cod outstrips salmon by nearly half, with the other species falling well below half the salmon value added figure. (For species specific values, the reader is referred to the economic analysis section of this report.)

Overview to Impact Analysis

Sand Point economic modelling results are somewhat ambiguous. They would seem to suggest that the Western Gulf of Alaska stands to lose from any of the proposed alternatives. Under each of the alternatives for each of the categories of Local, Instate, Outside, and Total U.S. Impacts, and for each of the subcategories of Income, Total Community (Area), and Employment there are, without exception, losses in every "cell." The declines range in magnitude from 0.13% to 7.38% of the base. It may be the case that for Sand Point, each of the alternatives as economically modelled is essentially a "wash" and that in essence Sand Point would experience "no change" under any of the alternatives. The "across the board" declines may be attributable to the importance of the cod fishery (both freezer/longliners and catcher vessels delivering to onshore processors) and the noninvolvement of Sand Point fishermen and processors in the pollock fishery. Given the relatively small allocative changes from the historical pattern suggested by the alternatives for Pacific cod in the Gulf of Alaska, the declines seen in the model projections may well be within the plus/minus tolerance of the model, meaning that the results could be statistically insignificant. Indeed, it is likely that recent plans to expand onshore processing facilities in Sand Point will have more effect on the community than will any of the allocative alternatives currently under consideration.

The onshore groundfish processing situation in Sand Point is most certainly not static, or even in equilibrium. There have been significant changes in local groundfish processing operations in the past several years, independent of the allocative alternatives, and these will be briefly noted below. Two of the main recent developments with respect to the groundfish fishery that have affected the community (or have a strong potential to affect the community) are the changing nature of the availability of Pacific cod, and the addition of a second groundfish processor to the community in January of 1991. The established local processing plant operated year round in 1988, but since then fisheries quota-based closures (at least partially due to the increased participation of offshore users) have served to shorten plant operations. In 1990, the plant was shut down in September, and remained closed until the January, 1991 season opening. These shut downs have several obvious implications for the local economy. The processor new to Sand Point signed a contract with the city at the time of field data collection and will moor a floating processor in municipal waters for the 1991 Pacific cod season. According to city officials, if this plant is successful in processing 10 million pounds of Pacific cod in the round, then the company plans to invest $10 million in a shore facility in the community, which would certainly influence the structure and economy of the community in a number of ways. An inshore allocation of Pacific cod would seem to foster the development of this new effort in Sand Point and this, in turn, would continue the trend toward stabilization of community population and economics. There may be some question as to whether the available supply of cod is adequate for two plants to operate year-round in Sand Point, given that one plant has not been able to do so. The absence of an inshore allocation, creating an uncertainty in access to cod, has been an important contributing factor to this pattern, and it can be expected that with an inshore allocation both plants will be able to plan their operations in an efficient and rational manner.

4.3.2.2 Population

Size and Composition / Household Size and Composition

The population of Sand Point can be expected to fluctuate, and will be influenced by two main factors. The first is the location of an additional shore plant for groundfish operations in the community. The second is the length of the seasons for groundfish (especially cod) harvesting (whether they are "year-round" or "shortened"). An inshore allocation can be expected to affect both of these (and of course they are not independent of each other).

In 1990, 22% of Sand Point's population lived in group quarters (i.e., were shore based fisheries employees). This is a large percentage for what is essentially a transient population and, as expected, fishery closures (affecting processing operations) strongly influence seasonal fluctuations of Sand Point's population. Changes in the activities of the local catcher fleet are expected to have few population effects, given the "permanent resident" nature of Sand Point's catcher fleet. Changes in household size and composition are anticipated to be minimal in any event, since locals compose virtually the entire catcher fleet while very few locals are employed at the local processing facility. Management practices with respect to local hire at the new processing facility are not known at this time, but will most likely resemble those of the present processor (a relatively transient labor living predominately in company group housing).

Educational Status

No student enrollments in Sand Point accrued from shore plant operations in the recent past. The strong development of the cod fishery has increased the stability of the local fleet by lessening the need for seasonal movement by catcher vessels. In effect, salmon and Pacific cod can fully occupy the local fishing fleet, with Pacific cod being used as the stabilizing resource to supplement the higher-value but much more seasonal salmon. This has, in turn, served to stabilize the resident population. If the harvest seasons for cod were to become increasingly shorter, the expected result of present dynamics, this trend can be expected to reverse again.

4.3.2.3 Socioeconomics

Economic Profile

The Commercial Fishing Industry

As is the case with all other communities, to one degree or another, it is not accurate to treat Sand Point as an isolated entity for the purposes of analysis. It is enmeshed in a web of relationships with other communities that influence events in Sand Point, and because of this the community to a certain extent should be examined within the context of the Aleutians East Borough (AEB) to which it belongs. That is not to say that this is an entirely homogenous region politically or economically. For example, while Sand Point-based catchers concentrate on the Gulf of Alaska, the Aleutians East Borough encompasses lands on both sides of the Alaska Peninsula and therefore has access to fisheries both in the Gulf and in the Bristol Bay/Bering Sea region. In the case of the AEB community of False Pass specifically, there is a local Peter Pan and a local Delta Western facility, and False Pass fishermen can go either to the Bering Sea or to the Gulf of Alaska with some of their boats. Obviously, not every community shares this degree of flexibility.

Within the AEB as a whole, there are approximately 250 vessels in the "home fleet" according to borough officials with close knowledge of the fishing industry. This "home fleet" is a diversified one and, in terms of the span of species targeted, it contrasts with other communities in Southwest Alaska. For example, Unalaska-based boats target primarily bottomfish and crab and Bristol Bay boats target salmon; on the other hand the AEB home fleet represents a multi-species fishery with six primary stocks fished, according to borough officials. Beyond the species mix itself, the AEB home fleet differs from most other catcher fleets in Southwest Alaska in a number of other characteristics. It is, for example, in general terms a Native, diversified, and locally owned fleet. The local fleet is comprised of smaller vessels, primarily 58-footers, and according to local residents, logistics mitigate against offshore deliveries by local vessels. Not surprisingly, local fishermen have developed vessels and knowledge appropriate to the area, which would tend to limit flexibility, but this is not to say that there have not been recent innovations and changes in the fisheries. For example, local fishermen are currently trying pot fishing for cod and see this as a cleaner, easier method that produces less bycatch (and has a low expense for "conversion" as they already have crab pots). Dragging is not a new technique (rather, it is a new application) to the "home fleet" as local fishermen are used to dragging for shrimp. With Sand Point having 134 local vessels and King Cove having 80, a local fisheries support sector is developing to service the full harbors. For example, both of these AEB communities have a 150 ton haul-out capacity. Having the haul-out means that boats winter over which supports local repair facilities. In addition families remain in the communities and this supports school revenues.

Location of the borough favors transportation development for fisheries (and other) products originating outside of the region as well as within it, due to the fact that it lays on the Great Circle Route between more southern North American ports and Asia (and between Kodiak and Unalaska along this route). In addition to surface shipping, there is potential for further expansion of air shipping to and from the region. The AEB community of Cold Bay has the third largest airport in the state, and the community itself is basically an airport service center.

Composition of Employment

Local (Sand Point) employment in the commercial fishing industry is structured by two factors: (a) the "localness" of the catcher fleet, and (b) the management practices of the local shore processor(s). The changes in composition of employment are most likely to result from (a) differing management practices of the new processor in town (if any), and (b) seasonal fluctuations as a result of shortened groundfish seasons.

Processing of Pacific cod employs approximately 350 workers at the established local plant, while salmon processing employs between 60 to 190 workers. It can be seen that a viable groundfish industry provides income for fishermen in what are otherwise "down times" in the non-salmon seasons, and provides local processing employment levels far higher than other species.

Groundfish Industry Development

Local processing of groundfish has allowed shoreside processing facilities to be utilized during a much larger portion of the year than would otherwise be the case, which is economically desirable to offset more or less fixed overhead costs. More constant levels of activity generated by groundfish development are also responsible for a number of spin-off economic activities, including increased fuel sales, increased freight moving across the city dock, increased business for marine support services, and increased activity in general service sector businesses. These activities are seen locally as highly desirable to build a more year-round, diversified economy than would otherwise exist.

However, current trends have resulted in the present Sand Point processor not being able to operate year-round. This seems to be due primarily from the uncertainty of the supply of cod. An inshore allocation would not increase the supply of cod for onshore Sand Point processors (and in fact may decrease what is available) but would certainly increase the predictability of the supply and provide for a much more rational and efficient planning process. The expanded processing capacity planned for Sand Point and the existing processing capacity in Kodiak may make this planning more problematic. Whether these plants can operate year-round will depend upon the aggregated management decisions of all of these onshore processors. Competition among them for fish, where processing capacity outstrips the supply of fish, may well result in less than year-round operation in a way similar to the current situation. The present dynamics make it a certainty that no onshore processor in Sand Point can establish a stable operating schedule, whereas an inshore allocation has at least the potential to do so. Whether one or two onshore processors survive in Sand Point will then be decided by the economic competition among all Gulf of Alaska onshore plants, an allocation would certainly stabilize the economic base of Sand Point, and thus the community as a whole.

In the absence of an inshore allocation, one fear of Sand Point fishermen is that the Bering Sea groundfish fishery will be split into quarterly allocations. If this were done, these informants fear that the Bering Sea offshore fleet would catch the Bering Sea quota and then, after closing that fishery, enter the Western Gulf and rapidly deplete whatever remains of that quota as well. This would certainly be to the detriment of fishermen who concentrate exclusively on cod in the Gulf, and most especially to the smaller local boats.

The current economics of the fishery in Sand Point differ from those of other communities in the region, due to historical/developmental differences, and they also differ from those of Sand Point itself even a few years ago. Shore plants, obviously, represent sizable investments in the community, and there are a number of spill-over effects from these investments. As for the catcher fleet, fuel costs are a bigger factor in the fishery now than has been the case in the recent past. It should be remembered, however, that there is a strong continuity with the commercial fishery in the AEB. Sand Point and King Cove are successful as a result of their own efforts -- King Cove since 1911 and Sand Point since the turn of the century -- in commercial fishing. As noted elsewhere, this is a very different case than that of Unalaska, for example, whose commercial fishery has always been dominated by non-resident fishermen, either from other areas of the state or from Outside. Unalaska's nearest neighbor and fellow beneficiary of groundfish development in the Bering Sea, the village of Akutan, is a similar case with economic growth based on harvesting by fishermen from outside of the community. In the words of one AEB official, "Akutan is a community of [shore]plants, not fishermen." The contemporary AEB regional economy has, in general, been built by exporting value, which is unlike some of the other contemporary communities in the Aleutian/Pribilof region, such as the St. George, St. Paul, Nikolski, and Atka. (Those latter communities were established based on the exploitation of resources that no longer provide an economic foundation built on export value.) In terms of adaptability, AEB communities have demonstrated the viability of local winter fisheries. People in Sand Point, according to a senior government official, are willing to take risks (1) politically, (2) financially, and (3) personally (going into the Gulf in winter) in order to be successful. Limited Entry brought stability to the salmon fishery, and local residents would like the Council's inshore/offshore policies to do the same for the groundfish fishery. Sand Point is an example of a small community developing a "home fleet" that is the basis for a stable economy, in combination with a local processing plant.

Another possibility of an inshore allocation is that it might prove to be an incentive for local processors to add pollock to their processing operations (a very unlikely scenario in the absence of an allocation). This would have implications for further economic and population stabilization for the community, through economic diversification. No one in Sand Point, however, discussed this possibility.

<u>The Municipality</u>

Much of the revenue for the City of Sand Point derives directly from taxes and fees from local commercial fishing industry activities. In 1990, fish tax accounted for 65% of local sales and use taxes (down from 70% the previous year with its longer fishing seasons). Also in 1990, fish tax accounted for 22% of total local revenues, while boat harbor fees accounted for another 17% of total city revenues. AEB does not have a property tax (1 of 2 in the state that do not), and was the first borough to issue debt (bonds) without a property tax. Current fish tax is 2%, but the borough forgives 25% of this, for an effective rate of 1.5%.

The AEB has its own "permanent fund" -- a portion of revenues that have been set aside in anticipation of fisheries fluctuations. In other words, if fish tax revenues decline, the borough now has a cushion. The permanent fund is controlled by ordinance, and can only be used in the case of natural disasters, to pay off bond debt, or if the schools are endangered (of course through voting residents can always change the ordinances). Increased revenues to the city may be expected if the local gold mining operation under development locally comes on line, and with the arrival of second shoreside processing operation (New West Fisheries) in the community.

Infrastructure

So far the thrust of Capital Improvements Projects has been principally for waterfront projects -- dock and harbor related projects. In the AEB area there are no erosion and flooding problems, therefore the capital projects go into actual developments, not erosion/flood control projects, etc. This direction of investment can be expected to continue, given continuing revenues. Waterfront projects enable communities to be more able to accommodate fishery changes, and a decline in such projects may be seen as detrimental to the long term economic vitality of the community.

Solid Waste Disposal

Solid waste disposal is considered problematic in the community, and must be addressed irrespective of fisheries allocation questions. Under its local planning powers, Sand Point recently completed a landfill study. The landfill is a locally recognized problem, and the community opinion is that it cannot wait for the state to solve it, as at the state level "they have their own problems."

Transportation

Sand Point has been characterized as having "the worst airport in the state." Improvements to the airport are in the process of being made, independent of fisheries considerations, per se. It should be noted, however, that as the primary driver of Sand Point's economy, fisheries operations will improve in efficiency with improvements in transportation capabilities.

Harbor

Present operational levels dictate a need for harbor expansion in addition to the harbor improvements currently underway. Groundfish allocation decisions are not expected to influence this to any significant extent.

4.3.2.4 Sociocultural Profile

Social Organization

Government

Government organization is not anticipated to change in response to any fishery allocation proposals. Fishery issues, however, have shaped the form of local government organization in the recent past. The Aleutians East Borough, of which Sand Point is a part, was incorporated in October, 1987 for three primary reasons: (1) funding for capital improvements; (2) educational improvements; and, (3) protection of fisheries. All of these are issues of local control. There are at least two ways that the AEB has worked directly on fisheries-protection issues. First, they hired a lobbyist in Washington, DC. Second, they have a part time lobbyist in Juneau (split services between AEB and a fishermen's group). The role of the lobbyists is to "get a foot in the door" for the community, as was the case when Sand Point recently received funding for airport improvements just prior to the close of the legislature. Those funds were discretionary monies that were allocated at the last minute.

Politics in Sand Point are shaped by borough membership, which is composed of other relatively small commercial fishing communities. Akutan is somewhat an exception to this generality. Akutan requested to join the AEB late in the formation process, but had existing ties with other AEB communities. For example, many Akutan residents have relatives in Sand Point as well as some of the other communities. Akutan desired membership in the AEB, according to borough officials, primarily because they wanted to be in a borough where they would be "an equal at the table." If, alternatively, they went into a borough with Unalaska they would be overshadowed. Historically, Akutan has been unreceptive to being formally politically linked to Unalaska, because of size differences and the fact that the politics in Unalaska is non-Native. Akutan is not alone in its relative size within the AEB: False Pass and Nelson Lagoon, two other AEB communities, are also in the 70 - 100 population range, and all three communities are guaranteed representation in the AEB in one of two ways. If a community within the AEB doesn't have a representative on the assembly from their community, then they have a member who is appointed. Appointed representatives vote and their vote is recorded, but it does not "count." This way they are part of the consensus formation, if not actual formal internal processes, and their position becomes part of the public record.

Quasi-Governmental and Native Organizations

Given that Sand Point's local Native Corporation is involved in a range of enterprises in the community, including service sector businesses and real estate development, the general economic vitality of the community in general is essential to the economic vitality of the corporation. Service businesses in particular are adversely affected by seasonal fluctuations in levels of activity, and the fact that the Pacific cod fishery appears to be becoming more of a "derby" fishery is a matter of significant concern.

Sand Point is a community whose residents have many cross-cutting ties in the kinship, political, and economic realms. Indeed, throughout the AEB in general, there is a strong personnel overlap between organizations, including Native corporations, fishermen's associations, and local governments. All of these organizations are involved in planning and economic development on the local and regional level. The general residential population is 70% Native (exclusive of relatively transient processing workers), and Native representation is often even higher on boards and committees. It should be noted that historically AEB communities have attracted persons from outside the region who have become residents rather than individuals who came, exploited a particular resource, and then left. The strongest example of this was the Scandinavian cod fishermen who at the turn of the century "married in" and settled down locally. What can be seen with later fisheries development is activities of <u>local entrepreneurs</u>, not the displacement of locals by outsiders coming in and fostering development. This is in direct contrast to a number of other communities in Southwestern Alaska, such as Unalaska. As a whole the AEB features virtually full employment: the Alaska Department of Labor figure of 0.8% summer unemployment in the region is the lowest in the state.

Social Services

Changes in social services available in Sand Point are more closely related to changes brought about by the recent assumption of health powers by the Aleutians East Borough than by changes in levels of demand resulting from various activity levels of the fishery. In essence, the AEB competed with the prior service provider, the Aleutian/Pribilof Islands Association. AEB felt that they could do a better job at serving local needs, and from a historical perspective, one could view the Aleutian/Pribilof Islands Association as a transition entity in the movement of the responsibility for the provision of services from the federal level (Bureau of Indian Affairs) to the local level (AEB).

The groundfish fishery development in particular did create some specific health care demands in the community, however, these demands were accommodated.

Sociocultural Values

Religion

No change in this area is anticipated in response to changes in fisheries management.

Views on Resource Management

Those involved in commercial fisheries in Sand Point are desirous of a management plan for commercial fish resources that will lead to stability and predictability (to the extent that this is possible within an industry that tends to be inherently unstable). A common theme among various viewpoints in Sand Point is that it is highly desirable that groundfish (i.e, Pacific cod in particular) be managed so that it is a year-round resource, or more precisely, is available for harvest during the salmon off-seasons, which fosters the ability to manage businesses in an economically efficient manner. This applies equally to fisheries businesses themselves and support sector enterprises, as has been discussed above.

Subsistence Activity

The AEB, in general, would not be characterized as a typical rural Alaska subsistence area. The residents in the communities are, for the most part, third and fourth generation commercial fishermen. A common generality is that people take subsistence fish out of the commercial catch, although there is some rod fishing as well. No change in subsistence activity is anticipated as a result of proposed changes in commercial fisheries allocations.

4.3.3 St. Paul, Alaska

4.3.3.1 Introduction

The community profile previously produced (which appears as an appendix to this document) and this impact analysis address the specific community of St. Paul. Nevertheless, it should be borne in mind that St. Paul is only one of the two communities that comprise the Pribilofs, and in many respects it does not make analytic sense to part the St. Paul-St. George dyad, as changes in one community necessarily influence the other community. For purposes of economy and other pragmatic constraints, however, our focus remains on St. Paul rather than on the Pribilofs as a unit or on differentiating St. George from St. Paul. The two communities share a common history and many characteristics, but also have some interests which differ and at times deal with problems in different ways. St. George is also a smaller community and is reported to be more socially cohesive (i.e., it has less visible public divisions). The fact that there are two communities in the Pribilofs, with many similar characteristics and problems but also some significant differences, should be kept in mind when reading and using the material we have developed on St. Paul.

Since the abolition of the commercial fur seal harvest, St. Paul has been attempting to construct a viable local economy through the development of local resources by the application of settlement and trust funds. To date the results have not been spectacularly successful. The main emphasis has been on the maintenance of employment through service jobs (which did little to develop a sustainable economy) and the construction of a breakwater system and harbor to attract fish processors, foster the development of a local fishing fleet, and to serve as the base for the development of a constellation of support services for the Bering Sea fishing fleet.

St. Paul at present has only a very limited fishing economy. The local fishing fleet is composed of small boats used to harvest halibut. Various measures have been instituted in attempts to ensure that these local boats can catch a substantial percentage of the allocation for halibut management area 4C. Despite these measures, local boats still take less than half the quota. Halibut have been locally processed on St. Paul, along with crab and Pacific cod delivered by non-local boats. The operation of this processing facility has been quite uneven, and has been marred by management and cash-flow problems. A large surimi/groundfish plant is under construction on St. Paul, but its future is very much uncertain at this time (and to a large extent dependent upon an inshore allocation).

At-sea processors contribute little to the St. Paul economy, although catcher/processor vessels are often within sight of the island. These ships employ no local residents and few use the new port (as yet). The larger vessels cannot use the harbor because they are too large (both in length and in draft). The support service economy of St. Paul is still rudimentary in any event. The fish processing that has occurred has not been of a scale to attract a large number of boats, and the harbor has not been open long enough to build a reputation as a service center. At present, the range of services offered is fairly narrow (water, limited fuel, mail, phone, accommodations for crew changes, airport, crab pot storage).

St. Paul is included in this study for reasons very different from those for the other communities. Whereas Kodiak, Sand Point, Unalaska, Bellingham, and Newport (and Seattle -- see the attached Ballard/Seattle addendum) are involved in the fisheries under consideration and are concerned about the effects of potential regulatory changes on that involvement, St. Paul is included as a community that at present has little direct involvement in Bering Sea fisheries and whose residents fear that they may already be effectively barred from such involvement. Given the limited economic choices open to St. Paul residents, such a concern is understandable and the rationale for its inclusion in the analysis is clearer. The nature of the argument justifying St. Paul's inclusion in an inshore allocation must necessarily be different from that of the other communities since it does not have a history of participation in these fisheries. However, until recently there was very little domestic participation in these fisheries whatsoever and they are still undergoing drastic changes from year-to-year. Whether the historical fishery participation pattern is actually what should be maintained or adopted as a standard is a question that only the Council can ultimately answer.

It is by no means certain that a general inshore allocation will be beneficial to St. Paul, but clearly any chance for the participation of St. Paul (and/or St. George) in the Bering Sea groundfish fishery depends on an inshore allocation. An inshore allocation will also make the few other options for economic development on St. Paul more viable and probable, but again will carry no guarantees. St. Paul informants believe that the current onshore processing capacity is great enough to absorb all of any likely inshore allocation, so that they would be in essence little better off under such a "two derby" (inshore and offshore) as opposed to the current "one derby" system. The planned onshore expansions in Unalaska and Akutan only serve to enhance these anxieties. These points are developed in the community profile and discussed below at somewhat greater length. The informed St. Paul opinion seems to be that a general inshore allocation is better for St. Paul (and the health of the resource) than the present system, in that entry into the bottomfish fishery for St. Paul would be impossible without it, but that it will still leave St. Paul in a fairly uncompetitive position in terms of groundfish. It may bolster other economic opportunities.

4.3.3.2 Population

Population Size

The potential effects of future development on St. Paul's population are largely speculative and dependent on the course that economic development takes. We will consider two basic alternatives that seem to be the most likely to occur -- those which will have little or no real effect on population (increased service sector, development of fish processors for non-pollock species) and those that would have potentially great effects on local population (completion of the surimi/fillet/other product processing plant). A third alternative, that of no inshore allocation and the continuance of present trends, will also be discussed.

The optimal present and past operations of Pribilof Island Processors (PIP) in St. Paul will be used as the basis for the first alternative. Actual performance is reflected more in the treatment of present trends in the absence of an inshore allocation. This is justified on the assumption that an inshore allocation will at least increase the need for the provision of services in St. Paul to the fishing fleet and thus would solidify the operation of any processors in that community, even if they were not processing pollock. PIP has operated seasonally, with crab being the most important product. Halibut and Pacific cod have also been important products. Much of the labor needed for the plant's operation has been supplied locally. This is especially true for gearing up the plant and deactivating it each year. A significant portion of the line crews has been imported from the outside. The total processing labor force is 40 to 90 per shift, and the plant can accommodate two shifts during the king and Tanner crab seasons, when more product is available. Last year (1990) the peak labor force was 180, with about a third of the workforce being comprise of local residents. The plant manager estimates that the maximum number of locally available workers is in the 45 to 60 person range.

Most of the labor was imported the first year the plant operated. This resulted in some community problems. These problems seemed to be a combination of the plant's relatively poor hiring practices (the public safety department reports most incidents, perhaps 95%, involved non-residents) and the unfamiliarity to most St. Paul residents of having a large number of strangers in their community. Since then the plant has screened employment applications much more carefully and has a higher percentage of local hire. The plant manager claims that a substantial number of these employees wish to return from year-to-year, which stabilizes the plant's labor force and also minimizes the social strain on the community. The plant workers from the outside are housed in dormitory facilities (they have space for 188 people, with four in a room) and are provided with meals. Plant workers have not had a great effect on the village, with the exception of the first year, although they have increased the perception that there are more strangers in the community than before.

Local boats have so far only delivered halibut to the local processor. It is possible that a more stable processing operation would encourage lenders to develop funding programs to allow local fishermen to purchase the larger boats and other equipment needed to fish for other local species (crab, Pacific cod). This would be dependent upon having at least one local economically viable shore-based processing plant. It is possible that developments on St. George may be sufficient to meet this requirement, as the floating processor *Galaxy* is moored in the St. George harbor as an inshore processor. Because this facility can easily move, however, there is no guarantee of the continuity of operations from year-to-year. There are other, less public, potential development plans for St. George that could also foster the development of a local Pribilovian fleet.

The service sector associated with the PIP plant and other components of the Bering Sea fleet has made an important, but as yet still mostly underdeveloped, contribution to the St. Paul economy. The plant operation has been too intermittent and payment to boats too uncertain to encourage a large number of deliveries, so that associated fuel and other supplies sales have not been as great as had been anticipated. Nonetheless, the community store is expanding their retail space and reports that since the harbor opened that their sales have been double what they had been before. Outside interests are also in the process of negotiating joint venture (JV) endeavors in St. Paul with the city and with Tanadgusix Corporation (TDX) to operate fuel sales to service fishing vessels, which is seen as an area of high potential. The most developed service at this point in time is a crab pot storage service, which employs six local people (through TDX). These developments and the possibility of more stable processor operations in the future have encouraged St. Paul residents as to future possibilities.

The economic input-output model clearly cannot be used for St. Paul in the same way as for the communities with a past record of participation in the groundfish fisheries. However, the numbers that are provided, based on a PIP-like operation of cod, halibut, and crab, are useful for discussing the potential effects of such an operation. It is likely that the halibut and crab contributions to this operation are understated, especially since local fishermen do participate in the halibut fishery. Even so, the "base case" results in 16 local full time equivalents (FTEs) being created by this facility. Given the seasonal operation of this facility and the amount of transient labor they have employed, this is the equivalent of 30 to 40 local employees, which is indeed what PIP has been employing (perhaps up to 60 at the peak of the local work force). The regulatory alternatives do not really apply to this sort of operation, since only pollock are under consideration in the Bering Sea and PIP does not process pollock. The most extreme case considered, however, results in the creation of 37 FTEs, which is still within the available labor force of the local community.

Few local informants expect local residents to work in the processing plant(s) as line workers. The wages offered are not high enough, and the work is not considered desirable. Local people would rather work in the service sector, where wages are expected to be higher, or as commercial fishermen as part of a local fishing fleet. The development of such a local fleet is perhaps the most highly valued community goal attached to harbor development. It requires the presence in St. Paul of at least one strong processor, however, and preferably more than that. These processors will then attract non-local fishing boats and increase the demand for support services, which should in turn stimulate more harbor development. As long as this development is constrained to one or two operations on the same scale as PIP, plus the planned St. Paul Seafood (SPS) surimi plant, the immediate population impacts would be minimal. All workers from outside St. Paul would be transient and would live in company-supplied dormitory housing (which for the most part already exists, at least in rough form). Informants state that the development of local fish processing beyond this level is possible, but is increasingly less likely because of other existing and planned facilities.

If the surimi/multi-species plant were to come on line, the population effects are even more speculative. Because of the recent softening of the price of surimi, the design of this plant has been modified to make it more of a multi-product and multi-species plant. It will still be highly automated, and the year-round labor force is planned to average about 100 people (with a peak of about 150). This is clearly beyond what can be provided by the present population of St. Paul, so most will come from the "outside," especially if PIP or a PIP-like processor is also in operation. There will be dormitory housing for up to 120 employees. This will be located at the plant site, which is located at the airport some distance from the village. Thus, they will be somewhat isolated from the village, although that was not an explicit reason given for choosing this site for the plant. The manager of this facility claims that no attempt will be made to establish an enclave and that interaction with the community will not be discouraged. However, he also made it clear that if the plant were to open, many of the workers would have little reason or motivation to go into St. Paul.

Few people are expected to move to St. Paul as permanent residents as a result of development. Rather, presently unemployed Pribilovians or transient workers will make up the expected labor force. There will be a Native preference for hiring plant workers, but it is not expected that it will be possible to attract enough Natives to fill most positions. For present planning purposes, the main reliance is on a more transient non-Native labor force. The only possible exception to this is skilled labor (managers, technicians, and so on) that may have to be imported to run the surimi plant. There is currently a housing shortage in St. Paul and the backers of the surimi plant are negotiating with Pribilovian interests to build six duplexes for family housing for the skilled labor that they will need to attract to the island. This is an explicit admission that future plant employees will not be permanent residents of St. Paul, but will instead be relatively short-term employees to be replaced or rotated on a regular basis (and this is the current pattern for most non-Native professionals). Family housing will be one incentive to attract skilled labor to St. Paul. These additional units would not add substantially to service demands on the community, especially if they were built near the plant where they could tie into that facility. St. Paul does need to upgrade much of its infrastructure to more adequately meet the needs of its current permanent population, but none of the development described is expected to add significantly to this permanent population and for the most part will use facilities already in place (the six duplexes being the major exception).

In the absence of an inshore allocation it is most likely that the population of St. Paul will remain relatively unstable. There are few opportunities for growth on St. Paul other than in the fisheries and harbor related services, and the two are closely related. Government and service jobs are by far the most significant on St. Paul for the resident population at present, and this areas are experiencing budget reductions. Settlement funds have been depleted for the most part and informants report that without the development of a sustainable economic base on St. Paul that many residents (and especially the younger ones) will be forced to leave St. Paul to look for employment.

Population Composition

The permanent population composition of St. Paul is not expected to change very much in the near future, even if the SPS plant is finished and operated at capacity. Perhaps a more precise formulation is that the permanent population will stabilize if harbor development (and associated fishing and service sector development) is successful. Local people will be able to remain in the community rather than be forced to seek employment outside of it. Given enough success and development of two PIP-size operations and one SPS surimi plant, it is possible that the permanent population may increase with the immigration of Aleut from other locations. Non-Aleut are not expected to move to St. Paul on a permanent basis even under these most positive of conditions.

Accompanying any successful development scenario as this will be the appearance of a relatively large (100 to 300) transient population of processor plant workers. Depending on the development scenario and plant operations, this labor force will be more or less seasonal. Almost 100 percent will be non-Aleut, and if the same patterns are followed as in other communities a significant percentage will be Filipino or other minority. Almost all will live in company-supplied, dormitory-type housing. SPS workers will be more isolated from the permanent community, whereas workers at waterfront processors will be located within the community itself.

This transient non-Native population will have significant effects upon St. Paul. It may swell the total community population during the peak processing season by more than 60 percent from the present level. Most would be expected to be young adults. Many informants report that St. Paul residents experienced a profound "culture shock" the first year the harbor was open merely from having a significant number of strangers in their community. With the development of stable fish processors in St. Paul this sort of isolation from these cultural influences will be a thing of the past. St. Paul is a twentieth century community, but it has so far been relatively isolated from the more common channels of mainstream American cultural influence. St. Paul has never had cable television, network reception is not terribly good, and programming choices are limited. St. Paul is physically isolated and has had relatively few visitors in the past. The increase in the number of video cassette players (reportedly every household has one) and the amount of traveling that the average Pribilovian has done has partially compensated for this relative isolation. Further development may well bring cable television and would certainly make St. Paul relatively less isolated. Community leaders and other informants perceive this transient population as potentially the most significant impact (or source of such impacts) of future economic growth and have initiated local planning efforts to evaluate options to minimize undesired effects associated with this anticipated development.

Household Size and Composition

The main influence on the permanent population of any inshore allocation will be one of stabilization (with perhaps some eventual growth) rather than any immediate increase or decrease. Thus, household size and composition should remain about the same. Most of the transient labor force will live in company housing, and so will not affect this question. Those families in company "family housing" will be few in number and can be expected to be non-Native nuclear families of relatively small size.

Educational Status

For the reasons discussed above, educational status of the permanent population is also expected to remain about the same. The permanent population should be stabilized, and the transient labor force is expected to consist largely of relatively young adults with no accompanying children. The few processor employees in family-style housing may have some school-age children and this would be a change for the present-day school, which has no non-Native students, but they should be few in number. The educational status of the transient processor labor force is expected to directly mirror the requirements of their employment duties.

4.3.3.3 Socioeconomics

Economic Profile

Previous studies and the community profile discuss the withdrawal of the National Marine Fisheries Service from the Pribilofs, the subsequent settlement and trust funds allocated to St. Paul and St. George, and the use of these funds to, in essence, temporarily prop up community services. No sustainable economy was developed to replace the commercial fur seal harvest. All viable economic alternatives appear to be tied to harbor development and form a natural constellation of complementary economic enterprises -- a local commercial fishing fleet, local fish processors, and a support sector for the local and Bering Sea fishing fleets. Tourism is a constant from year to year, but is seasonal and still a fairly small business. So far, there has been little local expertise developed in this area and not much local investment. The support of oil exploration and development activities proved not to be viable in the past, although it could become a possibility again sometime in the future. For now, however, all local informants agree that the future of St. Paul rides on harbor development and what proceeds from it.

Infrastructure

St. Paul has an infrastructure barely adequate to meet existing uses. There is a serious need for improvements in power generation, and an increase in water storage capacity was high on most informants wish list. Solid waste disposal will soon require that an alternative to the present land fill be found, and present sewage disposal is generally seen as in need of improvement. The harbor is also considered infrastructure, and is itself not complete. To be fully functional, portions of the harbor should be dredged to a deeper depth and more docks should be constructed. Money that went into the harbor was, according to some informants, diverted from other necessary projects (such as a power upgrade). It is not clear that onshore development related to an inshore allocation (or a Pribilof-specific allocation) would add to the burden on this infrastructure. The PIP plant is adequately serviced at present, and the SPS surimi/fillet plant is projected to be self-sufficient in most of these areas. Thus, with or without the allocation St. Paul will need to invest in its infrastructure. It may well be easier to convince the state and federal government of the need for this if the community has a more solid economy partially based on an inshore allocation.

Most harbor-related economic development also is not expected to place high demands on community housing and services. All or nearly all of the processors' labor force will live in company-supplied housing at or near their work sites. The SPS surimi/fillet plant will have its own power generation and water facilities, as well as a waste outflow (see the discussion below). Operations such as PIP tend to have at least backup power facilities. Housing for SPS will tie into the plant facilities, whereas the housing for PIP employees already exists and is already part of the current service load of the community.

The harbor is said to require at least 300 to 400 more feet of dock before a processor can be expected to operate a stable enterprise. Whether this will be publicly developed or will be privately funded is not clear at the moment. Public funds for the harbor appear to have been expended and future construction will depend on revenues from harbor use. TDX is actively pursuing the construction of a dock on its property, however, which would directly address this need. They would operate a TDX dock as a commercial enterprise, however, so that there will be differences in harbor operation depending on whether additional dock is built with public or private money. TDX informants believe that future development through private sector may be more beneficial for St. Paul in the long run, rather than pumping more money into the public (governmental) sector. This would be a relatively direct way to ensure that local people and institutions have a genuine interest in fish processing on the island. TDX would be able to negotiate directly with these processors on terms of usage of the docks in return for a local influence in fish processing development. Whether the City of St. Paul can do so in a similar way is less clear, since city facilities are public and there is one fee schedule for all customers (with no preference among customers in a similar usage class other than first come, first serve).

The Fishery

As was the case for other communities, we will follow the format of the community profile in developing our discussion. Given the developmental nature of St. Paul, this will be somewhat more speculative than for the other communities and will require an added "synthesis" section.

The St. Paul Halibut Fishery

The halibut fishery is the only fishery in which local fishermen presently participate. Their boats are too small (18 to 40 foot, with most in the lower part of that range) for other nearby fisheries (crab, cod, flatfish, midwater trawl pollock). Many locals wish to develop the capability to enter these fisheries, which they feel would be possible with 60 to 80 foot boats. This would first require a stable local processor, support facilities for such a local fleet, and the availability of financing for the acquisition of such vessels. The halibut regulations have been tailored to favor Pribilovians fishing for halibut in management Area 4C, so local fishermen are aware of the management possibilities available that could help them with entry into other fisheries as well. For halibut these have included trip limits, the timing of openings, and hold inspections at a fairly distant port (Unalaska) for those vessels who also take halibut in management areas other than 4C. St. Paul fishermen report that they still took less than a third of the quota last year (1990), however, because outside boats still came in even with these disincentives. This resulted in most St. Paul fishermen making very little money, and perhaps having a net loss. Those who had been most aggressive about entering the fishery (those buying the bigger local boats) were those with the biggest losses. This experience has taught St. Paul fishermen that a certain caution is required in all business risk taking, and most are now all too aware of the conditions that would have to hold for their dream of a local multi-species fishing fleet to develop. They see an inshore allocation as one asset necessary for this development.

Current (and Potential/Developing) Fish Processing in St. Paul

To a large extent, PIP and SPS have been described in the community profile and in the population section above. An inshore allocation is absolutely essential for the SPS surimi/fillet plant to continue with its development and to start production. Without an inshore allocation the SPS plant will not be able to obtain the additional financing that it needs to construct a waste outflow and other essential final features. PIP (or a similar operation) could function without an inshore allocation and by so doing may foster the development of a local support sector and somewhat of a local fishing fleet.

St. Paul informants prefer an inshore allocation specifically for the Pribilofs. That way, even if the community lacked facilities to process pollock they could trade the allocation for assistance in the development of their local fishing fleet (access to fish, loans for boats and equipment, and so on). This in turn would increase the stability of the local processor and make it more likely that more than one such operation could exist. A community-specific allocation would also solidify the future of the SPS processing plant. Even St. Paul's inclusion in a general inshore allocation increases the chances of the SPS plant being completed and opened, and such a plant would certainly contribute to the development of a support sector in St. Paul for that segment of the fishing fleet. The development and utilization of the St. Paul harbor would be fostered by an inshore allocation. The development of a local fishing fleet would probably also be encouraged by an inshore allocation. The SPS plant will have to produce fillets as well as surimi, and process higher-valued species as well as pollock, if it is to be an economically viable operation. However, its most dependable resources in terms of throughput would be pollock and Pacific cod. Local boats could perhaps more easily target Pacific cod than pollock, although informants state that eventually they wish to participate in all local fisheries.

The Local View of Fish Processing in the Economy of St. Paul

All local informants were of the opinion that any head of household who was also the main or only wage earner in that household needed to earn more than $7/hour, the wage offered by the fish processors. The most recent estimates of the St. Paul household monthly survival budget would require an hourly rate of $9.59. This is the most conservative estimate possible, as it is a purely survival estimate with no provision for off-island travel, motorized travel on the island, recreation, and other such "amenities" (City of St. Paul 1990). Thus there is understandably little apparent interest among the local population in working in the processing plants. On the other hand, there is an acceptance that for St. Paul to survive as a community the harbor has to function as the economic base, and for this to occur at least two or three fish processors must be operating on St. Paul, pretty much on a year-round basis. This in turn means that a relatively large transient (or not-so-transient) work force from off the island must be accommodated. As one prominent informant put it, the last five years have been spent ensuring that the harbor would be built. Now they have to concentrate on developing the commercial possibilities of the harbor and minimizing the social impacts of this development.

The logical question is then what advantages the local Aleut population expects to gain from the harbor (and fish processors). Local informants generally mentioned three sorts of developments that they wanted to pursue. One is support services for the fish processors. Such services may be as direct as trucking the fish to the plant and the product back to the harbor. Other services would be less direct, such as restaurants and stores catering to the imported labor force. A second sort of opportunity would be the support services provided to the ships that called at the harbor, for which the fish processors would serve as a sort of magnet. The prime example quite a few informants gave was that fuel sales would provide some jobs for residents, and a profit for the city and/or TDX (projected sales vary from informant to informant -- the most optimistic was 20 million gallons a year). Vessels need a reason to come to St. Paul other than to buy fuel, however, and stable fish processors would provide such a reason. These two support sectors are seen as perhaps the most promising base for a sustainable St. Paul economy (and some informants talked specifically in terms of economic multipliers). The third sort of economic opportunity mentioned was that local fishermen wanted the opportunity to participate in what they considered the local fishery. Given the chance, they believe that they can evolve from a small-boat halibut fishery into a 60 to 80 foot boat multi-species fishery (halibut, crab, cod, mid-water trawl pollock). This is clearly more speculative than the other two, in that it is less obviously tied to an inshore/offshore allocation on pollock, and also depends on harbor developments and individual investment decisions that the other two sorts of opportunities do not.

However, it is also the economic opportunity with the most appeal to a good number of St. Paul residents.

Few, if any, informants think that the economic future of St. Paul is assured. The success of the harbor and its development is far from certain. They see an inshore allocation, however, as one way to increase the chances of this success. Such an allocation appears to be essential for the SPS plant to attract the additional capital it needs to finish its construction. Such an allocation would lend stability to the current situation of uncertainty. Limited entry is not a viable alternative because St. Paul has no track record of participation in the fishery and so would be shut out. This was stressed continually by informants, who wanted to be sure that their option to develop a St. Paul-based fishing fleet in the (near or more distant) future is not precluded by present fishery management decisions.

Synthesis: St. Paul and an Inshore Allocation

An inshore allocation is not guaranteed to assure the development of a healthy economy in St. Paul based on fish processing, support services provided in and around the harbor, a local fishing fleet, or a combination of these. An inshore allocation will make any and all of them much more likely, and without an inshore allocation the possibility of these development may well be close to zero. We would be remiss in our responsibilities to the people of St. Paul as well as to the Council if we did not point out that the form an allocation takes will also be significant. Most St. Paul informants were of the view that a simple inshore/offshore allocation not attached to specific communities would do them little good, since Unalaska and Akutan could and would (in their opinions) absorb all of such a quota before St. Paul is in a position to benefit from it. They note that even under the most favorable circumstances that the SPS plant is not likely to be on line for a year or more, and that there are concrete plans for the expansion of bottomfish processing facilities in both Unalaska and Akutan. It is possible that St. Paul residents are unduly pessimistic in this regard and that an simple inshore/offshore allocation will be encouragement enough for the SPS plant to be completed, after which catcher boats will want to deliver there. These are not likely to be based in St. Paul, but would certainly buy fuel and other services there. It would appear, however, that an allocation tied to the community would be more certain to have these effects than one that is not.

The most common and strongest sentiment among informants was for a specific allocation to the Pribilofs (that is, to both St. Paul and St. George) under the provisions of the Fur Seal Act. They see St. Paul as neither fish nor fowl in that it is "an offshore community with an onshore need." There are few other resources available for economic development in the Pribilofs. Most informants also judge that it may be politically easier to obtain a special allocation for St. Paul under the unique jurisdiction of the Fur Seal Act rather than to rely on a more general inshore/offshore allocation mechanism under which the Pribilofs are given no special consideration. This position also has received support from Congressman Don Young (Young 1990).

Besides the obvious stabilizing effect such an allocation would have on the SPS plant on St. Paul, most informants are also convinced that an inshore allocation would benefit other local fisheries development. In the best of all worlds, St. Paul would receive an allocation for eight to ten percent of the total allowable catch (TAC) of pollock and cod administered through a fishermen's association (most likely the Central Bering Sea Fishermen's Association). That part of the allocation they could not take themselves could be traded for quotas of higher-value species which they could. The benefits for the development of a local fishing fleet are fairly clear, and if the allocation is made on a time-limit basis there is little danger of creating a permanent privileged class of fishermen. This then approaches a general community development allocation since there is no direction over where this fish would be landed or processed. The effects on the development/maintenance of St. Paul shore plants would be uncertain, but would appear to be positive.

A complimentary point is that in most informants' view the Bering Sea is currently being overfished. They do not have to examine economic statements or talk about overcapitalization to reach this conclusion, but merely note that the wildlife populations dependent on fish (and pollock in particular) are all in decline. This has two consequences, one general and fundamental and the other pragmatic. In the big picture, the Bering Sea environment may be being degraded, for short-term economic gains, in a manner that it may not be able to recover from. More pragmatically for St. Paul residents as fishermen, this means that given their lack of experience in the fishery and lack of resources, they will never gain access to these resources without an allocation. Most informants do see inshore allocations as one (perhaps the only) way to help insure the development of southwest Alaska while at the same time managing and conserving the Bering Sea resource base in a responsible way. In this regard, several informants also expressed the view that the Council (and regulatory agencies in general) had the unfortunate proclivity to try to manage resources as artificial units separate from each other. They would prefer a more ecologically oriented approach, with management units made up of logical regional areas and species complexes.

St. Paul people must gain access to the Bering Sea fisheries if St. Paul is to remain a viable community. Some form of inshore allocation will certainly aid them in gaining this access. The current derby atmosphere of the fishery is potentially detrimental to the resource and increases the likelihood that Pribilovians will never be able to enter into the fishery either as harvesters or processors. The time they need to develop their capabilities is not available within the present short-term time constraints of the fishery.

4.3.3.4 Sociocultural Profile

Social Organization

The social organization of St. Paul will remain fundamentally the same if an inshore allocation is made. The most fundamental change would occur in the absence of such an allocation, with the very real possibility that no viable economy would develop and that the community would disappear. Less drastically, a floating processor may moor inside the harbor (as the *Galaxy* is doing in St. George) and provide some of the benefits of a shore-based processor. Depending on the operator's commitment to St. Paul and the mix of product, this may afford the opportunity to develop a local fishing fleet or not. An inshore allocation will serve to stabilize the community.

Government

Federal and State Institutions

It is expected that an inshore allocation will reduce the dependence on federal and state institutions in the long-term. In the short-term there may be special needs for loan assistance or other development programs.

Regional Institutions

St. Paul residents have become interested in regional issues related to resource (and especially fisheries) development. The inshore/offshore issue is one aspect of this. We would expect that they will continue to track these issues and will continue to exert pressure in the protection of their interests.

Local Institutions

The City of St. Paul, the Aleut Community of St. Paul (the IRA organization), and the TDX, the village corporation formed under the Alaska Native Claims Settlement Act, are each discussed separately in the St. Paul community profile. Individually, they are all likely to be affected by local development. These are briefly discussed below. Potentially more important is an increased cooperation and coordination among these entities, reducing conflict and duplication of effort. Whether this is a result of the allocation issue and the potential subsequent development or simply an accompanying maturation of the local political system cannot be addressed here. Certainly the desire to progress toward this collaborative sort of effort has existed for some time. The development of a local viable economy may be the type of overwhelmingly important issue that facilitates such cooperation.

The City of St. Paul will potentially acquire a secure source of income in the form of a general sales tax and more specifically a local fish tax. This is still open to question, as there is some discussion at the local level of whether it in the community's best interests to impose a fish tax, or even a general sales tax. The community store has been collecting the sales tax, but the fish tax has been placed on a temporary hold (although passed by the City Council) until its legal and practical implications are sorted out. The City is, in the meantime, pressed for funds. They are interested in harbor development and have taken an active role in the formation of a leadership council to facilitate cooperation between local institutions in the pursuit of this goal. Presently, the city also at present sells and distributes fuel.

The Aleut Community of St. Paul is attempting to participate in the development of St. Paul through joint ventures. They are currently in such a joint venture with Delta Western to operate the community store. They are negotiating another joint venture with Delta Western to store and sell fuel. They are also interested in other business/investment opportunities as they arise.

TDX is perhaps the most active of the three local institutions, in that it has the liquid assets, the management expertise, and the formal organizational structure most adapted to participation in the economic development of St. Paul. TDX has various subsidiaries formed to handle different potential aspects of this development. At present they are stressing property management so as to encourage the investment of outside capital in fish processing facilities. They perceive an inshore allocation as beneficial to these endeavors. TDX is pursuing the construction of a private (TDX) dock to develop waterfront property on the harbor which they now control.

Together, these institutions possess a blend of capabilities that could foster development. In the past, these organizations have had conflicts so it is imperative that they work together if St. Paul's economy is to become more stable. Steps in this direction have been promising, with the renewed interest in a leadership council and increased consultation among the leaders of these institutions. There are still some perceived differences of interest and personality conflicts, but all have explicitly stated that the overall benefit of St. Paul as a primary goal. An inshore allocation should be formulated so as to foster these cooperative efforts. If there are separate institutional approaches concerning how best to use such an allocation, it is likely that little benefit will accrue from them. It thus appears likely that some forum such as the leadership council or a separate St. Paul organization with representation from the community as a whole will be the proper way to address such an allocation.

The steps the community and these institutions have taken toward this sort of approach are encouraging.

Social Services

Increased economic development will inevitably impose an increased service load upon St. Paul. More fishing vessels in the area, and a large transient labor force, will require an enlarged clinic. The need for emergency medical treatment and medivac services will increase. Given the likely age distribution of those working in the fishing fleet and processing plants, it is most likely that care situations resulting from accidents will make up more of this increased service demand than will routine health maintenance needs. It can be expected that the shore-based shore processors and the fishing fleet will make some contribution toward these expenses, but past experience indicates that these contributions will be less than the additional expenses these facilities impose on the local facilities. This is neither a positive nor a negative impact as such. In fact, it is likely that service levels for residents will improve because of the investment needed to ensure adequate care for transients (processor workers and members of the fleet) in the area. This will depend on funding levels, however, and the possible trade offs that may have to be made to achieve this funding level.

Public Safety will also need to increase its current level of services. Although it is not possible to predict the additional burden that the processor labor force and port calls from the fishing fleet will impose on St. Paul, there is no doubt that there will be an additional burden. Most community informants report that there is currently an alcohol problem on St. Paul among a certain part (fairly small) of the population. They do not expect this to be affected positively or negatively by any economic development. Supply of alcohol will remain about the same, they think. The effect on the availability of other drugs is more uncertain, partially because it is more "underground." It is expected that alcohol and drug problems may be fairly prevalent among the transient labor force and the fleet members, but St. Paul residents have seen such a difference in this regard between the first year that PIP operated (when such problems were prevalent) and the years since then (when such problems were minimal) that they think additional public safety resources will be needed more because of the numbers of additional people who will be on the island rather than because of the severity of the problems that they will bring with them.

The transient labor force and fleet members are not expected to add substantially to the case loads of social workers, mental health counselors, and so on. It is possible that certain population segments (such as young adults) of the St. Paul permanent population may be more affected than others. Increased staffing for these services is likely to be necessary.

Sociocultural Values

The sociological values of the resident population of St. Paul will likely remain the same regardless of fishery allocation decisions. There will be some adaptive changes in the form in which such values are expressed. There will be more continuity than change in these fundamental values, however.

Religious Organizations

Again, no changes related to the inshore allocation are foreseen. Existing trends toward lower church attendance (other than on high holy days) are likely continue.

Kinship and Informal Associations

Kinship and ethnic identity will continue to be the key components of social organization on St. Paul for the permanent population. For reasons discussed above, the non-Aleut population will be for the most part transient and relatively unintegrated into the community. Those trends in social organization discussed in the community profile will continue, but are related more to the overall direction of change on St. Paul rather than to the inshore allocation or specific aspects of St. Paul's economic development.

Voluntary Associations

No changes related to inshore allocations are likely. Some transients may wish to participate in the Fire Department, Search and Rescue, or Emergency Response Training, but this is not expected to have any large effects on the operation of these organizations or on the community at large.

Social Differentiation

With economic development, there will be the development of a much more concrete distinction between the resident population and the transient labor force. At present, the main transient labor force is comprised of the non-Native school personnel and other functionaries such as Public Safety Officers. These relatively "long-term transients" claim to be seldom, if ever, invited into a Native household and consequently feel rather separated from the resident population. There is little reason to expect this to be different for the larger transient labor force associated with fish processing of the fishing fleet. PIP has had only two or three years experience with this, but it seems to indicate that this general pattern will hold. Because of the larger numbers of transients, there will be a small number of individuals who make contact within the village because of personal characteristics or other factors. It may be that the transient processor labor force may have more in common with the resident Aleut population of St. Paul than the professional non-Native middle class school teachers and Public Safety Officers have had in the past. The formal roles these people occupy may also mitigate against easy interaction with the resident population.

In any event, it is likely that there will be a perceived gap between the permanent population and the imported transient labor force of the fish processors. The effects on social services and infrastructure have been discussed above. Income differences between this group and St. Paul permanent residents should not be great, or should be in the favor of St. Paul residents (otherwise one would assume that the processors would attract local labor rather than import it). This will serve to minimize social frictions between the groups. Clearly there will have to be a coordinated program between the employers of any such transient labor force and the residents of St. Paul to minimize disruptive influences and to make the employment environment as pleasant as possible. The high level of interest that local leaders have exhibited in these issues is a hopeful sign that such a program will indeed be developed and implemented.

Subsistence

Subsistence should be minimally affected by the inshore allocation and economic development. The transient population will for the most part not be legally allowed to hunt seals and would not be involved in subsistence harvesting activity anyway. Whether the present harvest of fish form the Bering Sea is affecting subsistence resources and will continue to do so into the future is not one of the issues this research was designed to address. This is clearly one of the local concerns about this fishery, however. An inshore allocation may make it easier to gather information on this question and to manage at least part of the fishery with a more ecologically oriented approach rather than a focus on specific species.

4.3.4 Unalaska, Alaska

4.3.4.1 Introduction

The Community of Unalaska

Unalaska is a community that currently has a strong local economy which is driven primarily by the fishing industry and related services. Unalaska was the number one port in the nation in 1989 with 504 million pounds of product brought on shore. In terms of dollar value Unalaska was the number two port in the nation at $107.2 million, according to NMFS figures. These numbers do not include the vast amount of product that is transshipped in the harbor. The Census Bureau collects information on transhipped product on Shippers Export Declaration forms, but these figures have proven difficult to obtain even after concerted efforts by local government. Local informants estimate that the volume of transhipped product exceeds one billion pounds annually. According to the city of Unalaska, over the past two years an excess of $225 million has been invested onshore in Unalaska. This includes additional processing facilities, service facilities, utility improvements, school facilities, housing, and road improvements. Specific projects include Westward Seafoods (new processing facility), UniSea Inc. (new dock, addition to processing facility, and fishmeal plant), Alyeska Seafoods (fishmeal plant), Delta Western (warehouse and service facilities), Offshore Systems, Inc. (warehouse and service facilities), Factory Trawler Supply (warehouse), and joint project of the Department of Housing and Urban Development, and the Ounalashka Corporation (multifamily housing development). In this connection, it was considered desirable to include some information on Akutan as an addendum to this chapter, even though Akutan is not a formal study community for this work. It is very near to Unalaska, is undergoing many of the same developmental processes, and its inclusion facilitates the interpretation of the numerical results of the economic input-output model.

Unalaska and Dislocation Effects of an Inshore/Offshore Allocation

Before considering by topical/analytical area the community of Unalaska itself, it is important to further contextualize Unalaska with respect to its unique role in the inshore/offshore issue. The basis of this discussion will be the results of the economic modeling provided to IAI by the economic analysis group. The study communities chosen for economic modeling and social impact analysis in the Bering Sea were Unalaska and St. Paul. Since the focus of the economic modeling was on the base year of 1989, when the Pribilofs had little or no participation in the groundfish fishery, Unalaska was the only analytical unit with true "base case" conditions (and these are documented in the community profiles appendix to this document). Initial modeling results were intuitively unsatisfactory, as they seemed to be at odds with what was observable "on the ground" in Unalaska in terms of the relative benefits of inshore versus offshore processing. This perceptual difference was not resolved in any final way (and may be due to relatively complex factors such as degree of foreign ownership, residency, and so on) but this apparent paradox did point out certain features of the model that are vital to understand to allow valid interpretation of its results.

A focus on Unalaska as an analytical unit results in what is essentially an asymmetric model. As constructed, the economic model allows for the capture of all of the Bering Sea offshore fishing activity (which was "credited" to Unalaska by the model's assumptions) but only that portion of Bering Sea inshore activity related to Unalaska's own onshore processing plants. That is to say, "Bering Sea offshore" was being compared with "community of Unalaska inshore" rather than with "Bering Sea inshore." When the allocative alternatives were run, using 1989 as the base case year of departure, the typical result was that significant local benefits were counterbalanced by even more significant losses to the Pacific Northwest ("outside" in modeling terminology) and the nation as a whole. When the other significant Bering Sea onshore plants are also included in the analysis, however, so that a truly regional result combining total Bering Sea onshore and offshore production is achieved, the results are instructive. Local benefits are elevated only slightly over the "Unalaska alone" case; state of Alaska benefits are increased somewhat more. More significantly, the negative effects on the Northwest are reduced so that they are roughly in balance with the positive local and state of Alaska effects, which is intuitively what one would expect (adding benefits in one place requires their subtraction elsewhere). The overall national effect then becomes positive (but this may be an artifact of the model and is at such a rarified and abstract level that it may not be all that significant).

The explanation of this balance of effects is quite interesting and is perhaps the crux of the social impact analysis. If inshore allocations are adopted, the small Alaskan coastal communities benefit directly from the creation of new local jobs and the income flow associated with them. This increase in the economic base provides more of an opportunity for the development of a range of community services and a more self-sufficient economy. The inclusion of Akutan in the modelling effort helps to highlight the point that the Northwest benefits perhaps more significantly from its role as a secondary processor and packager of product into final consumable form than it does as a primary harvester/processor. This point was made quite clearly for Bellingham (see the next section of this social impact assessment), which is buffered from almost any negative effects of an Alaskan inshore allocation. The Northwest in general is not quite as well buffered from negative impacts as this, but overall the dislocations should be well within the capabilities of the private sector and the current social service network. Some jobs will disappear (probably most especially those on some factory trawlers), but others will be created in other sectors of the fishing industry. Whether people would relocate from the Northwest to Alaska is problematic. The levels of job creation in Unalaska, and of net job loss in the Northwest, may not be high enough to stimulate such a migration. It is more likely that in Alaska temporary workers would gain working hours and become full-time, work would become less seasonal, and present labor recruitment patterns would be intensified, while in the Northwest displaced workers would move on to another job. Since trawler workers have been exposed to Alaska, it is possible that their passage to Alaska for newly created jobs would be facilitated. This was not an object of study for this work, however, so there is no information available in this area.

In the case of dislocation, whatever the net effect, real people (rather than statistics) will have to find other work and there is no doubt that there will be some personal hardships because of this. However, Seattle (where perhaps one half of the "job loss" will be) has a very diversified job market and a wide array of social services -- precisely what small coastal Alaskan communities lack. The rest of Washington and Oregon are similarly endowed. Since employment by the factory trawler fleet is more or less directly related to the size of one's community of residence and inversely related to the distance of one's residence community from Seattle, those who are put out of work by an inshore/offshore allocation should have reasonably good access to other job opportunities and other assistance when compared to rural Alaska dislocations that are highly likely to occur under the *status quo*.

The following sections discuss issues specific to the community of Unalaska, following the outline of presentation used for the other study communities. (For the reasons of clarity and accuracy -- these are discussed in the community profile -- the name "Unalaska" is used in this report rather than the term "Unalaska/Dutch Harbor." For the purposes of this report, these terms may be considered synonymous; where the term "Dutch Harbor" is used in the economic model discussion, "Dutch Harbor" is synonymous with "Unalaska" as it is used here.) This is immediately followed by the addendum comprised of the limited data that were developed for Akutan.

4.3.4.2 Population

Size and Composition

With continued expansion of the groundfish industry, among other factors, the population of Unalaska is expected to grow from the 1989 figures by 10 to 15% per year over the next two years and then grow more slowly at 5 to 10% per year through 1994 (Professional Growth Systems, Inc 1990:11). Even if fishery expansion and diversification do not occur as expected, growth will continue at a rate of 5% because the community is continually "behind the curve" in support services and housing. If, however, offshore groundfish fishing continues to expand, the economic vitality of Unalaska, with its associated population growth, will be called into question. Inshore allocations would have the effect of stabilizing or increasing Unalaska's population. The most extreme inshore allocation would result in the net gain of 388 FTEs in Unalaska, according to the projections of the economic model. As has been discussed for other communities, this need not reflect 388 physical bodies in Unalaska (if part-time workers become full-time, or if earnings of these people are higher than the community average, then there may be less than 388 "new" workers) or this figure may actually account for more than 388 people new to the community (if part-time or seasonal positions are created). Although at least part of this "new" FTEs would be absorbed by the present transient or part-time work force employed by the processors which no longer work year-round, it can be expected that there will be a net population increase in Unalaska as a result of an inshore allocation. While this may be expected to exacerbate Unalaska's housing shortage, group quarters at processing facilities are not utilized to capacity year-round, and it is likely that increases in jobs will come in the form of more stable year-round operations. Consequently, housing will not be affected as severely as might be anticipated. Household size statistics mean little in Unalaska, and many of these people would most likely be single in any event and live in group quarters, so the overall increase, taking place over several years, should be comparable to or smaller than increases over the last ten years. Between 1980 and 1990, according to just released U.S. Census figures, Unalaska has grown from a population of 1,322 to one of 3,089, an increase of 234%.

Shoreside Processing Population

Recent investment in the onshore fish processing sector has increased capacity greatly. The growth of the shoreside labor force has been rapid and significant. Housing of all sorts is in short supply, so that even some long-term employees who should be living in apartments are living in company bunkhouses (see discussion below). Most fish processors in Unalaska would prefer to operate year-round with a steady level of production, which has resulted in a definite trend toward a more stable (less transient) labor force. Since there are still periods of greater and lesser fish supply (and hence periods of varying labor needs) there is still a significant amount of "imported" transient labor. An inshore allocation would be expected to create, or maintain, an immediate need for labor that by onshore processors will require that people be brought in from "outside." The extent to which these people become more permanent, year-round, residents will depend on the degree to which onshore processing plants can operate continuously at a fairly stable production level. This, in turn, will depend on the supply of fish and the competition for this supply. These are factors that are not predictable, but recent history has been one of expansion in all segments (both the onshore and offshore) of the fishing industry. An onshore allocation would clearly serve as a stabilizing factor for the onshore processing sector and its labor force, if other factors are held constant. If the onshore processing capacity expands beyond that made available through an onshore allocation it would be expected that the social and economic costs of a more transient labor force would remain, but this is tempered by the fact that overall quotas, competition, and other market forces always serve to limit growth at some point.

If an inshore allocation is made, Unalaska is the only community where there are possible local dislocation effects from the shift of resources from the local offshore sector to the local onshore sector. This is because Unalaska has developed such a strong service sector oriented toward the offshore fleet. The net FTE gain discussed above results from a loss of 261 "local offshore FTEs" and a gain of 649 "local onshore FTEs." The movement from the offshore service sector to the onshore service sector should not cause too many local problems. Most of the new local onshore FTEs would be expected to be in the onshore processing plants. As discussed above, not all of these FTEs will be new to Unalaska. Some will be people already in Unalaska who are underemployed or part-time workers. It should also be noted that the number of FTEs attributed to Unalaska from the offshore sector by the economic model is far higher than the number of offshore-associated workers in the community today. This is because of the fact that offshore dollars spent in Unalaska, the basis for the generation of the number of FTEs, are, in fact, spent differently than onshore dollars and very likely to not create nearly as many local jobs as would equivalent amounts of onshore dollars. That is to say, the offshore dollars that are spent in Unalaska, primarily on fuel and ship support services, do not create all that many local employment positions although they do contribute very significant local revenues in the form of taxes. Shoreside operations, on the other hand, are local employment intensive. This has implications for economic "multiplication" of those dollars that are not captured by the economic model.

In the absence of an inshore allocation, no definitive projections of population and employment characteristics can be made. The trends are fairly clear, however, and are based primarily on the fundamental uncertainty of the supply of fish to the onshore processing plants. The more uncertain this supply, the less regular and predictable will be the operation of the plants, with more of a transient labor force. A developed economy with a full array of community services depends upon a resident labor force (Kodiak is a fairly good Alaskan example of this phenomena). This is made fundamentally clear in any input-output model of an economy, which measures how many times a dollar is spent before "leaking out" of whatever economic unit is being analyzed. Lack of an inshore allocation, given the present operation of the offshore fleet, will ensure that Unalaska remains a relatively one-dimensional economic outpost where little of the money that passes through the community, from inshore or offshore sources, actually makes much of an impression.

"Outlying" Population

Akutan, located less than 30 miles east of Unalaska, has a current population of 540. Most of this population consists of new employees of the Trident Seafoods processing and surimi plant. This development has been in response to the same factors stimulating onshore growth in Unalaska. Also, just as in Unalaska, the onshore processing sector in Akutan has been expanding, especially since 1989. This is discussed in more detail in the "Akutan addendum" to this chapter. In terms of population, Akutan is composed predominately of fish processor employees for whose companies Unalaska serves as a support base by providing transportation, logistical, retail supply, emergency, and other services. Akutan was not a study community for this analysis, but its ties to Unalaska call for its mention and the literature seems to indicate that the "permanent residency" of Akutan's population, like Unalaska, also depends predominantly on the nature of the operation of seafood processing plants (also discussed below).

It should be mentioned here that Akutan has been incorporated into the economic assessment model because consideration of Unalaska alone did not adequately capture onshore Bering Sea groundfish activity. Because Unalaska is the hub of all offshore activity in the Bering Sea, and no offshore activity is associated with Akutan, all inshore allocation alternatives have positive effects for *all* levels of analysis (local, state, "outside," and national). This counterbalances the apparent negative effects that inshore allocation alternatives in Unalaska would have "outside" so that the overall economic impacts of an inshore allocation in the Bering Sea would be more-or-less neutral at the national level (within the plus/minus tolerances of the model).

Household Size and Composition

Any discussion of household size and composition for Unalaska is highly problematic because of the demographics of the population and the severe housing shortage in the community. Although the work force is less transient than in the past, it still contains a significant proportion of young unmarried adults (although this percentage is decreasing). Much of this labor force is culturally and socially distinct from the rest of the community's population, with individual workers being of non-Aleut, non-Euro-North American ethnicity. It should also be noted that the labor force at each individual processor tends to have a stable ethnic composition from year to year, but ethnic composition of workforce tends to vary from processor to processor. (Ethnicity, which obviously overlaps with kinship and friendship networks, tends to play a role in labor recruitment by individual workers informing friends and relatives about job opportunities. This network is reinforced by the social network that then develops with the addition of workplace ties to the existing kin- and friendship-based ties, and so on.) This workforce is very fluid and when combined with the housing shortage results in often crowded and ever changing living arrangements.

According to local informants there has been a "zero vacancy" rate within the municipality for the last two years due to the rapid expansion of the bottomfish industry and the necessary development required to meet industry needs (service entities, residential, etc.). This has not, however, discouraged continued in-migration in general, while it has made life difficult for individuals. Almost every available motel room, bunkhouse facility, or other usable space has been taken up on an indefinite basis. In many cases, families are "doubling-up" until housing becomes available. Some individuals have been forced to leave the community either because they have lost housing or they could not locate acceptable housing (individual standards differ, but in some cases this means that there was absolutely nothing available). The municipality itself has lost several employees and has not been able to fill some vacancies due to lack of adequate housing.

One important trend that is related to these dynamics, but is problematic to examine through household size and composition statistics, is that the population is becoming less transient than has been the case in the past. "More permanent" may be another way to phrase this, but probably misplaces the essential nature of the labor force. Shore plants are now year round operations, at least ideally, which is a significant change from the past and imposes a requirement that the labor force be much more stable than in the past. This requires either a resident labor force or a coordinated schedule of rotating temporary workers (or some combination of the two strategies). Given the housing shortage in Unalaska, and the nature of the industry, processing workers tend to live in company housing. In spite of this fact, such workers are still often considered to be residents and make contributions to the community, such as serving as volunteers on the Fire Department and with the Emergency Medical Services, organizing recreational activities, and so on.

Educational Status

Information on the average number of years of education is not currently available for the Unalaska population and would be marginally useful at best, in any event. The Unalaska economy is dominated by the fishing, service, and government sectors. More important, perhaps, is the fact that very few people go to Unalaska for reasons other than employment. Put another way, with the exception of the relatively small segment of the population that was born and raised in Unalaska, almost everyone who arrives in Unalaska has a job or has been offered a job before they arrive. People do change jobs in Unalaska, but this is an exception rather than the rule. In cases of job changes, experience and personal characteristics are often as important (or more important) than education. The more fundamental questions of education in Unalaska concern the current state of the infrastructure and quality of the program in the community's schools.

As of the beginning of the 1990-1991 school year a new school remodelling project and addition were being completed. The original portion of the school was significantly altered and the overall size of the school has been nearly doubled in terms of square footage. Nonetheless, this facility still cannot meet present demand in the community. Indeed, after expending $8.5 million for the expansion, remodelling, and grounds improvements, the superintendent estimates that the school is still at least two classrooms too small in terms of the needs for the current school year.

Attendance at the school is projected to continue to increase as the community continues to grow. Attendance for the 1991-1992 school year is anticipated to be between 285 and 300 students (exclusive of the preschool), according to senior school administrators. Even if economic growth were to plateau, attendance figures are still expected to rise. As the economy of Unalaska has become more year-round and less seasonal, reflecting changes in the fishing industry, more families associated with the fishing industry are moving to Unalaska, and staying longer. It was further noted by school staff that a lot of these are "young" families with children in the lower grades (for 1991, 165 students, or 64% of the total students, at the school were enrolled in grades K-6). In other words, instead of Unalaska being a seasonal work site for large numbers of individual adults, more workers are making the community their place of residence and moving their families to the community. The shortage of housing also reflects this development, and it can be expected that the demand for other services (and a greater diversity of such services) will also continue to be evident. If the community were to destabilize through the disruption of onshore groundfish operations by increasing seasonality, the effects on school attendance is not clear. This would depend upon the ability of the seafood processors to retain those employees who have moved their families to the community, and the ability of the support sector of the economy to continue to thrive in spite of a fundamental change in basic economic foundations.

4.3.4.3 Socioeconomics

Economic Profile

Support Industries

Just as most fishermen and processors seem to prefer relatively steady, year-round operations, support businesses also operate best on a year-round basis. This includes the shippers in town, the airlines, and, according to city staff, *every* other industry in town. During the last two years, Unalaska has seen a tremendous growth of service industries, and this is documented in the community profile appendix.

In addition to the growth of support service industries themselves, there have been changes in the processing businesses as a result of the growth of the support industries. For example, UniSea Inc., one of the major onshore processors in Unalaska, offers some services that support offshore services. One such service is the UniSea Inn, which has a 98% occupancy rate. UniSea also own two restaurants, including the Ballyhoo Restaurant at the airport. In addition, with the expansion of services in the community, at least partially related to offshore support, has also allowed UniSea to get out of businesses they did not want to be in, such as crab pot hauling and catcher boat supply.

These were types of services that UniSea and other shore processors provided in past years because there were simply no other businesses available to take up the slack. They were, at best, tangential to the core business of the company. The growth of independent support service enterprises has allowed the processors to focus their capital, labor, and other efforts on their primary business ventures.

The Commercial Fishing Industry

Composition of Employment

Processing Employment: It is estimated that approximately fifty percent of the total community employment is engaged directly in fish processing operations. This is within the larger Unalaska context where, according to local government estimates, approximately 90% of total community employment is dependent on the fishing industry. There is no question that Unalaska is totally dependent upon, and would not exist in anything like its present form without, the fishing industry. Local government estimates place the number of fish processing "resident" employees (year round residents of the local community) to be in the neighborhood of 1,300. A large number of these workers live in the community year-round because, and only because, processing has relatively recently become a steady operation taking place in all 12 months. The number of transient, seasonal, "non-year-round" resident fish processing employees is estimated, by local government sources, to be 600. This number represents employees that spend parts of the year in the community during seasonal "peaks" in processing. This number is very responsive to onshore fish plant operations, which in turn are related to the supply of fish. Allocative measures that stabilize the supply of fish will increase steady employment and decrease transient employment in Unalaska, a highly desired local goal for the community.

As discussed in the population section, the local population increase that would be associated with an inshore allocation would be based primarily at first on employment in this sector. "Transients" would be expected to increase, at least in the short term, but the overall dynamics would remain the same as at present.

Vessels: Local estimates for vessels operating in Unalaska are as follows: 75 catcher/processors (factory trawlers), 260 crab boats, 175 longliners (including halibut), 30 catcher boats (trawlers and/or draggers). The total number is 540 vessels. These figures do not include "processing only" ships. The number of "resident vessels," that is vessels registered locally in Unalaska, is 33. These vessels use either longline or crab gear, and some will switch from one gear type to another depending on the opening. The number of transient or "non-resident" vessels is locally estimated at 575. Fleet composition may be expected to change with allocative alternatives, along with associated employment, but it is not clear in precisely what way. This is due to the lack of information on subsequent decision-making by vessel owners (to fish elsewhere, target different species, change seasonal patterns, and so on). It should be noted, however, that the "Unalaska" fleet is by far and away, composed primarily of vessels that are "home ported" elsewhere. This means that flexibility in response includes relative ease in relocating. This is a very different pattern from some other communities in southwestern Alaska, such as Sand Point.

Groundfish Industry Development

General: In recent years groundfish have accounted for an increasingly large share of the total pounds of fish landed at Unalaska. For example, in 1987 there were 73,950,688 pounds of groundfish landed. The number of pounds rose to 318,099,480 in 1988 and 398,563,817 in 1989. This represents an increase of approximately 540% over a three-year period. However, because the value of groundfish per pound is relatively low, its contribution to the total value of the catch landed at Unalaska is still overshadowed by shellfish landings. For example, if one looks at the total ex-vessel value of all groundfish species combined for the years of 1987 and 1988, it is exceeded by the value of each of two shellfish species in 1987 (Brown King Crab and C. opilio) and by the value of one species of shellfish in 1988 (C. opilio). In 1989 the ex-vessel value of groundfish landed surpassed any one species of shellfish landed for the first time, but only outdistanced C. opilio landings by 2.5%. The total value for all species of shellfish combined still accounted for over 63% of the total catch value landed at Unalaska in 1989, but this percentage has been declining steadily as the landings of groundfish have grown. The value of the groundfish landings is approaching 40% of the total for all species for the community despite the relatively short history of groundfish processing in the community (further consideration of species figures appears in the community profile appendix).

The significance of the groundfish fishery should not, however, be measured only by volume or value. As in the other communities profiled, all plant managers reported that operations were most efficient when both supply and demand are predictable and the labor force is stable. Thus, their preference is understandably for year-round operation, and the groundfish fishery makes this possible to a large extent.

Investment: To some extent, community investments are predicated on the outcome of the inshore/onshore allocation issue. For example, according to local senior management, Icicle Seafoods is considering building a shore plant in the community now, but only if some form of an inshore/offshore allocation measure is passed by the Council. In the absence of such an allocation, the rewards are too low and the uncertainty too high to warrant such an investment. Similarly, no further expansion is planned at Alyeska, according to senior plant management, due to both offshore and inshore competition: the competition provided by offshore factory trawlers, Westward's plans to build a new onshore plant in Unalaska (now under construction), and UniSea's plans to build additional capacity onshore in Unalaska. At UniSea, senior managers expressed an interest in replacing the barge *UniSea* with an onshore factory (with the possibility of taking the *UniSea* to St. Paul and processing there), but this would depend on the allocation decision as well. Expansion in the onshore processing capacity in Akutan is also planned for the near future. There is little chance Unalaska residents would become directly involved with factory trawling through investment. According to a senior city official, no locals have the access to capital required to field a factory trawler since this enterprise requires far too much capital up front and to maintain and operate. Local interests are therefore effectively excluded from moving into this area of the fishery.

Groundfish Diversity: Recently, Unalaska processors showed significant interest in Pacific cod, and salt cod is also being considered as a possible product. It is locally perceived that processing these resources would provide opportunity for a local day fleet. Such a fleet would have to be developed, but financing should be available for local boats and full support services already exist. For instance, Westward Fisheries, the newest of the processors, is going to be running crab, pollock, salmon, and Pacific cod. All three of the "big" processors in Unalaska (UniSea and Alyeska are the others) have multi-species capacity.

Stock Depletion/Bycatch: Of particularly strong local concern is depletion of local fish stocks. Catchers must return to shore plants within 48 hours, which limits their range. Therefore, there is strong local opinion in favor of separate quotas or area designations. There is also the perception that catcher/processors have a higher bycatch rate and a lower utilization rate of the target species than do catcher vessels which deliver to onshore plants. In terms of bycatch, last year's halibut bycatch caused the codfish season to be shut down early. It is estimated that this cost the City of

Unalaska some $200,000 in municipal revenues. As a result, there is strong local opinion that bycatch should be split between inshore and offshore operations so that one segment cannot shut down the other.

The Municipality

Shore plants add significantly to the assessed tax base of the community. Over the past two years there has been approximately $250 million in new construction costs put into the community, and another $150 million in construction associated with expansion of existing facilities. Given a 12.5 mil rate, this translates to over $2 million per year in property taxes. Shore plants also significantly contribute to the local 3% sales tax base (personal taxes).

The offshore segment of the groundfish industry does generate local revenues. Factory trawlers do buy fuel locally, and that is a major contribution to the local tax base. Shore plants are taxed differently and are taxed in two ways. First is the state raw fish tax. Bottomfish are currently taxed at a rate of 1%, but this will soon change to 3%, as soon as it is considered a "developed" fishery. 50% of this tax goes back to the local communities. Second, there is a local fish tax of 2% (2% of the value of the sale of the raw fish to the processors). Tax revenues based on local worker expenditures are also tilted markedly toward inshore associated labor.

Infrastructure

Electricity

Increased capacity has been added at the major shore plants in the recent past as a direct result of groundfish processing. No new capacity is anticipated for the municipal system in the near future. Fish oil, a byproduct of groundfish processing, is currently being used for power generation at the larger local processing plants.

Solid Waste Disposal

Municipal solid waste disposal capacity is considered inadequate to meet present needs. Unlike Kodiak, however, there is not an immediate crisis in Unalaska as a result of direct solid waste discharge from shore processors. By the end of 1991, it is anticipated that local processors will be able to comply with zero discharge regulations for fish processing byproducts as a result of increased local capacity in secondary processing.

Water and Sewer

Municipal water and sewer services have experienced increased demand as a result of increased shore processing activity associated with groundfish, and this may be seen as a burden on the local infrastructure. On the other hand, such a demand has also created revenue (the water bill from one processor last year alone was over one-third of a million dollars) and this has helped to finance radical improvements to the system that were-badly needed (as described in the community profile).

Transportation

Harbor/Transshipment: Unalaska does derive some benefit associated with movement of offshore-produced products. Some factory trawlers use local docks to discharge containers, and use local transportation operations thus providing some support employment in Unalaska. The vast majority of product, however, is transferred at sea directly to Japanese "trampers," resulting in little, if any, revenue to the community. According to local government estimates, of the total bottomfish cargo moving through the port, approximately 10% goes to container operations and 90% goes to Japanese trampers. Unalaska, being on the Great Circle Route, is a logical primary shipping port for the fishing industry, and is a transshipment point for cargo out of Kodiak, King Cove, Sand Point, the Pribilofs, and Bristol Bay. There are no hard figures available, but an estimated 1.8 billion pounds of product moves out of the port per year, including an estimated 600,000 metric tons of bottomfish and 200,000 metric tons of salmon and crab. There are no estimates of incoming shipping figures. According to vessel agent's data, the estimated value of foreign exports from the port for 1989 was just over $1 billion.

Port: Unalaska is the Port of Entry and Port of Clearance for the western and northern coasts of Alaska, including the Aleutians. Foreign vessels entering and clearing are moving a variety of seafood products from other regions, from Norton Sound herring to Kodiak and Bristol Bay salmon, to all Bering Sea products. In terms of vessel activity, on a per day basis, Unalaska is often the busiest port on the west coast of the U.S. For all of this activity, however, Unalaska derives little revenue (although it does derive some, as described in the community profile).

4.3.4.4 Sociocultural Profile

Social Organization

Government

Federal/State: According to local officials, the most critical need for Federal agency presence in Unalaska is in the form of the U.S. Coast Guard and the National Marine Fisheries Service, both needed regardless of groundfish allocation issues. General allocation/monitoring issues are also part of existing needs which include pollution control/marpol monitoring and enforcement, search and rescue, and fishery management and regulation enforcement. Re-establishment of the Bering Sea Patrol Base, to any extent, will receive overwhelming support from the residents and city government Unalaska. Despite the very high level of fishing activity in Unalaska, there are no state enforcement vessels based in the community. C-130 aircraft out of Kodiak monitor the Bering Sea, and NMFS observers present on fishing vessels in the Bering Sea are debriefed in Seattle.

Social Services

There are distinct differences noted locally between the social service needs created by shore plant and offshore workers. Shore plant workers, obviously, have shoreside enclaves for housing and socializing, whereas factory trawlers, on the other hand, have no physical base in the community. According to one local official, trawler "crews are out on the street and in the bars. There are a huge number of police calls generated because of them. State law, under Title 17, means that the community has 'detox' liability for these people. The city incurs tremendous cost because of these people, and they contribute little to the local tax base. There are high social costs generated by these people.

According to a large number of local sources, a new clinic is badly needed in Unalaska, but it will cost around $3 million. Locally, it is considered ironic that while most of the demand placed on the clinic comes from the factory trawlers, they are not seen as contributing their fair share to municipal or clinic revenues to pay for the increased demand in services. The offshore fleet is also seen as putting a lot of demand on other community services, particularly police and emergency medical services.

This is not an uncommon pattern. Emergency medical service patient residence statistics from 1989 are illustrative. During that year, emergency medical crews had as patients 36 local residents, 18 non-local Alaska residents, 117 US out of state residents, and 47 foreign residents. Offshore workers also create additional demand through worker strandings, as described in the community profile text.

Sociocultural Values

Religion

No change is anticipated in this area as the result of fishery allocation decisions.

Views on Resource Management

Waste: Resource waste is an emotionally charged issue in Unalaska, particularly with respect to differences in inshore and offshore processing operations. Resource waste is seen as threatening to the economic vitality of the community, and there are perceived to be clear differences between inshore and offshore conservation practices. Unalaska informants commonly report that factory trawlers keep approximately 55% of their catch, with the other 45% just going "back over the side." Several reasons are given for this belief including the ability of these vessels to catch fish faster than they can process them (at least occasionally), lack of storage space, the desire to "high grade" the fish that they process so that low quality fish will not count towards the quota, and so on. Of the fish that are kept and processed, these informants state that factory trawlers typically have a recovery rate of 20-25% if they are producing surimi. This computes to an effective utilization rate of 10% of the total fish they caught initially. For example, a factory trawler harvesting 500,000 pounds raw product per day would return 450,000 pounds back over the side (225,000 as whole, unprocessed, fish and 225,000 or so pounds as waste from processing). It is recognized that recovery rates are the subject of much debate and that the calculation of such rates is more alchemy than science. Therefore, it is not maintained that the figures in this example are precise. They are presented, however, since they represent the opinion held by a large segment of onshore catchers and processors.

Most factory trawlers do not have fish meal plants to process their waste, and there is no requirement that they have them. This is an important regulatory difference from shore plants, which will have to comply with EPA waste disposal regulations by the summer of 1991. Simply throwing this much of the resource away is also distasteful to many informants. They report that this is another area where shore plants have an advantage over at-sea processors. Shore plants even centrifuge oil from fish guts and use the oil as a heating fuel for making fishmeal (the machinery is started using diesel fuel, and then switched over to fish oil when it is warm and running). Shoreside management personnel report that, in general, regulatory supervision is simply better on land than at sea, for obvious reasons, and shore processors can be inspected at any time (and frequently are). For example, over one 10-day period last year, one of the major shore processors in Unalaska was visited by representatives from DEC, FDA, EPA, OSHA, DOSH, and a state electrical inspector.

Seasons: Given that the long-term viability of groundfish is seen as necessary to the long-term economic viability of Unalaska, there is strong local sentiment that a fisheries allocation decision takes into account optimal productivity for the amount of resource taken. For example, some senior processing personnel in Unalaska feel that the pollock quota should start mid-August when the recovery rate improves (with better quality fish), whereas now the fishery will be shut down during November and December, which are the best times for processing, in terms of producing the least waste. It has been stated that there is a 3% better recovery rate in November than in July; at 25 million pounds/month, that is 750,000 lbs. more product out of the same amount of fish.

Additionally, it is locally cited that herring bycatch is also highest in the summer and that later openings would eliminate around 75% of the herring bycatch, and that shifting the opening would also reduce the pollock catch during the roe season, which would be good for the fishery too.

Subsistence Activity

No change is anticipated in this area as a result of fishery allocation decisions.

4.3.4.5 Akutan Social Impact Assessment Addendum

The following information was developed for the community of Akutan, as noted above, in order to round out the picture of inshore processing in the Bering Sea. This rounding out is considered desirable due to the fact that (a) Unalaska support services facilitate activities in Akutan as well as Unalaska, and (b) Akutan represents the major inshore processing location for the Bering Sea outside of Unalaska. Some of the information presented here is analogous with information presented for Unalaska in the community profile appendix, and perhaps logically could have been presented there, but this information was only recognized as critical and developed subsequent to the production of the community profiles.

The community of Akutan is located on Akutan Island, the first major island northeast of Unalaska. The distance between the two communities is less than 30 miles. At present the population of Akutan consists of a relatively large "enclave" population of fish processing workers and a relatively small "permanent village" population. In fact, because of the (until recently) year-round operation of the processing plant, many of the workers there had considered Akutan their primary place of residence. Most of these employees live in housing provided by their employer, however, because of the lack of facilities in Akutan itself.

Trident Seafoods was the major shore processor operating in the community of Akutan during 1990. Trident first opened a shore plant in the community in the summer of 1982, but the original facility was destroyed by fire in June, 1983. The plant was rebuilt later that year, and an additional 110,000 square feet were added in 1990, nearly tripling the facility's overall size. The present facility is indeed a large one, with approximately 140,000 square feet devoted to processing/cold storage space. The overall cold storage capacity of 20 million pounds of product is split between two buildings with capacities of approximately 15 million and 5 million pounds each. Although the processing and storage operations are split between two locations on site, the entire Trident shore operation is managed as one facility.

Like the large processing operations in Unalaska, the Trident operation in Akutan is a multi-species facility, and the product capacity of the plant varies with the particular specie being processed. Plant capacity is 1.8 million pounds per day of pollock, 600,000 pounds per day of cod, 250,000 pounds per day of king crab, halibut, salmon, herring, or black cod, 225,000 pounds per day of bairdi crab, and 200,000 pounds per day of opilio crab.

Pollock processing is the backbone of the plant's operation. Pollock processing at the facility began in 1985, and continued on a year round basis until October of 1990, when the plant experienced the effects of the first closure of the fishery. Prior to that closure, the processing of pollock went on continuously, although level of effort varied as a function of other species activity. When other species that were available only for short seasons were being processed, the effort devoted to pollock processing was reduced, and following the conclusion of the short "other specie" season, pollock processing effort again increased. The only exception to this general pattern is the processing of opilio Tanner crab, which is available for a larger portion of the year than the other non-pollock species. The Trident plant varies from its Unalaska counterparts in its management structure, in that the Akutan operation features a single management structure for both its pollock and non-pollock operations; Unalaska plants typically have groundfish/surimi management team and a second management team that administers other plant functions. Groundfish products leaving the plant include surimi, cod head and gut and fillets, roe, milt, stomachs, heads, edible by-products, and fishmeal. While the plant has produced salt cod in the past, none is being done at present.

Employment levels at the plant vary during the course of the annual cycle. In a typical year, during the months of January through March, when operations are at their peak, Trident employs approximately 500 workers. From the time operations slow down in March and through the end of the year, the plant employs approximately 400 individuals. Workers are housed in bunkhouse facilities on site that are of various construction. As of early 1991, approximately 100 employees were housed on a permanently moored floating vessel, 70 were housed on what was formerly a barge but is now technically a shore building due to the fact it is resting on the bottom and is not moveable, and the balance are housed in shore buildings proper. Trident has plans for the near future to construct adequate shore bunkhouses so that housing on vessels will no longer be required.

Trident is a major economic force in a community the size of Akutan and, indeed, it is a large operation even when compared to other shore processors on the Bering Sea. The Trident facility features an annual local payroll of approximately $15 million. In addition to processing activities, the Akutan Trident facility also generates economic activity by serving as a support facility to a number of floating processors and catcher vessels in the area. Trident operates a fuel farm, and has the ability to make limited vessel repairs. Each year Trident pays approximately $600-800,000 in taxes to the Aleutians East Borough (of which Akutan is a part) as a result of operations at its Akutan plant. This tax figure does not include taxes paid by the up to four Trident floating processors that at times operate in Akutan Bay.

The number of catcher vessels delivering to the Trident plant varies by species. On a regular basis, the plant takes delivery from 10 pollock boats, between 2 and 12 cod boats, 36 crab boats, 40 halibut boats, and 4 herring seiners. Additionally, the plant takes deliveries from approximately 12 skiff-type boats from the village of Akutan itself.

Deliveries by village resident-owned skiffs is the primary means by which individual village residents derive personal income from the Trident plant. Only two villagers are employed as processing workers at the plant itself, although an additional four individuals work on catcher boats (over and above those who work the village-based skiffs). Social interactions between Trident employees and residents of the village proper are somewhat limited by the fact that the Trident site is more-or-less an industrial enclave and is separated from the village proper by church-owned land, the seaplane ramp, and coastal bluffs. While most traffic between the plant and village (and seaplane ramp) is by skiff, there are hiking trails that cover the half-mile or so to the village as well, and plant workers do frequent the roadhouse adjacent to the village that is also patronized by village residents.

With the pollock closure in 1990, Trident Akutan operations changed significantly. For the first time since the plant opening, processing workers had to be sent out of the community prior to the end of their contracts. Those workers who stayed were assigned to cod processing and some construction work, or simply did not work at all. The processing workforce at the Trident plant, because of the year round nature of the operation, had been a stable one. Senior management estimates that approximately 300 of the workers are "permanent" in the sense that they consider the Akutan facility to be the place where they live, and not just a seasonal work station. With the closure, and for the expected future where pollock are only available seasonally, this number can be expected to decline. Of the total processing workforce, pollock processing itself accounts for approximately 220 workers. Given the expected availability of pollock for 1991, senior plant management anticipates that overall employment may drop as low as 250 workers total for the facility. An inshore allocation is seen as critical to reversing this trend and restoring stability to the operation of the plant.

It should be noted that Trident by no means accounts for all of the processing activity in Akutan. Deep Sea, whose local processing operations preceded the construction of the Trident plant, also has a shore plant and barge in the community. The scale of the Deep Sea facility, however, is perhaps a quarter of that of the Trident facility, although permits have been filed for substantial shoreside expansion. Deep Sea processing operations are focussed on crab, herring, salmon, and cod at present, but expansion plans reportedly do include pollock. Recent newspaper accounts report that the fish for this plant would be provided from Soviet waters in a joint venture operation (Anchorage Times 03/30/91, C-1). It is quite apparent that such a plant would also be in position to benefit from a domestic inshore allocation as well. The potential effects of such an expansion upon Akutan's existing processors, as well as those in Unalaska, is problematic and would depend upon the availability of fish and the actual investments which do come on line. The full social and economic benefits of an onshore allocation will only be achieved and maintained in the absence of the development of excess onshore processing capacity. Economic competition can be expected to limit this development to some degree in the future, but it may be that there will be some dislocations among present and planned Bering Sea onshore processors even if an onshore allocation is made (and especially if some provision is made for the future entry of a facility located in the Pribilofs).

In addition to the shore facilities of Trident and Deep Sea, there are approximately 20 floating processors that operate out of Akutan Bay on an intermittent basis, with periods that feature a number of floaters processing simultaneously, and other periods were no floaters are present in the bay. These floaters, while processing in municipal waters, do contribute to village tax base through tax payments to the borough. It should be noted, however, that there are potential reporting problems with processing figures from floaters operating while anchored in municipal waters. In one recent case in Unalaska, the city government strongly suspected that fish processed in Unalaska municipal waters were being reported (and taxed) as being purchased and processed in another Alaska municipality where the vessel had business ties. Suspected manipulations (and tax evasions) such as these are very much harder to investigate and prove in the case of floating rather than physically shore-based processors.

4.4 The Northwest Coast Study Communities

Bellingham, Washington and Newport, Oregon were chosen for inclusion in this Social Impact Assessment of Bering Sea and Gulf of Alaska inshore/offshore alternatives so that issues related to the participation of non-Alaskan communities in the fisheries of the Exclusive Economic Zone off Alaska could be addressed. The reasoning behind the selection of these specific communities was that they are important fishing ports in the two states in the lower-48 with a high level of participation in Alaskan onshore and offshore fisheries, and that they were of a size that would allow the development of community information roughly comparable to that developed for the Alaskan study communities. Both communities, however, are larger than their Alaskan counterparts. While Newport is only somewhat larger in terms of population than Kodiak, the largest of the Alaskan study communities, Bellingham is several times larger than Newport.

Time and budget constraints precluded developing comparable information for the Ballard/Seattle area, which is of course the most important lower-48 fishing port in terms of Alaskan fisheries. In spite of constraints enumerated elsewhere, some topically relevant Ballard/Seattle information was collected, but because the information was much more focussed on fishery-specific issues, it has been framed in the form of an addendum. This clearly differentiates it from the other communities covered by this assessment, which are more directly comparable. One important distinction that this separation legitimately emphasizes is that Seattle is virtually the only significant port for the offshore Alaskan fishing fleet. The interested reader is referred to the Ballard/Seattle addendum for this information.

The fisheries in which Bellingham and Newport (and, it is assumed, most other non-Seattle Northwest communities) participate in are primarily "inshore" in orientation. This is not to imply that these fisheries are only or even predominately "local," since many salmon, crab, and longliner boats fish from Alaska in the north to California in the south. Almost all deliver their catch to onshore processing plants, however, and the Alaskan fisheries are some of the most important for most members of this fleet. Several informants (fishermen, marine extension agents, and processing plant personnel) remarked on the difficulty of talking about the "residency" or home port of particular boats, in that the present regulatory structure of most modern fisheries dictates that any full-time fisherman has to participate in a wide range of temporally and spatially separated fisheries. The result is that most boats exhibit a similar pattern of travel and participation (over time, not necessarily in any one year) and the "home port" is simply where the skipper happens to live or where he could obtain financing for the boat. Some informants even went so far as to say that it is at times difficult or impossible to distinguish "Alaskan" inshore fishing vessels from those coming from Washington and Oregon (and northern California). Thus the fish harvesting sectors of most non-Seattle Northwest communities seem to resemble those of Alaskan communities more than they do that of Seattle.

These non-Seattle coastal communities do differ in the degree to which they are tied into the processing network for Alaskan offshore product (one major difference between Bellingham and Newport), but an inshore allocation (or the lack of one) is not likely to have any significant consequences in terms of this difference. Newport, having essentially no connection with the Alaskan offshore fishery, will be minimally affected by whatever inshore/offshore allocation decision is made for the Bering Sea/Gulf of Alaska (although such an allocation for California/Washington/Oregon Pacific whiting is, of course, a different matter). Bellingham is well integrated into the secondary processing network for Alaskan product, both onshore and offshore, and thus is well buffered from any potential disruptions to the supply of product from any inshore/offshore allocation decision. This point is developed in the community profiles and the community-specific analysis which follows.

A significant proportion of fishermen from both Newport and Bellingham participate in Alaskan fisheries. Most of this participation would be classified as "onshore," in the sense that Newport and Bellingham based catcher boat deliveries are made to onshore Alaskan processing plants. The extent of this participation is very difficult to assess for a number of reasons, but is probably more important to the fisheries sector of the economy in Bellingham than in Newport. In both communities this participation is predominately by crabbers and longliners (and salmon vessels from Bellingham), although trawlers from these communities will sometimes fish in Alaskan waters and deliver to Alaskan processors (few in number and difficult to document).

Bellingham is geographically closer to Alaska, which can be seen to foster more direct participation, and it has somewhat of a more diverse local fishery than does Newport. Fishermen from Bellingham are thus represented in nearly all Alaskan fisheries, whereas Newport fishermen are somewhat more restricted. A greater proportion of inshore boats that occasionally deliver to Bellingham may make Alaskan fishing part of their regular schedule than for similar boats that deliver at times to Newport. On the other hand, informants in Newport state that the "local" fleet is a stable one and that where additional investment is being made, it is going into locally owned "Alaska" boats. Most of these are not targeting bottomfish, however, but are crabber/longliners or distant-water JV vessels. In general terms, JVs, targeting primarily on Pacific whiting, are more important in Newport than in Bellingham. There is interest in an onshore processing plant in Newport for Pacific whiting, but firm investment plans are being delayed until continued availability of the resource can be assessed. As in the Bering Sea, offshore catcher-processors could essentially have the capacity to take the TAC, so that shore-based investors have exhibited understandable caution. It should also be noted that there are aspects of Oregon involvement in "Alaska's" fisheries that are not captured through analysis of Newport. For example, most Oregon fishermen who fish for salmon in Alaska (gillnetters) are based in Astoria rather than Newport.

Both Newport and Bellingham have a very strong economic sector oriented toward servicing the predominately inshore fleet. These boats, no matter where they are registered, tend to fish from Alaska in the north to California in the south. Bellingham in particular provides support services for a large number of boats who fish "inshore" in Alaskan waters. Both ports, and again especially Bellingham, also provide some support services to those boats which fish "offshore" of Alaska. There are size constraints for the Bellingham harbor, however, although Bellingham shipyards can work on quite large vessels. Few or no offshore Alaskan vessels bypass Seattle to obtain services in Newport, although some JV boats which do occasionally see Alaskan waters are certainly based there.

Seattle differs from both Newport and Bellingham in that the offshore "Alaskan" fleet is based in Seattle and obtains a great deal of its support services there (initial provisioning, repairs, financing). However, Seattle resembles both Newport and Bellingham in that support services to the "onshore" fleet (both "local" and "Alaskan") is also quite significant. While relatively few inshore fishing boats have Seattle as a home port (both Bellingham and Newport outnumber it in this regard), many boats obtain services there. Thus, Seattle shares many of the same economic benefits from onshore fisheries components as do Alaskan coastal communities. Furthermore, since most secondary processing and product distribution flows through Seattle, the greater Seattle community derives a good deal of benefit from local boat and Alaska-based boat participation in Alaskan onshore fisheries.

To some extent separating Alaskan inshore and offshore fisheries segments is merely a matter of economic accounting since Seattle, and the American economy at large, gain a very significant part of the economic benefit associated with both. Seattle, however, is clearly the major beneficiary of the economic activity generated from the offshore fleet fishing Alaskan waters. More than fifty percent of the factory trawler workers come from the state of Washington, with most from Seattle and the immediately surrounding area. Exact figures on the number from Bellingham are not available, but local informants report that the number is not large. Oregon and California are the next two largest sources of factory trawler workers, but provide far fewer than Washington. Newport supplies little or none of this labor force. Idaho, Montana, and Alaska are the only other states that supply more than a minimal part of the factory trawler work force.

Individual impact analyses of Bellingham and Newport immediately follow. The reader is referred to the Ballard/Seattle addendum for further discussion of Ballard/Seattle-specific issues.

4.4.1 Bellingham, Washington

4.4.1.1 Introduction

Bellingham is well-integrated into the economic network of the Alaskan fisheries. However, Bellingham has a highly diversified economy and the fishing sector is a relatively small part of the total. That segment of the fishing economy related to Alaskan waters is only part of the total local fishing economy and is therefore buffered from most potential impacts of an inshore/offshore allocation decision. Furthermore, Bellingham is more involved with the secondary processing of Alaskan product than with its harvesting and so is further protected from dislocations likely to be caused by a coastal Alaskan inshore allocation. Bellingham shipyards may be negatively affected by an Alaskan inshore allocation by the loss of services to the offshore fleet, but this loss would likely be compensated by increased services to the inshore fleet. Bellingham gear suppliers will probably not be so affected, as they have well established relationships with offshore customers and a large clientele using other fisheries. In sum, there are few or no negative effects projected for Bellingham from an inshore allocation to Alaskan coastal communities (or from the lack of one). That part of the Bellingham fishing fleet which does participate in Alaskan inshore fisheries may, in fact, benefit to some extent from such an allocation. This potential beneficial impact was not documented further, since reliable data are not available (and could not be pursued within the cost and time constraints of this project).

4.4.1.2 Population

An inshore allocation to Alaskan coastal communities is expected to have minimal impact on the population of Bellingham. The few effects anticipated are positive due to local ownership interest in vessels participating in the inshore sector of the Alaskan groundfish fisheries. It is not expected that this would result in the attraction of additional population to Bellingham, although it could result in a marginal decrease in the rate of unemployment or an increase in labor force participation rates for partially employed individuals. If Bellingham ownership interests were heavily involved in the offshore fleet (and Bellingham informants state that this is not the case), there would still not be a large population effect even if these boats were displaced from the fishery. Of course, the economic effect would depend on the scale of the local ownership interest. Although the state of Washington provides over fifty percent of the work force for the factory trawler fleet, most of these individuals are from the Seattle area and relatively few from Bellingham. Thus, each of the subsections discussed in the Bellingham community profile will not be addressed here, since they will remain essentially unchanged with or without the inshore allocation.

4.4.1.3 Socioeconomics

Economic Profile

The health of Bellingham's diversified economy will not be affected by the inshore allocation decision in the Alaskan fisheries since the fishing industry is a relatively small segment of the total and is not expected to grow in importance. Consequently, although Alaskan product is quite important within Bellingham's fisheries economy, it will not be affected by whatever inshore allocation decision is made (see below). Furthermore, Bellingham's position as a secondary processor is well protected, and there is little local involvement (ownership or labor) in harvesting bottomfish in Alaskan offshore waters.

The Fishery

Sections of the Bellingham community profile will be discussed in turn. Only that which is most pertinent to Alaskan water operations will be discussed in depth.

Salmon

Bellingham salmon fishermen (an estimated 75% of the Bellingham fleet) unanimously agree that it is impossible to make a living simply by fishing Washington State salmon. Many of them also fish in Alaska, for salmon and other species. They need to do so partially due to the number of local fishermen, and partially due to the Boldt decision which, in essence, allocates fifty percent of all salmon harvested in Washington to the tribal fisheries. It is interesting to note that Native informants in Alaska stated their opposition to requests for Alaska allocations based on ethnicity. Evidently, the political baggage of a Boldt-like decision is more than Alaska Natives think the issue could bear.

Other Species, Other Fisheries

Available local statistics do not adequately represent the Bellingham fishing economy. Most Bellingham-based full-time fishermen fish outside of the local area a significant part of their time, and many are involved with Alaskan inshore fisheries. Those boats which operate as part of JVs are left out of most statistics and little information is available on their activities. Some Bellingham residents have ownership interests in catcher/processor vessels based in Seattle which operate predominately in Alaskan waters, and again the local economic effect of this is difficult to document.

Local harvesting involvement in the Alaskan fishery is also difficult to assess from the available information. Many fishermen participate in inshore fisheries. JVs operate in Alaskan (as well as Washington, Oregon, and Californian) waters. Catcher/processors with partial Bellingham owner interests operate in Alaskan waters. With respect to local processing, three large plants bring in frozen surimi and fish blocks (mostly Alaskan in origin) to process into finished product. This is probably the most significant aspect of Bellingham's participation in the Alaskan fisheries.

Local Processing of Alaskan Product

The three large plants make use of the large amount of cold storage available in Bellingham to receive the surimi and fish blocks and to process them into crab analogues and breaded portions. The surimi and fish blocks are produced at sea or in Alaskan shore-based plants, shipped to Seattle, and then trucked to Bellingham. In most cases the Bellingham plant is vertically integrated with the catcher/processor or shore-based plant from which the product originates. That is, there is common ownership wherein the central cold storage facility in Bellingham functions as a sort of facilitator/coordinator. These Bellingham processing facilities are buffered from the effects of an inshore allocation decision because of integration with the catcher/processors and Alaskan shore-based plants. Until such time as plants are built in Alaska for such "value added" products, Bellingham will have a stable position in the industry. However, because ownership of these processors involves a mixture of foreign and American investment (as is the case for the catcher/processor fleet and Alaskan shoreside processing plants), some revenue may "filter" overseas.

Bellingham does possess a developed service sector which provides services to the local fleet, the inshore Alaskan fleet (which overlaps the local fleet to a very large extent), and the offshore Alaskan fleet. An inshore allocation could affect this service sector by reducing offshore Alaskan water activity, but this assumes (a) that this fleet would not work elsewhere and (b) that Bellingham would no longer receive business from the fleet. Clearly, the support sector is not dependent on servicing the Alaska offshore fleet to an excessive degree since the fleet primarily uses Seattle facilities, but they are able to take advantage of such opportunities when they arise. The ship repair and modification facilities would probably still operate at capacity servicing the inshore fleet and the lower-48 offshore fleet. Net and other gear suppliers in Bellingham have good reputations with the Alaska offshore fleet (and other vessels); thus, an inshore allocation is not expected to have a large adverse effect on them. Those offshore vessels which do use the repair facilities available in Bellingham may continue to do so even if they begin fishing non-Alaskan waters.

Infrastructure

An inshore/offshore allocation decision is expected to have minimal effects on Bellingham's infrastructure or service demands. There are potential deleterious effects for local shipyards and repair facilities, which currently service both the inshore and offshore fleets since an Alaskan inshore allocation may reduce the number of boats in the offshore fleet and thus the need for services in Bellingham. On the other hand, Bellingham is the closest American port to Alaska with extensive repair facilities, so it is possible that inshore fleet related business could increase with an inshore allocation.

4.4.1.4 Sociocultural Profile

No effects are anticipated in this area from a possible allocation.

4.4.2 Newport, Oregon

4.4.2.1 Introduction

According to key informants, Newport will be little influenced by an inshore/offshore allocation. However, local participation in the offshore component of the Alaskan fisheries is difficult to assess since Newport residents have been involved in joint ventures in the Bering Sea and off the coast of the lower-48 as active participants, as investors in participating vessels, or both. Meanwhile, Newport residents are also heavily involved in the Alaskan crab, salmon, and longline fisheries. Newport processors do not process Alaskan groundfish product or service any component of the offshore fleet. Although the degree of ownership interest in the offshore fleet is not known, no offshore vessels are based in Newport. Oregon supplies five to ten percent of the factory trawler work force, but little of this is from Newport. It is clear that Newport boats do participate in the inshore sector of the groundfish fisheries in both the Bering Sea and the Gulf of Alaska. But, because it was not possible to document the extent of this participation due to time and budget constraints and the paucity of reliable secondary data, key informant and observational data were used to gauge local involvement. At least one trawler with Newport as its home port delivered to a shore-based plant in Kodiak during the field research period.

4.4.2.2 Population

The anticipated effects are positive and result from ownership interest in vessels participating in the inshore sector of the fisheries. Vessels targeting groundfish can be expected to receive direct benefits, whereas those focussing on other species may receive indirect benefits from the increased economic stability that shore-based plants would derive from an inshore allocation of groundfish. It is not expected that this would result in the attraction of additional population to Newport, although it could result in a marginal decrease in the rate of unemployment or an increase in labor force participation rates for partially employed individuals. If Newport ownership interests are heavily involved in the offshore fleet (and Newport informants state that this is not the case), there would still not be a large population effect even if these boats were displaced from the fishery. Thus, it will not be necessary to address each of the subsections discussed in the Newport community profile, since they will remain essentially unchanged with or without the inshore allocation.

4.4.2.3 Socioeconomics

Economic Profile

The economic profile of Newport will remain essentially unchanged regardless of an allocation decision. While the fishing industry is one of the keystones of Newport's economy, it is primarily a "local" (non-Alaskan) fishing industry. That portion of the fishing sector which is Alaskan is predominately non-groundfish. The most recent year for which statistics are available indicate that the total income contribution of commercial fishing to Newport in 1986 was about $120 million. Of this, about $28 million came from activities in Alaskan waters -- half from the crab and longline fleet and half from joint venture (JV) operations. An inshore allocation to Alaskan communities would not affect the crab/longline fleet, and may encourage the JV operations to deliver onshore. Other important components of the Newport economy will not be affected by the inshore allocation. The ownership interest of Newport residents in the inshore and offshore Alaskan fleets is currently unknown and would require a study focussed on that question before reasonably reliable analysis could be conducted.

The issue of inshore allocations in the Pacific fisheries would, of course, be expected to affect Newport directly. The Council has no jurisdiction in this area, but it should be noted that the Pacific Fishery Management Council (PFMC) is currently in the process of deciding how to handle Pacific whiting. As reported in the community profile, there is interest in Newport in starting an onshore plant to process whiting. Until the supply/allocation question is settled it is unlikely that financing for such a project will be forthcoming (especially since fish processors have been minimizing rather than expanding operations in Newport in the recent past). The economic effects of an onshore allocation in Newport would depend on a number of factors, among them the percentage of foreign ownership in various segments of the fishing industry involved. Newport residents currently have a significant stake in the Pacific whiting JV fishery which is in danger of being displaced by an American offshore fishery. An onshore allocation may be one method by which Newport interests maintain their participation in this fishery.

The Fishery

All the sections discussed in the Newport community profile are combined in the present analysis since the effects of an inshore allocation to Alaskan coastal communities (or the lack of such an allocation) are minimal. An inshore allocation may encourage some JV boat owners to deliver to onshore plants in the Bering Sea, but this is conjecture. JVs have been and are currently under pressure from the increasing number of domestic catcher/processor boats in any event, so that the inshore/offshore issue may be a moot point as far as they are concerned. The Newport boats that participate in the inshore sector of the Alaskan fisheries may well be strengthened by an inshore allocation, as it would make shore-based plants more stable. For the most part, the Newport fishing industry will not be affected.

One major concern expressed by Newport fishermen and processors was that the Bering Sea factory trawler fleet might try to enter Washington and Oregon coastal waters if they were partially displaced from the Bering Sea groundfish fishery. This would be disruptive to the Newport fishery because the addition of boats to the currently orderly and fully utilized fishery would introduce considerable competition and conflict. However, informants felt certain that regulatory measures would be put in place to ensure that this did not occur, and mentioned it only as a "worst case" scenario. Nonetheless, recent newspaper accounts indicate that factory trawlers are becoming interested in Pacific whiting (currently mostly a JV fishery). Theoretically, this interest in Pacific whiting could expand to other species. As mentioned above, the PFMC is examining onshore/offshore allocations as one possible mechanism for dealing with this situation.

According to Newport fishermen, the Bering Sea fisheries underwent a process of change with the "Americanization" of the Alaskan offshore fisheries in which Newport fishermen were among those who "pioneered" JVs. There is strong sentiment for the position that there should be free access to Alaskan waters for enterprising fishermen. The Seattle-based factory trawler fleet displaced the JV fleet from the Bering Sea even faster than the JV fleet had displaced the foreign fleet, however, so this sentiment is tempered somewhat with a concern for protecting local (Newport-based) fishermen and owners. An Alaskan coastal inshore allocation will not have much effect in Newport one way or the other. The decision the Council makes in regard to Alaska could have an effect on whether the PFMC examines the inshore/offshore allocation option, however, and that could have significant effects upon Newport and its fishing population.

Infrastructure

There are no infrastructure issues in Newport related to Council inshore/offshore deliberations, which is not to say that there are not developmental issues in this area. They are simply not pertinent to the options which the Council is at present considering.

4.4.2.4 Sociocultural Profile

Regardless of the decision that the Council ultimately makes regarding an inshore/offshore allocation, no effects are anticipated in this area.

4.5 Social Impact Assessment Addendum: Ballard/Seattle

4.5.1 Background

IAI contracted, in March of 1990, to provide in-depth community profiles and social impact assessments of six communities for use in consideration of proposed inshore/offshore amendments. These included an eastern Gulf of Alaska community (Kodiak, Alaska), a western Gulf of Alaska community (Sand Point), a central Bering Sea community (St. Paul), a Bering Sea/Aleutian Islands community (Unalaska/Dutch Harbor, Alaska), a State of Washington community (Bellingham, Washington), and a State of Oregon community (Newport, Oregon).

These communities were identified in cooperation with Council staff to represent the range and types of social impacts likely to occur at the community level as a result of the proposed amendments. After completing a draft version of the initial set of community profiles, upon which the analysis of potential social impacts would be conducted, IAI presented its analysis to the Fishery Planning Committee (FPC) for input and evaluation. At this FPC meeting, two members recommended and proposed additional study of the potential social impacts to Ballard/Seattle. The position was argued that since Ballard was the center of the factory trawler industry, it was also the community most susceptible to the potential negative consequences of limitations imposed on this sector of the industry. The committee recommended and the Council voted to direct IAI to expand its analysis of the potential impacts to Ballard/Seattle for the proposed amendments.

It should be noted for the record, however, that IAI was reluctant to undertake this task for several reasons, and clearly stated the limitations it faced in doing such analysis. First, Seattle is one of the nation's major cities, and it would be literally impossible to characterize the social, economic, and cultural organization of this city at the level of detail required for comparative analysis (i.e., in relation to the six communities already under consideration). Second, available funding would in no way be adequate to carry out a study of such magnitude. Third, even assuming there were sufficient resources, there was insufficient time within an already very tight schedule, to accomplish such a task. Fourth, and finally, it was already well understood that: (a) the fishing industry, *per se*, represented only a minor percentage of the overall economic base of Seattle; and (b) that the groundfish fishery represented only a part of the overall fishery component of the Seattle economy. Thus, to carry out a social impact assessment of a change in the allocation between inshore and offshore components of the Seattle economy presented a virtually insurmountable challenge.

IAI therefore proposed two options that it felt would allow the Council to consider potential social impacts to affected segments of the Ballard/Seattle groundfish fishery economy: (1) the study could be expanded to consider a selected sub-community (i.e., one of the smaller residential areas mentioned by a Committee member) in a way that mirrored the examination of the other six smaller communities; or (2) key interviews with processors, fisherman organizations, unions, local businessmen and leaders could be conducted to develop sufficient information to describe directly, in non-quantitative terms, the potential social impacts of the proposed regulatory changes on affected community clusters, at least at the issue level.

The second of the two options was selected by the FPC as the most effective under the circumstances and most likely to facilitate the description, at a relatively elevated level, of the principal social ramifications of the various proposed allocative alternatives, without, however, providing the direct comparative basis possible under the first option. Our contract was therefore amended to provide an additional 120 labor hours to carry out a preliminary scoping analysis of the social impacts potentially resulting from the proposed Inshore-Offshore Amendment under consideration by the

Council. It was also agreed that this study and resulting report would be submitted as an independent addendum to the originally contracted report since it would not provide parallel or comparable information on existing social conditions in Seattle. It does not meet, and could not be expected to meet, the standards IAI has established for the other six communities that were the subjects of community profile analysis.

Given the circumstances of the decision to carry out this research, however, IAI affirms that it provides a fair assessment of the potential social impacts believed by local industry representatives to affect the community of Ballard/Seattle in the event that: (1) no action is taken to modify the *status quo*; or (2) some mixture of the proposed alternatives are adopted by the Council.

4.5.2 Overview

In order to achieve the stated objectives within time and funding limitations, a plan of work was developed which concentrated the field data collection effort on meetings with processor and fisherman organizations, local businessmen, fisherman journalists, and opinion leaders in Ballard/Seattle. Over a period of three days in December (a period comparable to field research time spent in the other communities) leaders and representatives of seven of the major fishing organizations currently participating in the groundfish fishery were interviewed by IAI and Council staff. Those interviewed included: Fishing Vessel Owners Association/Iceboat Longliners; Fishing Vessel Owners Association/Freezer Longliners; Pacific Seafood Processors Association; North Pacific Fishermen's Vessel Owners Association; American High Seas Fisheries Association; Midwater Trawlers Association; and American Factory Trawlers Association. The comments, recommendations, conclusions, and arguments developed during these meetings were transcribed directly and form the basis of this summary report.

The general thrust of the questions posed to these fishermen's groups was, from their particular perspective:

(1) What is the relative dependence of Ballard/Seattle on the groundfish industry?

(2) What would the effect of continuation of the *status quo* be on your sector of the industry?

(3) What would your fishing sector's response be to passage of the "most extreme" version of proposed regulations by Council?

(4) How rapid or gradual would the decline or increase, or other change, be?

(5) What is the organization of the fishery, industry, or support sector most affected by the groundfish fishery (i.e., ownership, employment, mobility, economic adaptability/flexibility, etc.)?

(6) What is the relative dependence of local industries on that portion of the groundfish fishery derived from fishery resources affected by the proposed regulatory changes?

(7) What is the relative dependence of the various support sectors and industries on your particular segment of the groundfish fishery?

(8) Using your industry as the model, what is the anticipated distribution of social costs and benefits among affected social, ethnic, or economic groups in Ballard?

(9) What will be the consequences, as you see them, of each of the alternatives under consideration (a listing of major alternatives was available);

(10) What actions are you individuals, as representatives of this particular fishery group, likely to take in the event one or more of these various alternative actions are implemented?

(11) Do you think others in your industry (sector) will react in a similar way and, if so, what will be the aggregate consequence?

(12) Which sectors (industries) do you feel are most susceptible to the kinds of changes likely to occur under each of the various alternatives?

(13) What questions do you think I should have asked to have elicited what you believe are critical issues of concern to your particular fishery interests?

It should be noted that these questions were asked not in the manner of a questionnaire but, rather, followed a social interview protocol within the context of the ethnographic interview. Because of this format, they were considered informal interview protocols not subject to OMB restrictions on formal questionnaires.

4.5.3 Social Impact Assessment

The risks inherent in a rapid social appraisal process are considerable. Under such circumstances it is appropriate to err on the side of caution. We have therefore extracted from the interview material, and focused primarily on, the potential detrimental social consequences of: (1) the *status quo* option; and (2) an extreme version of the allocation percentages. No attempt could be made to balance the social costs and benefits of the action. This is made more acceptable, in our view, by fact that the ostensive purpose of these proposed regulations is to improve or make more equitable the distribution of benefits from a particular resource, thus, an increase in benefits is the assumed outcome.

The key findings of this assessment of potential detrimental social impacts are as follows:

1. There is universal agreement that the *status quo* cannot be maintained.

   It was recognized by everyone that "something has to give," that the groundfish fishery is "vastly" overcapitalized at the present time, and that the fishery itself is in jeopardy in the absence of some aggressive and effective action on the part of the Council. There was universal agreement that if nothing is done, the groundfish industry "is doomed to destruction." Many argued that regardless of efforts to manage the fishery, the long-term viability of this fishery remains open to question -- that the resource is already over-fished and efforts are overcapitalized. The common refrain was that there was "too much gear on too few fish." They argued that what we are looking at in the proposed amendment is just a short-term, stop-gap measure to postpone the "inevitable."

There was, in fact, considerable debate regarding the likely efficacy of the proposed regulatory alternatives from all fishing sectors. Few fishermen, however, even within specific fishery sectors, agreed on what other alternatives might prove more effective in achieving necessary changes.

2. Considerable uncertainty exists among and within the various fishing groups regarding the proposed inshore/offshore amendments.

This confusion results not only from the fact that such a wide range of potential alternatives, and sub-alternatives, are under consideration, but from the fact that individuals and even fishery sectors are not clear with respect to how they are classified. Once the basis of classifying fishery operations into the two principal categories (i.e., inshore and offshore) had been explained, it was soon evident that, with the exception of the factory trawler component of the fishery, all of the groups interviewed saw the proposed amendments as beneficial to their particular sectors of the industry.

3. It was generally agreed that the Ballard/Seattle support sector was more dependent upon fishermen participating in "inshore" fisheries than on the offshore component.

Representatives of the various support sectors who were present at these meetings, including those who attended the meetings with representatives of the factory-trawler industry, agreed that the inshore fleet provided the bulk of their business. These individuals concurred in the assessment that the Ballard/Seattle support sector relied more on the inshore sector than on the offshore sector. While it is beyond the scope of this work to quantify the distribution of these potential costs and benefits, it was clear in discussions with industry representatives that Ballard/Seattle is indeed more dependent on the inshore fishery fleet than on support of the offshore fleet. While logical, this outcome was somewhat unexpected given the high capitalization of the offshore fleet and its relatively high productive capacity.

4. It was uniformly agreed that the offshore component of the Ballard/Seattle groundfish fishery would bear the brunt of all the detrimental social and economic consequences of the proposed regulatory alternatives except the *status quo*.

Since the anticipated social benefits are believed to accrue to the inshore components of the Ballard/Seattle groundfish fishery, it is perhaps only logical that the anticipated social costs would accrue to the offshore component. We have, for purposes of this assessment, accepted this assumption and proceeded to assess the potential negative social impacts of the proposed allocation alternatives on this segment of the Ballard/Seattle groundfish industry. These impacts can be categorized as effects on capital (economic) and effects on people (social). Since the detailed economic effects will be addressed by the Council staff economists, we will enumerate here only those global economic factors which are expected to drive the social effects anticipated to result from the more extreme of the allocation alternatives under consideration.

A. It is expected that the economic analysis will show, regardless of the Council inshore/offshore decision, that the factory-trawler fleet is in an untenable position. The number of factory trawlers nearly doubled from 1986 to 1987 and again nearly doubled from 1987 to 1988. Between 1988 and 1989 the size of the fleet increased by 16%, and from 1989 to 1990 by 28%. In total, over the last four years the fleet has increased by over 500% (from 12 to 64 vessels). Even if an open groundfish fishery were to continue, and the entire catch were to be allocated to the offshore component, the 2,000,000-ton limit would ultimately make it unprofitable for certain vessel owners/operators to continue. Simply stated, the larger the allocation to the inshore processors, the more accelerated this process.

B. Vessel owners most susceptible to this process will be those with the highest fixed costs (i.e., the more highly capitalized vessels), those with the least flexible technical adaptation, those with the least successful captains, and those with the least managerial adaptability to rapidly changing markets. While these are nearly universal variables in determining the success or failure of a particular fishery adaptation, the factory-trawler industry presents an unusual case in the degree to which one of these variables is weighted. That variable is fixed costs. The entire capital investment is centered on the vessel itself. Any down time is the equivalent of lost revenue. Given the increasingly high cost of buying, operating, and maintaining these large vessels, it is not difficult to see an increasingly important role of capital in directing the course of the fishery.

C. Based on information developed by the American Factory Trawler Association (AFTA), approximately 30% of the factory trawler payroll expenditures are allocated to residents of the greater Ballard/Seattle community, with over 50% of the factory trawler workers living in the state of Washington. Thus, it could be assumed that the accelerated collapse of this segment of the industry would result in displacement of workers, but that this displacement would be dispersed over a regional rather than a community level.

D. AFTA representatives were clear to argue, however, that the economic collapse of a particular groundfish trawler operation would not necessarily lead to wholesale termination of employees. As with any fishing venture, the point at which the non-viability of the enterprise is finally recognized may be long after the operation has economically collapsed and is deeply in debt. Many vessels are already operating in, or near, the red. These vessels will now likely have to be sold at a substantial loss. The purchaser, in turn, will have obtained a considerably discounted vessel, outfitted for a particular task, the operation of which he expects to be profitable. In any case, the new investor must immediately put the vessel in operation. Thus, the prospect that large numbers of factory trawler processing workers will abruptly become unemployed may not be well founded.

E. It should also be added that only a relatively modest number of factory trawler workers are exclusively employed in this sector of the industry, or in the fishing industry in general. Factory trawler processing line workers endure considerable hardships over relatively long periods of time, with very few opportunities available for advancement. As a result, the duration of such employment is inherently limited (AFTA estimates that between 1/5 and 1/3 of each processing crew is on his/her maiden voyage). This would imply a very high rate of new recruitment into the industry and a high turnover rate.

F. Nevertheless, IAI has elected to consider the social effects such displacement might have on the larger Ballard/Seattle community. In order to assess potential social impacts, however, the "community" within which the effects would be felt had to be identified. Where do these individuals live, what ethnic and/or cultural traditions are likely to be affected, where do their children go to school, and in what ways to they interact within the greater Ballard/Seattle area? Residence, of course, is the critical variable. Again, based on information provided by AFTA, IAI estimates that between 25-30% of factory trawler employees live within the greater Ballard/Seattle area. Total employment in this industry has been estimated by AFTA as 7,682, of which 5,082 are Washington residents, and approximately 2,500 are residents of the greater Ballard/Seattle area. The total trawler fleet payroll expenditures for the greater Seattle and Ballard area is approximately $60 million, which represents an average annual wage of $24,000. These individuals, again according to AFTA-provided information, are distributed almost evenly throughout the larger metropolitan Seattle area (of over 2,000,000 residents), in over 30 different zip code zones.

G. It should also be pointed out that these workers differ in important social ways from residents of the small, isolated, rural Alaska communities and smaller coastal Washington and Oregon communities considered in the larger study. Based on AFTA information, factory trawler workers are generally in their late twenties, the majority have not completed their high-school education, have worked on a wide variety of alternative occupations, and are extremely "employment-mobile."

H. This picture is made all the more difficult given the general history of this employment population and the set of alternatives available to them in the event of a worse case scenario -- i.e., an abrupt involuntary termination of employment on a factory trawler.

5. In conclusion, it would not have been possible to have constructed a parallel community analysis for such an ethnically diverse, geographically dispersed, and highly transient employment population.

CHAPTER 5

CONCLUSIONS

CHAPTER 5

5.0 CONCLUSIONS

5.1 Biological Conclusions

Chapter 2 described the distribution of pollock and cod during the year, the availability of pollock within the Bering Sea inshore operational area, and the patterns of usage of the resources by foreign and domestic fisheries. Catch histories indicate that sufficient resources would be available to the intended industry sectors if allocations were made as provided by the Council's Preferred Alternative 8. Although some concerns have been raised about possible localized depletion of discrete stocks or substocks, there is little firm information to define discrete localized stocks or their boundaries. The Council recently has placed extra control on the harvest of Aleutian Basin pollock by defining a Bogoslof District and establishing a separate roe-season quota. Total removals of the pollock and cod resources are controlled by the setting of total allowable catches (TAC), and their monitoring has been enhanced recently to guard against overruns. The Council's preferred alternative will not change total removals from the stocks, and may provide an extra margin of safety against overruns by further partitioning the TACs.

Fishing on spawning stocks has been of concern to the Council. Though the relationship of spawning stock size and recruitment to the fisheries is obscure for pollock and Pacific cod, and little is known about the impacts of fishing on spawning stocks, the Council has responded to cautionary notes on potential impacts in the past by establishing various management measures such as quarterly allocations and limits on the roe fishery to mitigate any potential impacts on the stocks of fishing during the roe season. None of the alternatives will change that. In particular, the preferred alternative will maintain, after an initial slight increase, the amount of pollock taken from the inshore operational area during the spawning season at about the same levels experienced in the past. It also will provide a ceiling on future growth of the inshore pollock harvest from the inshore operational area that would not have been provided under the status quo or several of the other alternatives.

Bycatch of prohibited species such as crab, herring, and halibut is controlled as necessary and appropriate by extensive management measures in the Bering Sea and Aleutians and in the Gulf of Alaska, including closed areas, PSC quotas, bycatch disincentive programs, and authorizations to the NMFS Regional Director to limit bycatch and close areas with high bycatch rates. Measures to control the bycatch of salmon also are under consideration by the Council. None of the alternatives is anticipated to change the total removals of prohibited species or biological impacts on bycatch species, though there will be changes in fishing patterns and bycatch that will need to be monitored by the Council and which may require revisions of bycatch management measures. In particular, the Council may need to consider inshore-offshore allocations of bycatch to keep one sector of industry from preempting another through bycatch usage. The Council will consider a comprehensive bycatch program during its 1992 analytical cycle for implementation in 1993. This action could be used as a vehicle for addressing bycatch problems that may arise from implementing the Council's proposed actions on inshore-offshore.

Marine mammals have direct and indirect interactions with commercial fisheries. Direct interactions include shooting, harassment, disturbance, and entanglement in fishing gear or gear debris. Indirect effects include commercial fisheries related reductions in prey species for marine mammals. None of the alternatives is expected to measurably increase the direct impacts on marine mammals. Though the Council decision to allocate pollock and Pacific cod between inshore and offshore users could increase vessel traffic to and around coastal communities, the Council and NMFS have established protective buffer zones around major sea lion rookeries and walrus haulouts to minimize disturbance. Shooting and harassment also are banned. Should future problems be identified, establishment of traffic lanes or other measures could be implemented to reduce the frequency of interactions.

Trophic interactions and the potential for fisheries to degrade the prey available to marine mammals are currently issues of great concern. There are no data available that give conclusive evidence that the pollock fisheries are negatively impacting sea lion populations. Studies of sea lion pups in 1991 show that they generally appear healthy and without signs of anemia or malnutrition. None of the proposed solutions to the inshore-offshore preemption problem will change how harvest quotas are set for the pollock resource. The quotas will continue to be set taking into account a variety of factors including the potential for impacts on marine mammal populations. These considerations, used in combination with existing restrictions on fishing operations, such as buffer zones and restrictions on the amount of pollock that may be taken by quarter and area, will provide protection for sea lions populations. Section 7 consultations by NMFS earlier this year concluded that the groundfish fisheries are not likely to jeopardize the continued existence and recovery of any endangered or threatened species under the jurisdiction of NMFS.

Coastal and marine habitats are not expected to have identifiable increased impacts from the alternatives. Though there has been speculation that potentially increased inshore activity could lead to degradation of the marine habitat, those impacts will be mainly a function of how fish waste is disposed of, rather than the total amounts. Recent studies off Kodiak have shown that the nearshore environment can absorb considerable amounts of fish waste relatively rapidly without significantly reducing the dissolved oxygen content of the water. Various fish and shellfish species also benefit from the waste. For the long term, water quality will need to be monitored, especially in areas of low absorption, and measures such as enhanced utilization or dumping of fish wastes may need to be taken by industry and regulatory agencies should problems arise. None of the alternatives are expected to cause a critical environmental problem.

5.2 Economic Conclusions

The economic analysis of the eight alternatives in the proposed amendment examined the impacts on economic activity created by the specified and implied changes in resource allocation under the seven management options. These impacts include considerations of direct income, employment, indirect and induced activity, efficiency, costs, profitability, competitiveness, solvency, and total economic activity. These measures were estimated for pivotal catching and processing port locations in Alaska and the Pacific Northwest, where feasible, taking into consideration the distribution of economic impacts among and between the affected industry sectors.

The analysis is based on the economic organization and behavior of the principle catching and processing sectors that rely upon pollock and Pacific cod in the BSAI and GOA fishery management areas. The proposed management alternatives were applied to the existing economic environment, and estimates made of the resulting impacts. For Alternatives 3, 4, 6, and 7, a structured economic input-output model was used to project impacts resulting from changes in the prescribed allocations of pollock and Pacific cod. Comparisons of the estimated economic impacts provide the basis for assessing the practicality and effectiveness of each alternative.

The 1989 economic environment is specified as the base from which to evaluate impacts, because it is the most recent year for which a complete set of economic data were available at the time the analysis was undertaken. A comprehensive survey of the Alaska groundfish industry was undertaken to provide individual vessel and plant level information for the analysis. It is recognized that significant ongoing changes have occurred since 1989 in both the structure and operation of catching and processing activities in the affected fisheries. Where feasible, these more recent events are incorporated into the analysis.

The impacts of each alternative are cast in terms of their ability to solve the preemption dilemma as defined in the problem statement. The examination of **Alternative 1**, the status quo option, confirms that competitive pressures within the industry will continue to build as the "race for fish" intensifies. The combined effects of the final transfer of BSAI JVP Pollock to DAP status in 1990, along with internal industry efforts to lessen conflicts in the GOA appear to have temporarily reduced preemption problems in 1990, but the problem remains one of excess catching and processing capacity relative to available resources as preemption concerns reemerged in 1991. This economic impact of overcapacity problems was simulated with a modest 10 percent decrease in pollock availability to processors, resulting in significant declines (ranging from -25% to -83%) in annual net returns to individual plants. These conditions indicate that if the Council does nothing, preemption, instability, and subsequent firm failures are possible. These adverse consequences are not the only potential outcomes, however, to the extent that the pressure of competition also can lead to increased efficiency, product innovation, and lower consumer prices.

Alternative 2 represents the use of traditional management tools to address the preemption problem. The Council has had very limited success in using traditional measures to address allocative issues. Though the use of such tools appears initially to be a least burdensome alternative, they usually require considerable revision and fine-tuning over successive seasons, with no guarantee that the allocative goals will be achieved, as has been shown for halibut fisheries in the Bering Sea and Aleutians. This need for subsequent revision makes traditional management tools inappropriate for solving the inshore-offshore issue, particularly considering the immediacy of the problem.

The explicit resource allocation to the inshore and offshore industry sectors prescribed in **Alternative 3** is a significant departure from the open access conditions that have characterized this industry in recent years, and the resulting estimated economic impacts are important in judging the outcome. The variable relationship among and between the species, sectors, and management areas specified in the suboptions of Alternative 3 results in a somewhat irregular set of consequences. Generally, the various preferential allocations increase the inshore shares of pollock resources in both the BSAI and GOA, at the sacrifice of offshore allotments. The exvessel tonnage and value figures represented by the allocations are significantly larger in the BSAI, and the resulting economic impacts are proportionately greater there as well. The combined economic impacts of these proposed allocations are proportional to the implied change in share allocations to the inshore component. Such impacts are greatest under option 3.(2), followed by 3.(3) and 3.(1). Two of the Alternative 3 options result in allocations of GOA Pacific cod that slightly increase the share available to the offshore segment relative to the 1989 base.

Local Alaska port communities account for only a small portion of the total economic impacts arising from these allocations; nearly one half of the total economic activity generated by these actions occurs in the greater U.S. economy outside of Alaska and the Pacific Northwest. Of the direct incomes created, roughly 12.5 percent accrues to the local Alaska port economies, an equal amount collects in other Alaska communities, and the remainder passes on to Pacific Northwest port economies and beyond.

The direct income and employment changes that occur as a result of Alternative 3 preferential inshore allocations generally increase the benefits accruing to the inshore Alaska port communities, as well as the Alaska state economy. Corresponding declines in earnings and employment occur in the Pacific Northwest home ports of the displaced offshore processors. In cautious projections of aggregate regional economic impacts across both inshore and offshore categories, it appears that there are net gains in direct income (wages, salaries, and profits) arising from these preferential allocations, but they come at the expense of net declines in Pacific Northwest employment. Thus, reducing or eliminating the inshore/offshore preemption problem through preferential allocations adversely impacts the offshore sector. The net impact on the producing and manufacturing sector is likely to be insignificant, or minor, with gains to the inshore industry balanced by losses to the offshore component. There is no clearly superior allocation or option to this dilemma in Alternative 3. However, the trade off in economic impacts calls for careful consideration of the degree of preemption that exists in these fisheries, such that the offshore sector not be unduly penalized by a disproportionate inshore allocation.

Further analysis of efficiencies of the affected catcher and processor operations reveals apparent differences in operating costs between inshore and offshore segments. However, variations in product form, quality, mix, and recovery rates obscure simple costs comparison between these two sectors. For example, there were lower per unit costs estimated for the offshore production of surimi relative to inshore. But, inshore processing resulted in a greater total product output and value per ton of raw fish. Is not clear to what extent the lower offshore cost is the result of a lower recovery rate by offshore processors, or a legitimate competitive advantage in the context of resource use efficiency.

Alternative 4 prescribes fixed allocations of the resources to catcher vessels based on length, rather that the processor designations used in Alternative 3, but the ultimate allocation to processors would be determined by market forces, rather than regulation. Thus, the resolution of preemption in the processing sector would depend upon the resulting competition for the catch from harvest only vessels. The allocations of resource rights to these broad categories of catcher vessels create economic benefits for the small pollock catcher classification, relative to conditions in 1989, and declines accrue to large vessels. From a port location perspective, the distribution of these economic consequences of Alternative 4 is less distinct, since both large and small catcher vessels exist in Alaska and the Pacific Northwest, although the large vessel categories are concentrated in Seattle. In contrast to pollock, the economic impacts arising from the allocation of GOA Pacific cod based on vessel length benefit large vessels.

The suboptions analyzed under Alternative 4 result in significantly different economic impacts on the operations involved. The 50 - 50 split creates a relatively minor net economic impact, but the allocations based on historical catch generate dramatic shifts in harvest rights, generally benefitting small vessels at the expense of the large vessel group. Again, the impacts related to Pacific cod are an exception, but with modest economic consequences. The estimated economic impacts of the allocation of pollock to harvest vessels based on historical catch would likely force economic restructuring or business failure of the large vessel group even in the short run. To the extent large vessels are indicative of catcher-processors, processing activity dependent upon that same vessel's catch also would be affected adversely.

A version of the pollock-specific management scenario proposed in **Alternative 5** has been implemented already by the Council as the Amendment 19/14 "roe-stripping" package, along with elements of GOA Amendment 18. Early experience with these two regulations indicates that the problems associated with roe stripping may have been lessened, but the underlying demands placed on pollock stocks by excess processing capacity have not been addressed, and concerns over preemption persist. Alternatives 2 and 5 represent indirect solutions to the preemption problem, in that changes to the operational structure of the fisheries (seasons, gear, areas, etc) are intended to effect changes in the performance of the catchers and processors involved, which in turn results in a reduction of preemptive pressures on inshore processors.

A specific proposal to allocate the fishery resources to defined catcher vessel categories based on processing capability was included as **Alternative 6.** While similar in effect to Alternatives 3 and 4, this alternative establishes set allocations, through catcher vessels, to both the inshore and offshore components. In addition, 28 percent of the BSAI pollock TAC is left "unspecified" as to processor categorization, allowing for a market allocation. The version of Alternative 6 modeled in the analysis resulted in an allocation and economic impacts very similar to Alternative 3.2 in the BSAI, and 3.3 in the GOA. While offering inshore operations considerable relief from the preemptive pressures, Alternative

6, as configured, may create undue economic hardship for at-sea processors, due to the significantly reduced allocations afforded the offshore component.

Alternative 7 examines the effect of preferential shoreside allocations to certain western Alaska communities along the Bering Sea, a region that does not currently have an inshore pollock processing industry. Reports indicate that development of a significant processing industry in these communities will likely require a preferential allocation to reduce the uncertainty of future TAC availability. The analysis estimates the ability of St. Paul, Pribilof Islands--as representative of these communities--to capture the economic benefits associated with such allocations. This Alternative is not necessarily intended as a sole solution to the preemption problem; in fact, specific provisions are based on a presumed preferential inshore allocation.

Alternative 8, the designated preferred alternative, was developed as a part of Council deliberation over the SEIS for Amendment 18/23 in June, 1991. As such, this proposed strategy represents the Council's consensus that a direct allocation of pollock and/or Pacific cod TACs in the GOA and BSAI was the most appropriate means of offering a timely--though perhaps interim--solution to the inshore/offshore preemption problem.

The majority consensus of the Council is that a direct allocation of the fishery resources offers the most explicit and predictable means of resolving the preemption concerns raised in the proposed amendment. Alternative 8 represents a modified version of the original Alternative 3, more so than a separate philosophical approach. Compared to Alternative 3, the preferred alternative provides a more adaptive compromise between inshore and offshore resource use demands, adopting a phased-in, midrange inshore/offshore allocation formula. Alternative 8 also incorporates the community development quota concerns inherent in Alternative 7, as well as an operational zone around Dutch Harbor to provide some guaranteed access to pollock stocks by the inshore sector in the BSAI. Overall, Alternative 8 combines features of several different proposals and Council concerns into a single preferred alternative.

Economic impacts arising from Alternative 8 are projected to fall between those estimated under Alternative 3.1 and 3.3 in the BSAI, and Alternative 3.3 and 6 in the GOA. Combining the inshore and offshore regional impacts yields a net gain in direct income in year one of $8.5 to 9 million, and a loss of 175 to 200 FTEs. The employment losses in the Alaska-PNW region are projected to be slightly greater than the job gains, but associated increases in economic activity in the rest of the nation result in a modest gain in FTE employment nationwide. The regional net gain in direct income is a function of the more labor intensive operations of the inshore sector, rather than any inherent advantage in economic efficiency. Qualitative estimates suggest that the net national effects of the preferred alternative are positive under normative assumptions. Such benefits incorporate the economic effects noted above, as well as positive national impacts created by: 1) maintaining a balance in the social and economic opportunities associated with the pollock and Pacific cod fisheries; 2) helping insure that the fishery resources are available to provide private and community benefits to all parties; and 3) reducing the uncertainty and operational instability caused by the threat of preemption. It is intended that the pollock and Pacific cod allocations made for the GOA and BSAI are in the best interest of resource management and the nation at large.

In an open access fishery such as represented here, there are no exclusive rights to the resources, and the determination of preemption is--by inference--the rights associated with use over the past several years. Dramatic changes in the composition of the groundfish industry during this time period mean that the selection of the appropriate historical period will significantly influence the resulting allocation and economic impacts. An important feature added by Alternative 8, however, is the recognition that an inshore/offshore allocation may be only an interim solution to the long term rationalization of comprehensive fishery management in this region. Alternative 8 places a finite expiration date (December 31, 1995) on the regulatory provisions, initiates a research plan for additional long range analysis of problems in the fishery, and directs expedited action on a vessel moratorium. These actions serve as a bridge linking timely action on the immediate preemption problem to a more comprehensive, long term management regime.

The estimated economic impacts of the proposed allocations under the preferred alternative create winners and losers that may be different than if no allocations were made. Even if net economic impacts in terms of direct income or employment at the national level are positive, the individual gains and losses are distributed across different groups, and some redistribution impacts are uncertain. The excess harvesting and processing capacity in these fisheries will lead to financial crisis--failure for some--if conditions persist unabated from their trajectory of the past five years. The overcapacity problems fueled by open access in these fisheries portend some type of economic or operational changes either with or without regulatory action.

The costs and benefits estimated under Alternatives 3, 4, 6, 7, and 8 may not fully reflect the range of other alternatives open to catchers and processors. Conceptually, the economic impacts estimated in the input-output analysis likely overstate the resulting costs and benefits to the extent that segments of the industry make changes in their operations that mitigate adverse impacts, or exploit economic opportunities. In the course of the analysis, several alternatives are examined as options to the status quo; however, only conjectural evidence is available to suggest the likely reorganization of the industry that might ensue.

5.3 Social Conclusions

The social impact assessment profiled six study communities in relation to their participation in the Alaskan groundfish fisheries (these community profiles are contained in a technical appendix to this document) and appraised the effects that the allocative alternatives specified by the Council would have upon these communities, using the results of the economic modelling exercises as the projective variables. The study communities consisted of four Alaska communities (Kodiak, Sand Point, St. Paul, and Unalaska) and two Northwest Coast communities (Bellingham, Washington and Newport, Oregon). At the direction of the Council, assessment effort was directed primarily to two of the five allocative alternatives, the continuation of the *status quo* and various forms of an inshore/offshore allocation. Following initial assessment efforts, Ballard/Seattle was added as a locus for limited analysis devoted totally to fisheries related issues, rather than toward community characterization and overall community analysis, and the results of this effort appear as an addendum to the social impact analysis chapter.

Although the specific effects of the allocation alternatives differ for each of the communities, these effects can be grouped in terms of Alaskan communities, Northwest Coast communities, and Ballard/Seattle. As might be expected, the smaller communities (which are also the communities most fundamentally, or in the case of St. Paul potentially, dependent on the groundfish fishery) exhibited the most variability and the greatest vulnerability to socially disruptive dislocations. The different options within the inshore/offshore allocation considered also had different outcomes in the different study communities, but the differences were not precise enough (at either the economic or social modeling levels) to draw direct comparisons between them. Clearly the most extreme inshore allocations provide the greatest benefit for the Alaskan coastal communities and afford them the greatest chance at economic and social stability (and development/growth). At the same time, these communities were determined to be able to absorb the potential social disruptions associated with whatever growth allocation alternatives may bring. The tradeoffs in the Northwest Coast communities, and the Pacific Northwest as a whole that result from this most extreme allocative alternative are located mostly in Ballard/Seattle, and are thought to be well within the limits of change that can be handled by the economic/social structures of that community.

The Alaskan communities exhibited a great deal of variability in terms of size, economic and social diversity, and participation in the fisheries under consideration. All will be negatively affected by a continuation of the *status quo*, however, and all will benefit (to varying degrees) from an inshore allocation. The *status quo* is not a stable or equilibrium state, but is rather a situation in which inshore harvesters and processors are experiencing increasing uncertainty in the fish stocks available to them due to the pressure of the offshore fleet. This is not only an uncertainty in terms of the *amount* of fish available to the inshore sector (Kodiak and Unalaska especially, and potentially St. Paul in the near future), but also the *timing and predictability* of when these fish will be available (Kodiak, Unalaska, and Sand Point). As noted elsewhere in this document, while an inshore allocation would clearly benefit the Alaskan coastal communities at least in the short-term, such an allocation would not guarantee community stability in the long-term, as it does not control for continuing competition within industry sectors, stock reductions, price fluctuations, or other such non-allocation factors. Conclusions regarding the short-term social consequences in communities may be drawn with much more confidence than conclusions about long-term consequences.

Sand Point is actually projected by the economic model to minimally lose income under the allocation Alternative 3, but this is considered to be due to the fact that the fishery there concentrates on cod rather than pollock. The advantages of a stable supply (especially if bycatch caps are also separated inshore/offshore), allowing for rationally planned and efficient inshore processing plant operations will offset this and could in the long run actually increase productivity. Certainly the community is much more stable and has healthier prospects for both social and economic viability under the inshore allocation alternative. The processing plant located there had been operating essentially year-round until 1989, when fishery closures forced it to a seasonal schedule, with quite profound social effects which will continue if measures are not taken relatively quickly.

Kodiak and Unalaska are in similar, but less ambiguous positions. Each clearly benefit both economically and socially from an inshore allocation, as seen both in the economic modelling figures and through other data sources, and each is likely to be destabilized by the continuance of the *status quo*. Without an inshore allocation each will certainly remain a viable community, but it is likely that some inshore processors will go out of business and many will certainly only operate seasonally. This will have economic and social repercussions that differ for the two (Kodiak has a much more diverse and predominantly inshore fishing sector when compared to Unalaska), but both would experience economic downturns, the increase of more transient labor, and social "marginalization." Both communities, however, would continue to receive some economic benefit from offshore fishing activity. Compared to Kodiak, Unalaska is considered especially at risk by a continuation of the *status quo* as its recent and marked economic development has been fueled by economic activity associated with the groundfish fishery.

St. Paul, as a community explicitly in need of the development of a local sustainable economy, is a special case. If St. Paul is ever to have a place in this fishery, some form of inshore allocation (either in general or to the Pribilofs specifically) is necessary.

The Northwest Coast communities, like the Alaska communities, exhibit some differences in terms of effects of alternatives. Fishermen from communities such as Bellingham and Newport have a far greater stake in Alaskan inshore fisheries sectors than in Alaskan offshore fisheries sectors. Bellingham processors are tied into the processing network for Alaskan product, but because of current industry organization and vertical integration will not be affected by any inshore/offshore allocation decision. The flow of product to the secondary processing plants in Bellingham will not be interrupted and the economics will remain substantially the same. Newport is the homeport for many small trawlers that previously operated in joint ventures. This community is now increasingly associated with inshore operations in domestic fisheries.

Ballard/Seattle will be the only community of those studied that is negatively impacted in any significant way by an inshore/offshore allocation. Part of this effect will result directly from the reduced activity of the factory trawler fleet. Much of it will be less direct, however, and will occur in the support sector and non-fishing related areas. Many of these positions can be characterized as non-career and relatively temporary (months to several years) jobs held by people who are for the most part young and mobile. The social safety net and other services are also much more developed in Seattle than in the other study communities, particularly the Alaska communities. It should also be noted that the inshore component of Ballard/Seattle's economy receives a significant boost from any of the inshore/offshore allocations, and that much of the economic effect in Ballard/Seattle will be an internal relocation of resources from the one sector to the other. There will be a net loss, more-or-less balancing the gain by Alaskan communities, but it can be expected to be one that will occur over time rather than all at once. It should also be noted that the "losses" reflected in the output of the economic model projected over several years do not take into account any subsequent decision-making by the individuals and industries involved. The positive effects of an inshore allocation to the Alaska communities will be immediate and direct; the negative effects of such an action to the Pacific Northwest would be less immediate and less direct, and in all probability would not "fully develop" due to subsequent decision making by the parties involved. On the other hand, the continuation of the *status quo* is having immediate and direct negative consequences for economic development social stability in the Alaska communities while having very little positive impact on economic development or social stability in the Pacific Northwest.

5.4 General Conclusion

Both the inshore and offshore sectors of the Alaska groundfish industry have experienced explosive growth in the last few years; estimates of processing capacity indicate that this industry is capable of utilizing more than twice the current pollock and Pacific cod quota. This overcapitalization is expected to place increasing competitive pressure on industry participants to obtain the volume of fish necessary to supply this processing capacity. ***As defined by the Council, the underlying problem addressed in the proposed Amendment 18/23 is one of resource allocation, where one industry sector faces preemption by another.*** The analysis has examined the potential effectiveness of the proposed management alternatives in resolving this problem from a biological, economic, and social perspective.

The preferred alternative adopted by the Council (Alternative 8) prescribes a direct allocation of BSAI pollock, and GOA pollock and Pacific cod TACs to the respective inshore and offshore components of the industry specific to each of the fishery management areas involved. The percentage shares apportioned to each component incorporate the Council's consideration of historical and anticipated resource utilization patterns, community, industry, and national economic stability, as well as conscientious management of the fishery resources affected. Generally, the preferred alternative stabilizes or moderately increases the percentage share of the BSAI pollock and GOA pollock and Pacific cod TACs available to the inshore sector, relative to the 1989 baseline. Specific provisions were added to address community development opportunities and local access by the inshore fleet to fishery stocks in the BSAI. In addition, the preferred alternative places a finite expiration date (December 31, 1995) on the prescribed regulatory actions, initiates a research plan for additional long range analysis of problems in the fishery, and directs expedited action on a vessel moratorium. These latter three actions serve as a bridge linking timely action on the immediate preemption problem to a more comprehensive, long term management regime.

Allocating the TAC between inshore and offshore users is expected to provide the inshore sector with some relief from the adverse consequences of preemption by the offshore sector. Benefits of a preferential allocation primarily accrue to the shore-based catchers and processors, along with the affected local port communities. The economic and social benefits to inshore operations arise from increased or stabilized incomes, employment, and related economic activity. Benefits may also derive simply from reductions in the uncertainty, or threat of preemption that accompanies a set allocation. Generally, the percentage allocations of the TACs to the inshore category will necessitate a lowering of the share of the TACs currently being utilized by the offshore fleet. The reduction in tonnage available to the offshore component will result in economic losses to these operations, their supporting service industries, and communities.

The analysis recognizes that the risk of one industry sector preempting another is a direct result of overcapitalization within these fisheries. The remedy established by the preferred alternative provides relief from preemption *between* the inshore and offshore sectors, but does not address adverse competitive consequences arising *within* these defined sectors. The overcapitalization problem is not resolved by any of the proposed alternatives. As a result, the preferred alternative does not necessarily assure the financial stability of the industry or the inshore component over the long term.

The ever-changing operational and economic conditions that have characterized the Alaska groundfish industry during the past five years cloud the estimation of precise impacts under the management alternatives proposed. These conditions inject some variability into the analysis, and preclude definitive measurement of many key issues. Where feasible, sensitivity analyses, or qualitative assessments of impacts have been included to provide insight into such matters.

The biological analysis indicates that as long as the fisheries are managed within their respective quotas, the proposed alternatives will have only minor impact on the pollock and Pacific cod resources. Less certain are the potential impacts upon the related marine ecosystem, including mammals, seabirds, and coastal environment, although such impacts are perceived to be minimal, or manageable within the existing regulatory procedures. Changes in fishing areas and intensity as a result of direct allocations are possible and shifts in fishing or processing activity influence bycatch of other species. It is beyond the capability of this analysis to accurately forecast fishermen's behavior and thus predict how the Council's bycatch management program will be affected. However, qualitative assessment indicates that in the absence of any explicit short term provision to apportion bycatch between the inshore and offshore sectors, bycatch complications might limit the ability of Amendment 18/23 to contain the preemptive pressures between these two industry components. However, the existing mechanism for apportioning PSC limits among various industry segments might be used to address this problem.

The economic analysis presents a description of the relative impacts of the eight alternatives under consideration when compared to the 1989 base year, and with each other. Estimates developed using economic models of the affected industry indicate that in almost every case, the inshore industry and Alaska coastal communities benefit from an increase in their share of the TACs. Fundamentally, these allocations also prevent or limit the preemptive threat from the offshore sector. Much of the economic gain received by the inshore sector under the direct allocations (Alternatives 3, 6, and 8) or small vessels (Alternative 4) would be offset by an economic loss to the offshore sector. An economic trade-off between gains in direct income to local Alaska ports, and losses in Pacific Northwest employment was found for each of the preferential allocations of the TAC to the inshore sector. The percentage allocations in the preferred alternative attempt to balance a preemptive remedy for the inshore component against economic losses likely to be incurred by the offshore industry. The analysis suggests that in certain cases the net income effects to the nation may be positive, although such conclusions rest on several simplifying assumptions. Slight changes in these assumptions regarding the underlying price or cost variables generate impacts leading to the opposite conclusion. While the net dollar impacts of reallocating the fishery resources may be neutral on consumers or the direct catching and processing operations involved, there are national benefits associated with maintaining a balance in the social and economic opportunities inherent in these fisheries. Restricting or managing preemption helps insure that the fishery resources are available to provide benefits to all parties, without unduly obstructing the competitive element of the marketplace. The assignment of set harvest shares or allocations is expected to reduce the uncertainty and operational instability caused by actual or threatened preemption.

The economic analysis illustrates the narrow margin of financial solvency held by both inshore and offshore processors. Processors in both industry categories face ominous financial futures if resource shares continue to decline as new operations enter these fisheries. Shrinking harvest or processing shares will likely cause some operations to pursue other alternatives, with uncertain consequence. To the extent that the excess capacity can be productively channeled into other fisheries or modes of operations, the adverse consequences of preemption, or the proposed alternatives, may be reduced. The economic effects of preferential allocations could easily tip the scale one way or the other for many operators. While businesses are likely to fail in this overcapitalized industry regardless of regulatory action, an allocation of resources by the Council could lead directly to failure of some operations.

The social impact analysis indicates that only in the short-term and in extreme situations where substantial allocations of TAC are made to the inshore sector, would community infrastructure be incapable of accommodating the pressure on social services. In most cases, all Alaska communities studied would likely welcome the economic input into their area associated with a preferential inshore allocation. An increase in Alaska employment would effect a proportionally larger decrease in employment in the Pacific Northwest due to a lower cost of living and lower wages in Washington and Oregon, relative to Alaska. However, the social impact analysis suggests that the Pacific Northwest communities can more easily absorb this loss of employment into other industries. The social analysis also concludes that while an inshore allocation of pollock would tend to support economic stability in the Unalaska/Akutan communities, few of the positive effects would be realized in St. Paul unless the Pribilof Islands were to receive a specific allocation. Thus, specific community development quotas may be necessary to address the unique situations of such locations.

In summary, the Council has selected the preferred alternative from those under consideration given its ability to most effectively resolve the preemption problem, based on a considered analysis of biological, economic, and social variables involved. The direct allocation of pollock and Pacific cod TACs to defined inshore and offshore components of the industry appears more effective in providing a timely and succinct response to the preemption problem than do those alternatives offering indirect remedies, and/or requiring subsequent iterative adjustments by the Council. The preferred alternative provides for inshore/offshore allocations that are a moderation of features suggested in the original alternatives 3, 4, and 6, recognizing that the relief from preemptive conditions provided to the inshore sector results in some adverse economic impacts for the offshore component of this industry. While elements of the Alaska groundfish industry involve dynamic relationships that inject uncertainty into future projections, the analysis concludes that the biological, economic, and social benefits arising from the preferred alternative are consistent with the mandates of the Magnuson Act, and the fishery plans and goals established by the Council for the BSAI and GOA. In this context, the proposed actions to rectify the economic and social problems arising from preemption are expected to create positive social gains, while maintaining or furthering conscientious management of the fishery resources involved.

5.5 Impacts of the Alternatives on Small Entities

The Regulatory Flexibility Act requires examination of the impacts of proposed actions on small businesses, small organizations, and small jurisdictions to determine whether a substantial number of small entities will be significantly impacted by the management measures. In general, fishing vessels and many processing operations are considered to be small businesses. A total of 1,737 vessels may fish groundfish off Alaska in 1991, based on Federal groundfish permits issued by NMFS through March 19, 1991. Many of the vessels fall into the inshore/offshore categories defined by the Council for the pollock and Pacific cod fisheries. This analysis indicates that specific allocations to inshore/offshore users could benefit small harvesting or processing operations associated with one sector, and conversely, negatively impact small operations associated with the other sector.

The support service industry (e.g. equipment supply, fuel, groceries, entertainment) directly benefits from economic activity in both the inshore and offshore sector. It is possible that as allocations are made, loss in revenue associated with one industry category will be offset by gains obtained from the other.

5.6 Effects on Fisheries Conducted in Adjacent Areas

It is unclear as to what effects the inshore/offshore alternatives may have on fisheries conducted off the west coast of the United States. In 1991, elements of the Alaskan offshore fleet participated for the first significant time in the Pacific whiting fishery. In anticipation of the phase-out of the joint venture fisheries and the increased growth in the offshore domestic fleet, the Pacific Fishery Management Council has allocated the whiting TAC to harvest vessel categories, and indirectly to affiliated inshore and offshore processors. How a specific allocation of pollock or Pacific cod to inshore and offshore industry sectors in Alaska will further affect the Pacific whiting fishery or other fisheries along the west coast is unknown. Socioeconomic information reported in Section 4.4.1.3 and 4.4.2.3 suggests that any impacts will be minor, as the fleet for the most part is "inshore" dependent (and secondary processing facilities can take delivery from either inshore or offshore segments), but offshore displacement from "Alaskan" fisheries to "Pacific Northwest" fisheries may affect those "inshore" fishermen that fish both areas (this possibility, however, was not analyzed).

5.7 Consistency with Coastal Management Act

Each of the alternatives would be conducted in a manner consistent, to the maximum extent practicable, with the Alaska Coastal Management Program within the meaning of Section 307 (c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

5.8 Effects on Vessel Safety

Specific quota allocations to inshore and offshore users are not expected to negatively impact vessel safety. Vessel safety may be enhanced if the threat of preemption is lessened by the Council's action. Smaller vessels associated with the inshore component may have more freedom to not operate in bad weather without the threat of preemption from larger, highly mobile, all-weather vessels.

5.9 Relationship to Council's Comprehensive Fishery Management Goals

The Council adopted nine Comprehensive Fishery Management Goals in 1984 for the development of management plans. These Goals, along with the seven National Standards mandated by the Congress in the MCFMA, serve as the framework and guidelines for changes to the fishery management plans such as the proposed Inshore/Offshore Allocation Amendment 18/23.

While each of the nine Goals adopted by the Council apply to the proposed alternative, four of these objectives bear directly on the preferred alternative. These four Goals are listed below, along with specific qualifying issues and concerns relating to the proposed amendment, as cited in the Council's Comprehensive Fishery Management Goals.

Goal 2: Ensure that the people of the United States benefit from optimum utilization of the Nations's publicly-owned fishery resources.

1. production of high quality fish products over the maximum season at acceptable prices;
3. economic self-sufficiency and viability of the domestic fishing industry and supporting infrastructure;
5. generation of reasonable economic rent from utilization of publicly-owned resources;
6. positive benefit-cost ratio for public management operations.

Goal 3: Promote economic stability, growth and self-sufficiency in maritime communities.

1. stabilizing the flow of fishery-related revenues through a community so that revenues occur during longer and more regular periods of time throughout the year. This is more beneficial than short, intermittent bursts of activity;
4. fuller and more consistent utilization of fishery resources;
5. extending, within biological limits, the availability of fishery resources to the industry over the longest feasible season.

Goal 4: Achieve optimum utilization by the U.S. fishing industry of fishery resources in the fishery conservation zone off Alaska.

4. equitable allocation among domestic user groups;
8. capabilities of domestic fleets;

Goal 7: To the extent consistent with other comprehensive goals promote the economic health of the domestic fishing industry: encourage the profitable development of underutilized resources: discourage unneeded investment in fisheries with excess harvesting capacity.

1. fishery management should endeavor to provide stable populations of raw material (within the limits of natural fluctuations) harvested during periods when those populations are in prime marketable condition;
2. fishery management strategies shall consider harvesting and processing capacities and market demands;
5. evaluation and employment of appropriate management strategies, such as reduction of regulated inefficiencies, control of investment incentives, and limited entry as a means of effort management.

5.10 Changes in Administrative Costs

To the extent that two distinct fisheries would exist under the preferred alternative, administrative costs would be expected to increase. TAC quota and possibly bycatch monitoring and enforcement would have to include the separate examination of harvesting and processing in the different sectors. Additionally, to the extent that significant restructuring of the industry may occur, increased administrative costs are possible in response to unforseen issues arising from such reorganization.

CHAPTER 6

LIST OF PREPARERS

6.0 LIST OF PREPARERS

Steven K. Davis North Pacific Fishery Management Council P.O. Box 103136 Anchorage, AK 99510	Analytical Team Leader, editor, and contributing author.
Sandra Lowe Alaska Fisheries Science Center National Marine Fisheries Service 7600 Sand Point Way N.E. Seattle, WA 99815	Fishery Biologist and primary investigator of the biological analysis.
James C. Cornelius North Pacific Fishery Management Council P.O. Box 103136 Anchorage, AK 99510	Economist, and responsible for preparation of the economic analysis.
Marcus Hartley North Pacific Fishery Management Council P.O. Box 103136 Anchorage, AK 99510	Economist and contributing author to the economic analysis.
Margaret J. Kircher North Pacific Fishery Management Council P.O. Box 103136 Anchorage, AK 99510	Computer Assistant; responsible for compilation of economic database and development of graphics illustrations.
Lew Queirolo Alaska Fisheries Science Center National Marine Fisheries Service 7600 Sand Point Way N.E. Seattle, WA 98115	Economist; contributing author to the economic analysis.
Rebecca Baldwin Alaska Fisheries Science Center National Marine Fisheries Service 7600 Sand Point Way N.E. Seattle, WA 98115	Economist; contributing author to the economic analysis.
Mike Dueker Alaska Fisheries Science Center National Marine Fisheries Service 7600 Sand Point Way N.E. Seattle, WA 98115	Economist; contributing author to the economic analysis.
John S. Petterson Impact Assessment, Inc. La Jolla, CA	SIA Principal Investigator, analyst, and responsible for the preparation of the Ballard/Seattle addendum.

Michael A. Downs Impact Assessment, Inc. La Jolla, CA	SIA Project Manager, analyst, and responsible for the preparation of the Unalaska and Sand Point sections.
Michael S. Galginaitis Impact Assessment, Inc. Anchorage, AK	SIA analyst, and responsible for the preparation of the Kodiak, St. Paul, Bellingham, and Newport sections.
Mari Rodin Impact Assessment, Inc. La Jolla, CA	SIA analyst responsible for secondary data review.

CHAPTER 7

LIST OF AGENCIES AND ORGANIZATIONS CONSULTED

7.0 LIST OF AGENCIES AND ORGANIZATIONS CONSULTED

Alaska Department of Fish and Game

Alaska Fisheries Development Foundation

Alaska Groundfish Databank

Alaska Department of Labor

American High Seas Fisheries Association

American Factory Trawlers Association

Fishing Vessel Owners Association

International Pacific Halibut Commission

Kodiak Longline Vessel Owner's Association

Midwater Trawlers' Association

Minerals Management Service, U.S. Dept. of the Interior

National Marine Fisheries Service, U.S. Dept. of Commerce

Oregon State University

Pacific Seafood Processors Association

Southwest Alaska Municipal Conference

U. S. Fish and Wildlife Service, U.S. Dept. of Interior

United Fishermen's Marketing Association

University of Alaska, Sea Grant Program

Washington State Department of Labor & Industries

ADDENDUM

North Pacific Fishery Management Council

Richard B. Lauber, Chairman
Clarence G. Pautzke, Executive Director

605 West 4th Avenue
Anchorage, Alaska 99501

Mailing Address: P.O. Box 103136
Anchorage, Alaska 99510

Telephone: (907) 271-2809
FAX: (907) 271-2817

May 28, 1991

Dear Reviewer:

Enclosed are two addenda to the regulatory analysis of the inshore-offshore issue which was made available for public review on April 29, 1991. Addendum I is an overview of the pollock processing industry, prepared by Dr. Steve Freese, NMFS International Trade Specialist. It contains information on recent trends in processed pollock production, product mix, product prices, and a discussion of market structure and allocation of pollock catches as they relate to the inshore-offshore issue.

Addendum II provides information on alternatives available to displaced catching and processing operations. Such alternatives include internal changes in operation of the vessel or plant, a shift to other North Pacific fisheries or from offshore to inshore, or closing down operations temporarily or permanently. This information is based on follow-up discussions with affected catchers and processors during early May, 1991, which provided further industry reaction and input to the likely impacts of the proposed regulatory changes.

The North Pacific Fishery Management Council requests your comments on this information. As with the main analysis dated April 29, 1991, written comments should be received in the Council office no later than 5:00 p.m. (ADT) on June 20, to ensure that they are included in the Council's briefing books. Additional written comments received by the close of the 45-day comment period, June 24, will be supplied to the Council in their supplemental folders.

The Council will accept oral testimony at the June 24-29 meeting in Anchorage, but such testimony should be limited to clarification of earlier written comments and recommendations about the Council's choices rather than submission of new information.

NOA HLA/CORR

ADDENDUM I

to the

Regulatory Impact Review/Initial Regulatory Flexibility Analysis
of Proposed Inshore/Offshore Allocation Alternatives
Amendments 18/23 to the
Groundfish Fishery Management Plans
for the Gulf of Alaska and the Bering Sea/Aleutian Islands

AN OVERVIEW OF THE POLLOCK PROCESSING INDUSTRY*

The purpose of this discussion is to describe recent trends in processed pollock production and product mix and to indicate differences between the shoreside and at-sea processors in this industry. Some of the issues that will be addressed concern prices, foreign investment, and market structure.

Preliminary conclusions of this overview are: (1) shorebased operators produce proportionately more surimi than fillets in comparison to the at-sea sector, so there may be a change in product mix favoring surimi over fillets; (2) prices for fillets have increased relative to surimi, although surimi prices have shown a recent upward trend; (3) at-sea prices generally exceed shorebased prices but the differences may be the result of product quality and vertical integration within the industry; (4) the decline in surimi prices during 1990 are associated with oversupply as well as changes in market structure; (5) foreign investment in pollock processing is significantly higher in the shoreside sector; and (6) from an onshore-offshore perspective the relationship between foreign investment and market control cannot be quantified in a meaningful way given, among other things, the nature of ownership, recent patterns of investment, and the amounts of projected increased shoreside production of surimi relative to the size of the world market.

I. Recent Trends in Processed Pollock Production

In recent years there has been tremendous growth in the U.S. industry's ability to catch and process Alaska groundfish. Much of this growth has been the result of significant investments in surimi manufacturing. Based on estimates of actual production, at-sea production of surimi has expanded approximately four-fold from 31,200 tons in 1988 to 136,000 tons of surimi processed in 1990 (Table 1).[1] Shoreside production has similarly grown from 27,000 tons in 1988 to 43,000 tons in 1990. Combined, shoreside and at-sea production reached 179,000 tons of surimi in 1990.

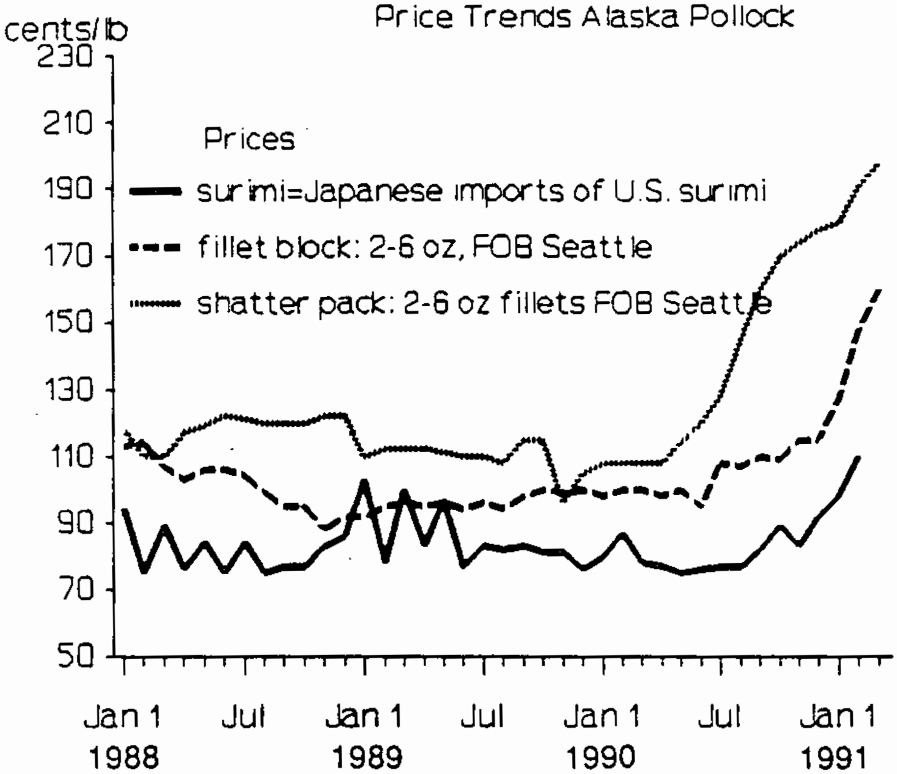
Mirroring the growth in surimi production, was the industry's ability to process fillets, blocks, and fish meal.[2] Since 1988, shoreside production of fillets has almost tripled to 14,000 tons in 1990 while at-sea production has grown from 28,000 tons in 1988 to 61,000 tons in 1990. Total fillet production in 1990 reached an estimated 75,000 tons.

In addition to the growth in capacity, another prime reason for the growth in fillet production has been the price increase of pollock fillets relative to surimi since mid-1990 (Graph 1). The growth in demand for pollock fillets has been spurred by the declining groundfish resources, especially the cod resources, in the North Atlantic. In 1983, groundfish catches by the major groundfish fillet exporting countries of Denmark, Canada, Iceland, and Norway totalled 4 million tons. By 1990, such catches are project to decline to 3.5 million tons. In both 1983 and 1990, approximately 50% of these catches were Atlantic cod.[3]

TABLE 1
PRELIMINARY ESTIMATES OF PROCESSED PRODUCTION OF POLLOCK

		Fillets or Blocks	Surimi	Minced Metric Tons	Roe	Whole or H&G	Fish Meal
Product Weight Estimates							
Shorebased							
1988		5400	27000	0	700	500	4000
1989		8700	31400	700	600	300	7000
1990		14000	43000	1600	1500	1200	17000
	BSAI	5000	38800	200	1400	30	16800
	GOA	9000	4200	1400	100	1170	200
At-Sea							
1988		28100	31200	0	560	300	6000
1989		30400	73200	1700	6100	100	8900
1990		61100	136400	12000	11100	3500	40100
	BSAI	59300	136100	11900	11100	600	40100
	GOA	1800	300	100	0	2900	0
Total							
1988		33500	58200	0	1260	800	10000
1989		39100	104600	2400	6700	400	15900
1990		75100	179400	13600	12600	4700	57100
	BSAI	64300	174900	12100	12500	630	56900
	GOA	10800	4500	1500	100	4070	200

Graph 1
Price Trends Alaska Pollock



Consequently, there is a shortage of groundfish fillets in the major world markets. For example, U.S. imports of groundfish fillets and blocks from all countries has declined from an average annual level of 300,000 metric tons for the 1985 -1987 period, to 250,000 metric tons for the period 1988 to 1990; approximately a 20 percent decline. [4] Imports of groundfish fillets and blocks typically fill over 85 percent of the U.S. market. (Total U.S. 1990 imports of 211,000 tons were 15 percent below 1989 levels.) Although the catch quotas for these countries declined approximately 10 percent from 1989 to 1990, there are indications that the North Atlantic cod stocks may start increasing as early as 1992. [3],[4],[5]

Another factor stimulating the growth in fillet production was the fall in surimi prices (Graph 1).[6] One prime suspect for the fall in surimi prices, especially when comparing 1990 to 1989, was excess supply as reflected in cold storage holdings (Graph 2). June-October 1990 cold storage holdings greatly exceeded June-October 1989 cold storage holdings. Coincidental with the October closure of the Bering Sea to pollock fishing, cold storage holdings have declined and continue to do so. (January, 1991 cold storage holdings are approximately 30 percent below January, 1990 levels.) In addition to the U.S. industry's switch of processing capacity towards fillets, other reasons for the decline in cold storage holdings are the poor pollock fishery in the Donut Hole, and declines in Japanese coastal landings of pollock and harvests in Soviet waters. Both the decline in cold storage holdings and increases in the prices of pollock fillets appear to be two of the reasons that surimi prices in March of 1991 have reached their greatest level since January 1988.

II. Product Mix

According to 1990 Weekly Production logbook information, there are differences in the product mix depending on whether production was based on pollock from the Bering Sea and Aleutian Islands (BSAI) or the Gulf of Alaska (GOA).[7] In the GOA, fillet production was greater than surimi production while in the BSAI surimi production was greater than double that of fillet production. Almost all roe production took place in the BSAI. Because of the much smaller GOA TAC, most of the pollock production takes place in the BSAI management area, and very little of the at-sea production takes place in the GOA.

In order to determine relative product mix, there is a need to find a method of aggregating different product forms. As there is a need to evaluate the relative impacts of different onshore-offshore distributions of the total pollock quota, product recovery rates were used to determine how much of the pollock resource is converted into surimi or fillets.[8] As minor differences in product recovery rates can cause major changes in the magnitudes of total processed production by product form, two sets of processed product recovery rates were used. The first set, is based on conversion rates proposed by NMFS and the second set of conversion rates reflect some of the comments to these proposed conversion rates.[9] During 1990, approximately 98 percent of the fillets produced were skinless and rib-less (boneless), therefore a 25 percent product recovery rate was chosen for fillets.

The general industry trend shows the influence of the rise in fillet prices regardless of conversion factor assumptions (Table 2). Fillet production increased in 1990 over 1989. Also influencing the relative proportion of the pollock catch that is converted to fillets is whether during the period increases in physical fillet production capacity were less than, more than, or equal to increased in physical production capacity for surimi.[10]

During 1990, at-sea processors in total devoted more of their catch to fillet production than shore-based operations. Depending on the conversion factors, it is estimated that approximately 20 percent of the total pollock harvested in 1990 was converted into fillets, and 80 percent into surimi. Also depending on the conversion factors used, at-sea processors processed a greater share (21 percent) of their catches into fillets than do shorebased operations (7-9 percent).

TABLE 2

ROUND WEIGHT ESTIMATES OF PROCESSED SURIMI AND FILLETS

(Based on Table 1)

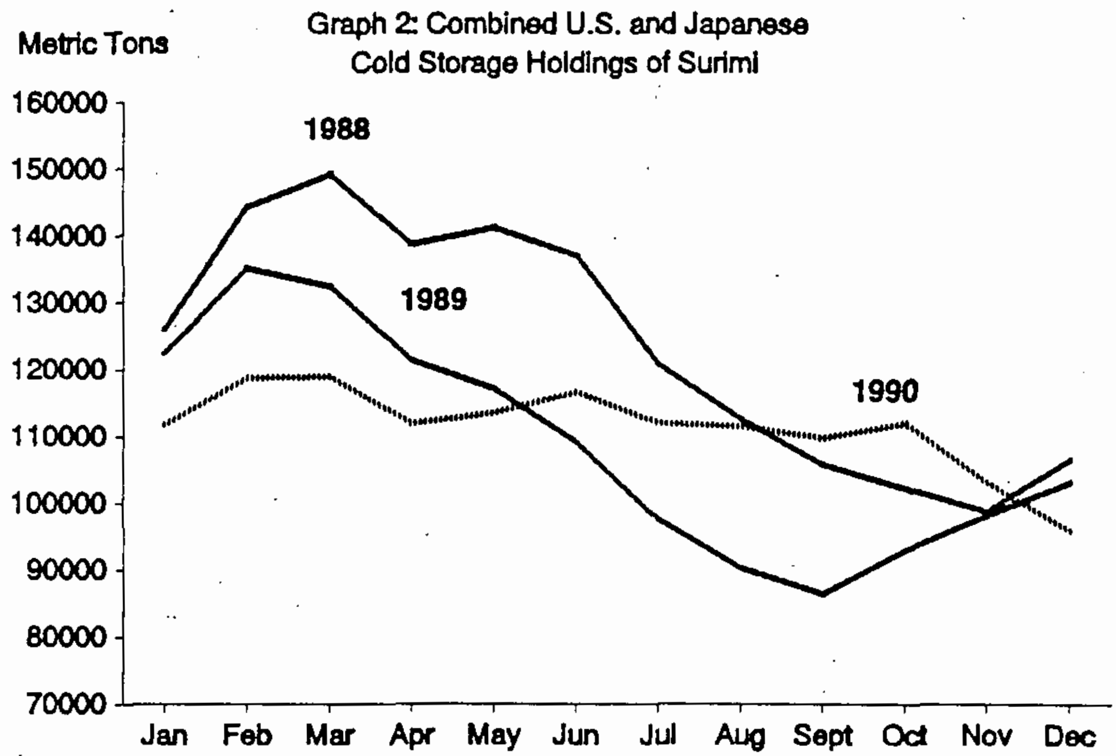
Round Weight Estimates: Metric Tons

I. Shoreside Product Recovery Rate: Fillet=25%, Surimi=15%
At-Sea Product Recovery Rate: Fillet=25%, Surimi=15%

		Fillets or Blocks	Surimi	Total	% Total Fillets	% Total Surimi
Shorebased						
1988		21600	180000	201600	10.7%	89.3%
1989		34800	209300	244100	14.3%	85.7%
1990		56000	286700	342700	16.3%	83.7%
	BSAI	20000	258700	278700	7.2%	92.8%
	GOA	36000	28000	64000	56.3%	43.8%
At-Sea						
1988		112400	208000	320400	35.1%	64.9%
1989		121600	488000	609600	19.9%	80.1%
1990		244400	909300	1153700	21.2%	78.8%
	BSAI	237200	907300	1144500	20.7%	79.3%
	GOA	7200	2000	9200	78.3%	21.7%
Total						
1988		134000	388000	522000	25.7%	74.3%
1989		156400	697300	853700	18.3%	81.7%
1990		300400	1196000	1496400	20.1%	79.9%
	BSAI	257200	1166000	1423200	18.1%	81.9%
	GOA	43200	30000	73200	59.0%	41.0%

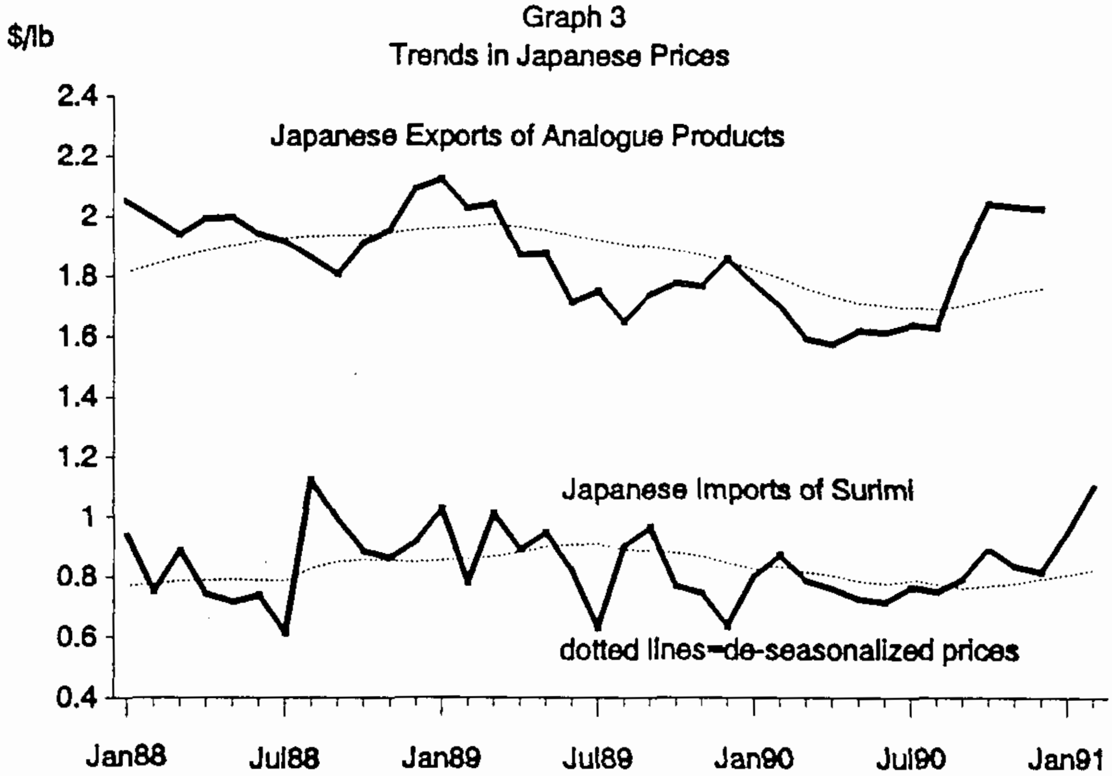
II. Shoreside Product Recovery Rate: Fillet= 25%, Surimi=20%
At-Sea Product Recovery Rate: Fillet=25%, Surimi=15%

		Fillets or Blocks	Surimi	Total	% Total Fillets	% Total Surimi
Shorebased						
1988		21600	135000	156600	13.8%	86.2%
1989		34800	157000	191800	18.1%	81.9%
1990		56000	215000	271000	20.7%	79.3%
	BSAI	20000	194000	214000	9.3%	90.7%
	GOA	36000	21000	57000	63.2%	36.8%
At-Sea						
1988		112400	208000	320400	35.1%	64.9%
1989		121600	488000	609600	19.9%	80.1%
1990		244400	909300	1153700	21.2%	78.8%
	BSAI	237200	907300	1144500	20.7%	79.3%
	GOA	7200	2000	9200	78.3%	21.7%
Total						
1988		134000	343000	477000	28.1%	71.9%
1989		156400	645000	801400	19.5%	80.5%
1990		300400	1124300	1424700	21.1%	78.9%
	BSAI	257200	1101300	1358500	18.9%	81.1%
	GOA	43200	23000	66200	65.3%	34.7%



Graph 2: Combined U.S. and Japanese
Cold Storage Holdings of Surimi
Metric Tons
160000
150000
140000
130000
120000
110000
100000
90000
80000
70000
1988
1989
1990
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sept
Oct
Nov
Dec

Graph 3
Trends in Japanese Prices



In December 1990, NMFS surveyed the surimi industry's intent to produce and export surimi to Japan. For 1991, despite the addition of two large surimi vessels, the Alaska Ocean and the Excellence, the at-shore industry projected that surimi production would fall from their actual 1990 levels by 10 percent, and by 40 percent from preseason 1990 estimates.[11] Similarly, the shorebased processors indicated that they would increase production by 15 percent from preseason estimates and by 81 percent from actual 1990 levels. This suggests that without an abrupt increase in surimi prices relative to fillets, during 1991 more of the at-sea pollock catch will be devoted to fillets while more of the shore-side delivered catch will be devoted to surimi relative to 1990 levels.

III. Product Prices

Preliminary review of both 1989 and 1990 processed product data indicate that at-sea processors do receive higher prices for frozen fillets and surimi. Below are NMFS survey statistics developed for 1989.[12]

Average Annual Pollock
1989 Wholesale Prices
(FOB PLANT)

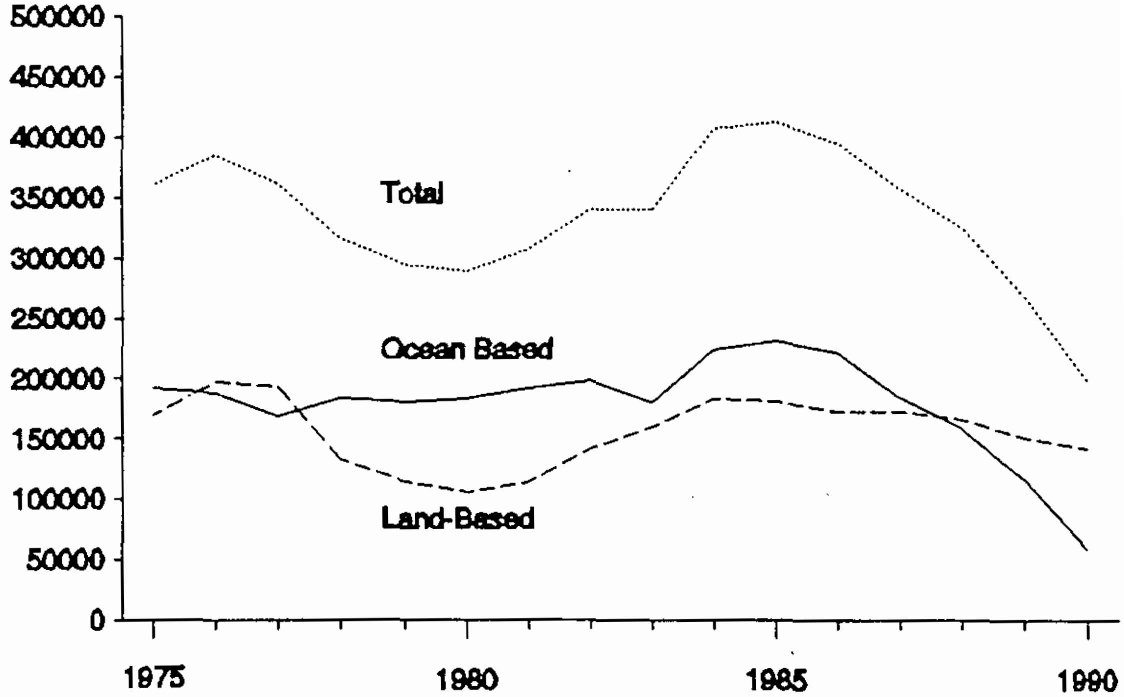
	At-Sea $/lb	Shorebased $/lb
Fillet Blocks	$0.83	$0.76
Fillets shatterpack	$1.06	$0.99
Fillets IQF	$0.80	$0.80
Surimi	$0.85	$0.82

There have been numerous discussions concerning the issue of quality. The prices displayed above indicate that "on average" at-sea processors receive higher prices than shoreside processors. What do these prices reflect? For the fillet categories, because the fillet market is an extremely competitive market where competing products are produced by many countries and sold to many countries, one could reasonably argue that at-sea processors, in general, during 1989 produced higher quality products. However, these prices do not prove or disprove any hypotheses that either sector can produce a higher quality product than the other.[13]

Based on reviews of company-by-company information, there is a wide range in prices for both at-sea and shoreside processors. In ranking these companies the high and low priced sectors may be interspersed. For example, at-sea processors receive not only the highest prices for surimi, but also the lowest. The implication, given the wide range of prices, is that even if a company had the capability of producing the highest quality product on the market, it does not necessarily follow that the company will chose to do so. Similar to the choice of what products a company makes, companies must also choose the level of quality.

Surimi is a good example of the quality choices a company must make. If prices for imitation crab are declining, then analogue producers may chose to use a lower quality surimi in their products to cut costs in order to maintain profits. A comparison of the trends in average price for Japanese analogue product exports with the price of Japanese surimi imports indicates that such a phenomenon may have been happening in 1990 (Graph 3). Additionally, the price of U.S. top quality surimi is a function of the availability of other sources of top grade surimi or alternative products. During 1990, it was reported that the demand for top quality surimi is expected to fall due to the growth of top quality surimi imports from

Graph 4
Japanese Production of Frozen Surimi



the U.S., along with the supply of top grade surimi from Japanese operations in the Donut Hole and from New Zealand, and the greater use of vegetable protein as an substitute for surimi. [14]

Other factors may underlie the differences between shoreside and at-sea surimi prices: targeted markets, contractual relationships, and the degree of vertical integration--relationships between the intermediary processor and the final processor. For example, it is widely held that the destination for top quality product is Japan, while, in general, the U.S. and Korean markets typically require only the lesser grade surimi. In the preseason 1989 interviews between NMFS representatives and U.S. surimi processors, shoreside processors indicated that 54 percent of their 1989 production was targeted for Japan, while at-sea processors indicated a higher percentage, 64 percent, was targeted for Japan.[15] Many at-sea companies have long term contractual relationships with Japanese importing companies and within these contracts there may be requirements for certain grades of surimi. Finally, does it make sense for surimi processors that are part of vertically integrated companies to charge/or be paid premium prices by their counterpart analogue producers? With respect to surimi, both the shoreside and at-sea sectors have companies that are part of vertically integrated companies; with respect to fillets, there is a growing trend towards vertical integration as both shoreside and at-sea companies are investing in U.S. breading facilities.

IV. Market Structure Issues

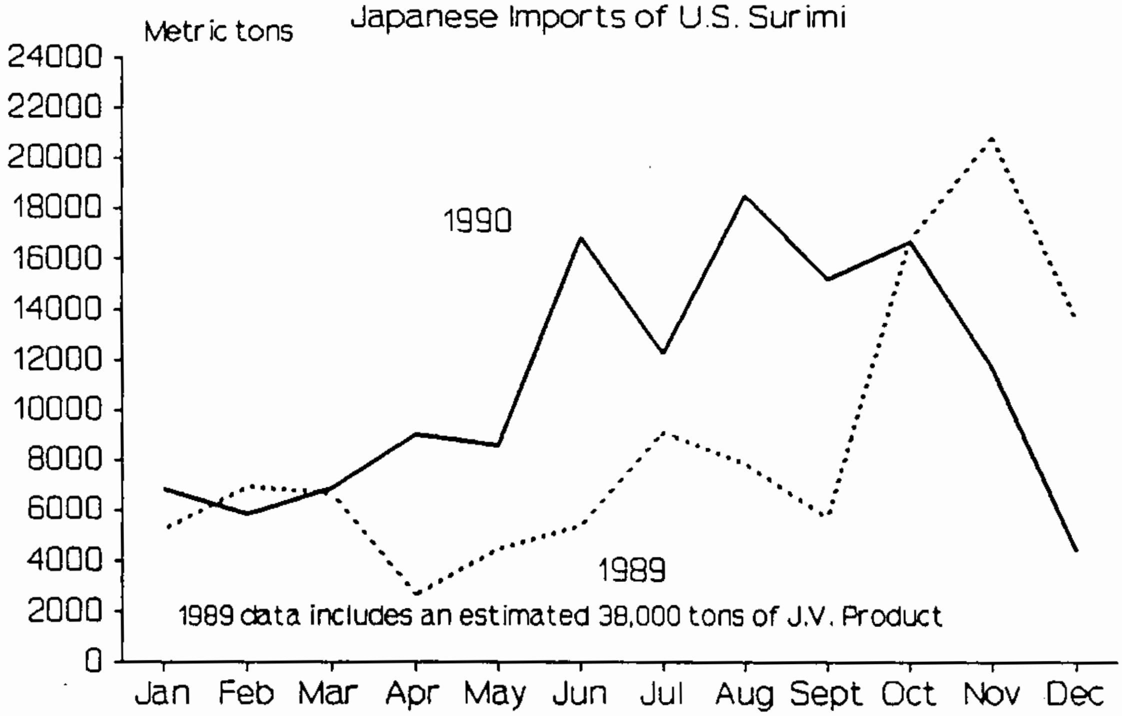
Relative to the fillet market, surimi is not as globally competitive. The overwhelming bulk of surimi is either produced in or exported to Japan. Japanese production (land based and ocean based) reached a peak of 400,000 tons in 1985 and has since fallen to approximately 200,000 tons in 1990 (Graph 4). Based on Japanese import statistics, Japan's imports of surimi from all countries reached a level of 143,000 tons in 1990. Of this amount 133,000 tons, or 93 percent, was U.S. product. U.S. export statistics suggest that approximately 121,000 tons of U.S. surimi was exported to Japan, and 22,000 tons to Korea, indicating that except for minor shipments to other Asian countries and to Europe, the U.S. market consumed the rest of 1990 U.S. production of 178,000 tons, or approximately 25 to 35,000 tons of surimi in 1990.[16] It appears that with respect to surimi, there are currently two suppliers (the Japanese and U.S surimi industries) and one consumer (Japan's analogue product manufacturers).

Discussions with the industry and the trends reported above suggest the following scenario which inter-links these trends with changes in market structure.[17] Currently there are 10 to 15 importers of surimi, 80 distributors, and 3,100 kamaboko manufacturers in Japan. Surimi is sold to the importers, who pass it on to the distributors, and then up to the kamaboko manufacturers. Once the kamaboko is made from the surimi, the kamaboko passes from the manufacturers back to the distributors and then the product enters into the retail sector or into the various wholesale sectors.

During 1991 it is expected that the Japanese surimi market will be quite competitive because of the projected shortage of surimi and the loss of market control by the dominant surimi companies. Prices will rise as a result. Five years ago there were only two major importers of surimi--Nippon Suisan and Taiyo. Through a complicated system of ownership, these two companies essentially controlled all market channels for surimi. Five years ago there were similar numbers of distributors and manufacturers as today, but they had to line up with either Nippon Suisan and Taiyo. With the growth in the number of U.S. companies and declining production in Japan, Nippon Suisan and Taiyo no longer could control the market. In addition to other fishing companies such as Nichiero and Hoko, trading companies such as Mitsui became importers of surimi, building relationships with the American factory trawlers which are not (except for the newest entrant "Excellence") owned or aligned with Nippon Suisan or Taiyo.

The 80 distributors and the 3,100 kamaboko manufacturers now have more options with respect to sources of supply. In this new situation, these companies, especially the kamaboko manufacturers, have a greater

Graph 5
Japanese Imports of U.S. Surimi



Source:F/SWR NMFS Foreign Fisheries Releases (Sonu) control over quality and greater access to the actual surimi manufacturers so that they can order the types of surimi that meets their needs.

During the first six months of 1990, much new U.S. at-sea capacity was brought on line and as a result much low grade surimi was produced as the factory trawlers were learning how to produce high grade surimi. In addition to this "start up" factor and the growth in total sales to Japan by U.S. at-sea and shoreside manufacturers, a further downward influence on price was that much of this product was supplied to Japan during the summer, a period when demand for surimi is typically weak (Graph 5). Also during much of the year, the new Japanese importers were offering surimi at reduced prices to attract customers and increase market share. In the past, Nippon Suisan and Taiyo would control the market such that they would receive high prices from the distributors and pay low prices to U.S. manufacturers. In the current situation, competitive forces are now causing prices in Japan to rise at all levels as well as to the U.S. manufacturers.

V. Allocation of Pollock Catches

As so little of the 1990 at-sea production of pollock took place in the GOA, the discussion below only looks at the issues concerning allocating the Bering Sea and Aleutian Island quota. To apply the implications discussed below to the proposed split of the quota into equal inshore and offshore components also requires the assumption that factory trawlers or motherships do not choose to become members of the inshore community as the proposed definition of "inshore" would allow if such vessels would agree to be tied up for a year or to not receive and process fish beyond the territorial sea.

A. Estimates of Changing Product Mix Between Fillets and Surimi.

As was discussed above, at-sea processors in 1990 processed more of their pollock catch into fillets than shorebased processors. There was a significant difference in their percentages: at-sea, 21 percent, and shorebased operations, 7 to 9 percent. As both sectors some capability to switch between fillets and surimi, a whole host of factors have to be taken into account such as: physical capacities, relative prices, ownership philosophies that are influenced by markets (export-domestic), long term sales contracts, or investment (foreign-domestic), resource abundance and average size of the fish, and changing fishery management regulations. Preseason industry projections of 1991 surimi production suggest that the at-shore sector will increase the share of its pollock catch towards more fillet production and the shoreside plants will increase the amount of production that is surimi.

More specifically, for purposes of providing an example, the implications of product mix of a 50-50 split of the Bering Sea pollock quota are as follows. As the 1990 data show (Table 2), it may be inappropriate to base trends in product mix on the percentages for 1988 and 1989. The breakout of production between the BSAI and GOA, shows a significant difference in product mix by area and by processor type. Consequently, especially with the current management regime in the GOA, the 1990 BSAI percentages seem to be the best reference points upon which to do an analysis.

A 50-50 split of the BSAI quota would imply, using the round weight estimates in Table 2, that the at-sea fleet would only be able to process 700 million metric tons as opposed to the 1.1 million metric tons indicated under either set of alternative conversion factors. A loss of 400,000 tons, based on the 1990 product mix percentages would result in 80,000 tons less of pollock being converted to fillets, and 320,000 tons less of pollock being converted to surimi by the at-sea processors. In terms of product weight, the at-sea sector would be producing 20,000 tons less of fillets, and 48,000 tons less surimi. Shorebased operators, on the other hand, would gain an additional 400,000 tons of catch, 8 percent would be converted into fillets and 92 percent into surimi.[18] On a product weight basis this translates into 8,000 more tons of fillets being produced and 55,000 to 74,000 tons of surimi being produced by shorebased processors. The net effect on the product mix is that relative to 1990, 12,000 tons less of fillets would be produced and 7,000 to 26,000 more tons of surimi produced. Total fillet production would decrease by about 16 percent while surimi production increase by about 4 to 15 percent.

Using the 1990 percentages underestimates the decreases in fillet production and increases in surimi production unless surimi prices significantly and rapidly improve in 1991 and beyond. Also note, that product mix is quite sensitive to relative prices and should the North Atlantic cod stocks return to healthy status, at-sea processors may increase surimi production.

B. Foreign Investment and Market Structure

A good summary of foreign investment issues voiced by the industry can be found in "Foreign Investment in U.S. Fishing Industry" by J. Sullivan and P. Heggelund published by Lexington Books in 1979. These authors succinctly state:

> "Even more significant for management purposes will be data on foreign and domestic investments in processing particularly if this investment is used by foreign firms as a way of gaining control of fish resources denied by council actions. The adverse effects of such investments could be (1) a reduction in processing labor as fish are shipped to the foreign nation for final processing; (2) the use of transfer pricing to repatriate profits without incurring U.S. corporate income taxes; (3) various restraints of trade; and (4) a forcing out of small wholly-owned U.S. firms by large integrated firms.
>
> The good effects could be (1) higher prices paid to fishermen; (2) lower prices to U.S. consumers because of the efficiencies gained by horizontal and vertical integration, economies of scale for small U.S. firms, and rationalization of processing through the use of different labor pools in several countries; (3) increased technology transfer; (4) capital inflow into the U.S.; and (5) the opening up of foreign markets not otherwise available to U.S. firms."
>
> "Some Japanese investors are thought to see low profitability for their equity investments as a first step in achieving total acquisition of these U.S. firms. Without profits the local participants are unable to finance reduction in Japanese debt or inequity."
>
> "The Japanese desire for tying procurement contracts to their investments can have the result of locking the American firms into prices which are lower than market and a threat to profitability."

One relevant question that may be asked is, will any of the alternatives allow Japanese companies to reassert control over surimi markets?[19] Returning to the example of a 50-50 split, it must be first determined if the addition of 7,000 to 26,000 tons of surimi to the market could cause prices to change. The 1990 sum of beginning cold storage holdings, imports, and total Japanese production was approximately 440,000 tons; down from 490,000 tons in 1989, and 595,000 tons in 1988 for a three year average of 508,000 tons. Ignoring quality issues, an additional 7,000 to 26,000 tons of surimi appears to be less than 5 percent of this average. The potential price impact of such a change will depend upon the nature of the demand for surimi.

Using 1989 revenues as a common base of aggregating across companies to develop an index of foreign control, it appears that the Bering Sea shoreside plants that processed pollock in either 1989 or 1990 have an average Japanese ownership of 70 percent. With the addition of the new Bering Sea plants in 1991 which are presumably 100 percent foreign-owned, this percentage will be higher. (Using 1989 revenues, at-sea companies reporting to the OMB foreign investment surveys, averaged approximately 20 to 30 percent foreign ownership. [20]) Using 1990 surimi production (product weight for revenues are unavailable at this time) as a base for aggregation across companies, the average ownership percentage calculation would be 70 percent as well. A 50-50 split would cause the shoreside sector total production of surimi from the Bering Sea to increase from 39,000 tons to somewhere between 93,000 to 112,000 tons based on the projections described above and the conversion factors used in Table 2. With an average foreign ownership of 70 percent, this would imply that at a maximum, 78,000 tons of shoreside produced surimi are "owned" by foreign interests; an increase of approximately 50,000 tons over the 1990 ownership level (38,800 tons x .7).

The next step of relating foreign ownership with market control is difficult as it requires a careful understanding of the marketplace and detailed knowledge of how the major individual participants in the market interact with each other. It is not known how much of the total supply of surimi is already controlled by these companies. Furthermore, the simple indices of foreign ownership employed above do not account for the level of active ownership. It is based on percentage of foreign ownership whether it be by stock or partnership. Stock ownership does not necessarily imply the owner has a direct say in the operations in the company, particularly if the stock is a publicly traded stock. Nor does being a partner necessarily imply having a direct say in the operation of the company, particularly if there are numerous partners. On the other hand, even with no foreign ownership, foreign control can be exerted through sales contracts, loans, or being the supplier of a key ingredient in the production mix. As a hypothetical example, imagine that only one company had the patent on the enzyme inhibitor needed for processing arrowtooth flounder into surimi. That company could exert control over production without owning the processing plant.

A past example of market access control was the pollock surimi import quota issue that surfaced during the period for which there was total allowable level of foreign fishing for pollock. Via the Magnuson Fishery Conservation and Management Act's foreign fishing allocation criteria, allocations were given to the Japanese for pollock partially based on the degree of the relaxation of the Japanese import quotas. These import quotas were set primarily with the stated purpose of restricting imports in order to keep the Japanese markets stable and orderly. The amount of the import quota is based not only on demand, but the production by Japanese companies. U.S. companies are impacted in two ways. First, collectively U.S. companies as well as other non-Japanese companies may wish to sell more product than the import quota would allow. Second, the tradition has been to allocate the import quota among various segments of the Japanese industry based on historical participation. frequently, the import quota is allocated to Japanese companies who are in direct competition with U.S. companies. In the case of surimi, U.S. companies no longer have problems selling product to Japan. (Table 3 shows the 1990 Japanese import quotas for April-March 1990.)[21]

A firm can exert control over another firm if it is able to restrict its rival from major markets. The more rivals, the more difficult it is for one firm to restrict the activities of another firm, as well as for groups of firms to form effective cartels to exert control over the market. However, during the 1960s, Japanese firms took advantage of Japanese Government economic policies that allowed them to concentrate financial and market power through legal collusive activities. Under the Trade Association Act for the Adjustment of Marine Products,

> "... authorized eight cartels to agree on prices, quantities exported, productive capacity, and/or the time and methods of sale. The products covered by these cartels include most of the major marine products exported, that is, pearls and a variety of canned and frozen fish."[22]

As indirect evidence that the Japanese surimi market still may not be a completely open market was the recent formation of an export trading company, the U.S. Surimi Commission, by nine at-sea factory trawlers for surimi and pollock roe under the Export Trading Act of 1982. The goal of the Act is to encourage the development of American Export Trading Companies, particularly for the benefit of small and medium sized companies and help them overcome:

> "Difficulties of financing both the production and transactional costs involved in foreign sales; difficulties in product standards and consumer standards in countries which make U.S. products unsuitable for export; difficulty in receiving payment for goods and services; and difficulty in obtaining adequate representation in foreign markets."

The U.S. Surimi Commission is able to establish for its members export sales prices, standardized export terms, uniform quality standards, and marketing strategies. Antitrust protection is extended only to the export conduct specified in the Export Trading Company's Certificate of Review as issued by the Secretary of Commerce with the concurrence of the Department of Justice. This U.S. cartel is probably quite similar to the Japanese cartels described above.[23]

As noted above, if one takes the degree of vertical integration into account and recognizes that several of the Bering Sea processors ship significant amounts of their product to domestic plants for value-added processing, then it becomes more difficult to assess the degree of foreign control. The addition of new sources of surimi such as from Pacific whiting, Soviet pollock joint ventures, blue whiting, and Argentine hake, in conjunction with the growth in imitation-crab facilities in Europe and in Asian countries other than Japan, would seem to weaken the ability of the major Japanese firms to control the market. However, much capacity, at-sea or shoreside, was added on line during 1990. On one hand the most recent expansion to shoreside capacity is related to an American-owned plant, while two of the most recent additions to at-sea capacity involved significant Japanese investment. During 1991, the expansion in shoreside capacity will be two additional surimi plants that are essentially 100% foreign-owned but by different Japanese companies. This implies that there will be strong competition for access to the resource, be it the offshore quota or onshore quota, making it difficult for companies to find the means to establish control. As a final note, a reminder that all of the above discussion is predicated on simple assumptions, including the assumption that the shoreside sector can process 700,000 tons of pollock. Industry estimates indicate that by the end of 1991, the Bering Sea shoreside plants may be close to having the necessary physical capacity to do so. [24]

NOTES

Prepared by Steve Freese[1]

[1] Table 1 is based on the following industry surveys: National Marine Fisheries Service Annual Processed Product Surveys (industry participation voluntary), 1989 Alaska Department of Fish and Game Alaska Commercial Operator's Annual Report (mandatory for shoreside plants and voluntary for at-sea processors); 1990 Alaska Groundfish Weekly Production logs (mandatory for shoreside and at-sea processors) which were summarized into annual totals by product. Table 1 includes some data corrections for 1990 as provided by companies through the end of March, 1991. In most instances where companies reported different data to the two 1989 surveys, data from the Alaska Commercial Operators Annual

[1]Prepared by Steve Freese, NMFS (Northwest Region) International Trade Specialist. This report is based on information provided directly or indirectly by Elaine Dinneford - Alaska Commercial Entry Commission, Jessica Gharrett - NMFS (Juneau), Sonee Sonu - NMFS (Southwest Region) and staffs of the North Pacific Fishery Management Council, NMFS - Alaska Region and Center, and NMFS - Northwest Region Market Statistics Branch

Table 3: Japan's Import Quota on Pollock 1987 and 1990
1000 Metric Tons

	FY 1987 Apr-Sept	FY1987 Oct-Mar	FY 1990 Apr-Sept	FY 1990 Oct-Mar
Fishermen's Associations				
Japanese Deep-Sea Trawlers Association	160	570	50	5
Japan Surimi Association	0	0	0	0
Japan Fisheries Association	0	28	0	0
Japan/North Korea Fisheries Council	0	50	0	0
National Federation of Medium Trawlers	0	100	0	5
Fish Processors				
National Federation of Processed Products Cooperatives	2.5	5	2.5	5
National Federation of Kneaded Fisheries Products Cooperatives	8.5	8.5	8.5	8.5
National Federation of Processed Delicacy Food Products Cooperatives	1.5	1.5	1.5	1.5
National Federation of School Lunch Products Cooperatives	1	1	1	1
National Association of Surimi Manufacturers	4	4	4	4
Japan Fish Sausage Association	1	1	1	1
Trade				
Hoyo Maru	0	65	0	65
Others	31.5	36	31.5	36
Overseas Fisheries Developments				
Overseas Fishery Cooperation Foundation	100	0	600	100
Total	310	870	700	232

Metric Tons round weight, 20% product recovery rate.
Fishermen's Quota are Major Fishing Associations
Japanese Deep Sea Trawlers Association-reflects U.S. joint ventures
Hoyo Maru Quotas reflect Soviet-Japan Joint Venture
Overseas Fishery Cooperation Foundation Quotas are used for U.S. Processed Surimi.

Metric tons raw fish base. fishermen are major fishing associations; users are major processing associations; and Traders are trading companies and Hosui (the company which operates the Hoyo Maru in the Japan Soviet joint operation.). The quota is based on raw fish tonnages. Conversion is based on a surimi yield of 20%. The Japan-North Korea IQ is part of the new fisheries agreement between the two nations. In addition to the North Korea" IQ part of the Users quota will also be used for North Korean pollock.

Report was chosen as it a more recent survey. Where appropriate, assumptions made about missing companies were based on other information such as vessel listings or preseason projections given to NMFS during its annual survey of the industry's intent to process and export surimi to Japan. Initial impressions of the completeness of the 1988 and 1989 data is generally satisfactory. However, the 1989 estimate of at-sea production reflects only a modest growth in fillets, and may be low based on the increased physical capacity of the fleet or because the 1989 production of several known fillet processors had to be estimated by interpolating 1988 and 1990 estimates. There is also a potential that since the 1988 and 1989 surveys were voluntary for non-Alaskan at-sea processing companies, an incomplete list of processors may have been developed. One method for testing the completeness of the estimates is to compare the companies that did report processed production in 1988 and 1989 to those companies that received pollock according to the NMFS and Alaska Fish and Game Fish Ticket system. For example, the March 9, 1990 Draft EIS/RIR for Amendment 19 for GOA and Amendment 14 BSAI, page 5, indicates that "....71 catcher boats, 48 catcher/processors, and 5 motherships reported pollock catch from the EEZ. There were 28 shorebased processing plants that received pollock in 1989. Of these 12 received more than 1000 mt of pollock." The total number of companies included in the 1989 data were fewer than that reported in the EA/RIR, but this may be due not only to incomplete compliance or inability to reconstruct all the possible processing participants in the 1989 fishery. Some information was aggregated by companies that may have more than one plant site. Nether the less, it is believed that all the major producers of pollock products are captured in the 1989 information reported in Table 1.

[2] In order to make the surveys comparable, individual product categories and to be aggregated into the product groups listed in the table, particularly since the available 1990 data does not identify fillets by block form. For example the following product forms were aggregated into the fillets and blocks category: fresh, shatter pack, layer pack, IQF, and unspecified fillets; meat fillet, and unspecified blocks; and skinned and rib-less, skin and no ribs, skinless and ribs, and skinless and rib-less fillets.

[3] Nilo Cachero, President of Canadian Association of Fish Exporters, The Global Market for Fresh/Frozen Groundfish Products: 90's, Address to the Fifth International Conference of the International Institute of Fisheries Economics and Trade, December 3-6, 1990 - Santiago Chile.

[4] Canadian Groundfish Market Study, Economic and Commercial Analysis Report No. ??; Department of Fisheries and Oceans, Ottawa Ontario.

[5] "Globefish Highlights", Food and Agriculture Organization of the United Nations, Fishery Industries Division, March 15, 1991.

[6] 1989 is the last year that Japanese import statistics include surimi made from U.S. joint venture harvests. In 1989, as reported in Bill Atkinson's News Report (Issue 376-December 5, 1990), approximately one third of Japanese surimi imports were from U.S. joint ventures.

[7] 1990 is the first year, where processed production was recorded by management area. In prior years, the only source of such information are fish tickets which indicate the receipt by buyer and vessel of unprocessed pollock, and the ADF&G Annual Commercial Operators Report which collects similar information on an annual basis.

[8] There was no attempt to convert the other products to round weight equivalents because in many instances they are ancillary products and double counting would result, and some double counting may even occur if some fillets are converted into surimi. It is possible to determine the amount of primary and ancillary production by product form in 1990, but the main purpose of this exercise is to an indication of the relative mix of products, not an accurate accounting of catch.

[9] Federal Register, Vol 56, No 22, February 1, 1991; Personal Communication with Ron Berg, Fishery Management Biologist, NMFS Juneau. During 1990, the recovery rates proposed or used by NMFS for quota monitoring purposes ranged from 18 to 25 percent for fillets and 15 to 22 percent for surimi (Federal Register Vol 55, No 179, September 14, 1990; Federal Register Vol 55, No 37, February 23, 1990) The Draft March 9, 1990 EA/RIR for Amendment 19 and Amendment 14 for GOA used a 16% product recovery rate for surimi.

[10] Several factors lead to the speculation that during this period, growth in surimi capacity exceeded fillet capacity. In the design and development of the at-sea fleet, many of the vessels were designed based on the economics of the industry circa 1985-88. The expansion in demand for fillets did not really start until 1988. The largest vessels in the fleet such as the Ocean Phoenix are primarily surimi producers. One major at-sea fillet processor burned and was out of the fishery for most of 1989. Finally, several of the companies that were interviewed in the winter 1990 for their intent to process surimi and export it to Japan in 1991 indicated a desire to switch more of their production to fillets but were constrained by sales agreements or the lack of available fillet capacity. One at-sea company stated that if it had a choice, it would convert all of its vessels to fillets while another at-sea company who had processed surimi in 1989, sold off all of its surimi equipment and converted to 100 percent fillet production. Also influencing this trend is the ban on roe-stripping that was implemented in 1990 as the carcasses were either converted to surimi, fillets, or fishmeal.

[11] NMFS December 1990 Interviews of U.S. Surimi Industry; compiled by Steve Freese NMFS:NWR--In some interviews, it was apparent that the same technique of forecasting that was typically employed for the preseason 1990 forecasts: (physical capacity) x (expected number of days of operation). With the rise in fillet prices in 1990 and the shock of the October closures, many companies developed projections that modified a projection of (physical capacity) x (expected number of days of operation) to account for such factors as: the split pollock seasons, the capacity of the fleet, the change in the product recovery rates that NMFS employs for quota monitoring (the new product recovery rates imply less production for the same amount of TAC), the relative prices of surimi to fillets, and exchange rates. One of the reasons that the shoreside preseason 1990 forecasts were high relative to actual production was because new additions to capacity did not come on line as early as anticipated.

[12] Average prices are very sensitive to the information reported by large companies. One at-sea company reported different price estimates for surimi to both NMFS and ADF&G, if the NMFS estimate is used then the price of surimi would be $0.84 for the fleet; if the ADF&G estimate is used then the price of surimi would be $0.86/lb. The 1990 surveys were not due until April 1, and price estimates from these surveys should be available by June along with the confirmation that the 1989 prices are accurate. The OMB survey reported prices differentials between inshore and offshore surimi significantly greater than those reported here. It is likely that the difference reflects some shipping costs included in the surimi price reported in the OMB survey for offshore processors, in which case offshore processing costs are proportionately larger as well.

[13] In reviewing available information on surimi prices, there were no Japanese surimi market data available that contrasted U.S. at-sea produced vs. U.S. land-based produced surimi at a given quality level. Available information concerning Japanese land-based produced surimi and Japanese at-sea produced surimi needs to be explored in depth. It is difficult to obtain good information concerning prices for surimi. Much of the surimi that is produced in the U.S. is contracted for and is delivered directly to the user. During 1990, only 54 thousand metric tons of surimi out of a possible 343,000 tons (Japanese production plus total imports) entered the six major Japanese wholesale markets. Wholesale prices at the Tokyo Central Market (frequently reported in U.S. publications), when converted into yen per lb. equivalents, did not vary significantly during 1989 and 1990 in comparison with Japanese surimi imports

prices (Graph A). This suggests that the Tokyo Central Market is either an extremely controlled market (thus, by inference, all of the Japanese wholesale markets), or that the amount of product that enters into any one market is so small that prices are not influenced, or that the reported prices are guide prices or first offer prices (industry rules of thumb) which form the starting point for the actual negotiations between buyer and seller. Whatever the reason, it is apparent that good price information concerning the Japanese market is unavailable.

In discussing this issue with one major at-sea U.S. company, the following rule of thumb, was reported:

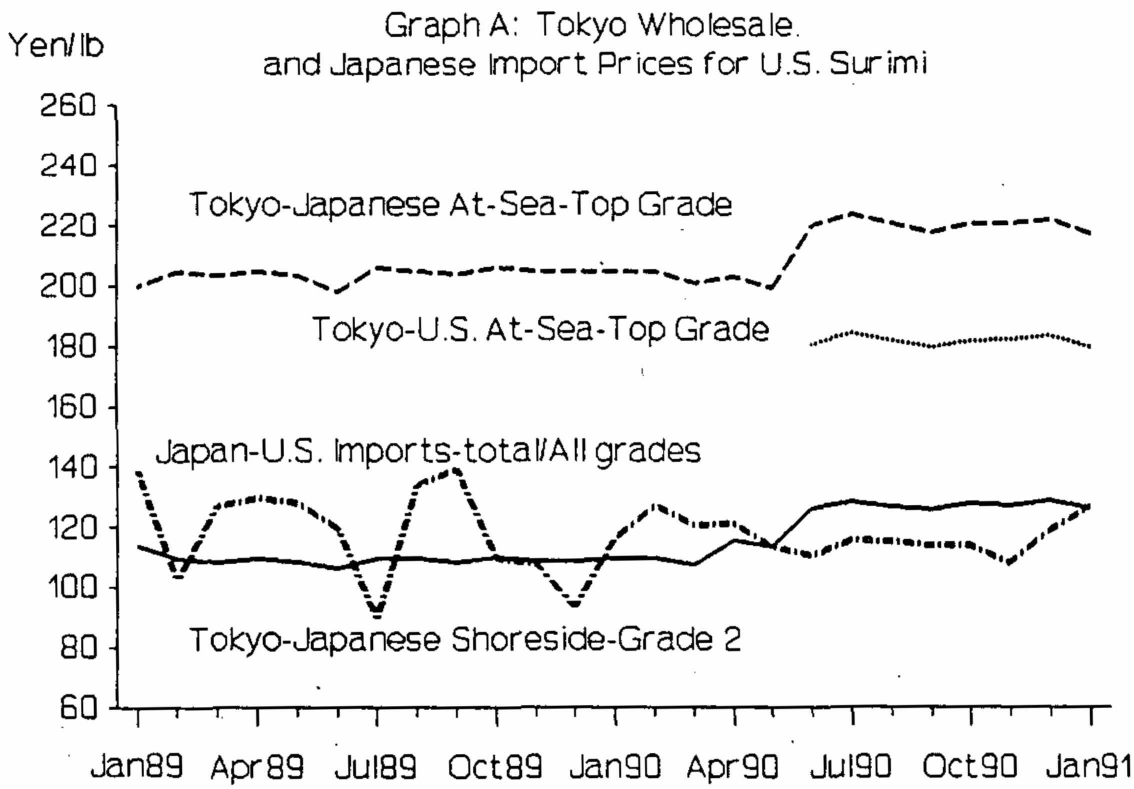
> "We are very very reluctant to provide you with a "rule of thumb" because prices vary according to quality. If we are talking about SA grade, (top quality) the following relationship may hold, assuming for example that Japanese Factory trawl price is $1.00/lb:
>
> Japanese Factory trawl= $1.00/lb
> Japanese Mothership=$.85-$.90/lb
> U.S. factory Trawl=$.85-$.90/lb
> U.S. shore side-Japanese owned and operated=$.75-$.80/lb
> U.S. shore side-U.S. owned and operated=$.60-$.65/lb
>
> However, shoreside plants can't make SA grade because SA grade needs to be produced with *fresh pollock*. Therefore, as you go down in quality although prices decline, the differences between shoreside and factory trawl prices also decline. As the U.S. market is only 35-50,000 tons annually as opposed to the Japanese Market of 700,000 - 750,000 tons, you cannot draw parallels between the two markets with respect to pricing strategies. "

Note the emphasis on fresh pollock--there is a need to explore the information potentially be developed by the biologists on the localized depletion issue, to determine how much pollock could be potentially harvested with the distance limits of "freshness" for shoreside plants.

[14] Bill Atkinson's News Report, Issue 363, September 1990.

[15] In preseason interviews for 1990 and 1991, both sectors indicated a greater percentage of production to be shipped to Japan with the shoreside percentage exceeding the at-sea percentage. Presumably, as the at-sea processors were cutting back production, a greater percentage of their product was governed by contracts with Japanese companies. With respect to shore-side companies, in light of cutbacks in at-sea production, meant that their Japanese parent companies required more product, or that Japanese markets were more favorable to shoreside production.

[16] The tariff codes used by U.S. Bureau of Census and Customs do not have a separate category for surimi. Surimi can be shipped out under the following categories which may include other species and products as well: 0304900000-Fish not specifically provided for-meat/minced, fresh, chilled or frozen; 1604201300-fish balls, cakes, and puddings, prepared and preserved; product; 1604206000-fish sticks and similar type products not coated and from minced product; and 1604204500-sticks and similar type products coated and from minced product. Based on the understandings that: almost all U.S. surimi is shipped out of Alaska; almost all the other major alaska species except for rockfish have identified tariff codes, the imputed prices for these product codes are similar to those reported for surimi; Japan and Korea are major markets for surimi; it is likely that almost all of the shipments to Japan and Korea under these four tariff codes are pollock products that are not fillets or roe-i.e. surimi. Japanese import statistics may differ from U.S. export statistics because they include joint ventures and the because of the time



Graph A: Tokyo Wholesale
and Japanese Import Prices for U.S. Surimi
Yen/lb
260
240
220
200
180
160
140
120
100
80
60
Tokyo-Japanese At-Sea-Top Grade
Tokyo-U.S. At-Sea-Top Grade
Japan-U.S. Imports-total/All grades
Tokyo-Japanese Shoreside-Grade 2
Jan89
Apr89
Jul89
Oct89
Jan90
Apr90
Jul90
Oct90
Jan91

differences in shipping product from the United States (export) to Japan (import). U.S. imports of surimi from Japan or Korea were less than 2000 tons in 1989, and negligible in 1990.

[17] As information on production by major Japanese company is unavailable, traditional economic analyses concerning market concentration and market control cannot be undertaken. Therefore the discussion that follows is drafted from the view: "If there was market control by the two major Japanese companies, is there evidence that such control is weakening?"

[18] Percentages are based on the average of the two alternatives in Table 2.

[19] A more thorough description on foreign investment will be provided at a later date. Description will summarize responses to Council Foreign Investment Surveys and include information collected from other sources.

[20] A more thorough description on foreign investment will be provided at a later date. This description will summarize responses to OMB Foreign Investment Surveys and include information collected from other sources.

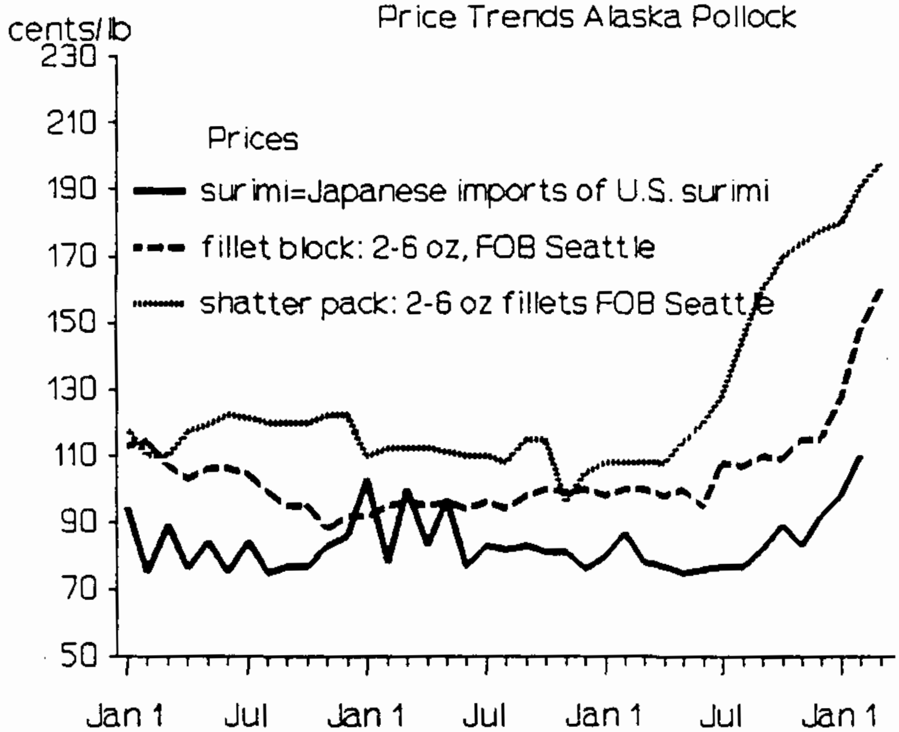
[21] Information compiled by Sunee Sonu, NMFS-SWR-various Foreign Fishery Information Releases.
*Note: Majority of Japanese Market Statistics taken from these reports.

[22] Kozo Yamamura, "Structure is Behavior: An Appraisal of Japanese Economic Policy, 1960-1972," in The Japanese Economy in International Perspective, edited by Isaiah Frank, Johns Hopkins University Press, 1975, p. 78.

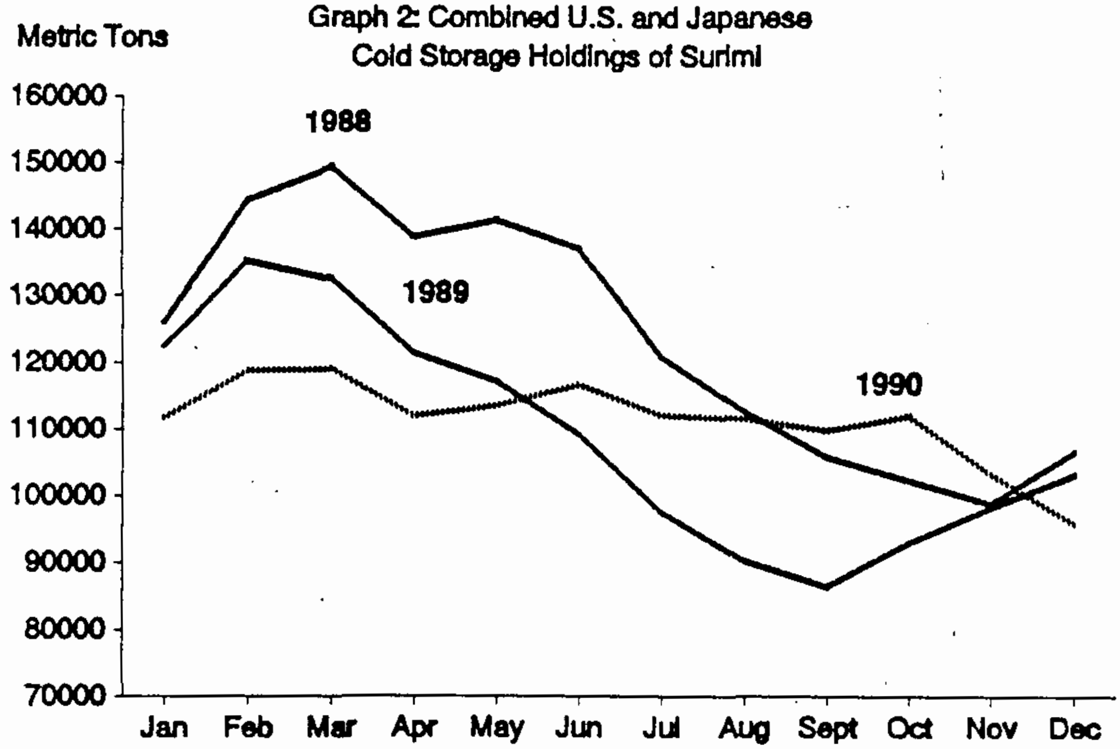
[23] International Trade Administration, U.S. Department of Commerce, "The Export Trading Company Guidebook," August 1987 (revised).

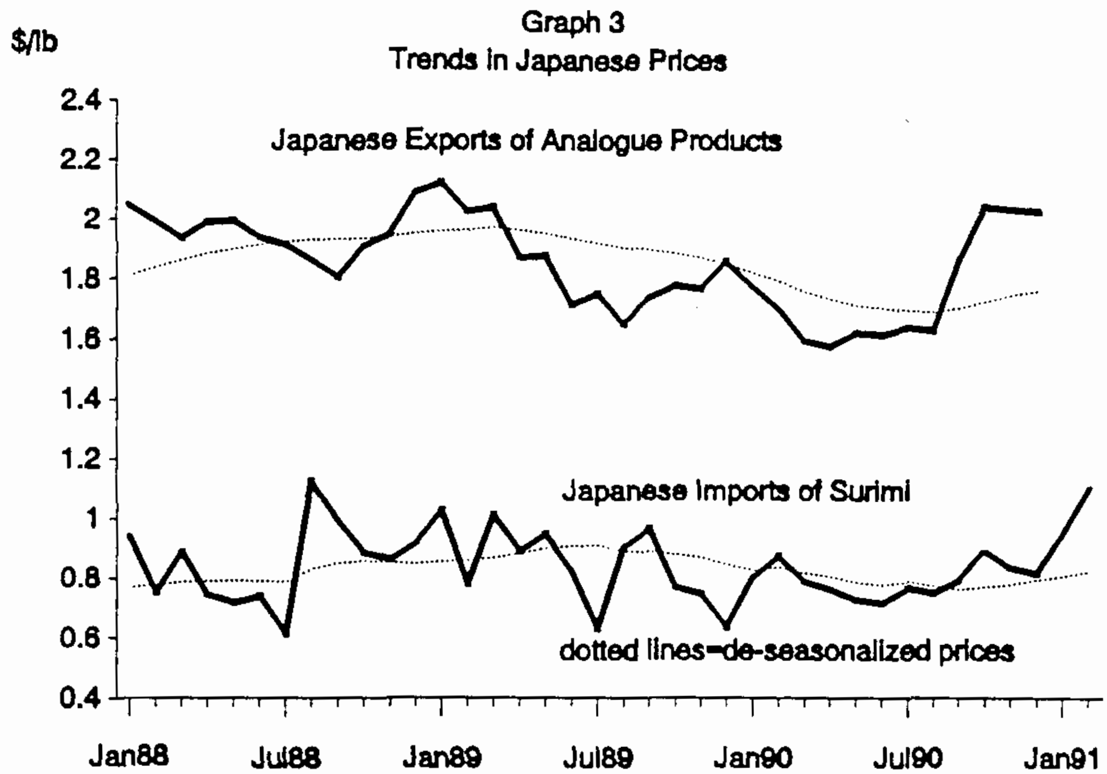
[24] Christopher Campbell Riley, "Economic Review of the Proposed In-Shore/Off-Shore Pollock Allocation in the North Pacific" March 1991.

Graph 1
Price Trends Alaska Pollock

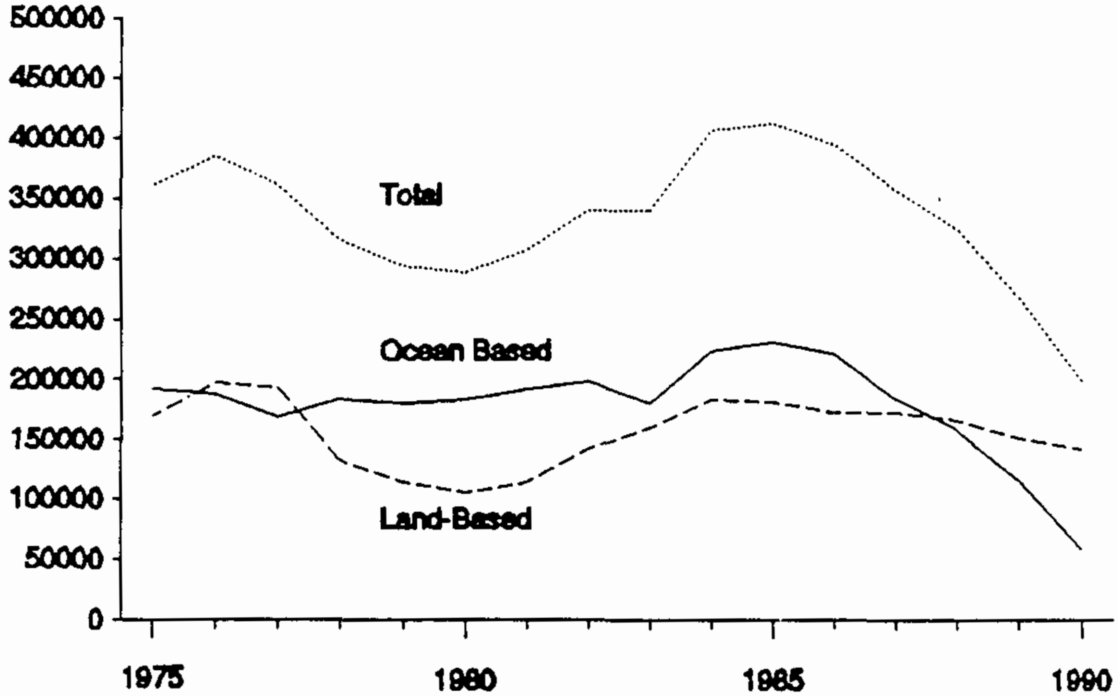


Graph 2: Combined U.S. and Japanese Cold Storage Holdings of Surimi

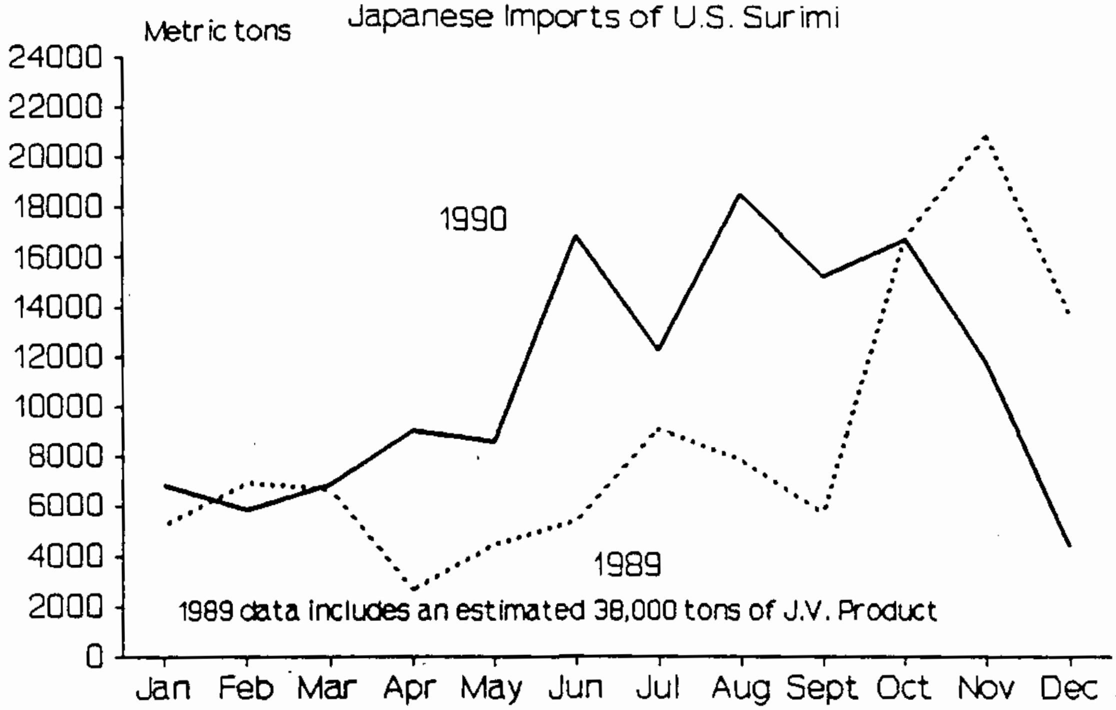



Graph 3
Trends in Japanese Prices
$/lb
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
Japanese Exports of Analogue Products
Japanese Imports of Surimi
dotted lines=de-seasonalized prices
Jan88
Jul88
Jan89
Jul89
Jan90
Jul90
Jan91

Graph 4
Japanese Production of Frozen Surimi



Graph 5
Japanese Imports of U.S. Surimi



Source:F/SWR NMFS Foreign Fisheries Releases (Sonu)

Graph A: Tokyo Wholesale and Japanese Import Prices for U.S. Surimi

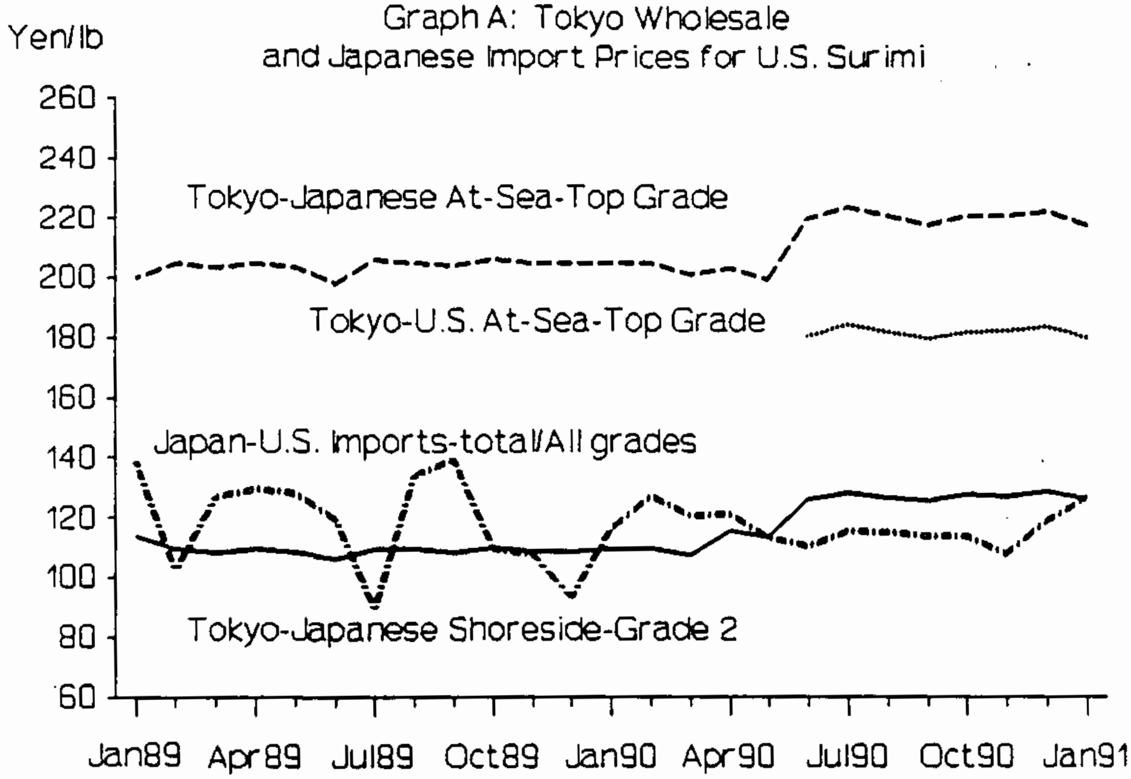


TABLE 1
PRELIMINARY ESTIMATES OF PROCESSED PRODUCTION OF POLLOCK

		Fillets or Blocks	Surimi	Minced	Roe	Whole or H&G	Fish Meal
				Metric Tons			
Product Weight Estimates							
Shorebased							
1988		5400	27000	0	700	500	4000
1989		8700	31400	700	600	300	7000
1990		14000	43000	1600	1500	1200	17000
	BSAI	5000	38800	200	1400	30	16800
	GOA	9000	4200	1400	100	1170	200
At-Sea							
1988		28100	31200	0	560	300	6000
1989		30400	73200	1700	6100	100	8900
1990		61100	136400	12000	11100	3500	40100
	BSAI	59300	136100	11900	11100	600	40100
	GOA	1800	300	100	0	2900	0
Total							
1988		33500	58200	0	1260	800	10000
1989		39100	104600	2400	6700	400	15900
1990		75100	179400	13600	12600	4700	57100
	BSAI	64300	174900	12100	12500	630	56900
	GOA	10800	4500	1500	100	4070	200

TABLE 2

ROUND WEIGHT ESTIMATES OF PROCESSED SURIMI AND FILLETS

(Based on Table 1)

Round Weight Estimates: Metric Tons

I. Shoreside Product Recovery Rate: Fillet=25%, Surimi=15%
At-Sea Product Recovery Rate: Fillet=25%, Surimi=15%

		Fillets or Blocks	Surimi	Total	% Total Fillets	% Total Surimi
Shorebased						
1988		21600	180000	201600	10.7%	89.3%
1989		34800	209300	244100	14.3%	85.7%
1990		56000	286700	342700	16.3%	83.7%
	BSAI	20000	258700	278700	7.2%	92.8%
	GOA	36000	28000	64000	56.3%	43.8%
At-Sea						
1988		112400	208000	320400	35.1%	64.9%
1989		121600	488000	609600	19.9%	80.1%
1990		244400	909300	1153700	21.2%	78.8%
	BSAI	237200	907300	1144500	20.7%	79.3%
	GOA	7200	2000	9200	78.3%	21.7%
Total						
1988		134000	388000	522000	25.7%	74.3%
1989		156400	697300	853700	18.3%	81.7%
1990		300400	1196000	1496400	20.1%	79.9%
	BSAI	257200	1166000	1423200	18.1%	81.9%
	GOA	43200	30000	73200	59.0%	41.0%

II. Shoreside Product Recovery Rate: Fillet= 25%, Surimi=20%
At-Sea Product Recovery Rate: Fillet=25%, Surimi=15%

		Fillets or Blocks	Surimi	Total	% Total Fillets	% Total Surimi
Shorebased						
1988		21600	135000	156600	13.8%	86.2%
1989		34800	157000	191800	18.1%	81.9%
1990		56000	215000	271000	20.7%	79.3%
	BSAI	20000	194000	214000	9.3%	90.7%
	GOA	36000	21000	57000	63.2%	36.8%
At-Sea						
1988		112400	208000	320400	35.1%	64.9%
1989		121600	488000	609600	19.9%	80.1%
1990		244400	909300	1153700	21.2%	78.8%
	BSAI	237200	907300	1144500	20.7%	79.3%
	GOA	7200	2000	9200	78.3%	21.7%
Total						
1988		134000	343000	477000	28.1%	71.9%
1989		156400	645000	801400	19.5%	80.5%
1990		300400	1124300	1424700	21.1%	78.9%
	BSAI	257200	1101300	1358500	18.9%	81.1%
	GOA	43200	23000	66200	65.3%	34.7%

Table 3: Japan's Import Quota on Pollock 1987 and 1990
1000 Metric Tons

	FY 1987 Apr-Sept	FY1987 Oct-Mar	FY 1990 Apr-Sept	FY 1990 Oct-Mar
Fishermen's Associations				
Japanese Deep-Sea Trawlers Association	160	570	50	5
Japan Surimi Association	0	0	0	0
Japan Fisheries Association	0	28	0	0
Japan/North Korea Fisheries Council	0	50	0	0
National Federation of Medium Trawlers	0	100	0	5
Fish Processors				
National Federation of Processed Products Cooperatives	2.5	5	2.5	5
National Federation of Kneaded Fisheries Products Cooperatives	8.5	8.5	8.5	8.5
National Federation of Processed Delicacy Food Products Cooperatives	1.5	1.5	1.5	1.5
National Federation of School Lunch Products Cooperatives	1	1	1	1
National Association of Surimi Manufacturers	4	4	4	4
Japan Fish Sausage Association	1	1	1	1
Trade				
Hoyo Maru	0	65	0	65
Others	31.5	36	31.5	36
Overseas Fisheries Developments				
Overseas Fishery Cooperation Foundation	100	0	600	100
Total	310	870	700	232

Metric Tons round weight, 20% product recovery rate.
Fishermen's Quota are Major Fishing Associations
Japanese Deep Sea Trawlers Association-reflects U.S. joint ventures
Hoyo Maru Quotas reflect Soviet-Japan Joint Venture
Overseas Fishery Cooperation Foundation Quotas are used for U.S. Processed Surimi.

Metric tons raw fish base. fishermen are major fishing associations; users are major processing associations; and Traders are trading companies and Hosui (the company which operates the Hoyo Maru in the Japan Soviet joint operation.). The quota is based on raw fish tonnages. Conversion is based on a surimi yield of 20%. The Japan-North Korea IQ is part of the new fisheries agreement between the two nations. In addition to the North Korea" IQ part of the Users quota will also be used for North Korean pollock.

ADDENDUM II
to the
Regulatory Impact Review/Initial Regulatory Flexibility Analysis
of Proposed Inshore/Offshore Allocation Alternatives
Amendments 18/23 to the
Groundfish Fishery Management Plans
for the Gulf of Alaska and the Bering Sea/Aleutian Islands

Alternatives Available to Displaced Catching and Processing Operations

Prepared by NPFMC Staff

A. Introduction

The management alternatives examined in the proposed Amendment 18/23 address the common concern over excess catching and processing capacity in the pollock and Pacific cod fisheries of the GOA and BSAI, and the attendant problems of preemption of one industry segment by another. Throughout the analyses a 1989 baseline scenario developed from the OMB industry survey provides the basis for judging the economic impacts of specific management alternatives. In each case, the suggested change in economic impacts presumes a continuation of operations by catcher and processor firms comparable to the 1989 baseline. Under the most extreme inshore/offshore allocation scenario posed in the alternatives under consideration, offshore BSAI offshore processors would experience a 50 percent reduction in pollock shares from the 1989 baseline, amounting to nearly 400,000 tons roundweight.

In cases of significant changes in the allocation of fishery resources, and even in the absence of further regulatory action, the affected catcher and processor firms may elect to modify elements of their respective business operations to account for changes in the economic and biological environment. As a result, the economic impacts projected under the baseline operating scenario may overstate or understate the ultimate outcome given dynamic change by industry participants.

Conjectural discussion about possible shifts in operations by catcher and processor firms is necessarily speculative; rarely is the outcome of change in a dynamic industry so predictable that the resulting actions and performance can be accurately predicted for individual firms or the industry. Nonetheless, it is important to understand the economic options open to the affected operations when assessing the costs and benefits of proposed regulatory action. This supplement explores the extent to which substitute activities may be available to mitigate or exploit the economic impacts of the proposed alternatives.

This addendum elaborates on that section of the *Regulatory Impact Review/Initial Regulatory Flexibility Analysis of the Proposed Inshore/Offshore Allocation Alternatives, Amendment 18/23, to the Fishery Management Plans for the Groundfish Fishery of the Bering Sea and Aleutians Islands and the Gulf of Alaska*, dealing with "Alternatives Available to Displaced Catching and Processing Firms", beginning on page 3-64. Follow-up discussions with affected catchers and processors during early May, 1991 provided further industry reaction and input to the likely impacts of the proposed regulatory changes, as well as possible alternative operations available to the industry.

B. The Rationale and Motivation for Changes in Operations

The seven proposed management alternatives range from relative fine-tuning of the existing regulatory environment, to significant reallocation of fishery resources, to "no action". Given the excess catching and processing capacity in the Alaska groundfish industry, it is anticipated that the "no action" alternative will lead to increasing competitive pressures on existing operations. The various alternatives designed to lessen preemptive conditions generally place restrictions on offshore processors, leading to reduced allocations of the affected fishery resources to this industry segment, and intensified competition among the offshore processors for available stocks. In each case, the economic consequence is due, in part, to over capitalization of the groundfish industry relative to existing fishery resources. Thus, some "decapitalization" of the industry--whether induced by regulatory action or as an outcome of the open market--may be required in order to ease the adverse preemptive conditions cited as the overriding issue in this proposed amendment. Decapitalization can occur in several different forms. The alternatives under consideration generally remove or restrict some of the capitalized fishing and processing effort from the pollock and Pacific cod fisheries under consideration in the North Pacific region.

In this case, the competitive or regulatory pressures to redirect effort away from the affected fisheries are considered to be the primary factors that would cause catchers and processors to undertake modifications in their operations, or seek viable alternatives. The concept of "opportunity costs" can be used to predict whether the managers of an operation will elect to change or not. Opportunity costs are the perceived returns that must be forgone as the result of the decision to employ resources in a given economic activity. For example, the returns for a catcher-processor at status quo with a fifty percent reduction in pollock allocation are compared to the returns with some modification in operations. If the expected net returns are higher under status quo, no change is likely. However, if a higher net return is possible under alternative employment of the capital and resources available--a better opportunity compared to the expected status quo--rational managers will be inclined to pursue the alternative.[1]

Thus, the incentive for change is based on how the current configuration of the operation compares to the next best alternative, even if neither is as financially rewarding as the original operation prior to regulation. This perspective applies to both profitable and unprofitable operations; other things equal, managers will opt for the alternative that minimizes losses if profitable applications are temporarily infeasible. The degree of certainty surrounding the outcome of various actions will directly influence the attitude of individuals towards perceived opportunities. The greater the risk, or uncertainly, the more the positive outcomes of a given alternative are likely to discounted by the decision maker. An individual decision maker's risk attitude, and the perceived returns from alternative operations may limit one's willingness to undertake new activities.

The concept of opportunity costs serves as the basis for anticipating how various components of the Alaska groundfish industry may react to the competitive and regulatory impacts identified in the analysis of this inshore/offshore amendment proposal. The quantitative precision with which opportunity costs can be estimated is very restricted due to the lack of empirical data; the evaluation that follows relies upon limited industry statistics and qualitative interpretations.

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[1]This is an obvious conclusion about business behavior, but is necessary to distinguish between what is technically possible (i.e., fish for Species X), versus what is a realistic economic alternative (i.e., which options provide a better economic return than what is currently practiced.)

C. Economic Options Available to Groundfish Catching and/or Processing Operations

For reference purposes, five economic options to status quo 1989 baseline operations are considered. These alternatives include: 1) internal changes in operations; 2) shift operations to other North Pacific fisheries; 3) shift operations to other fisheries outside the region; 4) change operational inshore/offshore status; and 5) cease operations temporarily or permanently. These options are not necessarily independent of one another, but will be examined individually.

1. **Internal changes in operation of the vessel or plant.** Given the prospect of significant increases or decreases in the volume of pollock or Pacific cod available for an individual operation, managers are likely to modify certain variables in anticipation of changes in capacity utilization. Facing likely reductions in stocks availability, managers may elect to temporarily or permanently deactivate certain processing or catching activities, change work schedules, or modify product recovery and form. Actions taken under the advance notification of a change in allocation are likely to be more cost efficient than those mandated by default, such as an unanticipated emergency closure. In the case of advance notification, or at least the expectation of imminent reductions in fishery resources, catcher-processors will likely attempt to speed up harvest activities resulting in shorter seasons,[2] and/or focusing on the higher valued products and product forms (i.e., pollock roe, rather than H&G or meal).

Depending upon the internal capacity of individual vessels and plants, these operations may also process products to a higher level, or at a higher recovery rate, in order to obtain greater utilization. The net result, in terms of fishing pressure and strategy, will hinge on fishery regulations, the configuration and processing capabilities of individuals vessels and plants, relative product prices, and the perceived threat by competitors given open access to remaining stocks. Generally, the extent to which property rights can be assigned to the fishery resources lessens the threat created by a race for fish, while conditions of open access intensify the problem. Moreover, advanced knowledge of stocks availability by individuals, as opposed to uncertainty, allows for more cost efficient modifications in vessel or plant operations.

2. **Shift operations to other North Pacific fisheries.** The development of the Alaska fishing and processing industry is a history of diversity and change. When species become over fished, or uneconomic, innovative segments of the industry search for new resources to develop. Diversity of operations is one of the most common risk management tools available to operators. Conditions of open access fisheries have facilitated this strategy in the past.

The ability of both inshore and offshore components to diversify is being restricted currently by increased competitive pressures on the fishing grounds, leading to shortened seasons and more regulatory action necessary to manage the fisheries given expansion in catching and processing activity. In addition, the existing configuration of both the inshore and offshore segments of the industry limits some processors to relatively specialized, species-specific operations. For example, the specialized pollock surimi operations have significant capital investment in plant and equipment that is limited in its application to other species. The stationary inshore surimi processing facility represents the extreme of this business strategy, and may be among the most vulnerable to preemption, as a result.

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[2]The Alaska halibut fishery provides a vivid example. Under conditions of high product value and open access, this fishery has become over capitalized. Increased harvest capacity has lead to shorter and shorter commercial seasons, creating a classic "race for fish." Halibut openings have been reduced to 24 hours or less on just a few days each year.

At the other extreme, in terms of business strategies, is the diversified, flexible operation capable of utilizing a variety of species in alternative seasons and product forms.[3] The vulnerability of highly diversified operations is the logistical planning, marketing, and coordination necessary to utilize the inherent flexibility of this strategy. At comparable full utilization levels of operations, per unit costs are likely to be higher for a diversified firm than for the specialized counterpart, but the diversified operation is less affected by changes in capacity utilization of any single product. Given these two directions in business strategy, the ability of the existing Alaska groundfish industry to shift operations away from pollock or Pacific cod to other fisheries in the region varies accordingly.

The availability of other fishery resources in the North Pacific is perhaps even more limiting than the physical capabilities of individual vessels and plants to shift to other species. Tables 1 and 2 summarize the 1990 acceptable biological catch (ABC), total allowable catch (TAC), the reported catch (both domestic and joint venture, including discards), and the apparent residual stocks by species for the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA), respectively. These statistics can be used to assess the potential for further diversification by catching and processing operations.

In 1990, the largest remaining TAC of the under utilized species in the BSAI was yellowfin sole, totaling 127,000 tons, along with 35,000 tons of rock sole, and 37,000 tons of other flatfish, primarily Alaska plaice and flathead sole. This unharvested tonnage of the combined flatfish complex in the BSAI totaled roughly 200,000 tons, about 15 percent of the BSAI pollock TAC. The acceptable biological catch (ABC) of the aggregated flatfish complex is even larger (the BSAI combined flatfish TAC is less than half of the ABC), but further harvest is limited by the 2 million ton TAC cap imposed under the BSAI fishery management plan. Moreover, with the exception of rock sole, much of the flatfish harvest is comprised of discards, according to NMFS Weekly Processor Production Reports. In addition to flatfish, nearly 56,000 tons of Pacific cod TAC remained in 1990, along with relatively smaller amounts (1,000 to 5,000 tons) of other groundfish and rockfish, although, as noted below, these residuals are likely the result of fishery management actions, rather than lack of effort. The 2 million ton cap placed on the BSAI TAC also imposes an upper limit on harvest of under utilized species. It is possible that the TAC for a commercially important species such as pollock may be expanded to absorb under utilized TAC elsewhere, so long as the acceptable biological catch (ABC) for pollock is not exceeded.

For the GOA, which has an overall TAC roughly 15 percent the size of the BSAI, the unharvested 1990 groundfish surplus was proportionately smaller. The largest stock of under utilized fishery resource relative to established TAC's in the GOA is also flatfish, primarily arrowtooth flounder (28,00 tons) and deep water flatfish (16,000 tons). There were smaller surplus TAC's of rockfish (9,000 tons) and Pacific cod (15,000 tons) in the GOA. The higher valued species, though available in relatively smaller tonnages, may be available to fill niches for individual operations, particularly the diversified processor. Product form may also impose some constraints on who can utilize the resources most effectively, in the sense that fresh product shipped to specialty markets commands a premium price over frozen production.

The apparent TAC surpluses calculated for the BSAI and GOA require further explanation, however, since bycatch, emergency closures, and lack of markets place restrictions on harvest, and on what might be harvested in the future. Prohibited species bycatch, in particular, resulted in emergency action closures throughout both the BSAI and GOA during 1990, accounting for much of the unharvested TAC,

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[3]The success and applicability of alternative competitive strategies have been popular subjects of discussion among business analysts during the past decade. Harvard Professor Michael Porter provides a thorough overview of these issues in his book *Competitive Strategy: Techniques for Analyzing Industries and Competitors.*

particularly for higher valued species such as Pacific cod. Fishery managers question whether significant increases in harvest beyond those achieved are possible without increasing bycatch problems, over fishing, and the risk of emergency closures.

The unharvested flatfish TAC in the both the GOA and BSAI represents the only large stock of fishery resources that may be available to displaced offshore pollock processors. Rock sole is being targeted already by some offshore processors. Based on averaged cost calculation obtained in the OMB survey, offshore catcher-processors targeting H&G rock sole derived a higher contribution to fixed overhead expenses ($.44/lb) on a finished per pound basis, compared to pollock surimi ($.27/lb). However, prices and catch rates are more variable for rock sole, and it is uncertain whether sufficient tonnages are available year around to offset significant reductions in pollock allocation. Factory trawlers targeted rock sole primarily during the roe season when the product is higher valued.

The domestic yellowfin sole fishery has recently begun to develop as processors adapt to the requirements of this resource.[4] Catcher-processors may be modifying their processing configuration to better utilize yellowfin sole in karimi form. Other evidence in 1991 suggests that offshore processors are investigating atka mackerel as an option. There is common recognition that arrowtooth flounder stocks are an important potential in both the GOA and BSAI, but technological problems involving the flesh degradation of the fish once caught have limited utilization of this fishery, despite the large stocks.

In addition to alternative groundfish resources, processors are exploring other fisheries as well. A factory trawler is reported to have purchased herring from catcher vessels in Togiak (Bristol Bay) during the spring 1991 fishery at exvessel prices 30 percent higher than that offered by shorebased herring processors in Dillingham. Similarly, offshore processors may enter the 1991 Alaska salmon industry by purchasing the catch exvessel from the existing fishing fleet.

In the case of alternative fisheries, the barriers and uncertainty that stand in the way to increased utilization complicate the estimation of future opportunities associated with these fisheries. The fact that some processors are experimenting with these resources, however, suggests that the development of the North Pacific fisheries is not yet complete, and that further diversification is likely, though perhaps more heavily regulated than in the past.

The pressures to shift to other fisheries within the North Pacific region are not limited to under utilized species. It is also likely that displaced catchers and processors will enter fisheries that are already fully utilized, if the potential benefits exceed those from other alternatives. In this sense, it is possible that the preemption problem may resurface in other fisheries such as rockfish or sablefish, as a result of regulatory actions directed towards pollock and Pacific cod. There is evidence from the Alaska sablefish and halibut fisheries that crowding on the grounds, alone, is not sufficient to dissuade expansion of effort or new entrants, so long as there is open access and the potential for economic benefits to the crew and owners.

In summary, the ability of catching and processing operations to shift away from pollock and Pacific cod to other species in the North Pacific region is limited by compatibility of operations, availability of alternative fishery resources, and technological problems associated with bycatch in multispecies fisheries.

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[4]The historical development of many groundfish species provides some perspective on what may occur with yellowfin sole. Foreign fleets pioneered most of the Alaska groundfish resources, later to be converted to joint venture arrangements with U.S. catcher vessels, and ultimately taken over entirely by U.S. domestic operations. Yellowfin sole has been the latest in a series of groundfish converted to an entirely DAP fishery, and could be the next major domestic groundfish resource targeted by domestic processors, based on past trends.

Given present processing technology, it appears unlikely that there is an immediate substitute for the pollock surimi specific processing operation without plant reconfiguration. Catching activity may be more readily redirected towards other species, although bycatch problems emerge as a grave concern. Some potential to utilize underdeveloped domestic flatfish TAC exists, as well as the further development of smaller niche markets for rockfish and specialty fisheries. Given the pervasive over capitalization of fishing and processing effort in the Alaskan groundfish industry, competitive pressures may increase effort in fisheries already at or near full utilization.

3. Shift Operations to Other Fisheries Outside of Alaska

Displaced offshore vessels also might shift to existing or developing fisheries in other regions of the United States or the world. The inherent mobility of vessels makes this a more plausible alternative for this segment, although inshore processors conceivably also might relocate outside of Alaska, to the extent that the fixed plant and equipment could be sold or moved to a new location without incurring excessive costs.

The extension of fisheries jurisdiction (EFJ) to coastal nations that occurred in the 1970s limits the opportunities of catchers and processors to simply relocate operations elsewhere. Moreover, the distant water fleets of traditional fishing nations (USSR, Norway, Japan) that were displaced during the 1980s remain positioned to enter new fisheries made available through open access or joint venture arrangements. Thus, U.S. catchers and processors hold some advantage in U.S. waters, but will likely face significant international competition elsewhere in the world.

The most immediate opportunity outside Alaska for pollock processors emerged in the 1991 Pacific whiting (hake) fishery off the coasts of Washington and Oregon. The Pacific whiting fishery has, until 1991, been largely a joint venture (JV) fishery between U.S. catcher vessels and foreign at-sea H&G processors. Moreover, there is not at present an established inshore whiting processing industry, although there is interest in this possibility from the perspective of economic development in the effected Pacific northwest communities.[5] A particular appeal of Pacific whiting is the available technology to utilize this species in surimi products, thus facilitating utilization by existing offshore Alaska pollock surimi processors. Preliminary reports indicate that numerous offshore pollock processor vessels participated in the Spring 1991 Pacific whiting fishery, moving down the West coast after harvesting the first seasonal allowance of pollock in Alaska.

The potential for shifting Alaska offshore processing capacity to the West coast Pacific whiting fishery is limited by the size of the whiting stocks, and pending allocation regulations under consideration by the Pacific Council. The Pacific Council's 1991 actions allocated 104,000 tons to catcher-processors, 88,000 tons to vessels that catch but do not process (that is, for either at-sea or shore-based delivery), and 36,000 tons held in reserve with first priority to vessels delivering shoreside, second to vessels delivering at sea, and third to catcher-processors. Through early May, 1991, 12 to 15 offshore processors had harvested 101,500 tons of the 196,000 tons available from the initial Pacific whiting allocation, accounting for 25 to 30 thousand tons weekly.

The 1991 whiting allocation available to offshore processors is roughly 10 to 15 percent of the combined 1,518,400 ton 1991 BSAI and GOA pollock TAC. Those stocks represent a significant alternative

[5]A March 1991 report to the Oregon Legislative Assembly entitled *Pacific Whiting; Resource Availability, Market Use and Economic Development Potential* examines these and other issues. This publication is available from the Oregon Coastal Zone Management Association in Portland, Oregon.

resource that might be available to supplement the shortened seasons and reduced allocations of pollock faced by offshore processors. This affected group will likely require some experience with the whiting fishery and processing in order to determine the economic potential, but the fact that several processor vessels experimented with the whiting fishery in 1991 indicates that the financial incentive is greater than that of setting idle.

In addition to Pacific whiting, there are under utilized stocks of jack mackerel (46,500 tons), and shortbelly rockfish (13,000 tons) off of the West coast.[6] Market demand, biological concerns, and catching/processing technology appear to be the limiting factors in further harvest of such species, since excess catching capacity is available in the Alaska and West coast groundfish industry. In general, the other fishery management regions of the United States are considered to offer very limited opportunities for the large volume, Alaska groundfish trawl catcher-processors. In all cases, however, further technological advancements in product utilization or fishing operations may create opportunities in other fisheries unforseen at present.

Outside of the U.S. Exclusive Economic Zone (EEZ), the potential for catching and harvesting activity becomes even more speculative. A recent survey categorized fifteen hake/whiting species world wide with market potential, roughly half of which appeared under utilized relative to potential yields.[7] An important factor in the development of whiting and pollock products has been the development of enzyme inhibitors used to prevent the deterioration of the flesh of these species once caught. This technology has created opportunities for finished products such as surimi. Such products also could become important inexpensive substitutes for cod in world markets.[8] In addition to whiting, there are rumors of opportunities for U.S. offshore processors in international joint ventures, and possibilities for fishing orange roughy in the South Pacific or pollock in the international waters of the North Pacific's "doughnut hole". These and other prospects that may draw the more adventurous operations. The potential for developing new fisheries, however, may be much different than the reality. Uncertainties abound in such ventures, encompassing legal, technological, economic, and market demand concerns accentuated by lengthy logistical channels to different corners of the world. The risks associated with such ventures may outweigh returns, in terms of committing even more capital and investment into undertakings of typically low margin profitability to begin with. Ultimately, the adoption of such alternatives will depend upon the situations of individual operations, weighing the expected returns of the options available.

4. Changes in Operational Status from Offshore to Inshore

The wording and definitions prescribed under Alternative 3 of the proposed inshore/offshore Amendment also present the opportunity for offshore operations to achieve "inshore" status by restructuring catching or processing operations. For example, an offshore mothership processor or factory trawler conceivably might become an inshore processor by restricting activities and mobility consistent with the definitional criteria of the proposal. Similarly, a factory trawler targeting Pacific cod in the GOA might achieve inshore status by converting to fixed gear (longline or pots) under the terms of Alternative 3.

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[6]*Status of the Pacific Coast Groundfish Fishery Through 1990 and Recommended Acceptable Biological Catch for 1991*, Pacific Fishery Management Council, Portland, Oregon.

[7]Natural Resource Consultants, *A Review and Analysis of Global Hake and Whiting Resources, Harvests, Products, and Markets, 1990*, Seattle.

[8]A review of market and technological research on whiting is reported by William Jensen in *Market Investigation Summary and Evaluation of Research on Pacific Whiting Production*, Resource Valuation, Inc., Vancouver, Washington

Such changes in operational status are not simple "loopholes" in the proposed amendment. The criteria are restrictive, with the intention of limiting the mobility of offshore processors to alleviate the preemption between inshore and offshore segments of the industry. The economic feasibility of such reconfiguration to achieve inshore status is uncertain, but would likely involve significant changes to operations by offshore processors. Prior investments in fishing capability (engine, hull design, gear, and processing layout) would likely be unnecessary for fixed location operations. The sunk costs of these features could restrict efficiency and increase per unit processing costs. The inherent advantages of mobility, immediate access to fish, and product freshness might be lost or reduced. Issues such as waste disposal and local taxes might also increase operating costs.

Alternatively, converting to inshore status may prove viable for some operations. This option allow offshore processors some limited mobility to relocate operations in a fixed remote location and access fishery resources unavailable to existing inshore plants. The variable costs associated with fishing would be eliminated, although fish would have to be procured from catcher vessels. Smaller H&G catcher-processors might convert to catcher only status, and supply stationary processing vessels. From the context of opportunity costs, converting to inshore status is in some ways similar to deactivating operations entirely, yet offering the potential for some positive return. Operating part of the year processing in this mode, and part deactivated entirely is another possibility.

This option also raises concerns over the resulting competitive behavior that might develop between newly configured "inshore" components of the industry, and the existing land-based processors. The potential for interception of catcher vessels, predatory pricing, or added inshore processing capacity could reopen concerns over preemption.

5. Cease Operations Temporarily or Permanently

In each of the above possible alternatives, there is the presumption of continued operation. Another option is to cease operations, or shut down. From a financial perspective, it is advantageous to shut down when the variable costs of operation are greater than the total returns. Fixed costs are ignored in this criteria, since such expenses (interest costs, rent, basic maintenance, and so forth) will be incurred regardless. Seasonal shut downs are already common in many components of the fishing industry, and are not necessarily synonymous with failure.

The feasibility of intermittent shut downs or cyclical operation will depend upon the profitability of the business while it is in operation, and the fixed costs incurred when operations are suspended. Pollock surimi processing depends upon large volume operations, since the per unit margins are low relative to higher value seasonal species such as crab or salmon. Moreover, the capital investment in either inshore or offshore pollock processing plants is relatively large, especially with automated surimi equipment. The financial viability of surimi processors is predicated on continuous, large volume operation. Both of these factors detract from the financial feasibility of intermittent operations, especially for surimi operations. Pollock or Pacific cod fillet operations are less sensitive to capacity utilization, and may prove more adaptable to interrupted operations during the year. In either case, catchers and processors forced to operate on reduced allocations and/or shorter processing seasons may incur higher per unit variable costs associated with labor expenses, as well as start-up and shut-down costs.

A final and more ominous outcome is permanent shut down or economic failure. This is applicable to both inshore and offshore segments of the industry. There is no single ultimatum that defines economic shut down, but the conditions often include negative income (total costs exceed total returns), insolvency (liabilities exceed assets), or insufficient returns relative to other alternatives. In some cases, otherwise viable operations may elect to quit their current business, and reinvest in alternative ventures with more promising returns. This option requires some financial liquidity, such as the ability to sell the existing operation and recoup invested capital. A more extreme outcome is total economic failure, whereby owners involuntarily liquidate their investment at a loss, and control of the operation is taken over by creditors. The failure scenario can happen overnight, or this process may occur gradually, and can be reversible in the case of reorganization under the protection of bankruptcy.

The consequence of failure can be to improve the outlook for survivors. The exit of some operations makes room for the more economically competitive, as the reduction of catching and processing capacity may increase shares available to the remaining firms in the industry. The exit or failure of catchers and processors is a direct means of decapitalization. However, the initial failure of some percentage of the industry is not necessarily the final solution in this process. As catching and processing operations leave the pollock and Pacific cod industry, they also leave idled resources--vessels, facilities, fishing and processing equipment--that may become available at lower cost as owners seek to liquidate salvaged assets. This can lead to subsequent rounds of attrition among the reorganized industry as cost and efficiency adjust to the availability of assets and resources liquidated by failing firms. For example, a failed processor might liquidate a fully equipped vessel for one-half of its replacement cost due to pressure from creditors. That vessel could then be acquired by new or existing processors and reenter the fishery because it now has lower per unit costs, and can compete against vessels that are being amortized at 100 percent of the replacement cost. The operations surviving the first round may be the victims in the second round, particularly if the overall fishing and processing capacity is not permanently reduced. The end result of this process is uncertain, ranging from an efficiently reorganized industry to one of lingering instability and cutthroat competition.

C. Summary

Reducing excess catching and processing capacity in the Alaska pollock and Pacific cod fisheries is unlikely to be a painless economic transition for this industry. The alternatives under consideration in the proposed Amendment 18/23 offer several strategies for reducing excess capacity viewed from the perspective of preventing preemption of one industry segment by another. The economic impacts associated with these alternatives were estimated in the Regulatory Impact Review (RIR) of the proposed Amendment relative to baseline 1989 operations of the affected groundfish catchers and processors. This Addendum to the RIR has examined some of the alternatives available for displaced operations facing reduced shares or allocations of pollock and Pacific cod.

The economic costs and benefits estimated under the baseline 1989 scenario may either overstate or understate the ultimate impacts, depending upon actions taken by individual catchers and processors, as well as the collective effect of industry performance. The various scenarios presented here provide qualitative references for judging the outcomes of such alternatives. The conceptual basis for evaluating options to the 1989 baseline relies upon consideration of the opportunity costs of employing the catching and processing resources elsewhere. That is, perceived financial returns, rather than technological feasibility, are expected to influence shifts in operations.

The adverse economic impacts estimated for the offshore segment will be reduced to the extent that genuinely under exploited opportunities exist elsewhere that can absorb the excess capacity represented in the two affected fisheries. Prospects for such opportunities in Alaska are guarded. Expansion into under utilized flatfish resources offers some potential, but problems with bycatch problems and market demand for some of these species will have to be overcome. Outside of this region, there are other fisheries such as whiting that hold some promise for further domestic development, and less certain opportunities world wide in developing various groundfish resources. A common thread in many such potentials is a high degree of uncertainty over technological and economic feasibility, as well as competition from distant water fleets of many nations. Thus, there are no simple "costless" alternatives available to catcher and processor operations that might readily absorb the excess capacity from the Alaska groundfish industry. There are alternatives available, however, such as the rock sole or yellowfin sole fishery, and portions of the Alaska pollock fleet are entering or expanding in other fisheries.

The options open to affected operations are not limited to under utilized resources; catchers and processors are likely to also test expansion into existing fisheries, possibly increasing competitive pressures on rockfish and other groundfish resources. Similarly, displaced offshore processing capacity may elect to seek operational status inshore, which could aggravate preemption concerns in some cases, leading to uncertain net economic impacts. Again, in order to reduce the aggregate economic costs estimated for the proposed alternatives, new economic activity will have to be found or created, rather than displacing some other operation in another already fully utilized fishery.

The potential for operations to temporarily or permanently cease operations may not increase the positive economic impacts of the proposed alternatives, but decapitalizing segments of the industry may lower the projected losses. Key variables in this case are the financial health of individual operations, their dependence upon capacity utilization, and the time period over which a decision to cease operations would occur. There are concerns over the possibility of widespread failure of catching and processing firms in the Alaska groundfish industry due to over capitalization, but limited evidence of this happening as of early 1991. This suggest that continued operations are still justifiable relative to shutting down. It remains to be seen whether this will continue given the expansion in capacity that has occurred, or if--barring alternative operations--extensive failure in the industry might be forthcoming.

Viewed in aggregate, it is probable that actions taken by firms to either mitigate costs or exploit the advantages associated with the proposed alternatives will include all of the options available, rather than any single path. The diversity of inshore and offshore segments, and variety even within each segment suggests that what may be advantageous for one need not be for another. The flexible, diversified operations would appear to have some advantage in adjusting to change, compared to the highly specialized enterprises. Similarly those operations most highly dependent upon pollock are more vulnerable that processors with multispecies or multiproduct capability. Thus, the costs, benefits, and alternatives available could be uneven in terms of the operations within each segment of the industry.

It is likely that the affected firms will modify their internal operations to the extent possible in order to adjust to changes in available shares of pollock and Pacific cod. Advanced notice of resource availability will enhance individual firm's ability to make these adjustments. Lacking empirical evidence of how catchers and processors will react, as well as what changes in regulations may be forthcoming, the industry's ability to modify the economic impacts estimated in the RIR remain conjectural. To the extent that under utilized fisheries can be productively developed by the displaced catchers and processors, these estimated cost impacts may be reduced.

Table 1

Comparison of 1990 BSAI ABCs, TAC and Catch

Species	Area	ABC	TAC	CATCH a/	Surplus ABC		Surplus TAC	
					ABC-Catch	% ABC	TAC-Catch	% TAC
Pollock	BS	1,450,000	1,280,000	1,280,007	169,993	12%	(7)	-0%
	AI	153,600	100,000	72,870	80,730	53%	27,130	27%
Pacific Cod		417,000	227,000	171,009	245,991	59%	55,991	25%
Yellowfin sole		278,900	207,650	80,584	198,316	71%	127,066	61%
Greenland turbot		7,000	7,000	9,619	(2,619)	-37%	(2,619)	-37%
Arrowtooth flounder		106,500	10,000	4,232	102,268	96%	5,768	58%
Rock sole		216,300	60,000	24,076	192,224	89%	35,924	60%
Other flatfish		188,000	60,150	23,252	164,748	88%	36,898	61%
Sablefish	BS	2,700	2,700	2,255	445	16%	445	16%
	AI	4,500	4,500	2,207	2,294	51%	2,294	51%
Pacific Ocean perch	BS	6,300	6,300	6,240	60	1%	60	1%
	AI	16,600	6,600	17,707	(1,107)	-7%	(11,107)	-168%
Other rockfish	BS	500	500	385	115	23%	115	23%
	AI	1,100	1,100	864	236	21%	236	21%
Atka mackerel		24,000	21,000	22,205	1,796	7%	(1,205)	-6%
Squid		10,000	500	472	9,529	95%	29	6%
TOTALS b/		2,883,000	1,995,000	1,717,981	1,165,019	40%	277,019	14%

a/ Catch data is from PacFIN, NPFMC Groundfish Reports, Report # 001, March 1991, and includes JV catch as well as all discards.

b/ Does not include ABC, TAC, and catch of non-specified species.

Table 2 Comparison of 1990 GOA ABCs, TACs and Catch

Species	Area	ABC	TAC	Catch a/	Surplus ABC ABC-Catch	Surplus ABC % ABC	Surplus TAC TAC-Catch	Surplus TAC % TAC
Pollock b/	WG/CG	70,000	70,000	77,772	(7,772)	-11%	(7,772)	-11%
	EG	3,400	3,400	9	3,392	100%	3,392	100%
Pacific cod	WG	29,500	29,500	32,737	(3,237)	-11%	(3,237)	-11%
	CG	59,500	59,500	41,720	17,780	30%	17,780	30%
	EG	1,000	1,000	190	810	81%	810	81%
Deep Flatfish	WG	16,300	3,650	64	16,236	100%	3,586	98%
	CG	77,700	15,300	4,473	73,227	94%	10,827	71%
	EG	14,400	3,050	61	14,339	100%	2,989	98%
Shallow Flatfish	WG	30,200	3,570	1,210	28,990	96%	2,360	66%
	CG	52,200	6,180	5,497	46,703	89%	683	11%
	EG	2,100	250	65	2,035	97%	185	74%
Arrowtooth	WG	27,000	4,450	999	26,001	96%	3,451	78%
	CG	141,000	23,170	2,999	138,001	98%	20,171	87%
	EG	26,600	4,380	44	26,556	100%	4,336	99%
Sablefish	WG	3,800	3,770	2,044	1,756	46%	1,726	46%
	CG	11,800	11,700	12,907	(1,107)	-9%	(1,207)	-10%
	W. Yakutat	4,600	4,550	5,956	(1,356)	-29%	(1,406)	-31%
	EY/SO	6,000	5,980	6,424	(424)	-7%	(444)	-7%
Rockfish Slope	WG	4,300	4,300	4,084	216	5%	216	5%
	CG	7,700	7,700	8,298	(598)	-8%	(598)	-8%
	EG	5,700	5,700	5,273	427	7%	427	7%
Rockfish Pelagic Shelf	WG	1,400	1,400	162	1,238	88%	1,238	88%
	CG	5,800	5,800	643	5,157	89%	5,157	89%
	EG	1,000	1,000	489	511	51%	511	51%
D.S. Rockfish e/	S. Outside	unknown	470	467	--	--	3	1%
Thornyheads	GOA	3,800	3,800	1,646	2,154	57%	2,154	57%
Gulf of Alaska Total c/		606,800	283,570	216,231	390,569	64%	67,339	24%

a/ Catch data is form PacFIN, NPFMC Groundfish Reports, Report #001, March 1991, and includes all discards.
b/ Includes Shelikof district.
c/ Does not include ABC, TAC and catch of non-specified species.

ADDENDUM III
to the
Supplemental Environmental Impact Statement/
Regulatory Impact Review/Final Regulatory Flexibility Analysis
of Proposed Inshore/Offshore Allocation Alternatives
Amendments 18/23 to the
Groundfish Fishery Management Plans
for the Gulf of Alaska and the Bering Sea/Aleutian Islands

RESPONSE TO COMMENTS

Comment #1 - The DSEIS (Draft Supplemental Environmental Impact Statement) fails to provide the required comment period. The commenter indicated the time allowed for public review of the April 29, 1991, DSEIS was shortened based on a Council newsletter. The Council newsletter indicated that comments were due June 20, 1991, instead of June 24, 1991, as stated in the Federal Register notice. Response - The Council newsletter cannot change the comment period announced in the Federal Register, which was May 10, 1991, to June 24, 1991 (56 FR 21676; May 10, 1991). The June 20, 1991, date referred to by the commenter was the date by which the Council requested comments be submitted for inclusion in the Council members' notebooks for the June meeting. Those received after June 20 and before June 24, were provided to the Council members in a supplemental folder at the meeting. In addition, a subsequent 45-day comment period from November 22, 1991, to January 6, 1992, was provided on the revised draft dated September 19, 1991 (FR 56 58904; November 22, 1991), which included Addendum I (An Overview of the Pollock Processing Industry) and Addendum II (Alternatives Available to Displaced Catching and Processing Operations).

Comment #2 - The DSEIS fails to analyze the effect of other regulations (i.e., quarterly allocations and a ban on roe stripping). Response - Seasonal allocations and a ban on roe stripping were considered under Alternative 5, which noted that quarterly allocations and a prohibition of roe stripping were implemented under Amendment 14 for the Bering Sea/Aleutian Islands (BSAI) and Amendment 19 for the Gulf of Alaska (GOA) (56 FR 492; January 7, 1991).

Comment #3 - The DSEIS fails to consider business decisions. Response - This comment is not pertinent to the scope of the DSEIS but will be considered as a comment on Amendments 18 and 23.

Comment #4 - The DSEIS fails to properly describe the length of the fishery.
Response - While it is unlikely that the groundfish processing plants could operate year-round, a reduction of fishing effort by removing the offshore sector would extend the length of the

fishing season. This assumes that fishing effort will not increase. In reality, fishing effort has steadily increased. The length of a fishery, regardless of the type of season, cannot be predicted as it depends on the amount of fishing effort and the seasonal catch limit allotted at the beginning of a fishing year.

Comment #5 - The Office of Management and Budget (OMB) groundfish survey was flawed. The commenter criticized the OMB groundfish survey instrument indicating it was ambiguous and contained little or no guidance.
Response - The DSEIS, at 3-8, 3-9, addressed concerns regarding complexity of the OMB Survey that was distributed to the public in 1990. The target populations of catcher and processor firms were adjusted to eliminate those originally contained in the population estimate that were in fact far removed from the geographical or species-related concerns raised by the issue. The DSEIS noted that the survey proved to be a frustrating exercise for the industry. Survey results that were unusable were deleted from further analysis. The data generated by the OMB Survey was also supplemented with data from NMFS, discussions with industry representatives and analyses from other amendments. Additional data used in the analysis are further explained at 3-9, 3-10 of the DSEIS.

Comment #6 - The DSEIS fails to adequately address processor options. The commenter indicated alternative fishing options for the offshore fleet were not adequately identified in regard to barriers that may be encountered. In addition, the "donut hole" was listed as an alternative.
Response - In a letter dated July 25, 1991, to the Council Chairman and the Executive Director of the Council, the Regional Director and NOAA General Counsel noted that the SEIS should include consideration of the effects on the human environment of vessel owners/operators that may be forced out of the pollock fishery as a result of the alternatives. Addendum II that addresses alternatives available to displaced catching and processing operations was developed and added to the September 1991 DSEIS that was distributed for public review in November 1991. Five possible options available to those owners/operators displaced from the pollock and/or Pacific cod fisheries were discussed. This addendum indicates that the potential for catching and harvesting outside the Exclusive Economic Zone (EEZ) may be limited by legal, technical, economic, and market demand uncertainties. Risks associated with such ventures depend on the situations of individual operations. At the time the DSEIS was drafted, the Council and the Secretary of Commerce had not yet adopted regulations prohibiting fishing in the "Donut Hole."

In Addendum II, it was noted that empirical evidence of how catchers and processors will react to adoption of the preferred alternative remain conjectural but the addendum provides qualitative information as to the fisheries that are at present underutilized and the management options available to displaced processors.

Comment #7 - The DSEIS understates the offshore surimi recovery rates.
Response - The National Marine Fisheries Service (NMFS) product recovery rate (PRR) for pollock surimi proposed in 56 FR 4029 (February 1, 1991) proposed a recovery rate at 15 percent. Public comments on this and other PRRs for different product types were solicited and information was submitted by some shoreside processors that indicated the PRR of 15 percent was too low and that shoreside processing plants actually had a PRR of 20 percent for pollock surimi. An interim final rule was drafted that incorporated the proposed PRRs with some changes, one being a distinction between pollock surimi product from a shorebased processing plant versus pollock surimi processed by factory trawlers at sea. Since there was no additional information that disputed the 15 percent PRR for pollock surimi processed at sea, the interim final rule was drafted with a 20 percent PRR for pollock surimi processed by shoreside plants and a PRR of 15 percent for pollock surimi processed at sea. During a lengthy review process for the interim final rule, at-sea processors stated that they experience an 18 percent recovery for pollock surimi, higher than the 15 percent NMFS had assigned in the interim final rule. NMFS has decided to review the available data and publish another proposed rule reflecting the current PRRs for pollock surimi and solicit public comment before finalizing the rule.

New information that comes to light during a review process should be incorporated into the National Environmental Policy Act (NEPA) analysis and distributed for public and agency review. However, there has been no data submitted showing that at-sea processors actually receive a higher PRR for pollock surimi.

Comment #8 - The DSEIS did not take into consideration the economic impact of the Gulf and Southeast Coast states shipyard builders.
Response - The economic impacts of the several alternatives as they relate to the Gulf of Mexico and Southeast shipyards were not specifically analyzed in the DSEIS. However, the DSEIS is replete with information on the possible national economic impacts that will occur if a shoreside preference allocation is made. Also, Appendix IIIa to Chapter 3 of the SEIS provides information on the distribution of expenditures for ports analyzed in Alternative 3. Furthermore, section 3.4.4 of the SEIS and Addendum II discusses the alternatives available to displaced catching and processing firms and specifically addresses impacts of failure of individual firms and those who depend on them for business.

Comment #9 - The DSEIS fails to consider the effects on endangered species (i.e., the Steller sea lion).

Response - Sections 2.2.5, 2.3.5 and 5.1 of the SEIS consider the effects of the alternatives on marine mammals, including effects on endangered and threatened species. The analysis concludes that, "[n]one of the alternatives is expected to measurably increase the direct impacts on marine mammals." This conclusion is supported by the findings of biological opinions prepared for the preferred alternative under Section 7 of the Endangered Species Act. A November 12, 1991, informal consultation found that the preferred alternative for the Gulf of Alaska is not expected to cause the GOA fishery to affect listed species in a way that was not already considered in prior biological opinions. A March 4, 1992, formal section 7 consultation concluded that the preferred alternative for the Bering Sea/Aleutian Islands is not likely to jeopardize the continued existence of any endangered or threatened species under the jurisdiction of NMFS.

Comment #10 - DSEIS fails to provide the Regulatory Impact Review (RIR) and Analysis required by Executive Order 12291, which includes determination of whether the action is a major rule.
Response - NEPA requires that social and economic impacts be analyzed in an SEIS. The Council usually addresses the requirements of NEPA, E.O. 12291 and the Regulatory Flexibility Act in one document. This procedure was followed for Amendments 18/23. The requirements of E.O. 12291 are not identical to those of NEPA. E.O. 12291 requires a determination of whether a proposed rule is major or non-major under criteria set forth in the executive order whereas NEPA does not. Neither NEPA or E.O. 12291 require a formal cost-benefit analysis and the Council chose to analyze economic impacts of the alternative through the use of an input-output model. A cost-benefit analysis was conducted by NMFS staff for the preferred alternative and is attached to this FSEIS as Appendix C to Addendum III. Executive Order 12291 requires preparation of an analysis to determine whether any action would be a major rule. This is not a requirement of the DSEIS under NEPA.

Comment #11 - DSEIS fails to incorporate commenter's recommendation to include a moratorium, an allocation by vessel length, and other groundfish species.
Response - The Council derives its alternatives through a political process. All features recommended by the commenter apparently were not agreed to by other participants in this process. A moratorium was considered as a concept for Amendments 18 and 23. The Council's rationale for not considering a moratorium (limited entry) is addressed on page 1-6 of the DSEIS. "[T]he Council concluded that such management probably would not address specifically the nearshore and offshore conflicts." A moratorium, individual fishing quota, or other form of limited entry would not, by itself, prevent the offshore vessels from taking their share of the resource from areas available only to inshore vessels. However, as a separate issue, the Council is

currently developing a limited access recommendation for Secretarial consideration.
Allocation by vessel length was considered under Alternative 4 based on: a) 1989 snapshot; b) 50-50 split of the total allowable catch (TAC); c) average catch between 1986 and 1989; and d) average catch between 1986 and 1988. This form of allocation was determined to be an indirect procedure for setting inshore/offshore allocations that would not ensure protection of the inshore processors from the offshore sector.
Preemption of harvest of other groundfish species is not currently considered to be a problem. Pacific cod had been considered in the BSAI but was deleted from the analysis for the above reason. Should problems arise concerning other groundfish species, recommendations for their consideration will be made to the Council at that time.

Comment #12 - The commenter states concerns over the ability of independent harvesters to sell their catch to the market of their choice. In essence, catcher vessels that sell to the offshore market are reduced to a second class status.
Response - This comment concerns the recommended policy of Amendments 18 and 23, and not the DSEIS analysis.

Comment #13 - The commenter has indicated a "dual track" review of the DSEIS and the amendments is impermissible under NEPA. The reasoning given by the commenter is "[b]ecause the Council exercises primary policy-making authority under the Magnuson Act, and because NMFS does not substitute its judgment for that of the Council in the identification and selection of preferred fishery management alternatives, it inevitably follows that NEPA requires that preparation, circulation, and consideration of draft environmental impact statements and/or any supplement or revised thereto occur at the Council level."
Response - The agency's understanding of "dual track" refers to the two separate review periods under NEPA and the Magnuson Act. It is the agency's position that the Secretary of Commerce (Secretary) is the final decisionmaker in the Magnuson Act process. Although the Secretary does not have authority to choose an alternative other than that recommended by the Council, the Secretary does have the authority to approve, disapprove, or partially disapprove FMPs or plan amendments if they are inconsistent with the Magnuson Act or other applicable law. 16 U.S.C. section 1854(b). As such, the Department of Commerce is the decisionmaker under NEPA with the aid of the public comments. This is an appropriate integration of the two statutes.

Comment #14 - NEPA requires that the Council, as the primary Federal policy-maker, integrate environmental considerations into its decisional processes. The Council, not the Secretary, is responsible for preparing complete NEPA documentation.

Response - NMFS has encouraged the Council to satisfy NEPA requirements by fully analyzing environmental considerations before adopting a plan or plan amendment and submitting the plan or amendment with the NEPA document to the Secretary. However, the Secretary, not the Council, is the primary Federal policymaker and therefore ultimately responsible for compliance with NEPA. For the Council's proposed Amendments 18 and 23, the Secretary determined that the April 1991 DSEIS had been substantially changed and required an additional public review period. Therefore, the Secretary appropriately circulated a revised draft SEIS for further NEPA public comment (56 FR 58904; November 22, 1991) prior to the agency's decision.

Comment #15 - NMFS' procedures and past practice recognize that draft environmental documents must be circulated at the Council level. Fishermen do not believe that written comment to the Secretary will have any significant influence on fishery management policy.
Response - Since the Secretary is ultimately responsible for compliance with NEPA, it is appropriate, and sometimes necessary, for NMFS to assist the Council with the preparation, circulation, and consideration of draft NEPA documents. The Secretary will consider all public comment before making a final decision to approve, disapprove, or partially disapprove a Council proposed plan amendment.

Comment #16 - The DSEIS demonstrates the inappropriateness of NMFS' approach to NEPA compliance in that the analysis of the preferred alternative (Alternative 8) was not presented for public review prior to the Council's final decision to select that alternative as the preferred alternative.
Response - Alternative 8 was basically a further refinement of Alternative 3, incorporating aspects of Alternatives 2, 6, and 7, added to remedy any ambiguities in the existing proposals as discussed in section 1.5, page 1-17 and section 3.3.8.2, page 3-104. Although the analysis of the Council's preferred alternative (Alternative 8) came after the Council's final action in June 1991, subsequent public comment received on the analysis of that alternative will be taken into consideration by the Secretary in deciding whether to approve, disapprove, or partially disapprove the Amendments. NMFS' guidance to the Council is that it is preferable to provide an opportunity for public comment on the analysis on all alternatives, including the preferred alternative, prior to final action by the Council. The Council's failure to do this is not critical to the determination of compliance with NEPA.

Comment #17 - The DSEIS failed to include the Department's separate "economic analysis" of Amendments 18/23. Any separate economic analysis should be a part of the NEPA process.
Response - The Department's DSEIS includes a section on the description of the economic environment and associated

consequences of the proposed management alternatives. A separate, cost-benefit economic analysis was prepared by NMFS staff as an aid to the decisionmaker. The analysis uses a database that was available to the public. The cost-benefit analysis has been appended to Addendum III as Appendix C.

Comment #18 - The DSEIS fails to demonstrate the need for Amendments 18 and 23 in that it: a) never explicates the connection between inshore/offshore and overcapitalization; b) assumes the 1989 incident provides a basis for regulatory measures; c) does not demonstrate preemption; d) does not demonstrate relevance of operational area; and e) provides no explanation as to why all five issues raised in the problem statement were not addressed.

Response - The inshore and offshore sectors of the Alaska groundfish industry have experienced rapid growth and estimates of processing capacity indicate this industry is capable of utilizing greater amounts of the resource than currently exist. Additionally, the offshore sector generally characterized by larger harvesting vessels with greater harvest capacity and mobility than the inshore sector. In such instances, preemption of harvest by one sector over the other is inevitable.

a) The Council recognized the problem of overcapitalization in the context of different capabilities of the inshore and offshore components of the industry. As a matter of policy, the Council choose to deal with the inshore/offshore allocation prior to dealing with the aspect of overcapitalization. In selecting its preferred alternative, the Council indicated its intent to proceed with resolutions of the overcapitalization problem.

b) and c) The 1989 incident, which inspired the Council to begin work on the amendments, serves as an example of how competition can lead to preemption. The Council anticipates continued incidences of preemption problems because the potential for preemption exists whenever fishing capacity is growing, the resource remains finite and one sector has a clear advantage in mobility and harvest capacity over another.

d) The operation area is necessary to ensure that the inshore sector will be able to take its allocated percentage within the inshore catching vessels operational constraints. Operators of inshore harvesting vessels experience practical restraints on their fishing practices due to their inability to travel great distances from shore to harvest fish. The harvest vessel operational area is discussed throughout Chapter 3 on pages 3-101, 3-128 and 3-131.

e) The five issues mentioned in the problem statement are ongoing general concerns of the Councils. Most of these concerns are solved by traditional management tools. Localized depletion is traditionally dealt with through area closures. Exceeding the TAC is controlled by NMFS enforcing quotas set by the Council and by shortening seasons when the fishing capacity is more than that necessary to harvest the TAC available within a fishing year. Increased waste was addressed in the Council's proposal concerning roe stripping, Amendments 14 and 19 (55 FR 492; January 7, 1990). The problem of preemption was the one concern not previously addressed by the Council and was, therefore, focused on as a matter of policy.

Comment #19 - The DSEIS fails to adequately address the alternative of "no action" in that it: a) includes joint venture landings; b) assigns 80% of the joint venture landings to the inshore sector instead of recognizing these landings as being part of the offshore sector; c) defines some factory vessels as shoreside processors; d) indicates that Alternative 5 is effectively a "no action" alternative but then does not analyze it; and e) ignores OMB survey data for the first half of 1990 and other events in 1990, 1991, and 1992 including the inshore/inshore "preemption" in the summer of 1991.

Response - Analysis of a status quo or "no action" alternative is required by NEPA to be included in any DSEIS. One difficulty in analyzing status quo for the Alaska groundfish fishery is the inherent variability in fish stocks, markets, and fishing operations from year to year.

a) Inclusion of the joint venture (JV) landings for 1989 was deemed appropriate because many of the vessels operating as JV catchers continued to operate in the entirely domestic fishery in later years.

b) It was the Council's perception that roughly 80% of the former JV harvest was delivered to inshore processing operations after replacement of the JV fishery by the entirely domestic fleet. This perception was based on public testimony to the Council. The allocative effect of this assumption was acknowledged in the analysis in Section 3.3.3.3 beginning on page 3-39. For analytical purposes, the JV operations in the BSAI area could be perceived as "offshore landings." In this case, the analysis would consider only the inshore/offshore percentages of the domestic harvesting and processing (DAP) fishery. For example, the 1990 BSAI pollock inshore proportion was 16% of the total DAP harvest. If 80% of the 1990 JV pollock catch were allocated to the inshore sector, its proportion would increase by only 1% making it 17% of the total pollock catch. The year 1990 was the last year of JV operations in the BSAI area. In 1991, the inshore proportion of the total DAP pollock harvest increased to 28%. This represents an increased tonnage of pollock harvested in the BSAI area by the inshore sector of 72% from 1990 to 1991.

c) The choice to include some factory vessels (i.e., freezer longline factory vessels) in the inshore category was a policy decision of the Council. The extent to which this could bias the analysis was acknowledged in Section 3.3.3.3 on page 3-48 but was not expected to significantly alter the economic impacts as it is a definitional rather than allocative change.

d) Alternative 5 discusses measures such as pollock roe stripping seasonal allocations, and the division of the GOA pollock area into districts. These were all either under consideration or

implemented at the time of analysis of this alternative as mentioned in Section 3.3.5 beginning on page 3-82.
e) Since 1989 was the base year for analytical purposes, it would be inconsistent to include information from other years in a discussion of the OMB survey. Section 3.3.3.1, page 3-37, explains the estimation procedures and states that the 1989 base year implies no specific standard of optimality, rather it serves only as a known reference.

Comment #20 - The DSEIS fails to analyze all reasonable alternatives such as exclusive registration areas and limited access; however, when confronted with similar management problems, the Council has identified limited access as a reasonable management alternative. The justification for failure to include this viable alternative is unpersuasive (i.e., difficulties in coming to a decision, amount of time needed to evaluate, failed efforts to involve industry, and the controversial nature of the alternative).
Response - The approach of limited access is under intensive consideration by the Council on a separate schedule. A discussion of limited access is in Section 1.6 beginning on page 1-17. The analysis at page 1-20 acknowledges that the only limited access system that could directly address the inshore/offshore issue is some form of individual fishing quota. For a variety of reasons as outlined in that section, the Council made a policy decision that the preemption problem was of great urgency and limited access alternatives would require considerable time to implement. Therefore, limited access was not considered to be a practicable alternative for the purpose of resolving the preemption problem in the near term.

Comment #21 - The DSEIS analysis is conclusory in regards to those alternatives not involving preferential inshore allocation in that a) Alternatives 1, 2, and 5 contain little more than a conclusory discussion of what the Council did not like; b) no meaningful analysis is provided for Alternative 2; c) an adequate evaluation of Alternative 5 would have demonstrated that the adoption of its measures could have been effective in addressing the preemption problem; and d) omits analysis of key issues and does not provide sufficient information on which to choose among alternatives.
Response - NEPA states that only a brief discussion of issues other than those of greatest significance is required (Section 1502.2(b) of the Council of Environmental Quality (CEQ) regulations). Impacts shall be discussed in proportion to their significance. In addition, an environmental impact statement (EIS) shall be kept concise and no longer than absolutely necessary. The DSEIS does provide a brief analysis of all alternatives. The Council's decision to eliminate Alternatives 1, 2, and 5 from detailed study was reasonable because the Council concluded that they would not be as effective at solving the preemption problem in the near term. Alternative 1, status

quo, is discussed in Section 3.3.1 beginning on page 3-21, Alternative 2, use of traditional management tools, in discussed in Section 3.3.2 beginning on page 3-25, and Alternative 5, pollock roe stripping and seasonal allocation, is discussed in Section 3.3.5 beginning on page 3-82. Even without detailed study of these alternatives, the SEIS includes sufficient analysis to allow the public and the agency to choose among the alternatives.

Comment #22 - The DSEIS fails to discuss all environmental impacts of the alternatives in regards to: a) differentiation among environmental impacts; b) marine mammals; c) bycatch and localized depletion; d) coastal habitat; e) General Agreement on Tariffs and Trade (GATT) implications; f) net national economic benefits and competitiveness; g) human environment (i.e., vertical integration and other economic and social implications); and h) impact on other fisheries.

Response -

a) Environmental impacts of each alternative have been discussed throughout the text of Chapter 2, section 2.3. Appendix A to this Addendum elaborates on these discussions.

b) Section 2.3.5 of Chapter 2 discusses the physical and biological impacts of the alternatives on marine mammals. An expansion on effects to marine mammals is contained in Appendix B to this Addendum.

c) Bycatch is discussed in Section 2.2.4 beginning on page 2-68, Section 3.4.5 beginning on page 3-126, and again in Appendix A to this Addendum. The risk of localized depletion is a possibility, however, the risk is mitigated as pollock and Pacific cod are highly migratory, as discussed in Appendix A to this Addendum.

d) Increased inshore waste disposal and its effect on the coastal and marine environment are governed by State and Federal regulations. Appendix A to this Addendum includes further discussion of the potential effects of waste disposal.

e) The GATT was not specifically analyzed, however, none of the alternatives is expected to conflict with its requirements.

f) The analysis summarizes economic costs and benefits to the Nation in Section 3.5 beginning on page 3-133. This section includes a discussion of competitiveness that concludes that both sectors would adapt to the most efficient and profitable level of product utilization.

g) Chapter 3 of the DSEIS is devoted to the economic analysis and the consequences of the various alternatives. Chapter 4 is the social impact assessment (SIA), and it details the social environment and its consequences. One consideration, vertical integration, is not expected to be any different than if no action is taken. Another concern is the choice of cities used in the analysis. The cities outlined in the SIA were chosen to represent the range and types of social impacts likely to occur at the community level. The assessment of Ballard as a community was not comparable to the other six communities chosen because Ballard is a neighborhood within Seattle and Seattle is one of

the Nation's major cities. It is not essential to a reasoned choice among alternatives to characterize the social, economic, and cultural organization of this city at the level of detail required for comparative analysis. The fishing industry in Seattle represents only a minor percentage of the overall economic base of Seattle and, the groundfish fishery represents only a part of the overall fishery component of the Seattle economy. Newport, Oregon, and Bellingham, Washington, were chosen, not because they have a groundfish fishery, but rather because there are fishery industries based there and they were of comparable size to the representative Alaskan communities. Chapter 5 discusses and concludes that the potential negative social consequences to Pacific Northwest communities are believed to be well within the limits of change that can be handled by the economic/social structures of those communities (page 5-6 and the SIA).
h) The impact on other fisheries is considered in Section 3.4.4 beginning on page 3-120, which indicates there are several alternatives available to displaced offshore participants but the economic feasibility of these alternatives is unclear. Even "no action" is expected to lead to some reorganization of the Alaskan groundfish industry given the current overcapitalized condition of the fisheries.

Comment #23 - The commenter states that NEPA only requires consideration of the physical environment (i.e., environmental impact and adverse environmental effects that cannot be avoided).
Response - Section 1502.23 of the CEQ regulations states that an EIS should indicate those considerations, including factors not related to environmental quality, which are likely to be relevant and important to a decision. The non-environmental factors are commonly known as secondary impacts and include social and economic effects of the alternatives. Section 1502.23 also states that if a cost-benefit analysis relevant to the choice among environmentally different alternatives is being considered for the proposed action it shall be incorporated by a reference or appended to the statement as an aide in evaluating the environmental consequences. Appendix C of Addendum III contains a cost-benefit analysis prepared by NMFS staff.

Comment #24 - The DSEIS identified but did not consider the social impact on the problem of alcohol abuse in Unalaska.
Response - Included as an Appendix to Chapter 4 is the Community Profile of Unalaska Developed for the SIA which discusses alcohol abuse. "Economic instability is, whether it is associated with rapid positive or negative growth, is locally felt to be associated with social problems in general and alcohol abuse in particular" (page 73).

Biological impacts of the proposed alternatives:

Alternative 1: Status quo

The "status quo" has changed since the original analysis done in 1990. The issue of preemption by the offshore segment of the industry was not the problem it was in 1989. In fact, preemption by various segments within the inshore sector was a factor in the 1991 pollock fishery. We do not have evidence to suggest that adverse biological impacts are presently occurring in the fisheries. The harvest levels are set utilizing the best available information.

Alternative 2: Use traditional management tools including but not limited to: trip limits, periodic allocations, super-exclusive registration areas, and gear sizes.

This alternative is also status quo. The current pollock TAC in the Eastern Bering Sea is allocated between a roe and non-roe season. The pollock TAC in the Gulf of Alaska is allocated quarterly, and also distributed among four management areas within the Gulf. These measures serve to spread the pollock catch out temporally as well as geographically. There are no similar measures for Pacific cod in the Gulf, but the cod fishery has not experienced the problems associated with the pollock fishery, to the same degree. Current management of the pollock fisheries lessens the risk of possible localized depletion, and possible adverse impacts due to targeting spawning populations. There is no evidence to show that the Pacific cod population is being adversely affected by the current harvest levels and management regime. The TACs have been specified for Pacific cod utilizing the best available scientific information.

Under this alternative the amount of waste being put forth into the environment would not increase. The distribution of effluents would be spread out over time and possibly over larger areas. A possible negative impact might occur if effluents are being discharged in areas or during times where flushing is poor. There is insufficient data at this time to quantify this.

The longer fishing seasons provided for in the current management regime for pollock, also serve to provide more time for managers to monitor the fishery to keep harvests within the TACs. The problem of exceeding TACs for both pollock and Pacific cod has been further reduced by the NPFMC's domestic observer program and expanded reporting requirements.

Alternative 3: Allocate the TAC between inshore and offshore components of the industry. Specifically this alternative examines the Gulf of Alaska pollock and Pacific cod fisheries, and the Bering Sea pollock fishery, under various allocation percentages, and defines operational areas for pollock in the Bering Sea.

Relative to the status quo (Alternatives 1 and 2), this alternative would not result in increased overall removals from the pollock and Pacific cod fisheries as they are limited by the TACs. However, the geographic distribution of the harvests would likely change. The largest impact is likely to occur in the eastern Bering Sea; in the Gulf of Alaska, the majority of the pollock harvest is already taken by the inshore component. Proposed inshore allocations for Gulf of Alaska pollock are 46%, 69.2%, and 100% The percentage of the total GOA pollock catch taken by the inshore component in 1990 and 1991 was 78% and 89%, respectively (1992 SAFE). Therefore, more of the GOA pollock harvest would be shifted to the offshore component (except under the 100% allocation). Under the 100% allocation, there would be an increased harvest by the inshore component relative to the 1990 and 1991 fisheries.

There are substantially different discard rates (discarded pollock:retained catch) associated with at-sea processors and shoreside processors. In addition, discard rates reported by the Regional Office are lower than those reported by observers. Estimates of discard reported by the Regional Office for shoreside processors averaged 4.5% for 1990 and 1991, compared to 39.7% for at-sea processors (1992 SAFE). Comparable average rates for 1990 and 1991 reported by the observer program, were 7.6% and 70%, for shoreside and at-sea processors, respectively (1992 SAFE). It is important to recognize that the estimates of annual discard of pollock from all fishing vessels combined differ substantially from the estimates of discard from vessels targeting on pollock. Estimates of 1990 pollock discard rates from directed pollock fisheries reported by domestic observers were 1% and 28.5%, for shoreside and at-sea processors, respectively. The implications of these rates of pollock discard is that any allocation which allocates a greater share of the harvest to the inshore component would result in decreased amounts of pollock discard. We have no evidence to suggest that the amount of pollock discards are negatively impacting the environment. There could be inverse impacts in confined areas with poor flushing, on the other hand, these discards provide food and nutrients to other components of the ecosystem.

The proposed GOA inshore Pacific cod allocations are 93%, 82.9%, 80%. This compares with 78% of the total cod harvest that was taken by the inshore component in the 1991 fishery (Juneau, Regional Office data). Therefore, an increased portion of the

GOA cod harvest would be shifted to the inshore component, relative to status quo.

Estimated 1991 discard rates of Pacific cod in the Gulf of Alaska were 2.8% and 6% for shoreside and at-sea processors, respectively. Data from observers indicated higher rates averaging 4.4% and 13.4% for 1990 and 1991 for shoreside and at-sea processors, respectively. Under this alternative, there will likely be significant reductions in the amount of Pacific cod discarded as the harvests are shifted to the shoreside component. There is no evidence to suggest that the current amount of cod discards are negatively impacting the environment.

Proposed inshore allocations for Bering Sea pollock are 33%, 59.2%, and 50%. The percentage of the total Bering Sea pollock catch taken by the inshore component in 1990 and 1991 was 15.7% and 27.6%, respectively. This alternative would shift a large proportion of the Bering Sea pollock harvest to the inshore component, resulting in significant changes in the temporal and geographic distribution of the harvest. The operational area for pollock will also redistribute harvests geographically and among the sectors to a great extent. Overall, 90 percent of the catches delivered to shoreside processors in the eastern Bering Sea were taken from the proposed operational area in 1990. Twenty-one percent of the catch taken by offshore processors came from the inshore operational area. First quarter data from 1991 shows that 21% of the offshore pollock harvest was taken in the operational area (pers. comm., Lowell Fritz AFSC). The harvest by the offshore component would be shifted to areas outside the proposed operational area. The Bogoslof Area, which had been utilized by the offshore fleet, will be closed for the 1992 fishery. This will likely cause the fleet to increase its effort north along the Bering Sea shelf for pollock.

Estimates of Bering discard reported by the Regional Office for shoreside processors averaged 2.4% for 1990 and 1991, compared to 10.3% for at-sea processors. Comparable average rates for 1990 and 1991 reported by the observer program were 4% and 12% for shoreside and at-sea processors, respectively (AFSC). Estimated average discard rates from 1990 and 1991 from directed pollock fisheries were 1.7% and 8.3% (AFSC). Under this alternative, there will likely be significant reductions in the amount of pollock discarded, as the harvests are shifted to the shoreside component. We have no evidence to suggest that the current amount of pollock discards are negatively impacting the environment.

It is not possible to quantify to what extent shifts of harvest to the inshore component would result in increased harvests in nearshore areas. The inshore component cannot necessarily be equated with nearshore harvesting. The definition of the term "inshore" under Alternative 3 includes shorebased processing plants, all fixed gear catcher/processors, and all motherships and floating processing vessels that process groundfish at any time during the calendar year in the waters under the jurisdiction of the State of Alaska. Although the fixed gear catcher/processors fall under the inshore category, they would not necessarily catch and process fish nearshore. However, this would only have a bearing on the Pacific cod fishery, and the bulk of the harvest has been taken by trawl gear.

There is certainly a concern regarding the probable increased concentration of effort within the operational area (by the inshore component) and along the shelf (by the offshore component). Localized depletion and possible adverse effects due to targeting on spawning populations are possibilities. However, there is no evidence to suggest that increased harvests nearshore or within small areas would result in negative impacts on the stocks relative to the status quo. Pollock and Pacific cod are highly migratory species, which lessens the possibility of localized depletion. It has been noted that a shift in fishing effort along the Bering Sea shelf southeast of the Pribolofs, results in a concentration of fishing in an area that had a declining pollock biomass from 1986-1990, and has experienced relatively high fishery exploitation rates during the last 5 years (pers. comm., Lowell Fritz AFSC).

Apportionment of the TACs between the inshore and offshore components could prolong the fishing seasons. On the other hand, if the apportionment is less than a component's previous harvests, the season would be shortened. This is a likely effect for the offshore component, particularly in the Bering Sea pollock fishery. There is no evidence to suggest that fishing mortality occurring in short time periods negatively impacts a stock. A possible effect is the difficulty for managers to keep pace with the fishery. As noted above, this possibility has been greatly diminished due to the observer program and increased reporting requirements.

Under this alternative, the amount of waste being discharged would not increase relative to the status quo. There could be increased discharges nearshore. Current indications are that the amount and type of processing discharge are not negatively impacting the environment, except possibly in confined areas. Such occurrences and other adverse effects of additional discharges of processing waste would be reduced if existing EPA requirements were more closely adhered to, specifically, if all processing waste were ground into 0.5 inch particles.

Bycatch of halibut, red king crab, and C. bairdi Tanner crab in the BSAI groundfish fisheries is limited by caps, portions of which are allocated to specific directed fisheries. In the Gulf of Alaska, crab are protected by closed areas in the vicinity of Kodiak Island, and halibut bycatch caps set by the Council apply to bottom trawl and longline groundfish fisheries. It is anticipated that the total removals of prohibited species would not be exceeded under any of the alternatives due to the bycatch caps. However, the rates at which these caps are attained would likely change if fishing patterns are altered. Briefly, if any of the alternatives lead to increased effort in certain areas or during certain times, it can be expected that bycatch caps would be reached in shorter time periods. This could severely constrain or even shut down fisheries, thereby preventing the attainment of the intended allocations, and effectively reapportioning the initial allocations of directed quota between inshore and offshore sectors.

The Bering Sea inshore operational area proposed by the Council overlaps slightly with the region of high red king crab concentrations in Bristol Bay (Stevens and MacIntosh 1989). If an inshore operational area is adopted, and if such a measure displaces bottom trawl effort by the offshore processing sector further to the north and west, this sector may have diminished need for red king crab bycatch allowances and increased need for <u>C. bairdi</u> Tanner crab bycatch allowances. Due to the closure of the Bogoslof Area for the 1992 fishery, the offshore component will likely increase effort along the eastern Bering Sea shelf. This fishery will likely encounter increased halibut bycatch along the shelf in the first quarter relative to the Bogoslof Area. The overall amount of halibut mortality would not increase due to the caps, but the rate at which the halibut bycatch cap is attained would increase. Without adequate and species specific bycatch allowances, initial directed fishery allocations may not be attainable.

<u>Alternative 4</u>: Allocate TAC on the basis of species (as specified in Alt. 3) and vessel length (for example, partition the BSAI TAC 50-50 between vessels over 150' and those less than 150'. A threshold for the GOA might be 125').

Relative to the status quo, this alternative would not result in increased overall removals from the pollock and Pacific cod fisheries as they are limited by the TACs. However, the geographic distribution of the harvests would likely change. The biological impacts would be similar to those discussed in Alternative 3. The assumption being made is that the small vessels would harvest their allocations nearshore.

<u>Alternative 5</u>: Use a combination of the following measures: ban roe-stripping everywhere, delay opening of the GOA pollock season until after roe season, split pollock into roe, non-roe seasonal quotas, and divide GOA pollock area into separate districts.

A combination of these measures is being implemented for the 1992 fishery. Roe-stripping is prohibited and seasonal allowances for pollock in the Gulf of Alaska and Bering Sea/Aleutians were implemented under Amendments 19/14. The current pollock TAC in the Eastern Bering Sea is allocated between a roe and non-roe season. The pollock TAC in the Gulf of Alaska is allocated quarterly, and also distributed among four management areas within the Gulf. These measures serve to spread the pollock catch out temporally as well as geographically.

The biological impacts of this alternative have been discussed under Alternatives 1 and 2.

<u>Alternative 6</u>: The allocation of pollock and Pacific cod will be at the vessel level, categorized by vessels that catch and process on board, and vessels that catch and deliver at sea or to shoreside processors. A reserve is set aside with first priority for catchers that deliver inshore.

Alternative 6 is a modification of Alternatives 3 and 4, allocating specifically to catcher vessels based on processing capability, with designated inshore and offshore processor apportionments, as well as a portion that is available via the marketplace from catcher vessels to either inshore or offshore processors. The biological impacts are similar to those discussed under Alternative 3.

<u>Alternative 7</u>: Ten percent of the shoreside allocation available in the Bering Sea would be available for delivery to shorebased plants north of 56° N. latitude and west of 164° W. longitude.

This alternative establishes a specific allocation available to shorebased plants in the portion of the Bering Sea largely encompassing communities not presently active in the commercial processing of pollock. The biological impacts would be similar to those discussed under Alternative 3, assuming some allocation scheme between the inshore and offshore components. In addition, there would likely be increased effort along the Bering Sea shelf north of 56° N. latitude and west of 164° W. longitude. There is not sufficient information to determine if there could be adverse biological impacts due to increased effort nearshore to these communities. As noted above, there is no evidence to show that localized depletion would result due to concentrated effort in small areas.

If these communities utilize their allocation and begin actively processing, there would be effluents being discharged into the water. There is insufficient data to determine if this would cause adverse impacts in these nearshore waters.

Alternative 8: A comprehensive fishery rationalization program for the groundfish and crab resources of the Gulf of Alaska and the Bering Sea and Aleutian Islands.

This alternative is a variation of Alternative 3 incorporating aspects of Alternatives 2, 6, and 7. Under this alternative, 100% of the GOA pollock TAC would be allocated to the inshore component. Ninety percent of the GOA Pacific cod TAC would be allocated to the inshore component. These allocations would result in shifts of the pollock and Pacific cod harvests to the inshore component, relative to the 1990 and 1991 fisheries

There is a phase-in period of 3 years for the Bering Sea pollock TAC as follows:

	Inshore	Offshore
Year 1	35%	65%
Year 2	40%	60%
Year 3	45%	55%

This alternative also includes a Bering Sea Harvesting Vessel Operational Area (discussed under Alternative 3). Any pollock taken in this area in the directed pollock fishery must be taken by harvesting vessels only, with the exception that 65% of the at-sea roe-season allocation available to the offshore segment from January 1 - April 15 may be taken by the offshore segment in the operational area. Twenty-one percent of the 1991 first quarter Bering Sea/Aleutian Islands pollock harvest by the offshore component (catcher processors excluding motherships), was taken in the operational area (pers. comm., Lowell Fritz AFSC). The closure of the Bogoslof Area will likely cause the offshore component to utilize its 65% allocation, and shift its effort into the operational area. This will result in increased effort in this area relative to the 1991 fishery. The possible impacts of shifts in harvest effort have been discussed under Alternative 3.

APPENDIX B to ADDENDUM III

Marine mammal issues:

A summary of data collected on foraging ranges, locations, and food habits is presented below.

Foraging Ranges and Locations

Juveniles - Three groups of animals have provided information on movements of Steller sea lion juveniles - pups branded by the Alaska Department of Fish & Game (ADF&G) in 1976-77, pups tagged/branded by National Marine Mammal Laboratory, NMFS (NMML) biologists (with cooperating ADF&G biologists) at Marmot and Ugamak Islands in 1987-90, and two pups radio tagged by NMML biologists at Ugamak Island in November 1991.

1. ADF&G 1976-77: Animals branded by ADF&G in 1976-77 at Kodiak area sites were frequently observed at Kayak Island (Cape St. Elias) during intensive observations in 1977-78 (Calkins and Pitcher 1982). The longest movement was to Biali Rocks in southeast Alaska (near Sitka). Animals branded at Marmot and Sugarloaf Islands appeared to disperse both to the east (to SE Alaska) and west (to the Semidi Islands). Based on frequency of resightings, the direction of movement of 1-2 year old animals appeared predominantly eastward, particularly into the Prince William Sound area. However, there appeared to have been more resighting effort in the Prince William Sound area.

    These data indicated that animals generally did not return to their natal rookery until they were adults. The number of branded animals resighted at Sugarloaf increased from 54 in 1979 to 928 in 1980. Eighty percent of the Sugarloaf 1980 resights were animals born at the site.

    During 1982-83, 15 sightings of branded animals (all from Marmot and Sugarloaf) occurred at haul-outs during March-July in SE Alaska (Calkins 1986). These were all adult animals (sex unknown); it was also unknown whether they had permanently migrated to SE Alaska or were just there to forage. NMML biologists observed a branded male at Ugamak Island (eastern Aleutian Islands) during the 1986 breeding season (NMML unpub. data). This animal appeared to be looking for a territory.

2. NMML 1985-89: Eight-hundred pups were tagged at Marmot Island during the summers of 1987-88. Several animals were resighted during the next 2 to 3 years, with the longest movement to Vancouver, British Columbia. As in the ADF&G study, most of the resights occurred in Prince William Sound and SE Alaska. One of the 1988 animals was resighted at Puale Bay in February 1991.

   Pups have been flipper tagged at Ugamak Island in a number of years since 1985. The site where they have been most frequently resighted has been at Round Island in Bristol Bay.

3. NMML 1991: Two male pups (around 6 months old) were radio tracked during November-December 1991 from their tagging site at Ugamak Island. One moved within a month to the Pribilof Islands, over 250 nautical miles (nm) away. The second pup was regularly observed 8-10 nm away near Tigalda Island, and on at least two trips was seen as far as 20 nm away near Akun Island.

Basically, NMFS has learned that weaned (and perhaps unweaned) sea lions seem to be capable of long movements away from their natal rookeries during their first years of life (e.g., from Marmot Island to Vancouver, British Columbia, or from Ugamak Island to the Pribilof Islands). These movements appear to involve a dispersal away from the rookery during year one (probably undirected) and eventually involve a return migration to the rookery as an adult. These animals are capable of long movements (>10 nm) even during their first winter.

<u>Adults</u> - Prior to NMFS satellite tracking, the only data on adult distribution was from the ADF&G resight data and plots from NMFS Platform of Opportunities (POP) Database. Kajimura and Loughlin (1988) summarized the POP sighting data and found that northern sea lions appeared to be confined to shelf areas. Seasonal distribution patterns did not appear to change.

The tracking data provides a somewhat different picture (Merrick et al. in review). To date NMFS has generally only instrumented females with pups. In the summer, six animals studied remained close to the rookeries ($\bar{x}$= 13 km or 8 nm, though range is up to at least 34 kilometers (km) or 20 nm), made brief trips (<= 2 days), and made shallow dives ($\bar{x}$ < 30 meters (m)). Deepest dive was 120 m. This appears to be characteristic of animals at the five sites where instruments were deployed (Chirikof, Ugamak, Ulak, Seguam, Kiska). The short trip durations recorded (and as a result short trip lengths) are confirmed by previous on-land observations at Ugamak and Marmot Islands (Merrick 1987; NMML unpub. data). However, it has also been noted in these on-land observations that females <u>without</u> pups stayed at-sea longer, and as a result, probably forage further away from the rookeries.

Winter results (again using females with pups) from five animals (one at Marmot and four at Chirikof) indicates that trips are much longer in time (up to 4 months) and distance (over 270 nm or 450 km offshore), and animals dives deeper ($\bar{x}$ up to 30-84 m with deepest dives 273 m). An adult female tracked from Ugamak Island foraged 25-30 nm away in Akun Bay and at Davidson Bank.

Aside from the areas immediately around rookeries, the areas that NMFS scientists have identified where animals appear to be foraging include:

- o Marmot Island (one animal) - Portlock Bank and Marmot Bay
- o Chirikof Island (three animals) - Albatross Bank (one animal), Marmot Gully (one animal) and Gilbert/Patton Seamounts (three animals).
- o Ugamak Island (two animals) - Akun Bay and Davidson Bank

Two animals tagged at Puale Bay, Shelikof Strait in February 1991 foraged within the strait during the 1 to 2 weeks they were tracked--one stayed at the southern end and the other foraged on the west side of Kodiak Island. An animal tagged at Marmot Island in January 1990 also visited the northern end of the strait on one trip.

There is still much to learn about adult movements, but these few data seem to indicate that postpartum adult females in summer stay quite close to the rookeries (within 20 nm), while in the winter they regularly range out more than 20 nm away. It is suspected that females without pups (even in summer) will forage out much further than those with pups. Forage range of pups increase as the pup matures and by 6 months they may regularly forage more than 10 nm away from the rookery.

Feeding Habits

Prey size - Prey sizes are remarkably consistent both within and between species. Fish in the 20-30 centimeter (cm) size range seem to be preferred, although much smaller fish are consumed (Table 1). The only collections with exceptionally larger fish come from small collections in the Pribilof Islands and stomachs of animals incidentally caught in the Shelikof Strait pollock fishery (Loughlin and Nelson 1986). The only study that says anything about temporal changes in sizes of prey consumed are the Gulf of Alaska collections. There it does appear that pollock size declined between 1976-78 and 1985-86.

Juvenile prey sizes were smaller in most cases, but the sample sizes are very small. in the 1981 Central Bering Sea/Kamchatka collections, juvenile (<= 4 years old) males consumed significantly smaller pollock ($\bar{x}$ = 22.4 cm) than older males ($\bar{x}$ = 26.9 cm). Two juvenile males at St. Paul in 1986 ate larger yellowfin sole ($\dot{x}$ = 25.0 cm) than three older males ($\dot{x}$ = 21.6), but smaller pollock ($\dot{x}$ = 25.1 cm versus $\dot{x}$ = 41.9 cm).

There is some indication that adult animals are selecting prey in proportion to their abundance. Adult sea lions collected in 1981 in the central Bering Sea has consumed mostly 2-3 year old pollock. These were fish from the 1978-79 years classes, which were the dominant part of the pollock biomass in the Bering Sea in 1981. Sea lions collected in the Gulf of Alaska in 1983 had fed mostly on 5-year old pollock, which were from the dominant 1978 year class.

Overall prey preferences - In virtually all collections made since the 1970's, walleye pollock has been the number one prey (Tables 2-4). While the overall impression from the earlier collections is that pollock was unimportant (e.g., there were no Chernabura stomachs with pollock), it must be noted that four of five stomachs collected by Imler and Sarber (1947) in the Kodiak area contained pollock. Overall, there appears to have been a steady increase in the proportion of pollock in sea lion diets.

Capelin was commonly found in stomachs at Chernabura in 1958 (Mathisen et al. 1962), and in stomachs in Unimak Pass and at Afognak Island in 1960 (Fiscus and Baines 1966). In the GOA it was the second ranked prey item in 1975-78, but was observed in no stomachs in the 1985-86 collection.

Octopus or squid have been high ranking prey items in most studies. Pacific cod, flatfishes, and salmon have also been somewhat important in most studies. Yellowfin sole was important in one study in the Pribilof Islands. Atka mackerel has been found in stomachs and scats from the Aleutian Islands.

Seasonal differences in prey preferences - Very little information is available for October through March; the only reported data (Table 6) comes from Calkins and Pitcher (1982). The data from 1976-78 indicate that walleye pollock was important in the Kodiak area in all seasons--it was #1 during winter and spring, and #2 in the summer and fall. Capelin was #1 in the summer and #2 in the spring. Octopus was #1 in the fall. Capelin and octopus were also important during the spring/summer in the few studies conducted prior to 1965. However, pollock still appeared in the diet of four of five animals collected in the Kodiak/Barren Islands area by Imler and Sarber (1947).

Area differences in prey preferences - Of all prey items, walleye pollock seems to be the most widely consumed. In the 1975-78 Gulf collections it was #1 in the Peninsula, Kenai, Prince William Sound, and NE Gulf areas, and was #2 in the Kodiak area. In the 1985-86 collection it was #1 in both SE Alaska and in the Kodiak area. It was also #1 in three of four studies conducted in the Bering Sea.

Some prey items seem to be particularly important at some sites. Octopus seems to have been important at Chernabura Island during the Mathisen et al. (1962) collections and at Sea Otter Island during the ADF&G 1985-86 collections. Greenling and sculpins also appeared quite important at Chernabura, but not elsewhere. Capelin may be important locally as well as seasonally.

Juvenile prey preferences - There is little data available, but what is available indicates juveniles either consume the same fish as adults but in smaller sizes (see above) or small fish in general. Fiscus and Baines (1966) found they consumed capelin, sculpin and sand lance. Mathisen et al. (1962) found they consumed octopus, rockfish, and greenling at Chernabura Island.

Summary - These limited data indicate that there is a general year around preference for walleye pollock in almost all areas in the 20-30 cm size range. Some sites may have localized prey preferences, but consumption of pollock is more widespread. Juveniles have a tendency to consume smaller fish than adults.

How many marine mammal incidental takings were observed near rookery zones (10 nm), and in the critical habitat areas? When did the incidental takings occur? Commercial fishery takes of marine mammal species were reviewed for 1990-91. Data for animals identified as Steller sea lions, northern fur seals, and harbor seals are presented in Table 5. Forty-one animals were taken (32 dead and nine decomposed). Dead animals were freshly dead, while decomposed animals had been dead for some time and probably had not been killed by the fishery operation (according to the observer).

1. Steller sea lions - Thirty-one of the takes were Steller sea lions (26 dead, five decomposed). Five of the dead and four of the decomposed Steller sea lions were taken in the Bogoslof-eastern Bering Sea critical habitat area, and one was from the Seguam Pass area. None of the dead and one of the decomposed came from within the eastern Aleutian Island buffer zones. Of the eight dead sea lions taken in buffer zones, seven came from near Tag or Gramp Rock (in the central Aleutian Islands), and one came from near Agligadak Island (central Aleutian Islands). The one decomposed sea lion taken from a buffer zone was caught near Akun Island.

2. Northern fur seals - A total of five northern fur seals (three dead, two decomposed) were taken during 1990-91. One dead animal was taken near Akun Island (perhaps in the 10 nm buffer zone there), and as a result was taken within the Bogoslof-eastern Bering Sea critical habitat area.

3. Pacific harbor seals - Five harbor seals were also taken during 1990-91 (three dead and two decomposed). Once again the single animal taken (dead) in the Bogoslof-eastern Bering Sea critical habitat area was taken in the Akun buffer zone.

An additional two dead and four decomposed animals were taken in the Bogoslof-eastern Bering Sea area during 1990-91 (none within buffer zones). This included one Pacific walrus (decomposed, 1991), one ribbon seal (dead, 1990), one harbor porpoise (decomposed, 1990), one Dall's porpoise (dead, 1990), and two unidentified cetaceans (decomposed, 1990).

Generally, animals were taken at random from throughout the year. The only temporal pattern of note was the taking of Steller sea lions in the central Aleutian Islands. In 1990, three animals were taken dead in the Delarof Island group in May (this included one from the Tag-Gramp Rock buffer zone. In 1991, an additional six animals were taken from near Tag-Gramp Rock in March.

What are the potential effects on fishing effort that may result from the amendments? The amendments will not increase the TAC - this is set separately. The amendments will also not dramatically effect the temporal allocations of the TAC. These have been set through other amendments and through the TAC setting process. In the Gulf there are quarterly allocations (FMP Amendment 19). In the BSAI there are two seasonal allocations (FMP Amendment 14).

The amendments will also not have a major effect on the spatial allocations of the TAC within the Gulf as these have been apportioned to three (actually four) zones in the GOA under FMP Amendments 19 and 25. Impacts on the proposed Shelikof Strait critical habitat area should be minimal.

Ultimately, the major effects on fishing will be a result of establishing the Bering Sea Harvesting Vessel Operation Area (the Area) under Amendment 18. This will not effect the Aleutian Islands District (area 540) nor the proposed Seguam Pass critical habitat area, as these areas are basically beyond the reach of vessels delivering shoreside in Dutch Harbor.

Fishing in the Area during the past decade was as follows:

1. Data provided with the SEIS documents the amount of fishing that has occurred in the area from 1980 to 1991 (Table 6). Basically there were three phases:
   a. **1980-85** - Foreign fishing vessels were excluded from fishing in virtually all of the Area during December 1 through May 31. Thus, there was essentially no trawl harvest during winter-spring. During the remainder of the year, there was no more than 50% of the quarterly harvest taken in the Area.
   b. **1984-89** - Joint venture operations were phased in and foreign fishing were phased out in this period. In part because the catcher boats were American, and as a result vessels were able to fish closer inshore, more fish were caught in the Area. Annual catches from the Area increased from 26% of the total during 1980-84 to 39% during 1985-88 (Table 6). This shift was particularly obvious during quarter one. During the 1980-84 period there was no catch in the Area during the first quarter, but during 1985-88, 58-78% of catch came from the Area (SEIS). Substantially higher catches (compared to foreign fishing) came from the Area in all other quarters as well.
   c. **1989 to present** - Now the fishery is completely domestic with two components--onshore and offshore. The onshore takes almost all of its catch inside of the Area (86% in 1990, AFSC). In

1990 catches by the offshore component came mostly from the Area during the first quarter and then shift northwards for other quarters. Note that in 1990 the Area catch fell from 47.7% of the eastern Bering Sea total to 22.7% (Table 6). First quarter catches also fell in 1990 (to 6.7% of the total) and were at similar levels in 1991 (AFSC). Closure of the Bogoslof District (518), much of which is outside of the Area, will focus more effort on the Area during the "A" season.

Exploitable biomass trends in the BSAI in recent years has been as follows:

1. Fish in the Bogoslof District (518) are now considered to be a separate stock, and this stock has shown a sharp decline in spawning biomass in recent years. During 1988-89 winter hydroacoustic surveys the biomass there was estimated at around 2 million metric tons (mmt). In 1991, it was estimated at 0.6 mmt. This has resulted in the closure of the Bogoslof District to directed pollock fishing.

2. Pollock in the Aleutian Islands District (540) may be a separate stock from Bogoslof and the eastern Bering Sea. Biomass in this district peaked in the 1983 survey at around 0.5 mmt. It has since declined and in 1991 was estimated at 0.2 mmt.

3. Pollock biomass in the eastern Bering Sea peaked at around 9.4 mmt in 1985 and has since declined. The 1991 estimate was 6.6 mmt. Biomass trends have been different to the north and south of the Pribilofs. From 1985 to 1990 bottom trawl biomass increased to the north (area 521) from around 2 mmt to around 5 mmt; to the south (area 517, which includes much of the Area) biomass declined in the same period from around 0.9 mmt to round 0.2 mmt. The 1991 survey found this pattern reversed with 521 biomass dropping and 517's increasing.
   a. Note in the attached figure how similar area 517's summer bottom trawl biomass and the annual catch have been since 1987. This is somewhat misleading because of the way fish move through 517 seasonally; still their similarity implies that exploitation levels have been much higher there in recent years than for the Bering Sea as a whole. Despite this high exploitation, the summer biomass may have increased in 517 during 1990-91.
   b. Note also that despite the declining biomass in the eastern Bering Sea, and despite the redirection of effort onto the shelf which will come about

because of the closure of the Bogoslof District (0.23 mmt in 1990), the Council chose the same TAC in 1992 as in 1991.

The changes in pollock catches that could result from implementation of the Amendment 18 allocation scheme in the Area were determined as follows:

1. Rough calculations concerning what the catches might be in the Area under this allocation scheme are shown in Table 6. These calculations assume:
   a. The proportional split will be as specified in Amendment 18,
   b. The TAC remains at 1.1 mmt, and the "A" season share remains at 40%, and
   c. All of the inshore allocation comes out of the Area, and 65% of the "A" season offshore share comes out of the Area (but none of the offshore "B" season allocation).

2. The results (Table 6) may be that
   a. The total catch in the area (0.576 to 0.658 mmt) will be twice that of the preceding decade's mean (0.311 mmt).
   b. Catches in the first quarter in the Area (0.343 to 0.358 mmt) will be greater than all preceding years except 1987 (0.392 mmt), and will nearly four times that of the preceding decade's mean (0.091 mmt).

3. The 1991 survey biomass estimates for areas 511 and 517 (no comparable data is available for 518-519) indicated there were 1.15 mmt in those zones. Assuming this represents much of the biomass fished on in the Area, catches on the order of 0.576 to 0.658 mmt would represent exploitation rates far higher than the 18% rate for the Bering Sea as a whole. There appears to be a real chance for a localized depletion of pollock stocks in the Area.

How are expanded fishing efforts expected to impact marine mammals? The preceding section documents that pollock biomass is probably declining in much of the BSAI, and that Amendment 18 will probably focus catches in the Area. Three effects are possible--changes in the levels of incidental takes, reductions in the number of small fish (due to bycatch), and localized depletions of large pollock.

1. Incidental takes - While increased harvests in the Operational Area may increase the likelihood of incidental takes of fur seals, sea lions, and other marine mammal species which frequent the Area, it is doubtful that the takes will be more than a few animals. As most of the takes during 1990-91 were from outside of the Operational Area, it is possible that there may be no net overall change.

2. Localized depletion of small prey resources - A focus of fishing effort on the Area will increase the take in the Area of small fish as bycatch. However, the redirection of fishing effort towards the Area could decrease harvests to the north of the Pribilofs (area 521) where much of the small pollock bycatch has occurred. This could be of some marginal benefit to fur seals there, especially if biomass has truly decreased in area 521 since 1990. Overall, relatively small amounts of fish (e.g., >0.05 mmt) are involved relative to biomasses which may be greater than 1-2 mmt, and it is hard to believe that these amounts of small fish removals could seriously effect foraging.

3. Localized depletion of large fish prey resources - If pollock fisheries have a significant effect on marine mammal prey then it must relate to localized changes in the availability of large walleye pollock (age 3+ or >30 cm). This is not a problem within the Gulf of Alaska (Amendment 23), but could be within the eastern Bering Sea (Amendment 18). Significant annual increases will occur in pollock catches within the Operational Area, which is immediately adjacent to several major eastern Aleutian Island sea lion rookeries. Fishing pressure in the Area will also increase during winter (particularly with the recent closure of the Bogoslof District), a time hypothesized to be particularly critical to juvenile, and pregnant or lactating adult female sea lions.

   The leveling off of the eastern Aleutian population decline during 1989-91 came at a time of decreasing walleye pollock catches in the Area and supports a possible linkage between fish catches and sea lion survival. However, nothing conclusive can be said about this relationship, because it is premature to say the declines have stopped, and because of the lack of area specific domestic fisheries data from 1988 and 1989.

Sea lion declines have occurred at times of high pollock abundance. Therefore, NMFS has hypothesized that any relationship between the sea lion decline and pollock concentrations may relate to prey availability at specific locations (e.g., near rookeries) and during specific times (e.g., in winter and spring). However, the biological opinion of March 4 concluded that the adoption of Amendment 18 is not likely to jeopardize the continued existence of Steller sea lions. NMFS will continue to evaluate this issue in 1992.

Table 1.--Prey size by species and study.

Species	Study area	year	No. stomachs /fish	$\dot{x}$(cm)	range
All ages					
Walleye pollock	GOA	1976-78	102/2,030	29.8	5.6-62.9
	Shelikof	1983	/68	39.3	34. -49.
	Shelikof	1984	/93	42.1	32. -52.
	Kodiak	1985-86	43/1,064	25.4	7.9-54.2
	SE AK	1985-86	8/80	25.5	4.8-55.7
	Pribilofs	1976,79	2/280	46.9	-
	Cent. BS	1981	?/497	26.8	-
	Kamchatka	1981	?/638	23.5	-
	E. Aleutians	1981-82	4/46	29.9	1.7-42.7
	Pribilofs	1986	2/6	33.5	20.8-44.5
	St. Matthew	1985	10/109	21.8	10.5-51.6
Pacific herring	St. Matthew	1985	6/43	27.5	25.0-31.1
Pacific cod	Pribilofs	1986	3/13	27.5	4.3-59.4
Yellowfin sole	Pribilofs	1986	5/97	23.7	9.8-35.7
Juvenile (age <= 4)					
Walleye pollock	Central BS and Kamchatka	1981	?/?	22.4	-
	Pribilofs	1986	1/3	25.1	20.8-28.7
Yellow fin sole	Pribilofs	1986	2/70	25.0	12.0-32.7
Subadult or adult (age > 4)					
Walleye pollock	Central BS and Kamchatka	1981	?/?	26.9	-
	Pribilofs	1986	1/3	41.9	39.2-44.5
Yellow fin sole	Pribilofs	1986	3/30	21.6	9.8-35.7
Pacific cod	Pribilof	1986	3/13	27.5	4.3-59.4

Table 2.--Western and central Gulf of Alaska northern sea lion food habits 1975-78 and 1985-86 based on the percentage of stomachs containing the prey item.

Rank	1975-78[a]	1985-86[b]
1	Walleye pollock (41.8%)	Walleye pollock (58.1%)
2	Octopus/squid (25.5%)	Octopus/squid (36.4%)
3	Capelin (25.5%)	Flatfish (13.5%)
4	Pacific cod (16.3%)	Pacific cod & sand lance (6.8%)
5	Salmon (10.9%)	-
6	Flatfish (9.1%)	Herring, salmon, & shrimp (2.7%)

[a] Calkins and Pitcher (1982), Pitcher (1981)
[b] Calkins and Goodwin (1988)

Table 3.--Seasonal occurrence of principal prey items from the Kodiak Island area from 1976-78 collections[a].

Rank	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
1	Pollock	Pollock	Capelin	Octopus
2	Pacific cod & octopus	Capelin	Pollock & salmon	Pollock
3	-	Pacific cod	-	Flatfish
4	-	Octopus	Octopus, salmon & flatfish	Pacific cod
5	-	Salmon & flatfish	-	

[a]Calkins and Pitcher 1982

Table 4.--Steller sea lion prey items ranked by frequency of occurrence in stomachs (n=61) for four studies conducted in the Bering Sea and Aleutian Islands during 1981-86.

Prey	1981 Central BS (n=32)	1981-82 Eastern AI (n=5)	1985 Central BS (n=13)	1985-86 St. Paul (n=11)
Walleye pollock	1 (32)	1 (4)	1 (10)	3 (3)
Pacific cod	2 (9)	4 (1)	5 (1)	2 (5)
Cephalopod	3 (6-12)	2 (3)	nd	3 (3)
Flatfish	4 (6-9)	3 (2)	-	1 (6)
Herring	5 (2)	-	3 (6)	-
Sculpins	5 (2)	3 (2)	2 (8)	-
Rockfish	6 (1)	-	3 (6)	-

n=stomachs with contents
numbers within parentheses indicate number of stomachs with such contents

Table 5.--Dead or decomposed pinnipeds taken by trawl and long line fisheries during 1990-91.

Species	Year	Dead/decomposed takes Within buffer	Within Area[3]
Steller sea lion[1]	1990	2/0[2]	5/3
	1991	6/1	0/1
Northern fur seal	1990	0/0	0/0
	1991	1/0	1/0
Pacific harbor seal	1990	1/0	1/0
	1991	0/0	0/0
Total	1990	3/0	6/3
	1991	7/1	1/1

[1] Note that no Steller sea lions were taken with eastern Aleutian Island buffer zones
[2] Numbers represent dead/decomposed
[3] Area means Bogoslof-eastern Bering Sea

Table 6.--Past and forecasted catches of walleye pollock within the Bering Sea Harvest Vessel Operation Area.

	Annual catch		Quarter 1	
Year	mmt	% of Bering Sea total	mmt	% of Bering Sea total
Historical				
1980	0.220	21.2	0.000	0
1981	0.351	35.8	0.000	0
1982	0.232	24.4	0.000	0
1983	0.202	23.3	0.000	0
1984	0.276	23.9	0.028	2.4
1985	0.393	32.4	0.034	2.8
1986	0.274	32.8	0.110	13.2
1987	0.458	43.8	0.392	37.5
1988	0.394	47.7	0.256	31.0
1989	nd	nd	nd	nd
1990[1]	na	22.7	na	6.7
Mean	0.311	30.8	0.091	9.4
Projected[2]				
Year 1	0.576	51.9	0.343	30.9
Year 2	0.617	55.6	0.351	31.6
Year 3	0.658	59.3	0.358	32.2

[1] These data are significantly different from that included in the SEIS and result from recent analysis by REFM staff.
[2] Catch calculations are described in text but generally were made as follows:

Annual catches = 100% of the inshore components annual catch + 65% of the offshore components "A" season catch

1st quarter catches = 100% of the inshore components "A" season catch + 65% of the offshore components "A" season catch

<u>Citations:</u>

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APPENDIX C to ADDENDUM III

Cost-benefit data prepared by NMFS staff

The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) require that a cost-benefit analysis, prepared independent of NEPA and relevant to the choice among environmentally different alternatives, be incorporated by reference or be appended to the Supplemental Environmental Impact Statement (SEIS) as an aid in evaluating the environmental consequences. 40 CFR section 1502.23. When a cost-benefit analysis is appended, a discussion of the relationship between that analysis and any analyses of unquantified environmental impacts, values and amenities is to be included.

Unquantified environmental impacts, values and amenities are included in the SEIS for Amendments 18/23. A full discussion of these impacts, values and amenities is provided in the SEIS, however, a summary of these impacts is included in this appendix to comply with the mandates of NEPA and CEQ regulations.

In brief, the SEIS, at 4-8, notes that the specific social impacts of the alternatives varied among the several communities that were studied. However, there are two common social benefits, or costs, that would exist for each of the Alaska communities depending on the ultimate decision on the preferred alternative. In the absence of some action by the Council to allocate fishing privileges among the inshore and offshore sectors of the industry, the social impact analysis (SIA) determined that current dynamics of the pollock and Pacific cod fisheries will result in increasing uncertainty of groundfish supply to inshore processing plants. This impact will, in turn, result in a less stable labor force and, in more dramatic situations, the possible wholesale decline of communities. These were determined to be very high, unquantifiable, social costs that would accrue if some form of groundfish allocation is not made between inshore and offshore sectors of the industry off Alaska.

The SEIS concluded that "it . . . [is] clear that for all Alaskan study communities, the main beneficial social effects derive from the social consequences of a stable labor force employed steadily by a more or less year-round processing sector, and all of the support sector and other derived activities that accompany a stable fundamental economic base." SEIS, 4-9. Second, a high social benefit to be derived from an allocation between inshore and offshore sectors is that the pollock and Pacific cod resources would be available on a more regular basis for shoreside communities.

The SIA noted that the economic input-output model seemed to indicate that the communities of Sand Point and St. Paul would be better off without an inshore allocation. However, the cost-benefit analysis shows that inshore communities as a whole would benefit economically from the allocations of the preferred alternative. Additionally, the SEIS notes on 4-20 that, for Sand Point, "[t]he absence of an inshore allocation, creating an uncertainty in access to cod, has been an important contributing factor to [the lack of year-round processing operation], and it can be expected that with an inshore allocation, both plants will be able to plan their operations in an efficient and rational manner due to the regularization of the availability of Pacific cod." For St. Paul, the SEIS concluded that,

> an inshore allocation is absolutely essential if this community is to have any hopes of entry into this fishery, and would also be quite beneficial in terms of more general development plans. The viability of St. Paul as a community depends upon the growth of a sustainable economic based centered on its harbor. While it is not clear that an inshore allocation is absolutely essential for the growth of such an economy . . ., it has the potential to greatly aid the process.

SEIS, at 4-10.

Unalaska, it was noted, is the main service center for the offshore fleet in the Bering Sea. Therefore, an inshore allocation is expected to cause some local dislocation and/or displacement effects. Kodiak is likely to experience both a higher percentage of the catch and a more stable supply of fish. SEIS, at 4-10.

The cost-benefit analysis for the preferred alternative demonstrates that net economic losses will be incurred with implementation of the preferred alternative. Social benefits such as labor force stability and certainty of fish supply are to be gained by the Alaskan communities studied in the SIA and Alaskan communities as a whole if the preferred alternative is approved. The net economic losses that will accrue in the Gulf of Alaska from the allocations contained in the preferred alternative are small if implemented. The net economic losses that will accrue in the Bering Sea/Aleutian Islands from the allocations contained in the preferred alternative become increasing larger for each year of implementation after 1992.