3/1284

Fricke

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Washington, D.C. 20235

AUG - 1 1989

MEMORANDUM FOR: Distribution*

FROM: F/CM2 - Joe P. Clem

SUBJECT: Secretarial review of Amendment 13 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands and Amendment 18 to the Fishery Management Plan of Groundfish of the Gulf of Alaska

Please review the subject amendments for approvability according to the national standards of the Magnuson Act and other applicable Federal law.

Both amendments contain: (1) a new enhanced system of recordkeeping and reporting requirements with an increase in burden hours under the Paperwork Reduction Act, (2) an observer program for domestic fishing vessels, (3) an ability to change fishing seasons for any target species through regulatory amendment, and (4) the ability for the Secretary to combine or split species within target species categories during the annual specification process.

The amendment to the Bering Sea plan proposes two unique management measures: (1) allocation of sablefish between fixed and mobile gears in both the Bering Sea and Aleutian Island subareas and (2) seasonal closures of groundfish fishing in the Walrus Islands and Cape Peirce for walrus protection.

The amendment to the Gulf of Alaska plan contains several unique measures including: (1) establishment of a Shelikof District and east and west reporting areas for pollock, (2) extension of king crab time/area closures around Kodiak Island for three more years, and (3) allocations of the halibut mortality cap between fixed and trawl gear.

Please forward your comments on these amendments to me by COB, August 21. If you have any questions, call Mark Millikin at 427-2341.

Attachment

*Distribution

F/CM - Schaefer
F/CM1 - Fricke
F/CM2 - Leedy, Millikin, Hooker
GCF - Gleaves
GCEL - Cooney
F/PR2 - Karnella
F/PR3 - Hall
F/EN - Pallozzi
OGC - Malone
OMB - Scarato
GC - Johnson
F/MB1 - Ross-Dickens
F/MB - Everett
F/TS - Fox (Norman)
F/TS - Bentz
F/RE3 - Meehan
F/IA1 - Rothschild
N/ORM4 - Allin
SBA - Hankins

ENVIRONMENTAL ASSESSMENT/REGULATORY IMPACT REVIEW/ INITIAL REGULATORY FLEXIBILITY ANALYSIS FOR AMENDMENT 18 TO THE FISHERY MANAGEMENT PLAN FOR GROUNDFISH OF THE GULF OF ALASKA AND AMENDMENT 13 TO THE FISHERY MANAGEMENT PLAN FOR GROUNDFISH OF THE BERING SEA/ALEUTIAN ISLANDS

Prepared by the Plan Teams for the
Groundfish Fisheries of the Gulf of Alaska
and the Bering Sea/Aleutian Islands,
the Staff of the North Pacific Fishery Management Council,
and Members of NOAA Fisheries, the Alaska Department of Fish and Game,
and the U.S. Fish and Wildlife Service

Anchorage, Alaska

July 21, 1989

SUMMARY OF AMENDMENTS 18 AND 13
TO THE
GROUNDFISH FISHERY MANAGEMENT PLANS
FOR THE GULF OF ALASKA
AND THE BERING SEA/ALEUTIAN ISLANDS

As part of the annual plan amendment cycle for the Gulf of Alaska and Bering Sea/Aleutian Islands groundfish fishery management plans (FMPs), the North Pacific Fishery Management Council reviews proposed changes submitted by the public and management agencies. Upon recommendations of the Plan Amendment Advisory Group, the Advisory Panel, and the Scientific and Statistical Committee, the Council forwards those proposals of merit to the Plan Teams for analyses in January and reviews the initial analyses in April. Soon after the April Council meeting a draft amendment package, including a draft environmental assessment/regulatory impact review/initial regulatory flexibility analysis (EA/RIR/IRFA) is released for public comment. In June, the Council reviews the public comments and decides which amendment issues should go forward for approval and implementation by the Secretary of Commerce.

At its meeting on June 20-23, 1989, the Council approved seven amendment proposals for the Gulf of Alaska groundfish FMP and six amendment proposals for the Bering Sea/Aleutian Islands groundfish FMP. These amendment proposals, with synopses of the rationale for their selection, are:

(1) Allocate sablefish in the Bering Sea/Aleutian Islands - to allocate sablefish total allowable catch (TAC) in the Bering Sea subarea so that 50% of the TAC may be taken by fixed gear fisheries and 50% may be taken by trawl fisheries, and in the Aleutian Islands subarea so that 75% of the TAC may be taken by fixed gear fisheries and 25% may be taken by trawl fisheries. (BSAI FMP)

Currently, all gear groups compete for the available sablefish TAC. Substantial amounts of sablefish are taken as bycatch, and stocks are limited. Consequently, it is likely that NMFS would continue to curtail directed fishing for sablefish prior to TAC attainment to allow for sablefish bycatch in other directed fisheries and to reduce wastage due to discards, as it has in the recent past.

The Council preferred this alternative over (1) the status quo, and (2) determination and allocation of "true" bycatch needs, with any residual TAC being made available to directed fisheries, without regard to gear type. The accompanying EA/RIR indicates the speculative nature of determining "true" bycatch needs for sablefish given unpredictable characteristics of the fisheries and the economic attractiveness of sablefish. In addition, the Council felt that gear type allocations were appropriate as small, fixed gear vessels were at much greater risk of being precluded from the fishery in the absence of gear allocations than were larger trawling vessels. The allocations recommended by the Council reflect the desire to (1) protect small fixed gear vessels more highly dependent on this resource; (2) avoid precluding activities of the trawl fleet targeting on other resources; and (3) avoid or minimize discard mortality on a sablefish stock of questionable strength.

(2) Fishing Seasons - to establish a procedure to set fishing seasons on an annual basis by regulatory amendment (BSAI and GOA FMPs).

Fishing seasons are currently defined within their respective FMPs, and require a plan amendment to change. Rapid increases in domestic fishing effort in the EEZ off Alaska, the development of new and more diverse groundfish products and markets, and increasing complexity of management options have caused increasing numbers of requests to the Council for specific fishing seasons in order to permit the safe, economically and biologically sound harvest of groundfish quotas.

This alternative was preferred to (1) the status quo, and (2) a framework procedure for annually setting fishing seasons through a rule-related notice procedure. The preferred alternative will allow changes in fishing seasons to be made in a more timely fashion than the current procedure, and offers more flexibility

in the setting of seasons by allowing for serial openings or split seasons, than the proposed framework procedure would permit.

(3) Shelikof District - to establish a Shelikof District in the Central Regulatory area of the Gulf of Alaska (GOA FMP).

A significant portion of the Gulf of Alaska pollock stock is known to spawn in Shelikof Strait. Large spawning aggregations of pollock have become the target of a commercially important industry in recent years. The Council voted to establish a Shelikof District management region as a necessary precursor to conservation measures to protect spawning aggregations of pollock in this area.

(4) Walrus Haulout Closed Zones - to close to groundfish fishing waters seaward of three miles out to 12 miles surrounding the Walrus Islands (Round Island and The Twins) and Cape Peirce from April 1 through September 30 (BSAI FMP).

Walrus hauled out on Round Island (Walrus Islands State Game Sanctuary) and at Cape Peirce (Togiak National Wildlife Refuge) declined by over 50% coincident with the initiation of fishing for yellowfin sole in northern Bristol Bay. Data establishing a causal link between groundfish fishing and the observed decrease in numbers of walrus using these sites are unavailable. The U.S. Fish and Wildlife Service, in cooperation with the Alaska Department of Fish and Game, is conducting acoustical studies at Round Island and at Cape Peirce this summer to collect information on the levels of acoustic disturbance caused by vessels of various types and sizes.

Recognizing both the circumstantial nature of current information and the efforts to obtain more reliable data, yet desiring to afford some additional level of protection to hauled out walrus in the short term, the Council chose this alternative, with a two year sunset (December 31, 1991), over (1) the status quo, which would close no waters seaward of the State's three mile limit and (2) a more restrictive measure which would seasonally close waters north of a line from Cape Constantine to the southernmost tangent of a 12 mile radius around Cape Peirce.

(5) Kodiak Island Crab Protection Closed Zones - to implement revised bottom trawl closures around Kodiak Island to protect crab (GOA FMP).

The alternative chosen by the Council will extend existing trawl closures around Kodiak Island for three years, and close additional areas noted as important rearing areas or migratory pathways should there occur a significant crab recruitment event. The Council felt the continued depressed condition of crab stocks makes additional conservation measures for crab appropriate. This alternative was chosen in preference to (1) the status quo, which would allow existing trawl closures to sunset December 31, 1989; and, (2) an alternative to extend the existing time/area closures for three years.

(6) Halibut Bycatch Management - to implement halibut prohibited species catch (PSC) mortality limits of 2,000 mt for trawl gear and 750 mt for fixed gear for the period January 1 - December 31, 1990. Suspends the existing halibut PSC framework for all of 1990, and reinstitutes the halibut PSC framework on January 1, 1991 (GOA FMP).

The Council chose to implement this one of several suboptions to more fully implement the existing halibut PSC framework. The suboptions selected sets PSC mortality limits for trawl and fixed gear groups. In addition, the Council chose to permit the use of pot gear that minimizes halibut bycatch. This measure will be implemented by regulatory amendment, and is not part of this amendment package. The Council rejected three other suboptions at this time, but indicated that these management options should be reevaluated during the 1990 amendment cycle.

(7) Splitting Species Groups - to clarify the authority of the Secretary to split or combine species or species groups within the target species category (BSAI and GOA FMPs).

This amendment proposal clarifies the authority of the Secretary of Commerce to split or combine species or species groups within the target species category. This measure provides the Council the ability to establish total allowable catches (TACs) for additional target species within the "target species" category for purposes of managing small stock components. Clearly establishing the appropriate framework procedure means these changes can occur on a much more timely basis than if an FMP amendment were used.

(8) Data Reporting Requirements - to establish a new recordkeeping and data reporting system (BSAI and GOA FMPs).

The Council and NOAA Fisheries require the best available biological and socioeconomic information be used in managing and conserving groundfish fisheries, as well as other fish resources such as crab, halibut and salmon, that are incidentally caught in the groundfish fishery. Current recordkeeping and reporting requirements are deficient in that the information provided is incomplete, incompatible and not enforceable. The alternative chosen by the Council corrects these deficiencies by requiring fishing and processing vessels, and shoreside processing plants, to submit revised effort, catch and processing information better suited to the efficient management of the fishery.

(9) Observer Program - to establish a new frameworked observer program of up to 100% coverage of domestic fishing and/or processing vessels and at shorebased processing plants (BSAI and GOA FMPs).

The Council and NOAA Fisheries require the best available biological and socioeconomic information to manage and conserve groundfish resources. Some data for measuring the effects of fishing on the resources can only be reliably collected through an observer program, both shorebased and at sea. The Council voted to approve a frameworked observer program that complements the revised recordkeeping and reporting requirements. Observers will collect biological information, including information on marine mammals and birds, and will verify catch and discard information.

Measures Not Advanced

The Council voted to retain the status quo on an amendment proposal to expand the Pacific Cod trawl exemption zone in southern Bristol Bay. It was not possible for the EA/RIR to predict with confidence the impact of such an expansion on either vessels fishing for cod, or on stocks of prohibited species taken as bycatch (i.e. halibut, crab and herring). With the newly mandated recordkeeping and reporting requirements and observer program, the Council felt it best to defer action on this topic until more definitive information on likely impacts was available.

The attached EA/RIR/IRFA presents a detailed assessment of the likely impacts resulting from the implementation of various proposed alternatives to amend the Bering Sea/ Aleutian Islands Groundfish FMP (Amendment 13) and the Gulf of Alaska Groundfish FMP (Amendment 18).

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1.0 INTRODUCTION

The domestic and joint venture groundfish fisheries in the fishery conservation zone (3-200 miles offshore) of the Gulf of Alaska and Bering Sea/Aleutian Islands are managed under the Fishery Management Plan (FMP) for Groundfish of the Gulf of Alaska (GOA) and the FMP for Groundfish of the Bering Sea/Aleutian Islands (BSAI). Both plans were developed by the North Pacific Fishery Management Council (Council) under the Magnuson Fishery Conservation and Management Act (Magnuson Act). The GOA groundfish FMP was approved by the Assistant Administrator for Fisheries, NOAA, (Assistant Administrator) and became effective December 11, 1978 (43 FR 52709, November 14, 1978). It is implemented by Federal regulations appearing at 50 CFR Parts 611, 620, and 672. Amendments 1-11 and 13-17 to the FMP have been approved by the Assistant Administrator. Amendment 12 was adopted initially by the Council at its July and December 1982 meetings but was later rescinded by the Council at its September 1984 meeting without having been submitted formally for Secretarial review.

The BSAI groundfish FMP was also developed by the Council under the Magnuson Act. It was approved by the Assistant Administrator and became effective on January 1, 1982 (46 FR 63295, December 31, 1981). This FMP is implemented by Federal regulations appearing at 50 CFR Parts 611, 620, and 675. Eleven of twelve amendments to the FMP have subsequently been implemented; Amendment 12a has been approved but not yet implemented.

The Council solicits public recommendation for amending the GOA or the BSAI groundfish FMPs on an annual basis. Amendment proposals are then reviewed by the Council's GOA and BSAI groundfish FMP Plan Teams (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 analyzed by the PT for their efficacy and for their potential biological and socioeconomic impacts. After reviewing this analysis the AP and SSC make recommendations as to 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 an amendment proposal and accompanying analysis is released for public review, then the AP, SSC, and the Council will consider subsequent public comments before deciding whether or not to submit the proposals to the Secretary of Commerce for approval and implementation.

1.1 List of Amendment Proposals

As a result of Council deliberation at its June 20-23, 1989 meeting, nine amendment proposals are forwarded to the Secretary of Commerce for approval and implementation. Six of those comprise Amendment 13 to the Bering Sea/Aleutian Islands Groundfish FMP, while seven comprise Amendment 18 to the Gulf of Alaska Groundfish FMP:

(1) Allocate sablefish total allowable catch (TAC) in the Bering Sea subarea so that 50% of the TAC may be taken by fixed gear fisheries and 50% may be taken by trawl gear fisheries, and

in the Aleutian Islands subarea so that 75% of the TAC may be taken by fixed gear fisheries and 25% may be taken by trawl gear fisheries (BSAI FMP).

(2) Establish a procedure to set fishing seasons on an annual basis by regulatory amendment (BSAI and GOA FMPs).

(3) Establish a Shelikof District in the Central Regulatory Area of the Gulf of Alaska (GOA FMP).

(4) Close to groundfish fishing waters seaward of three miles out to twelve miles surrounding the Walrus Islands (Round Island and The Twins) and Cape Peirce from April 1 through September 30 (BSAI FMP).

(5) Implement revised bottom trawl time/area closures around Kodiak Island to protect crab (GOA FMP).

(6) Implement halibut prohibited species catch (PSC) mortality limits of 2,000 mt for trawl gear and 750 mt for fixed gear for the period January 1 through December 31, 1990. Suspends the existing halibut PSC framework for all of 1990, and reinstitutes the halibut PSC framework on January 1, 1991 (GOA FMP).

(7) Clarify the authority of the Secretary of Commerce to split or combine species or species groups within the target species category (BSAI and GOA FMPs).

(8) Establish a new recordkeeping and data reporting system (BSAI and GOA FMPs).

(9) Establish a new observer program on domestic fishing and/or processing vessels and at shorebased processing plants (BSAI and GOA FMPs).

1.2 Purpose of the Document

This document provides background information and assessments necessary for the Secretary of Commerce to determine that the FMP amendments are consistent with the Magnuson Act and other applicable law.

1.2.1 Environmental Assessment

One part of the package is the environmental assessment (EA) that is required by NOAA in compliance with the National Environmental Policy Act of 1969 (NEPA). The purpose of the EA is to analyze the impacts of major federal actions on the quality of the human environment. The EA serves as a means of determining if significant environmental impacts could result from a proposed action. If the action is determined not to be significant, the EA and resulting finding of no significant impact (FONSI) would be the final environmental documents required by NEPA. An EIS must be prepared if the proposed action may be reasonably expected: (1) to jeopardize the productive capability of the target resource species or any related stocks that may be affected by the action; (2) to allow substantial damage to the ocean and coastal habitats; (3) to have a substantial adverse impact on public health or safety; (4) to affect adversely an endangered or threatened species or a marine mammal population; or (5) 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. Following the end of the public review period the Council could determine that Amendment 18 to the GOA FMP or Amendment 13 to the BSAI FMP will have significant impacts on the human environment, and proceed directly with preparation of an EIS required by NEPA. This EA is prepared to analyze the possible impacts of management measures and their alternatives that are contained in these amendments.

Certain management measures are expected to have some impact on the environment. Such measures are those directed at harvests of stocks and may occur either directly from the actual harvests (e.g. removals of fish from the ecosystem) or indirectly as a result of harvest operations (e.g. effects of bottom trawling on the benthos--animals and plants living on, or in, the bottom substrate). Environmental impacts of management measures may be beneficial when they accomplish their intended effects (e.g. prevention of overharvesting stocks as a result of quota management). Conversely, of course, such impacts may be harmful when management measures do not accomplish their intended effects (e.g. overharvesting occurs when quotas are incorrectly specified). The extent of the harm is dependent on the amount of risk of overfishing that has occurred. For purposes of this EA, the term "overfishing" is that which is described in the "Guidelines to Fishery Management Plans" (48 FR 7402, February 18, 1983). It is a level of fishing mortality that jeopardizes the capacity of a stock(s) to recover to a level at which it can produce maximum biological yield or economic value on a long-term basis under prevailing biological and environmental conditions. Environmental impacts that may occur as a result of fishery management practices are categorized as changes in predator-prey relations among invertebrates and vertebrates, including marine mammals and birds, physical changes as a direct result of fishing practices, and nutrient changes due to processing and dumping of fish wastes. If more or less groundfish biomass is removed from the ecosystem, then oscillations occur in the ecosystem until equilibrium is again achieved.

1.2.2 Regulatory Impact Review

Another part of the package is the Regulatory Impact Review (RIR) that is required by National Marine Fisheries Service (NMFS) for all regulatory actions or for significant Department of Commerce or NOAA policy changes that are of significant public interest. The RIR: (1) provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; (2) 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; and (3) 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 way.

The RIR also serves as the basis for determining whether any proposed regulations are major under criteria provided in Executive Order 12291 and whether or not proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act (P.L. 96-354, 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. This Act requires that if regulatory and record-keeping requirements are not burdensome, then the head of an agency must certify that the requirement, if promulgated, will not have a significant effect on a substantial number of small entities.

This RIR analyzes the impacts that Amendment 18 and 13 alternatives would have on the Gulf of Alaska groundfish fisheries and Bering Sea/Aleutian Islands groundfish fisheries, respectively. It also provides a description of and an estimate of the number of vessels (small entities) to which regulations implementing these amendments would apply.

1.3 Catch and Value of Groundfish in the Gulf of Alaska and in the Bering Sea/Aleutian Islands Area.

With the exception of rockfish in the Bering Sea and Atka mackerel in the Gulf of Alaska, all of the major species and species groups harvested from 1984-88 have witnessed large percentage increases in wholly domestic (DAP) catch and revenue (Table 1.1). The total DAP catch and exvessel revenue for all of Alaska in 1988 were 90% and 70% higher, respectively, than in 1987. Pollock catch increased by 120% and accounted for approximately 80% of the groundfish catch and 40% of the exvessel groundfish revenue. Sablefish revenue increased by over 50%, largely due to higher prices, and contributed one-third of the 1988 groundfish revenue. Pacific cod landings were up nearly 100% in the BSAI, but lower prices throughout Alaska tempered the effect this had on revenue.

1.4 Description of the 1989 Domestic Fishing Fleet Operating in the Gulf of Alaska and in the Bering Sea/Aleutians Islands Area

The NMFS vessel permit database has been examined to determine the current composition of the domestic groundfish fishing fleet. A total of 1,890 vessels may fish for groundfish in the Bering Sea and Gulf of Alaska in 1989 (Table 1.2). This number is based on 1989 Federal groundfish permits that have been issued to domestic vessels as of April 12, 1989. Fishing operations in which these vessels participate include: harvesting only, harvesting and processing, processing only, and support. The latter type of operation includes transporting fishermen, fuel, groceries, and other supplies to other vessels.

Of the total 1,890 vessels, 94 percent, or 1,786, are five net tons or larger. Six percent, or 104 vessels, are less than five net tons.

Vessels Five Net Tons or Larger

The larger vessels, i.e., those that are 5 net tons or larger, are located in Seattle, Sitka, Kodiak, and Dutch Harbor, and other ports. Most of these larger vessels come from Alaska, based on telephone area codes given with permit applications. The numbers of vessels that come from Alaska is 1,119, the number from the Seattle area is 470, and the number from other areas is 197. These numbers are summarized in Table 1.3 by processing mode.

The total number of catcher vessels (harvesting only) and catcher/processor vessels (harvesting/processing) is 1,576 and 156, respectively. Net tonnages of catcher vessels and catcher/processor vessels vary widely. The total net tonnage of the catcher vessels is 68,670 tons, and the total net tonnage of the catcher/processor vessels is 60,772 tons.

Vessels involved in harvesting only (catcher vessels) employ mostly three types of gear: hook-and-line (longline), trawls, or pots. Most of the catcher vessels are hook-and-line vessels and number 1,320

Table 1.1 -- Catch and exvessel value in the domestic (DAP) fisheries off Alaska by area, species, and year, 1984-1988.

	Catch (mt)			Value[1] ($ millions)		
	Gulf of Alaska	Bering Sea/ Aleutians	All Alaska[2]	Gulf of Alaska	Bering Sea/ Aleutians	All Alaska[2]
All Groundfish[3]						
1984	14,779	48,378	63,157	8.9	18.8	27.6
1985	33,177	81,481	114,658	21.0	22.7	43.7
1986	60,964	106,013	167,687	37.4	27.7	65.3
1987	111,399	295,892	407,333	67.4	72.9	140.4
1988	139,420	650,133	789,615	98.3	138.5	236.9
Pollock						
1984	1,037	7,313	8,350	.1	1.3	1.4
1985	15,379	30,755	46,134	2.7	3.6	6.3
1986	21,328	57,904	79,808	2.3	10.0	12.3
1987	39,871	215,470	255,342	6.9	35.3	42.2
1988	53,694	516,560	570,254	8.8	86.5	95.2
Sablefish						
1984	8,875	1,055	9,930	6.6	.4	7.0
1985	11,366	3,375	14,741	15.6	3.7	19.4
1986	21,684	6,013	27,770	28.2	6.6	34.9
1987	26,349	7,784	34,134	39.2	9.8	49.1
1988	30,979	6,584	37,609	65.4	13.1	78.6
Pacific Cod						
1984	3,231	38,658	41,889	1.0	16.7	17.6
1985	2,954	45,823	48,777	.8	14.8	15.6
1986	8,045	34,235	42,334	2.4	8.5	10.9
1987	29,454	44,708	74,192	12.0	17.0	29.0
1988	30,622	86,733	117,358	10.6	25.5	36.1
Flatfish						
1984	432	23	455	.2	.0	.2
1985	461	81	543	.1	.1	.2
1986	1,519	6,565	8,084	.5	2.2	2.6
1987	2,633	15,885	18,518	.7	6.2	6.8
1988	5,258	35,536	40,796	1.6	11.9	13.4
Rockfish						
1984	1,058	1,328	2,386	.9	.4	1.3
1985	2,706	950	3,655	1.5	.3	1.8
1986	7,881	1,052	8,939	3.7	.4	4.1
1987	12,749	10,991	23,747	8.3	4.3	12.6
1988	18,293	2,640	20,943	11.5	.9	12.4
Atka Mackerel						
1984	31	0	31	.0	.0	.0
1986	0	4	4	.0	.0	.0
1987	0	124	124	.0	.1	.1
1988	68	1,947	2,014	.0	.5	.5

Source: PacFIN management data base, extracted 3-23-89.

[1]Values do not include the value added by at-sea processing.
[2]Totals for all of Alaska may include landings for which the region of catch is not specified.
[3]Totals for all groundfish include landings of species/groups not reported individually.

(Table 1.4). They are the smallest vessels fishing groundfish, having average net tonnage capacities equal to 30 tons and average lengths of 49 feet.

Vessels involved in harvesting and processing (catcher/processor vessels) also employ mostly hook-and-line, trawls, or pots. The number of catcher/processor vessels using hook-and-line gear is 77 (Table 1.5). These vessels are the smallest of the catcher/processor vessels, having average net tonnage capacities equal to 176 tons and average lengths of 97 feet, but are larger than the catcher vessels using hook-and-line gear. Pot vessels number 12 and trawl vessels number 67. Their respective average net tonnage capacities are 276 and 656 tons. Their respective average lengths are 140 and 184 feet. Vessels involved in processing only (motherships) number 19. These vessels are large, having average net tonnage capacities equal to 1,256 tons and average lengths of 218 feet.

The number of vessels by length, by gear type, and by operating mode varies. Table 1.6 summarizes these parameters.

Table 1.2 Numbers of groundfish vessels that are less than 5 net tons or 5 net tons and larger that are Federally permitted in 1989 to fish off Alaska.

Mode	Number of Occurrences: Less than 5 net tons	Over 5 net tons		
HARVESTING ONLY	100	1,576		
HARVESTING/PROCESSING	4	156		
PROCESSING ONLY	0	19		
SUPPORT ONLY	0	35		
TOTAL VESSELS	104	+ 1,786	=	1,890

Table 1.3 Numbers of groundfish vessels that are Federally permitted to fish off Alaska in 1989 from the Seattle area, Alaska, and other areas.

Mode	Number: Seattle Area	Alaska	Other Areas
HARVESTING ONLY	340	1,057	179
HARVESTING/PROCESSING	96	47	13
PROCESSING ONLY	15	4	0
SUPPORT ONLY	19	11	5
TOTAL	470	1,119	197

Table 1.4 Numbers and statistics of CATCHER VESSELS by gear type that are Federally permitted to fish off Alaska in 1989.

Mode	Number	Avg Net Tons	Avg Length (ft)
HOOK-AND-LINE	1,320	30	49
POTS	20	122	90
TRAWL	232	115	90
OTHER GEAR 1/	4	26	51
TOTAL	1,576		

1/ Other gear includes combinations of hook-and-line, pots, trawls, jigs, troll gear, and gillnets.

Table 1.5 Numbers and statistics of CATCHER/PROCESSOR and MOTHERSHIP (processing only) VESSELS by gear type that are Federally permitted to fish off Alaska in 1989.

Mode	Number	Avg Net Tons	Avg Length (ft)
HOOK-AND-LINE	77	176	97
POTS	12	276	140
TRAWL	67	656	184
OTHER GEAR 1/	0	0	0
TOTAL	156		
MOTHERSHIPS	19	1,256	218

1/ Other gear includes combinations of hook-and-line, pots, trawls, jigs, troll gear, and gillnets.

Table 1.6 Numbers of vessels Federally permitted to fish off Alaska in 1989 by 25-foot length increments, by gear type, and by operating mode.

	Catcher				Catcher/Processor				Mothership
Length (ft)	Trawl	Pot	LL	M*	Trawl	Pot	LL	M*	
1- 25	2	0	47	1	0	0	1	0	0
26- 50	31	3	938	4	3	1	27	0	0
51- 75	53	2	346	2	0	0	10	0	0
76-100	78	9	63	0	4	1	10	0	0
101-125	51	4	14	0	2	1	4	0	0
126-150	6	2	2	0	8	1	8	0	3
151-175	9	0	2	0	12	7	15	0	2
>175	7	0	0	0	38	1	6	0	13
Subtotal	237	20	1,412	7	67	12	81	0	19

Total Vessels: 1,855

* Denotes multiple gear types.

2.0 ALLOCATE SABLEFISH TOTAL ALLOWABLE CATCH IN THE BERING SEA/ALEUTIAN ISLANDS

2.1 Description of and Need for the Action

In 1988 the NMFS Regional Director (RD) determined that the sablefish TAC was insufficient to accommodate both a directed and bycatch harvest in the Bering Sea management area. The RD closed the Bering Sea subarea sablefish fishery (June 11) prior to the attainment of TAC. This was done because the attainment of the sablefish TAC would have required the RD to either close the groundfish fisheries that take sablefish as bycatch or prohibit retention of sablefish bycatch for the remainder of the year. The former would have imposed a substantial cost on the groundfish industry in terms of foregone catch and earnings and the latter would have resulted in substantial waste and potentially unaccounted for fishing mortality. In 1989 it was determined that the entire initial TAC was needed to support the bycatch needs of other directed groundfish fisheries.

The Magnuson Act requires that conservation and management measures prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery. While the NMFS action can be justified in these terms, an effect of the action was a de facto allocation of sablefish to the non-directed fisheries, which are primarily trawl fisheries. Amendment proposals requesting the Council to consider the allocation issue were submitted by representatives of both the trawl and fixed gear sectors of the industry.

Given that the total TAC for sablefish in the Bering Sea will be harvested whether or not a directed fishery exists, the concern is not with the level of the sablefish TAC, but rather with its gear/mode allocation. This amendment presents two issues: the allocation of sablefish between directed and bycatch harvests, and the allocation of sablefish between the fixed and the trawl gears. Trawlers have typically been identified with the bycatch of sablefish, especially in the pollock, Pacific cod, Greenland turbot, and Pacific ocean perch (POP) fisheries. Longliners have accounted for the majority of the directed sablefish catch. However, longline fisheries targeting on Pacific cod and Greenland turbot also take sablefish as bycatch. A discussion of the historical and current utilization of this resource is presented, followed by an analysis of the allocation issues.

2.2 The Alternatives

This amendment topic was initiated by the receipt of three public proposals which requested different fixed allocations of sablefish between fixed gear and trawl gear in the Bering Sea and Aleutian Islands area. Allocation by gear type is Alternative 3, the other alternatives include the status quo (i.e., no specificly stated allocations) and allocating the available resource between directed and bycatch harvests.

A controlled access system might solve some of the problems to be considered in this amendment but this option is not considered as it is being addressed in another proposal before the Council and is beyond the scope of this report.

Under each of these alternatives, the initial sablefish TAC would continue to be reduced by 15% as part of a nonspecific reserve.

2.2.1 Alternative 1: Do nothing -- status quo.

This alternative would allow harvest of sablefish by all gear groups in the Bering Sea and in the Aleutian Islands region. All gear groups would compete against one another for the available TAC. In recent years, NMFS has closed the directed fishery prior to attainment of the sablefish TAC. Under this option, it is likely that NMFS would continue to curtail directed sablefish fishing prior to the TAC being attained, to allow for bycatch of sablefish in other fisheries and to reduce wastage of the species due to discards.

2.2.2 Alternative 2: Determine expected "true" bycatch, and allocate the remaining sablefish TAC in the Bering Sea/Aleutian Islands to the directed fishery.

Estimates of the rate of "true" incidental catch would be applied to the TAC for each of the groundfish fisheries that have sablefish bycatch demands. The summation across these fisheries would be set aside from the sablefish TAC to accommodate expected bycatch. The remaining sablefish TAC, if any, would be made available for directed fishing. The directed fishery would be open to all gear groups.

This alternative explictly gives bycatch demands preference over the directed fishery in order to both reduce the discards of sablefish taken as bycatch and to ensure full utilization of other, larger groundfish fisheries that take sablefish incidentially to their target species. This has been the existing policy in recent years, under the status quo, but this alternative would allow the calculation of expected bycatch prior to the beginning of the season and would allow for industry input into the decision through the normal Council process.

2.2.3 Alternative 3 (Preferred): Allocate the Bering Sea/Aleutian Islands sablefish TAC between the fixed and trawl gear groups.

Bering Sea subarea: 50% to fixed gear and 50% to trawl gear. Aleutian Islands: 75% to fixed gear and 25% to trawl gear. Under this alternative, the RD would be expected to, as necessary, set aside a portion of each gear group's share to meet its expected bycatch. The actions of the RD would allow for the fullest utilization of the other groundfish resources available to each gear group, reduce wastage due to sablefish discards, and reduce the potential for overfishing.

The Council felt an allocation by gear type is appropriate as a measure to protect the large number of smaller vesels using fixed gear. These vessels would be at increased risk of being precluded from the fishery if directed fishing for sablefish was limited to very low levels.

The allocations chosen recognize the larger demand for sablefish bycatch in trawl operations in the Bering Sea relative to the Aleutian Islands subarea, and the greater opportunities available to trawl operations to fish in areas and ways which minimize sablefish bycatch.

2.3 Historical Data and Description of the Impact of the Fishery

2.3.1 Historical Data

Prior to 1985 sablefish in the Bering Sea and Aleutian Islands were primarily harvested by the Japanese, with longline being the dominant gear. The first significant domestic harvest of sablefish in this area occurred in 1985 and the fishery has essentially been a domestic fishery since then.

Sablefish is harvested in the domestic fisheries by both trawl and fixed gear as target catch and as bycatch. Much of the sablefish taken by trawlers appears to be bycatch when targeting on other groundfish such as pollock, Pacific cod, Greenland turbot, and POP. The majority of the longline sablefish harvest has been taken as target catch; however, longline fisheries for Pacific cod and for Greenland turbot also take sablefish as bycatch. The demand for sablefish by these longline fisheries or by the trawl fleet could increase, depending on the availability of a market, the exvessel prices, and the total allowable harvest of these species.

As noted above, the domestic fishery in this area has really only been in existence since 1985, so neither the trawlers nor the longliners have a long-standing involvement in this sablefish fishery.

In 1987 the RD closed the sablefish fishery on August 15, in order to protect the sablefish stock from the potential of overfishing and to allow the full utilization of other groundfish stocks in fisheries that take sablefish incidentally. In 1988 the directed fishery was again closed by the RD, this time earlier in the year (June 11). In 1989, it was deemed necessary to allocate the entire sablefish TAC to bycatch.

No data are presented on the distribution of catch between directed and bycatch mode, as it is hard to attribute individual hauls or trips to either mode. Federal regulations have recently been modified to define sablefish bycatch as 1% or less of retained catch for a trip (10% for the Greenland turbot and POP fisheries). In some instances it would be possible for the retained catch composition to be below this level despite an intentional effort to harvest sablefish during part of a fishing trip. Since the intent of the vessel is not known, it is often difficult to attribute the harvest to either catch in a multiple target trip or incidental bycatch.

Data on the distribution of sablefish catch between trawl and fixed gear in the Bering Sea and Aleutian Island areas are presented in Table 2.1. In the Bering Sea fishery, trawlers took an average of 36% of the annual harvest in 1985-87. In the Aleutian Islands, the trawl share averaged 13% of the total harvest. However, the trawlers have expanded their harvest in recent years; in 1987, 47% of the sablefish catch in the Bering Sea was by trawlers although the closing of the directed fishery in August by the RD probably reduced the amount that would have been taken by the longliners had the fishery remained open.

2.3.2 Impact of the Fishery

A redistribution of the harvest of sablefish will have an impact on the number of vessels and fishermen within a gear type that this fishery can support.

There are many more vessels operating with fixed gear (longline and pot) than with trawl gear in this fishery (Table 2.2). In 1988, 71 vessels had reported landings of sablefish using fixed gear (66 longline, 5 pots) while 16 trawlers reported landing sablefish. These data count only those vessels that had landings of sablefish, and do not include any vessels that harvested sablefish and did not retain the catch.

Table 2.1 -- Distribution of Sablefish Catch (in mt and percent) by area and gear type, 1985-1987.

Region	Year							
	1985		1986		1987		3-year avg.	
Bering Sea								
Fixed	1,973.0	(95%)	1,725.4	(56%)	2,153.1	(53%)	1,950.5	(64%)
Trawl	86.4	(5%)	1,336.7	(44%)	1,923.7	(47%)	1,115.6	(36%)
Total	2,059.4		3,062.1		4,076.8		3,065.9	
Aleutian Islands								
Fixed	1,191.7	(91%)	2,521.1	(86%)	3,299.2	(87%)	2,337.3	(87%)
Trawl	123.5	(9%)	423.8	(14%)	479.5	(13%)	342.3	(13%)
Total	1,315.2		2,944.9		3,778.7		2,682.9	
BS/AI								
Fixed	3,164.7	(94%)	4,246.5	(71%)	5,452.3	(69%)	4,287.8	(75%)
Trawl	209.9	(6%)	1,760.5	(29%)	2,403.2	(31%)	1,457.9	(25%)
Total	3,374.6		6,007.0		7,855.5		5,745.7	

Source: NMFS, Alaska Region.

Table 2.2 -- Number of vessels that made domestic landings of sablefish, by gear, 1985-88.

Year	Trawl	Longline	Pot	All Gear
1985	13	73	9	88
1986	18	88	9	115
1987	18	91	9	118
1988	16	66	5	87

Note: Some vessels may fish with more than 1 gear type.

Source: CFEC/NWAFC vessel file.

Although more vessels operate with longline gear, the trawl vessels tend to be slightly larger (Table 2.3). During the period 1986-88 the median length class for trawlers was 135'-159', and for longliners was 60'-84'.

Vessels that are closed out of the Bering Sea directed sablefish fishery can switch target species and/or area. Some individual boats currently fish sablefish during part of the year in the Gulf of Alaska and off the coast of Washington and Oregon. If they were closed out of the Bering Sea, they could redirect more effort to these alternate fisheries. Because these fisheries are fully exploited by domestic vessels, they will likely be unable to recover all of the loss and their increased effort in these other fisheries will tend to reduce the shares of the catch to other U.S. vessels.

Alternatively, vessels could remain in the Bering Sea and switch target species. Longliners have the option of participating in either the Pacific cod or Greenland turbot fisheries. These fisheries would provide the vessels with a different target species, and would also allow them to utilize sablefish as a portion of their catch. Trawl vessels have the option to target on a variety of groundfish species.

It should be noted that different vessels will face different sets of choices. Preferred product forms and vessel size constraints may make some choices feasible for some but not all vessels. For example, small ice boats switching to Pacific cod would be able only to bleed and ice their catch and would receive a lower price for their delivered product than would be received by vessels that can land frozen cod products. Vessels within each gear type have alternatives to fishing for sablefish. The extent to which these alternatives will provide less compensation depends on the allocations and on the exvessel prices for those alternative targets.

Sablefish is higher-priced than most of the species within the groundfish fisheries (Table 2.4). The market for most of the sablefish harvested in this area (>90%) is Japan. With the favorable (for the Japanese) yen-to-dollar ratio, and the loss of their direct supply, the Japanese have contributed to an overall increase in real prices for U.S. sablefish. One can not expect the rate of price increases for sablefish to continue at the same pace as it has in recent years but prices should remain fairly high and sablefish will continue to be viewed as an attractive species for U.S. fishermen to harvest. Vessels that are forced to switch targets will suffer a loss in gross revenues, unless the catch rates for the new species are high enough to offset the lower exvessel prices.

Because sablefish is more highly-valued than most other groundfish species, there is currently an economic incentive for some vessels to land sablefish in a mixed target fishery. To illustrate the incentive for a given vessel, a simplified example of one 100-mt trip is presented:

	Retained Catch	1988 price ($/ton)	Gross revenue
Greenland turbot (and similarly valued species)	90 mt (90%)	$ 481	$43,290 (68%)
Sablefish	10 mt (10%)	$2,000	$20,000 (32%)
Total	100 mt		$63,290

Table 2.3 -- Number of vessels that made domestic sablefish landings by gear and size in the Bering Sea/Aleutian Islands region.

Year	Trawl	Longline
1985		
< 60	1	36
60 - 84	4	33
85 - 109	2	2
110 - 134	3	1
135 - 159	0	0
160 - 184	1	0
>= 185	2	0
Unknown	0	1
1986		
< 60	1	16
60 - 84	1	26
85 - 109	1	0
110 - 134	3	1
135 - 159	3	0
160 - 184	3	0
>= 185	2	0
Unknown	4	7
1987		
< 60	1	36
60 - 84	0	41
85 - 109	0	3
110 - 134	5	2
135 - 159	3	1
160 - 184	1	0
>= 185	5	0
Unknown	3	8
1988		
< 60	0	31
60 - 84	0	26
85 - 109	2	2
110 - 134	3	4
135 - 159	3	1
160 - 184	4	0
>= 185	4	0
Unknown	0	2

Source: NWAFC vessel database.

Table 2.4 -- Comparison of annual average exvessel prices ($/mt) for select domestic groundfish fisheries in the Bering Sea and Aleutian Islands region, 1986-88.

	1986	1987	1988
Sablefish	1091.20	1261.15	1987.52
Greenland turbot	450.82	568.28	480.99
POP	278.85	425.89	204.32
Pacific cod	249.03	379.35	293.95

Source: PacFIN database, as of 3/6/89.

Under current federal regulations, the 10 mt of sablefish would be considered bycatch because the catch proportion did not exceed the 10% rule for sablefish. Yet this 10 metric tons contributed almost 1/3 of the gross revenue of this hypothetical trip.

The issue of bycatch "needs" requires some clarification. For many operations that target on some of the lower-valued species, these vessels might anticipate a certain percentage of their total harvest to be sablefish in order to ensure a worthwhile return from that fishery. These operations will modify their fishing patterns in an attempt to increase their catch of sablefish. These vessels are really participating in directed fishing for sablefish during part of the trip, yet because on a post hoc basis these trips are assigned to 1 target species, their usage of sablefish becomes part of the bycatch "need" from that target fishery. Therefore, their bycatch "needs" will exceed the true incidental catch totals that would occur if they were indifferent to catching sablefish or actively seeking to avoid sablefish. Since use of the term "needs" obscures the question here and in the rest of the analysis we will refer to this as "demand" for sablefish.

Figures 2.1 and 2.2 provide some data on the range of observed bycatch in two fisheries (Greenland turbot and Pacific cod) that traditionally are assumed to have high bycatch demands. The data are from individual sampled hauls of Japanese trawling operations in the Bering Sea. In 1981 the Japanese had a fairly large harvest allocation for sablefish (2,091 mt out of a total harvest of 2,604 mt) but by 1986-87 the Japanese received small allocations of sablefish in the Bering Sea and Aleutian Islands. Subsequently, they placed internal constraints on their trawling operations to ensure that the majority of their sablefish allocation was available to their longline fleet.

Although there remains a wide range in the percentage of sablefish catch in individual hauls in both fisheries, there was a definite drop in the sablefish bycatch rates under the restricted case relative to the 1981 unrestricted fishery. For the Greenland turbot fishery, the bycatch rates ranged from under 1% to 37% of an individual haul in the unrestricted fishery. Approximately 42% of the sampled hauls had bycatch rates in the 0.01% to 1.99% categories, with an average bycatch rate of 2.2%. In the restricted case the rates varied from under 1% to 15%, and more than 80% of the sampled hauls had sablefish catches in the 0.01% to 1.99% categories. The average bycatch rate of sablefish dropped to 0.1% of the total catch in the Japanese turbot fishery.

Similarly in the Pacific cod fishery comparison, the bycatch rates ranged from under 1% to 37% for the unrestricted and from under 1% to 3% for the latter restricted fishery. Approximately 53% of the sampled hauls in the unrestricted and 90% in the restricted fishery had rates under 1.99%. The average rate declined from 0.4% in the unrestricted fishery to 0.1% in the restricted cod fishery.

These data would appear to indicate that policy decisions can change the demand for sablefish in these other groundfish fisheries. Vessels which are given incentives to avoid sablefish may have lower bycatch demands than vessels that are indifferent to the harvesting of sablefish (natural bycatch). Programs that increase the cost of harvesting sablefish or lower the value of the retained sablefish will make the return from this species less attractive to those who fish it in a bycatch mode and thus lower their bycatch demands. Vessels operating in target fisheries that face the possibility of losing access to that fishery if they exceed a given apportionment will probably alter their behavior to reduce the amount of sablefish taken in their harvest, if there is sufficient coordination among the vessels in that fishery.

Figure 2.1

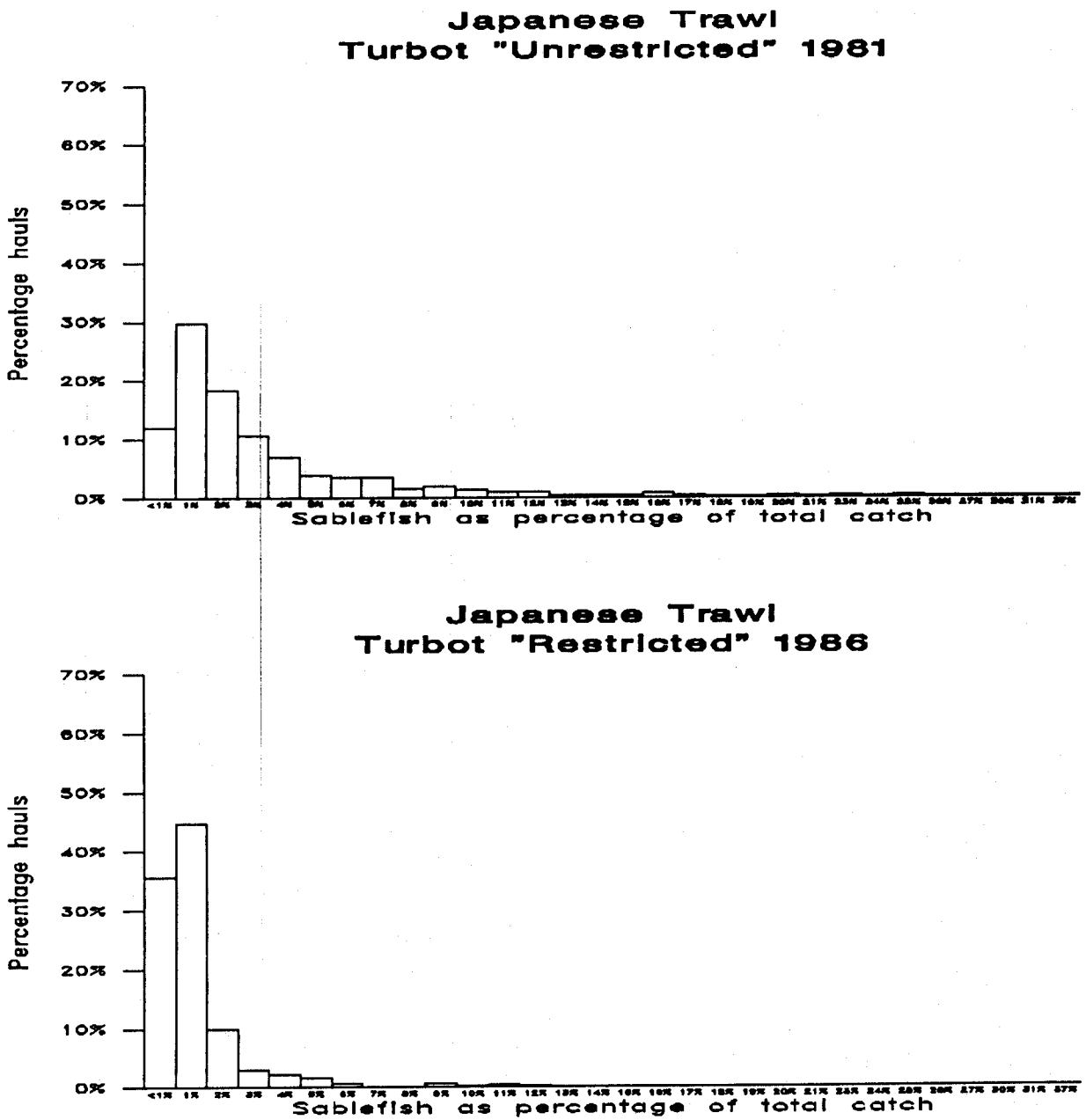
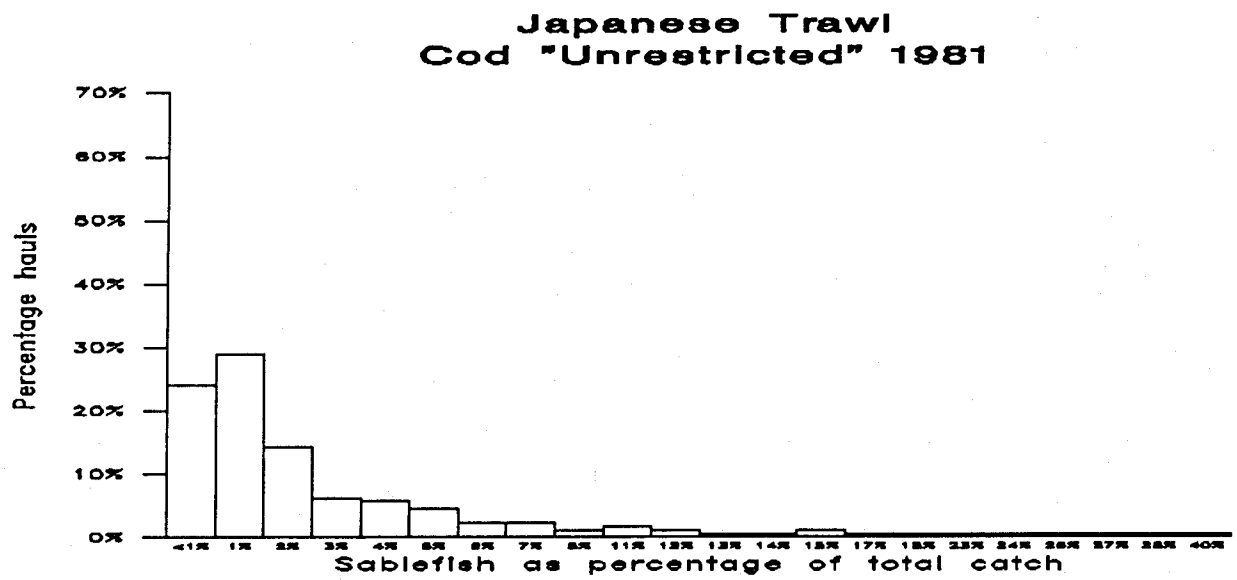
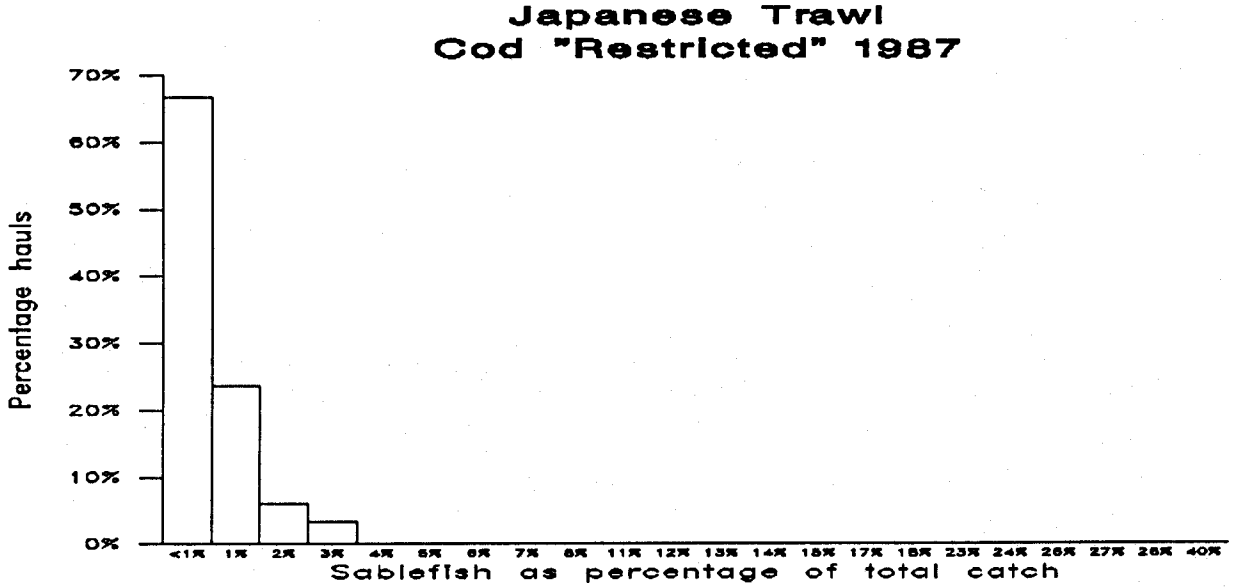

Japanese Trawl
Turbot "Unrestricted" 1981
Percentage hauls
70%
60%
50%
40%
30%
20%
10%
0%
Sablefish as percentage of total catch
Japanese Trawl
Turbot "Restricted" 1986
Percentage hauls
70%
60%
50%
40%
30%
20%
10%
0%
Sablefish as percentage of total catch

Figure 2.2


Japanese Trawl
Cod "Unrestricted" 1981
Percentage hauls
70%
60%
50%
40%
30%
20%
10%
0%
<1% 1% 2% 3% 4% 5% 6% 7% 8% 11% 12% 13% 14% 15% 17% 18% 23% 24% 26% 27% 28% 40%
Sablefish as percentage of total catch


Japanese Trawl
Cod "Restricted" 1987
Percentage hauls
70%
60%
50%
40%
30%
20%
10%
0%
<1% 1% 2% 3% 4% 5% 6% 7% 8% 11% 12% 13% 14% 15% 17% 18% 23% 24% 26% 27% 28% 40%
Sablefish as percentage of total catch

In an effort to identify the "natural" bycatch or coincidence rates, individual haul data from the 1985 RACE Bering Sea slope survey were examined. Survey data were used, as opposed to commercial data, as during a survey there are neither incentives nor disincentives to target on sablefish. To mimic a commercial venture that is indifferent to sablefish, the survey data were then assigned to various target fisheries categories, since a commercial venture is presumably targeting on some species and is therefore not indifferent to everything.

The data from the NMFS trawl survey are presented in Table 2.5. There appears to be a great deal of variability between "target" fisheries, between individual hauls within target subsets and, in some cases, between areas and depth of tow. Based on this data set, the average bycatch rate for sablefish in the Greenland turbot fishery is 12.15%, with a sample standard deviation of 11.33%.

Given that a number of factors can change the sablefish demands of an individual vessel, establishing an appropriate bycatch rate can be difficult. Any attempt to regulate the actual incidence of sablefish for other groundfish fisheries should consider the variability of incidence and allow a large enough buffer to reduce imposing significant losses to these fisheries. If the calculation uses bycatch rates above the incidental harvest rate, then a percentage of the sablefish harvest would be given to bycatch users that could have been harvested in a directed mode, but the total harvest level would be approximately the same. However, if the bycatch rates and demands are underestimated then the total amount of sablefish available to meet bycatch demands could be a binding constraint on the ability of vessels to harvest other species. This could result in an increase in the discards and subsequent waste of sablefish by vessels that are no longer able to retain the species and/or the possible foregone catch and revenue from other species. Thus, the costs of "guessing" wrong are greater for underestimating rather than overestimating bycatch demands.

Although for an individual operation the inclusion of sablefish can be an important source of revenue, for the industry overall, the sablefish fishery of the Bering Sea and Aleutian Islands is relatively less important than many other groundfish species, both in total harvest and in total value.

In 1988 sablefish accounted for 0.5% of the Bering Sea/Aleutian Islands commercial groundfish harvest and 3.6% of the exvessel value of that harvest applying PacFIN domestic prices to all catch. The opposite is true for the Gulf of Alaska, where the sablefish stock has a higher biomass and is one of the most significant groundfish fisheries. In 1988 sablefish accounted for 18% of the commercial groundfish harvest and 55% of the exvessel value of that harvest. For the Gulf, therefore, bycatch demands from other groundfish fisheries were not such a major consideration in the determining of the sablefish allocation.

2.3.3 Summary

In the domestic sablefish fishery of the Bering Sea, there appears to be a trend toward growing utilization of the stock by vessels in bycatch mode, leading to the probable demise of a directed fishery in that region and a possible de facto allocation to one type of gear (trawl). That trend appears to be the result of growth in the domestic groundfish fisheries that utilize sablefish as bycatch and of actions by the Regional Director to ensure maximum utilization of both the sablefish and other groundfish stocks, while reducing the risk of overharvesting the sablefish resource. The decline in sablefish stocks and subsequently in TACs is also a factor.

Table 2.5.—Comparison of percentage sablefish for different target species.

Sablefish as % of total groundfish		Area/Depth: Zone 1 100'	Zone 1 300'	Zone 2 100'	Zone 2 300'	Combined
Greenland turbot "target" fishery	Mean	20.90	18.01	2.75	4.50	12.15
	St. dev.	10.26	9.17	5.08	9.63	11.33
	Min.	6.00	.00	.00	.00	.00
	Max.	42.00	41.00	24.00	40.00	42.00
	Count	22	52	38	16	128
Pacific cod "target" fishery	Mean	14.06		1.84		6.54
	St. dev.	13.15		3.13		10.35
	Min.	.00		.00		.00
	Max.	47.00		12.00		47.00
	Count	35		56		91
Walleye pollock "target" fishery	Mean			.06		.06
	St. dev.			.13		.13
	Min.			.00		.00
	Max.			—		—
	Count			10		10
Pacific Ocean perch "target" fishery	Mean	5.13		2.92		3.03
	St. dev.	—		4.07		3.99
	Min.	5.13		.00		.00
	Max.	5.13		12.00		12.00
	Count	1		20		21

Source: 1985 RACE Bering Sea Survey data.

In response to proposals from the industry, this analysis attempts to determine if a rationale exists for setting a definite allocation in the sablefish fishery as opposed to the status quo, where intervention only takes place when deemed appropriate. A variety of factors needs to be examined in order to fully measure the impact of any redistribution of harvest, either between gear types (trawl/fixed) or between fishing modes (directed/bycatch). Generally, when considering whether changes in allocations are justified, the Council determines whether any one user group is dependent on income from that fishery and how the change in the allocation will impact the value (gross and net) from this and other fisheries.

There appears to be no strong historical justification for any one sector, nor is any one gear type completely dependent on access to these fisheries. Vessels in both gear groups have alternatives to sablefish harvest (direct or indirect), although some choices are less desirable than others. In addition, allocations based on past performance do not necessarily yield the optimal division of harvest in the future and may not make economic sense in an area that is rapidly changing with regards to developing domestic fisheries, to new product forms, and even to market destination.

Justifications for setting allocations of this stock appear to be a concern for the future health of the stock, ensuring enough "true" bycatch to allow the continuation of other domestic fisheries, and increasing the returns from the sablefish resource. These issues will be addressed in the following analysis of the alternatives.

2.4 Biological and Physical Impacts

2.4.1 Alternative 1: Do nothing -- status quo.

The sablefish resource has recently shown significant declines in the eastern Bering Sea. According to the results of the 1988 Japan-U.S. longline survey, the Bering Sea biomass remains at a very low level. Significant recruitment in this area has not been observed since the 1977 year class. Thus, the eastern Bering Sea biomass is expected to remain at low levels.

The eastern Bering Sea TAC was set at 3,400 mt in 1988 and at 2,800 mt in 1989. Under the assumption that the eastern Bering Sea TAC will continue to be set at a low level, the demands for directed and bycatch harvest will exceed TAC. It is likely that NMFS will continue to stop directed fishing for sablefish prior to the attainment of TAC, to allow for the bycatch needs of other groundfish fisheries and prevent wastage of the resource. This policy prevents overharvesting. If this policy is not continued, TAC is likely to be attained early in the year and sablefish would then be declared a prohibited species. Once a species is declared prohibited, it must be discarded from all groundfish catches for the remainder of the year. The impact of this would be overharvesting due to discard mortality; that is, sablefish fishing mortality would exceed the TAC.

The sablefish TAC has never been attained in the Aleutian Islands region. Due to the rapidly expanding domestic fishery, the Aleutian Islands could potentially face the same problems experienced in the Bering Sea fishery in the near future. This could pose problems of overharvesting due to unknown discard mortality levels.

2.4.2 Alternative 2: Determine "true" bycatch, and allocate the remaining sablefish TAC in the Bering Sea/Aleutian Islands to the directed fishery.

The effects of this alternative are probably very similar to the status quo (Alternative 1). With this alternative it is likely that most, if not all, of the TAC would go to bycatch fisheries, which use mainly trawl gear. The biological impacts of this alternative depend on the sablefish TACs. Under the assumption that the TACs will continue to be set at low levels in the eastern Bering Sea, it is likely that any percentage allocation will be insufficient to meet the demands of the directed fisheries. The TAC would likely be attained before the end of the year. Sablefish would then become a prohibited species and have to be discarded. If sablefish continue to be caught incidentally and there is discard mortality, the potential for overharvesting exists; that is, sablefish fishing mortality will exceed the TAC.

On the other hand, if the allocations are sufficient to meet the demands of the directed fisheries then the TACs would not be reached prematurely, alleviating the potential problem of overharvesting.

A potential biological impact is due to the size selectivity of the different gear types. Trawls tend to select for smaller sablefish than do longline gear. This could affect yield, but the extent is unknown.

2.4.3 Alternative 3 (Preferred): Allocate the Bering Sea/Aleutian Islands sablefish TAC between the fixed and trawl gear groups.

The biological impacts of this alternative depend on the sablefish TACs and management actions taken by the RD. Under the assumption that the TACs will continue to be set at low levels in the eastern Bering Sea, it is possible that any percentage allocation will be insufficient to meet the demands of the fixed and trawl fisheries, and that the RD would take management actions intended to prevent overharvesting of the resource. Management actions by the RD include area closures, gear restrictions, or prohibition of directed fishing on certain species. If the TACs allocated to the fixed and trawl gears are insufficient to meet their demands, and the RD does not take any management actions, the TACs will be attained before the end of the year. Sablefish would then become a prohibited species and must be discarded. If sablefish continue to be caught incidentally and there is discard mortality, the potential for overharvesting exists.

If the allocations are sufficient to meet the bycatch demands of the fixed and trawl fisheries then the TACs would not be reached prematurely, alleviating the potential problem of overharvesting.

Longline operations for sablefish in the eastern Bering Sea have experienced interactions with killer whales. Depredation by killer whales on longline catches in the southeastern Bering Sea have been reviewed and documented by Dalheim (1988). Dockside interviews were conducted in February and March of 1988 with domestic Bering Sea longline fishermen, representing 50% of the winter longline fleet (Dalheim, 1988). The fishermen reported killer whale predation on 6% to 50% of the sets, with an average rate of 20% of sets affected. The estimated value, by fishermen, of the fish lost per day by a single fishing vessel ranged from $250 to $5000, with an average loss of $2,293.

Dalheim (1988) also reviewed U.S. observer reports from Japanese commercial longline vessels from 1977 to 1985. Every vessel within the Japanese fleet had reported fishery interactions with killer whales in the

Bering Sea. Depredation by killer whales on the sablefish longline catches was documented for 15% of the trips, and was found to occur throughout the year.

There has not been documentation of killer whale/sablefish fishery interactions in the northeastern Bering Sea. Japan-U.S. cooperative longline surveys have fished the eastern Bering slope north to 59° N. yearly since 1982. Killer whale interactions have been reported each year in areas south of 57° N. Killer whale interactions have not been reported north of the Pribilof Islands by the surveys.

In addition to the Japan-U.S. longline surveys in the eastern Bering Sea, NMFS has also conducted trawl surveys of the eastern Bering Sea slope in 1979, 1982, 1985, and 1988, which extended to approximately 60° N. A decreasing trend in sablefish catch rates was evident from the southern to northern Bering Sea stations. Catch rates south of the Pribilofs were more than twice as high as catch rates from more northerly areas.

Geographic trends in the eastern Bering Sea catch rates from the longline surveys were not as apparent. Killer whale interference with the longline survey in the southeastern Bering Sea has occurred each year of the survey, making it difficult to assess trends in this area.

As noted above, a potential biological impact is due to the size selectivity of the different gear types. Trawls tend to select for smaller sablefish than does longline gear. This could affect yield, but the extent is unknown.

2.5 Socioeconomic Impacts

2.5.1 Analysis of the Alternatives

2.5.1.1 General Analysis

Allocation under the status quo currently favors the bycatch fishery. A reallocation away from this procedure would make sense if the expected benefits exceed the potential costs.

Most vessels participate in a variety of fisheries. Typically, the degree of historical dependence on a fishery varies within a gear group; therefore, the ranges of dependence for different gear groups usually overlap. In such cases, dependence on a fishery does not provide a good basis for allocating a TAC by gear type.

Sablefish can be used as bycatch in fisheries targeting on other species or as catch in fisheries that target in part or exclusively on sablefish. Within each of these types of usage, sablefish can be taken by different gear groups.

Modifying the allocation of sablefish between competing gear groups will change the flow of revenues from these fisheries to the various groups. Currently, there exist a price premium for larger size sablefish and for those caught by hook and line versus trawl. A review of Japanese wholesale prices and exvessel prices for 1986-88 (through 8/88) indicates that both premiums are decreasing. In 1986 the price per product pound for sablefish, size 5-7 lb., averaged 33% more than the per pound price paid for the 3-4 lb sablefish in the Tokyo wholesale market. By 1987 the average difference was 15% and in 1988 it had decreased to

12%. Similarly at the exvessel level, the premium paid for sablefish caught by hook and line instead of trawl in the Aleutian region declined from 48% in 1986 to 22% in 1988. The higher exvessel price with fixed gear is explained by the fact that fixed gear landings typically have larger proportions of both dressed fish and larger fish. A shift towards a higher allocation for longliners would probably increase gross revenues from the sablefish fishery, due to the existing premium. However, it is uncertain which operation would be able to generate the highest net returns from this fishery. That would depend on differences in CPUE and costs, for which currently there are insufficient data to provide an estimate.

However, within a given gear type, sablefish is likely to be higher-valued as bycatch. Assuming that the size distribution of catch, product form, and quality remain the same (within a gear group with the comparison between directed and non-directed mode), then there should be no difference in the prices offered for these fish or in the gross revenues. Net revenues should be higher for vessels taking sablefish as bycatch because the marginal costs of harvesting the sablefish while pursuing another target is fairly low. A significant redistribution of the sablefish TAC from the bycatch fishery to the directed fishery should lower the net returns from the sablefish TAC unless the vessels operating in the target sablefish fishery have much lower fishing costs or higher-valued product forms than those vessels that take sablefish as bycatch.

In addition, the allocation of sablefish to bycatch has an impact on the value obtained from other species. For example, if Pacific cod cannot be harvested without harvesting sablefish at a rate of 1 mt of sablefish per 250 mt of cod then the value of 1 mt of sablefish to the cod fishery is that of the net value of landing 1 mt of sablefish and 250 mt of cod if the cod fishery is closed when the sablefish TAC is attained. The gross exvessel value of this is about $75,500 (using 1988 prices presented in Table 2.4). In general, if the sablefish that is taken as bycatch can be landed and the actual bycatch rate is both low and constrains the amount of the target species that can be harvested, then the value of sablefish as bycatch will be much greater than its use as target catch. Therefore, in terms of maximizing harvest value, it is appropriate to meet bycatch demands for sablefish prior to considering the demands of the sablefish fishery. This is currently the RD's policy under the status quo.

If there is sufficient growth in demand for sablefish as bycatch, then the total TAC for sablefish may be exceeded by bycatch harvest alone, which would result in either the discard of sablefish (with its inherent waste and foregone revenue) or in the underutilization of other groundfish stocks due to closures (with revenue foregone from those fisheries). The potential for this exists under all three alternatives.

2.5.1.2 Model Construction

In order to evaluate what might happen under the proposed alternatives, a model was constructed to project total groundfish catch and sablefish bycatch for various target fisheries. The 1989 TACs were apportioned between gears and areas based on actual 1988 catch percentages (Table 2.6). The pollock TAC was separated into a midwater and bottom pollock fishery because there are substantial differences in bycatch rates and species mix between the two fisheries. A 70%-30% (midwater/bottom) split was considered as was the converse. The bycatch rates of sablefish and the species composition for each target fishery (i.e. the percentage pollock in the cod fishery, the percentage pollock in the midwater pollock fishery) are estimated from the 1986-88 weekly joint venture processing vessel data. To simulate domestic fisheries, for which there exists no comparable joint venture fishery, these data were supplemented by data from the Japanese small trawler fleet.

Table 2.6 -- 1989 Bering Sea and Aleutian Islands TACs apportioned by gear and area.

	Bering Sea	Aleutian Islands
Trawls		
Pollock	1,340,000	13,450
Cod	219,062	4,699
Flatfish	263,858	-----
Rock sole	90,762	-----
Atka mackerel	------	20,285
Greenland turbot	4,970	950
Rockfish	5,400	6,100
Fixed Gear		
Cod	6,000	920
Greenland turbot	1,750	330
Rockfish	-----	1,000

As previously noted, bycatch demand for sablefish can vary from fishery to fishery and within a given fishery, for a variety of reasons. As it is difficult to ascertain true incidental catch and as the cost of underestimating attainable rates is probably considerably higher than the cost of overestimating them, a range of sablefish bycatch rates was considered. For each target fishery, the sample mean bycatch rate was calculated. In order to construct a 95% confidence interval, the other two rates used were plus 2 standard deviations from the mean and minus two standard deviations from the mean. The latter case implied a negative bycatch rate, which realistically was truncated at zero. The two bycatch rates used (the mean and the mean plus two standard deviations for each target species) are listed in Table 2.7 by gear, area, and target.

Using the given TACs, our estimates of species composition (Table 2.8) in each target fishery, and assumptions concerning the distribution of TACs between areas and target fisheries, we were able to project the total amount of target species caught in each fishery. The estimates were generated from the mathematical solution of series of simultaneous equations, where the catch for each species (TAC) is characterized by an equation relating total weight (excluding sablefish) caught in a target fishery and the proportion of catch of each species.

The two bycatch rates were then applied to our estimate of catch in each target fishery in order to provide a range of expected sablefish bycatch by area. The total harvest and resultant bycatch of sablefish is presented in Table 2.9. The total projected bycatch demand for sablefish was then compared to the amount allocated to each gear group, under the fixed share proposal. Three levels of TACs were evaluated to address the issue of changing stock condition under a fixed share allocation.

Sablefish TACs:

Scenarios		1	2	3
Bering Sea Total		3,400	2,800	2,200
Proposal 1	Trawl	2,380	1,960	1,540
	Fixed Gear	1,020	840	660
Proposal 2	Trawl	1,020	840	660
	Fixed Gear	2,380	1,960	1,540
Aleutian Islands Total		5,000	3,400	1,800
Proposal 1	Trawl	3,500	2,380	1,260
	Fixed Gear	1,500	1,220	540
Proposal 2	Trawl	500	340	180
	Fixed Gear	4,500	3,060	1,620

Proposal 1 reflects a 70% allocation to the trawlers in each area. Proposal 2 is a 70% allocation in the Bering Sea and a 90% allocation in the Aleutian Islands to the fixed gear.

Given the assumption that bycatch demands will take priority over the directed fishery, especially in the trawl fleet, Table 2.10 presents the summary comparison of the projected gear and area sablefish harvest to the

Table 2.7 -- Estimates of bycatch rates of sablefish (in percentages) used in model projection by target fishery.

	Bering Sea		Aleutian Islands	
Fisheries	A	B	A	B
Midwater Pollock	.062%	.006%	0.045%	.005%
Bottom Pollock	.385	.073	1.049	.321
Cod	.812	.070	1.515	.255
Flatfish	.046	.002	-----	----
Rock sole	.000	.000	-----	----
Atka mackerel	----	----	0.269	.043
Greenland turbot	11.06	3.20	12.70	3.50
Rockfish	7.91	2.70	14.08	4.50

A: sample mean plus 2 standard deviations
B: sample mean

Table 2.8 -- Catch composition excluding sablefish of target species by area, gear, and target species.

BERING SEA

Trawl Gear

	Fishery						
Species	Midwater Pollock	Bottom Pollock	Cod	Yfin/ Oflats	Rock sole	Turbot	Rockfish
Pollock	.9927	.887	.3337	.0882	.13	.0264	.0712
Cod	.0052	.0314	.5536	.057	.14	.0015	.2174
Flatfish	.0001	.0616	.097	.83	.20	.1000	.0828
Rock sole	.0	.0	.0	.02	.50	.0	.0
Turbot	.0	.0001	.002	.0	.0	.7977	.0118
Rockfish	.0	.0003	.006	.0	.0	.0104	.5244

ALEUTIAN ISLANDS

Trawl Gear

	Fishery					
Species	Midwater Pollock	Bottom Pollock	Cod	Atka Mackerel	Turbot	Rockfish
Pollock	.9962	.6547	.2069	.0907	.0	.2391
Cod	.0025	.0832	.5084	.1173	.1023	.0363
Atka mackerel	.0	.1000	.0	.7600	.04	.0
Turbot	.0	.0	.0004	.0003	.6632	.0287
Rockfish	.0001	.0114	.0118	.0272	.059	.6186

Longline

	BERING SEA		**ALEUTIAN ISLANDS**		
	Fishery		Fishery		
Species	Cod	Turbot	Cod	Turbot	Rockfish
Cod	.915	.0224	1.00	.02	.21
Turbot	.0271	.9010	0.00	.91	.1
Rockfish	.0	.0	0.00	.036	.67

Table 2.9 -- Projected 1989 trawl harvest level and sablefish bycatch (mt) for individual target fisheries by area.

BERING SEA

Target Fishery	Total Harvest	Case I Sablefish Catch	Case II Sablefish Catch
Midwater Pollock	404,956	251	24
Bottom Pollock (70%)	910,186	3,504	664
Cod	275,571	2,238	193
Flatfish	174,747	80	3
Rock sole	174,534	0	0
Turbot	5,329	589	171
Rockfish	6,518	516	176
		7,178	1,231
Midwater Pollock (70%)	944,898	586	57
Bottom Pollock	292,092	1,125	213
Cod	301,525	2,448	211
Flatfish	217,931	100	4
Rocksole	172,807	0	0
Turbot	5,340	591	171
Rockfish	6,574	520	178
		5,370	834

ALEUTIAN ISLANDS

Target Fishery	Total Harvest	Case I Sablefish Catch	Case II Sablefish Catch
Midwater Pollock	4,050	2	0
Bottom Pollock (70%)	10,616	111	34
Cod	847	13	2
Atka mackerel	25,238	68	11
Turbot	1,055	134	37
Rockfish	8,438	1,188	379
		1,516	463
Midwater Pollock (70%)	9,451	4	0
Bottom Pollock	1,882	20	6
Cod	1,980	30	5
Atka mackerel	26,388	71	11
Turbot	1,050	133	37
Rockfish	8,527	1,201	384
		1,459	443

Case I applies the bycatch rates of the sample mean plus 2 standard deviations.
Case II applies the bycatch rates of the sample mean.

Table 2.10 -- Comparison of the projected model trawl sablefish bycatch demands under the different allocation and bycatch scenarios.

BERING SEA

	Trawl Allocation	Trawl Bycatch Demand				Difference (Allocation-Demand)			
		A	B	C	D	A	B	C	D
Proposal 1/Scenario 1	2,380	7,178	5,370	1,231	834	-4,798	-2,990	1,149	1,546
Proposal 1/Scenario 2	1,960	7,178	5,370	1,231	834	-5,218	-3,410	729	1,126
Proposal 1/Scenario 3	1,540	7,178	5,370	1,231	834	-5,638	-3,830	309	706
Proposal 2/Scenario 1	1,020	7,178	5,370	1,231	834	-6,158	-4,350	- 211	186
Proposal 2/Scenario 2	840	7,178	5,370	1,231	834	-6,338	-4,530	- 391	6
Proposal 2/Scenario 3	660	7,178	5,370	1,231	834	-6,518	-4,710	- 571	- 174

ALEUTIAN ISLANDS

	Trawl Allocation	Trawl Bycatch Demand				Difference (Allocation-Demand)			
		A	B	C	D	A	B	C	D
Proposal 1/Scenario 1	3,500	1,516	1,459	463	443	1,984	2,041	3,037	3,057
Proposal 1/Scenario 2	2,380	1,516	1,459	463	443	864	921	1,917	1,937
Proposal 1/Scenario 3	1,260	1,516	1,459	463	443	- 256	- 199	797	817
Proposal 2/Scenario 1	500	1,516	1,459	463	443	-1,016	- 959	37	57
Proposal 2/Scenario 2	340	1,516	1,459	463	443	-1,176	-1,119	- 127	- 103
Proposal 2/Scenario 3	180	1,516	1,459	463	443	-1,336	-1,279	- 283	- 263

A: mean plus 2 stnd deviation bycatch rate; 70% of pollock assigned to bottom fishery
B: mean plus 2 stnd deviation bycatch rate; 70% of pollock harvested in midwater fishery
C: mean bycatch rates; 70% of pollock harvested in bottom fishery
D: mean bycatch rates; 70% of pollock harvested in midwater fishery

Proposal 1: 70% allocation in both areas to the trawlers
Proposal 2: 70% allocation in the Bering Sea to fixed gear
90% allocation in the Aleutain Islands to fixed gear

Scenario 1: Bering Sea sablefish TAC = 3,400 mt
Aleutian Islands sablefish TAC = 5,000 mt
Scenario 2: Bering Sea sablefish TAC = 2,800 mt
Aleutian Islands sablefish TAC = 3,400 mt
Scenario 3: Bering Sea sablefish TAC = 2,200 mt
Aleutian Islands sablefish TAC = 1,800 mt

TAC allocation. In the Bering Sea, under the different scenarios, sablefish bycatch demands from the trawl fleet range from 834 mt to 7,178 mt and at one extreme exceed the allocation by 6,518 mt.

The text and tables that summarize the implications of the three alternatives as determined by the model were not complete at the time this document was made available for public review. They are included as an addendum to this document.

2.5.1.3 Alternative 1: Do nothing -- status quo.

2.5.1.4 Alternative 2: Determine the expected "true" bycatch, and allocate the remaining sablefish TAC in the Bering Sea/Aleutian Islands to the directed fishery.

The impacts under these two alternatives are essentially the same. Under Alternative 1, sablefish bycatch preference and harvest is set by the RD after the TACs are assigned by the Council. Under Alternative 2, the Council, with input from the industry, would calculate bycatch rates and set aside an allocation for expected bycatch demands. The rest of the TAC, if any, would be available for utilization within a directed fishery framework. This would not deal directly with the question of allocation between gear groups, as under these alternatives both trawlers and longliners could participate in the directed fishery, if it exists. Both gear groups would also have the option to harvest sablefish as bycatch under either alternative. Vessels which lose access to this resource will direct their effort to their next preferred choice, and may suffer a loss in net revenues.

If expected bycatch exceeds the sablefish TAC as it is calculated to do with bycatch rates toward the upper end of the ranges or with lower sablefish TACs, action would have to be taken to decrease bycatch rates or the other groundfish TACs cannot be taken. Although it may be appropriate to take such actions to protect the sablefish stocks, it typically would not be appropriate to do so in order to make more of a TAC available to the sablefish fisheries. The reason why is that actions that increase the cost in one fishery to decrease its sablefish catch so that another fishery can increase its costs and sablefish catch will decrease the net benefit of the total sablefish catch unless the gross value of sablefish in the latter fishery is substantially greater.

Alternative 2 does have the additional benefits of reducing uncertainty for the fleet as the allocation is determined prior to the fishing season, and of allowing the decision to be made with input from the various user groups inside the Council format rather than by the RD.

2.5.1.5 Alternative 3 (Preferred): Allocate the Bering Sea/Aleutian Islands sablefish TAC between the fixed and trawl gear groups.

Allocation by gear type will still allow for competition within each gear type between demands in the directed and bycatch harvest. In addition, it is extremely likely under this alternative that the RD would deem it necessary, in a given year, to set aside a portion of each gear's allocation to accommodate bycatch demand within each gear and to limit both underutilization of other TACs and discards of sablefish bycatch. This alternative would not necessarily ensure the existence of a directed fishery, depending on the actual split and the actions of the RD.

If the allocation to the trawlers is not sufficient to meet bycatch demands and the trawlers discard sablefish, then there will be revenue lost to the trawlers and a net loss to the sablefish fishery. Alternatively, if the bycatch demands exceed the trawlers' apportionment, then other groundfish fisheries could be closed prior to reaching the TAC for that species, which will result in a foregone catch and revenue from those fisheries as well. The RD would not have the flexibility under this alternative to shift one gear group's allocation to meet the expected bycatch of another user group. If closure of other groundfish fisheries did occur, the cost in terms of harvest foregone would be similar to those trade-offs discussed under Alternative 2.

In addition, as the total domestic harvest of other groundfish expands, then it is to be expected that their demand for sablefish as bycatch will increase. By dividing the sablefish TAC into fixed allocations, the ability to respond to those changes in demand is diminished.

2.5.2 Reporting Costs

No change in reporting or paperwork costs are indicated under any of the alternatives. Weekly reports are already required with estimates of discards by DAP catcher/processors. Under all three alternatives, there is an incentive to underreport discards and it might be desirable to have on board observers.

2.5.3 Administrative, Enforcement, and Information Costs

Given the desirability of this stock for DAP harvesting, close monitoring of the catch by all groups will be necessary. With current levels of TACs and bycatch demands, these costs should not be substantially different under any of the alternatives.

2.5.4 Distribution of Costs and Benefits

Under all three alternatives the costs and benefits will be shared among different domestic fishermen. Under the status quo and Alternative 2, it is expected that bycatch demands will continue to utilize all or the majority of the TAC, so the costs will be in terms of lost revenue to those vessels operating in the directed fishery.

Under Alternatives 2 and 3, costs and benefits will depend to a large extent on the percentage given to each sector but in general, any percentage allocation towards a directed fishery or to fixed gear vessels will benefit fixed gear operations. The trawlers, who currently operate mainly in a bycatch mode, will have imposed costs of foregone catch and revenue from the sablefish fishery and possibly from other fisheries, if they are closed out for exceeding sablefish TACs.

Any change in allocation under the three alternatives will probably not have a significant effect on retail sablefish prices because (1) the allocation of a TAC between sablefish fisheries and other groundfish fisheries or between gear types may not significantly affect total landings, (2) much of the catch is exported to Japan, and (3) the Bering Sea/Aleutian Islands area is the source of a relatively small part of the total supply of sablefish.

3.0 ESTABLISH A FISHING SEASON FRAMEWORK FOR ALL GROUNDFISH FISHERIES IN THE GULF OF ALASKA AND BERING SEA/ALEUTIAN ISLANDS

3.1 Description of and Need for the Action

Fishing season(s) is defined as the period when harvesting a fishery resource is permitted. Fishing seasons will usually be within a calendar year for statistical purposes. But it is recognized that there may be occasions where the management of fisheries requires seasons which extend into the next calendar year. Currently, fishing season opening and closing dates are specified in the fishery management plans and require a plan amendment to change. This procedure had been satisfactory for groundfish fishery management since the season matched the calendar year and there were few reasons for fisheries to be scheduled for a particular time. However, with the rapid increase in domestic fishing effort, the development of new and more diverse groundfish products and markets, and management options becoming more complex, the Council is facing more and more requests for specific fishing seasons in order to permit the safe, economically, and biologically-sound harvest of the groundfish quotas.

For example, in 1985 the fishing industry requested and the Council approved an April 1 opening for the sablefish pot and hook and longline fisheries primarily for weather and vessel safety reasons. Because of the lengthy plan amendment process, this season was not put into effect until 1986. In 1987 fishermen submitted proposals to delay the April 1 opening date for the sablefish fishery until the first halibut opening or even later to help reduce halibut bycatch mortality. More recently, consideration has been given to managing the sablefish fishery in a similar fashion as the halibut fishery, where a series of short seasons are used to spread the catch. A series of seasons could also help prevent exceeding existing processing capacity, and provide time to calculate sablefish catch-to-date statistics.

In 1988 the BSAI joint venture pollock fishery was split into two time periods. This action was taken to protect spawning concentrations of pollock from excessive harvest early in the year, to control roe-stripping, and to provide greater opportunity for DAP pollock fisheries. Also in 1988 industry requested a September 15 opening date for the 1989 joint venture flounder fishery in the Gulf of Alaska citing the reduced incidental take of halibut later in the calendar year as halibut move out of shallow areas to the deeper Continental Shelf edge or Slope; this measure will be implemented by placing a condition on the joint venture permits, a management option not available for the wholly-domestic fishery. Industry also requested a July opening date for Gulf slope rockfish in 1989 to minimize trawl and longline gear conflict and to reduce bycatch of prohibited species.

Given these examples and anticipating that the Council will be faced with an increasing number of requests for special fishing seasons, a framework or related procedure is believed desirable to enable the Council to more efficiently respond to season proposals.

3.2 The Alternatives

Several alternatives to the status quo were initially examined and two, in addition to the status quo, are analyzed in the following sections. A fishing seasons framework with specified criteria used to evaluate proposals and recommend changes is described as Alternative 2. This is a true framework in that, once established, seasons would be specified by Notice, and annual OMB review and preparation of an RIR would

not occur each time a season change is recommended. Plan team environmental and socioeconomic analyses of proposed fishing season changes would be prepared and presented to the Council. The Council's action would set in motion publication of a rule-related notice which would implement the season. Season openings could only be set within specified time periods without plan amendment.

Another alternative for changing fishing seasons is presented in Alternative 3. In this case the Council would receive proposals and recommend to the Secretary any season changes. Season openings could be specified for any time of year. NMFS would prepare a regulatory amendment which incorporated environmental and socioeconomic analyses of a fishing season change, and the Council would recommend the regulatory amendment be forwarded to the Secretary for review and implementation.

Several other alternatives were examined, but each was merely a variation on the two concepts described above.

3.2.1 Alternative 1: Do nothing - status quo.

Retention of the status quo would continue the problems and weaknesses of the plan as described in the above description of need. Both the GOA and BSAI plans specify the groundfish fishing season as beginning on January 1 and ending on December 31 unless closed due to a PSC bycatch cap being reached or following the attainment of the TAC for all groundfish fisheries except sablefish. For sablefish in the GOA, the hook and longline fishery begins on April 1 while the sablefish season using trawl gear begins on January 1. Adjustment of these dates prior to the season requires a plan amendment that takes up to a year to implement. Some in the fishing industry prefer the status quo since it provides a long review period to change seasons during which time industry can better plan for the upcoming season's fishing activities. Many also feel that the long review process helps ensure a good analysis and a more thorough evaluation of the consequences of any action taken.

3.2.2 Alternative 2: Establish a framework procedure for the annual setting of fishing seasons (date specific) for any of the managed groundfish species using a rule related notice procedure for implementation.

A framework procedure has been developed that would allow the Council to make recommendations on adjustments to existing fishing seasons on an annual basis following a review of public proposals. Proposals would be received by the Council and evaluated prior to the year in which they would go into effect. Some of the factors the Council may consider in recommending fishing seasons are:

- Biological: spawning periods, migration, and other biological information.
- Bycatch: consideration of biological and allocative effects of season change.
- Exvessel and wholesale prices: these prices can be affected by the timing of seasons.
- Product quality: producing the highest quality product to the consumer.

- Safety: seasons could be scheduled to avoid severe weather conditions, and therefore minimize loss of men, vessels, fishing time, and equipment.

- Cost: costs of industry operations are affected by the timing of seasons; larger, more seaworthy vessels can effectively operate in seasons when poor weather is more prevalent.

- Other fisheries: that will be making demands on the same harvesting, processing, and transportation systems needed in the groundfish fishery.

- Coordinated season timing: the need to spread out fishing effort over the year, minimize gear conflicts, and allow participation by all elements of the groundfish fleet.

- Enforcement and management costs: the costs of enforcement and management as affected by the timing and area of different groundfish seasons and as affected by seasons for other resources.

- Allocation: the timing of seasons may have direct allocative effects among users and indirect effects on coastal communities.

Procedure for setting fishing seasons.

The timing of actions and procedures to be taken in setting fishing seasons are as follows:

(a) April. Council issues a call for proposals to change fishing seasons.

(b) May. Deadline for season proposals. A proposal must be well thought out, provide an objective, and include a rationale and supporting documentation to qualify for Council consideration. Plan teams and staff review, screen, and summarize proposals (similar to how the plan teams review FMP amendment proposals) using the criteria listed above.

(c) June Council meeting. Council reviews proposals and selects those which are of high priority. Council asks plan teams to prepare environmental and socioeconomic analyses of selected high priority proposals. Public notice is made of those fishing season changes the Council will evaluate in September.

(d) September Council meeting. Council reviews the plan team analyses and approves the package for public review. NMFS review also occurs during this time period. The Secretary, after consultation with the Council, will publish a notice in the FEDERAL REGISTER proposing the season dates, if different from the status quo. Public comments on the proposed season dates will be accepted by the Secretary for 30 days after the notice is published, most likely during October - November.

(e) December Council meeting. Council reviews public comments, takes public testimony, reviews Plan Team analyses, and takes final action on proposed seasons. Approval or disapproval of one or more season proposals will depend on whether the proposed season

change provides significant biological, economic, or management advantages over the designated fishing season it is intended to replace. Different seasons may be established for wholly-domestic, joint venture, and foreign fisheries, or for subdivisions of these fisheries.

(f) As soon as practicable, usually within approximately three weeks, the Secretary, after consultation with the Council, will publish a notice in the FEDERAL REGISTER that establishes new season dates.

The Council may also begin the process of evaluating a fishing season change earlier in the year. If a concern develops which the Council believes merits immediate analysis, Council and NMFS staff and the Plan Team could begin their evaluations considerably earlier than the June Council meeting. The June-December decision-making process outlined above would still be followed, but the length of time for review and analysis would be greater.

Season Opening Windows

In the past, a criticism of a fishing season framework was the potential negative impact on the fishing industry's ability to predict with some degree of certainty when a fishery's opening dates would be set. The proposed measures would overcome this concern by implementing the following "windows" within which opening dates for the directed fishery could be set. Another reason for windows is that they bound the framework sufficiently to satisfy Office of Management and Budget requirements for reasonable predictability in when season openings might be set. These windows were developed by reviewing the 1988 domestic monthly catch statistics for each of these fisheries:

Gulf of Alaska:

All fisheries not specified below -- January 1 - March 31
Sablefish longline -- March 1 - May 31
Slope rockfish -- May 1 - July 31

Bering Sea/Aleutian Islands:

All fisheries not specified below -- January 1 - March 31
Sablefish longline -- May 1 - July 31
Atka mackerel -- February 1 - April 30
Squid -- March 1 - May 31

In certain cases in the future the Council may wish to establish a fishing season opening outside these windows. A split season may be desirable, or a series of short openings for a fishery may be recommended throughout the fishing year. In these cases better data on each fishery should be available to evaluate how to designate other "windows". An amendment to the FMP would be required to implement a season change outside the above listed windows.

If species lists are excluded from both groundfish FMPs, as proposed in this amendment package, then as new fishery categories are designated by the Council and a TAC/DAP apportionment made to that fishery, the Council would establish a fishing season opening window for that fishery as part of the follow-up regulatory amendment process.

Operational Guidelines in the Fishery Management Plan Process

Several provisions discussed in the Operational Guidelines for the Fishery Management Plan Process, as related to framework measures, are directly addressed by this fishing season framework. The circumstances under which a change in fishing seasons may be considered by the Council and ultimately implemented include an annual timeline of public notice and comment, commencing with the call for fishing seasons proposals in April. In essence, industry management entities or the public will make recommendations for season changes and provide the rationale and supporting documentation for these changes. Then a review of the proposals by the Council will occur in June followed by publication of the proposed changes for public comment and approval of changes in September. The season changes would then be subject to environmental and socioeconomic analysis by the Plan Team in November and then final Council action in December. Various criteria are specified for which the Council may change fishing seasons, including biological, market, safety, economic, and several other factors. The plan teams and the Council will utilize these as guidelines for determining need and for selecting their recommendation from among a suite of available options.

The procedures for making the changes in fishing seasons will be the above-described public comment and review process, culminating in the Council's consultation with the Secretary and a January Notice in the FEDERAL REGISTER. Because of the above mechanisms, the Council will carefully deliberate the merit of a proposed season change and notify the public very early in this process of changes being considered so that an adequate and orderly review and comment process, including analyses of biological and economic effects of changes, will occur prior to implementation of any new fishing season dates.

An additional feature of this framework is the flexibility provided to the Council to initiate the process of changing a season at any time during the year (although the actual decision making would remain in the September to December period). In this case the review of a season change might begin in June, for example, providing a longer period of time for analysis and review prior to Council action in December.

3.2.3 Alternative 3 (Preferred): Establish a procedure for the annual setting of fishing seasons (date specific) for any of the managed groundfish species using a regulatory amendment procedure for implementation.

Under this alternative fishing seasons would not be set in the FMP; seasons would be set by the Secretary after Council recommendation. Generally, Alternative 3 provides for beginning the process of setting seasons in April. However, the timing of the process and the procedure for setting fishing seasons could differ slightly, depending on whether the season-setting process began in April or at a later date. The alternative provides for an optional initiation date other than April. In this situation, the Council could begin consideration of a fishing season at any of its meetings; the steps outlined below illustrate the timing of actions and procedures to be taken in setting fishing seasons with April (or any Council meeting) as the initiation date.

(a) Prior to April (or Meeting 1). The Council issues a call for proposals to change fishing seasons. Season change proposals are scheduled for Council discussion at its April meeting (or Meeting 1). If many proposals are received, NMFS and Council staff and the

Plan Team would screen the proposals to ensure they were workable, and prepare a listing for the Council meeting.

(b) April (or Meeting 1). Deadline for season proposals. A proposal must be well thought out, provide an objective, and include a rationale and supporting documentation to qualify for Council consideration. The Council requests NMFS to prepare a draft regulatory amendment incorporating the proposed season changes.

(c) April - June (or interim period). NMFS prepares draft regulatory amendment with assistance from Council staff and plan teams. The regulatory amendment will include environmental and socioeconomic analyses of the proposed fishing season changes.

(d) June Council meeting (or Meeting 2). Council reviews the draft regulatory amendment, receives any additional testimony relative to the reasons for the fishing season changes, approves the season changes, and requests that the regulatory amendment be submitted to the Secretary for implementation.

(e) July - November (or subsequent 4 1/2 month period). The season change would be proposed in the FEDERAL REGISTER and public comments would be invited. After review and response to comments, final rulemaking is cleared through NMFS Washington office, NOAA, DOC, and OMB and then published in the FEDERAL REGISTER. The fishing season change would be in effect for the beginning of the fishing year if this regulatory amendment process began in April.

Similar to Alternative 2, the Council could begin the process of evaluating a fishing season change earlier (or later) in the year. If a valid concern develops which the Council wishes to begin to evaluate immediately, then NMFS could be requested to begin preparing a regulatory amendment earlier (or later) than the April Council meeting. The decision-making process and the regulatory amendment timeline outlined above would still be followed.

It may be more desirable for fishing season changes to be considered along with the Council's process of setting fishing quotas for the next year. In this situation, season changes could be reviewed initially by the Council in September, a draft regulatory amendment would be prepared for Council and public review, and the final Council approval would occur in December along with final setting of ABCs and TACs. The season change would not be effective until the Secretarial review process (January - May) was completed. However, the season change could be established by emergency rule if the change affected a fishery early in the fishing year and the Council requested the season change be implemented immediately.

The Council chose this alternative because it combined the advantages of the other two alternatives by shortening the time frame for implementing season changes, while retaining the flexibility to alter, or split, seasons outside the bounds of pre-set windows.

3.3 Biological and Physical Impacts

Under the status quo alternative, seasons can be set by plan amendment only, a process that can take about a year unless the change is made by emergency regulation under Section 305(e) of the MFCMA, in which case a minimum of six weeks is needed. Hence, the problem is administrative. Assuming that the same amount of groundfish would be harvested under the current seasons as under seasons modified by plan amendment, emergency rule, or by either the framework or the regulatory amendment procedures, no significant impacts on groundfish stocks or the environment should occur. A procedure for setting fishing seasons by an administratively efficient mechanism is superior to the status quo.

3.4 Socioeconomic Impacts

3.4.1 Fishery costs and benefits

The principal advantage for a framework measure is to provide administrative flexibility in establishing fishing seasons. The difference between Alternative 1, 2 and 3 is the length of time it takes to implement approved season dates. Another difference is in the time provided for review and analysis and in the time provided during the analysis period for industry to react to proposed changes and to plan for future fishing activities. Under the status quo, a plan amendment may take as long as 11 months or more to develop and implement. This has been a major criticism of the plan amendment process. Alternative 2 would allow for implementation within seven months from the receipt of proposals for season changes. The Alternative 2 framework gives latitude to decision makers in responding to changing resource or market conditions. Alternative 3 would require a similar amount of time to effect season changes as Alternative 2, but Alternative 3 could be less predictable in the amount of time required to finalize a season change due to uncertainty over time required for each step in the Secretarial review process (RIR, proposed rule, public comment, final rule, and OMB clearance). Alternative 2 specifies windows in which season openings could be set, another difference from Alternative 3. Thus, Alternative 3 provides a mechanism for serial openings or split seasons that can be set any time during the fishing year. Alternative 3 also provides more lead time for industry to plan for how a season change may affect their next year's fishing activities.

As effort has increased in the sablefish fishery, seasons have become extremely short, especially in the Eastern Gulf of Alaska. The increased effort and short season has led to considerable problems in processing and transporting the catch, maintaining high product quality, and preventing the overharvest of quotas. Other groundfish fisheries are following this pattern of decreasing season length (for example, pollock and yellowfin sole). The ability to change the timing of the season in an efficient manner in response to rapidly increasing effort is an advantage that Alternatives 2 or 3 possess over the status quo. Alternative 2 is an administratively efficient means of changing seasons, although Alternative 3 provides for more flexibility because windows are not a constraint on when a season can be established.

Other advantages become clear upon review of the criteria used in evaluating season date proposals. For example, if new biological information were to arise that suggested a sensitive time period for reproduction, the Council could schedule a fishing season (citing the biological risk factor) around this period so that commercial fishing would not interfere with reproduction. Similarly, the timing of seasons can alter product quality. One determinant of product quality is the ability to properly process fish once landed. This is a function, among other things, of the volume of landings processed at that time. If effort increases to the point that many species are landed during a short period of time, shorebased processors may not be able to maintain a high quality product (a problem experienced in the halibut and sablefish fisheries) and both

economic inefficiency and resource wastage may occur. Seasons could be set under Alternative 3 so as to distribute landings more evenly throughout the year (citing the product quality and season coordination criteria). This would tend to employ processing capacity more optimally and enhance the quality and availability of product to the consumer. Season changes under Alternative 2 would be restricted to opening dates within the window specified for a particular species. Since the framework is a preseason tool, data from previous years would need to be used in setting the season dates.

Costs of industry operations are affected by the timing of seasons. Operating during periods of bad weather increases costs due to down time and injury, lost gear, and increased insurance premiums. Scheduling seasons that account for weather and cost factors is desirable. Variations in demand for seafood products can fluctuate during the year due to seasonal, cultural and religious influences in markets. Scheduling seasons to more precisely meet expected market requirements could benefit harvesters, processors, and consumers.

3.4.2 Reporting costs

The alternatives would not alter the reporting costs of the harvesting and processing sectors.

3.4.3 Administrative, enforcement and information costs and benefits

The adoption of Alternative 2 or 3 would lower management costs by eliminating the need for plan amendments to change season dates. Council and NMFS staff time would be reduced, freeing this labor for other management needs and services. There would be no change from the status quo with regard to enforcement and reporting costs. Monies saved by streamlining changes in fishing seasons would likely be used to provide additional staff time for other issues.

There may be some differences between Alternatives 2 and 3 in terms of Council and NMFS staff time expenditures. Council and NMFS staff time savings will occur if the regulatory amendment preparation and review process in Alternative 3 occurs smoothly, since an amendment could be in place within approximately two months after the Council's action. This time could be utilized in other pressing fishery management activities. However, Alternative 3 would not necessarily accrue the same level of savings as in Alternative 2 due to the potentially time-consuming process of Secretarial and OMB review and approval of the regulatory amendment.

3.4.4 Impacts on consumers

No changes in impacts on consumers are expected from any of the alternatives, since setting up a mechanism to change seasons is only an administrative/management convenience and would not, in and of itself, affect markets.

3.4.5 Redistribution of costs and benefits

A mechanism to change fishing seasons is simply a measure of regulatory efficiency. These benefits would be shared by all participants in the fishery.

More efficient management should free policy makers and research personnel for assignment to higher priority management issues. And again, this amendment, in and of itself, will not impact cost redistributions since no changes to fishing seasons are included here; only the mechanism for making such changes is proposed. The proposed mechanisms are expected to affect the administrative costs of making changes but not the nature of such changes.

3.4.6 Benefit-Cost conclusion

One of the major criticisms of current fishery management policy making is that managers are often in a reactive mode, forced to react to one crisis after another and not anticipate potential problems in the fisheries. This imposes significant costs on fishermen, processors, consumers, and the American public. Alternatives 2 and 3 are proposed in light of the recent and continuing large influxes of effort in the groundfish fisheries, which can only increase the burden on the resource and all those who use and/or are responsible for management of it. This has already occurred in the sablefish fishery. Fisheries that currently possess large amounts of effort and confront excess harvesting capacity and processing capacity constraints, such as crab and halibut fisheries, have adopted this type of flexibility in setting seasons.

The majority of benefits of Alternative 2 would be from increased efficiency in setting seasons. Alternative 3 provides some additional flexibility in setting serial openings or split seasons not found in Alternative 2. The removal of the need for plan amendment, as outlined in both Alternatives 2 and 3, will also decrease administrative costs. While regulations would be the same as under the plan amendment process, they would be less expensive to implement, thus reducing the burden on the taxpayer. A lesser benefit could accrue from Alternative 3 because of the potentially longer time period required to gain approval of a regulatory amendment. Alternative 3 provides more lead time to industry for planning the next year's fishing activities.

4.0 ESTABLISH A SHELIKOF DISTRICT IN THE CENTRAL REGULATORY AREA OF THE GULF OF ALASKA

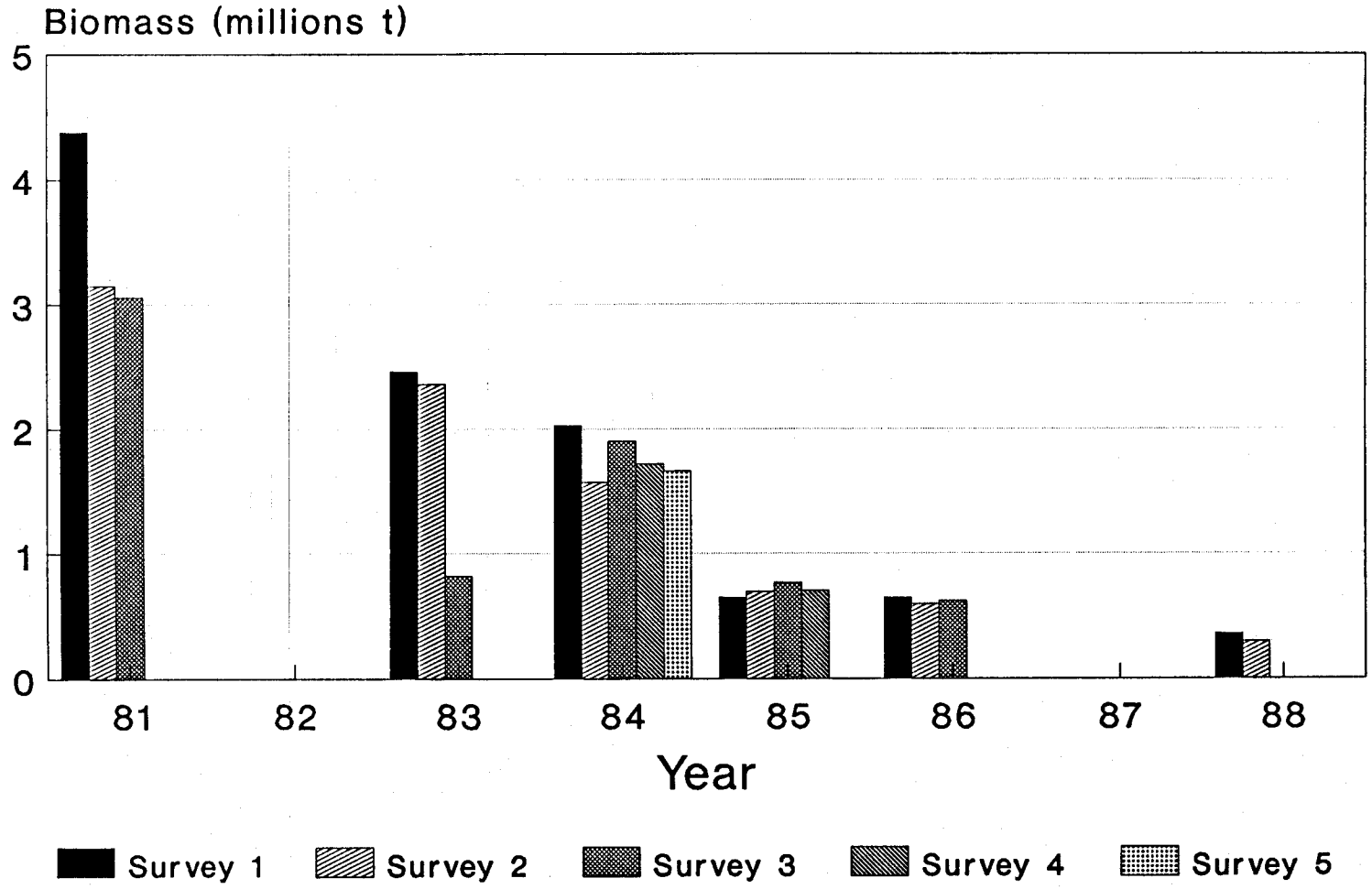
4.1 Description of and Need for the Action

Provisions for regulating the harvest of walleye pollock (hereafter referred to as pollock) from the Shelikof Strait region of the Gulf of Alaska are needed to protect the spawning stock. During the last decade, a significant portion of the Gulf of Alaska pollock stock has spawned in the Shelikof Strait region. These large spawning concentrations became the target of a commercially important fishery. The best available information on the condition of the Gulf of Alaska pollock stock indicates that the stock has experienced a significant decline. If the pollock stock remains at a low level of abundance, it may be necessary to adopt strict conservation measures to protect the spawning stock. One type of conservation measure would be to regulate the harvest of pollock in the Shelikof Strait area. To implement this type of regulation a new Shelikof Strait management region must be defined.

Total biomass estimates for the Gulf of Alaska pollock stock are derived from hydroacoustic and bottom trawl survey data collected by the Northwest and Alaska Fisheries Center (NWAFC). Hydroacoustic surveys were conducted in 1981, and annually since 1983. The annual hydroacoustic surveys were conducted in Shelikof Strait focusing on aggregations of pollock while they were in spawning condition (March - April). Since few pollock were believed to be present outside Shelikof Strait during this time, the information obtained from the hydroacoustic surveys was thought to represent most of the pollock biomass occurring in the Western/Central Regulatory Area. Bottom trawl surveys of the entire Western and Central regions of the Gulf of Alaska were conducted in 1984 and 1987 during the summer (May - September). The bottom trawl survey data provides information on the distribution and abundance of pollock during their summer feeding period.

Recent estimates of pollock biomass in the Gulf of Alaska show biomass peaked in 1981 and declined rapidly in subsequent years (Nunnallee and Williamson, 1988; Megrey, 1988). The 1988 hydroacoustic survey in Shelikof Strait produced a biomass estimate that was the lowest on record (Megrey, 1988a) (Figure 4.1). The low biomass is attributed to poor recruitment of the 1984 and 1985 year classes. Information obtained from the 1987 triennial bottom trawl survey also showed a decline in pollock biomass between 1984 and 1987; however, the decline in biomass was not as large as the hydroacoustic survey suggested (Eric Brown, Northwest and Alaska Fisheries Center, Seattle, WA, pers. comm., November 1988) (Figure 4.2). Since the 1987 bottom trawl biomass estimate was substantially higher than the 1988 hydroacoustic survey estimate, the premise that hydroacoustic surveys in Shelikof Strait provide the best estimates of pollock abundance for the entire Western/Central Regulatory Area is being questioned.

Because of the apparent decline in pollock biomass, the Council recommended a limited quota for the Shelikof Strait region in 1989. The limited quota was imposed as a conservation measure, to protect pollock, which in past years has been harvested in Shelikof Strait to obtain roe from mature female pollock. The Secretary concurred with the Council's recommendation and adjusted the TAC under the inseason management authority contained in 672.22 such that no more than 6,250 mt of pollock may be harvested in Shelikof Strait (Figure 4.3). The Secretary requested that fishermen use "621" as the statistical area for purposes of reporting Shelikof Strait pollock harvests on catch reports required under 672.5.



1982 - No survey
1987 - No estimate available

Figure 4.1 Pollock biomass estimates from 1981, 1983 - 1988 Shelikof Strait Acoustic-Midwater surveys. Each survey represents the biomass estimate from different passes through the

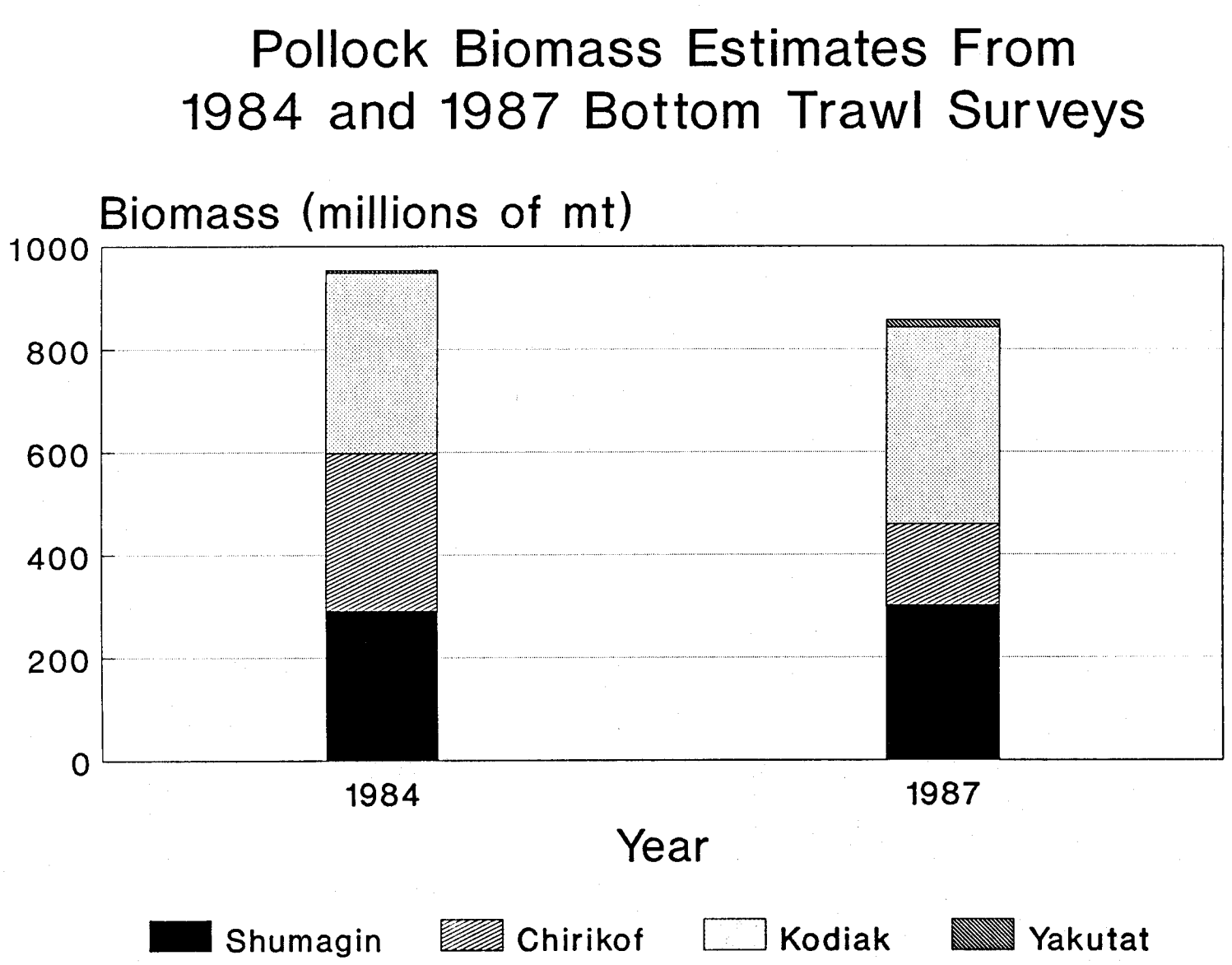


Figure 4.2 Pollock biomass estimates by INPFC area from the 1984 and 1987 bottom trawl surveys of the Gulf of Alaska.

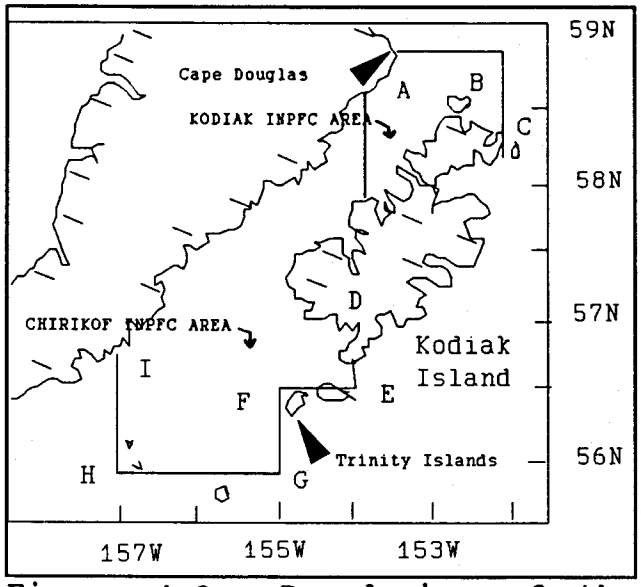


Figure 4.3 Boundaries of the Shelikof Strait District in the Gulf of Alaska.

The Shelikof Strait district means all waters of the EEZ enclosed by a line connecting the following points in the order listed:

Reference point	N. Lat.	W. Long.	Description
A	58°51'N.	153°15'W.	Cape Douglas
B	58°51'N.	152°00'W.	then south to the
C			intersection of 152°00'W. with Afognak Island, then counter clockwise around the western shorelines of Afognak, Kodiak, and Raspberry Islands to
D	57°00'N.	154°00'W.	Alitak Bay then south to
E	56°30'N.	154°00'W.	then west through Trinity Islands to
F	56°30'N.	155°00'W.	then south to
G	56°00'N.	155°00'W.	then west to
H	56°00'N.	157°00'W.	then north to
I			Intersection of 157°00'W. with the Alaska Peninsula.

A separate Shelikof Strait management area should be established to provide a mechanism for monitoring the amount of pollock harvested from Shelikof Strait in future years. Under the present management regime, the inseason adjustment imposed in 1989 to limit harvest in Shelikof Strait will expire on December 31, 1989 or whenever the TAC is taken, whichever comes first. Therefore, the FMP should be amended to establish a Shelikof Strait management area to provide the necessary regulatory basis for managing pollock, including regulations to require reporting as is the current practice in other management areas.

The coordinates defining the proposed Shelikof Strait region are provided in Figure 4.3. In order to maintain the time series of historical catches based on International North Pacific Fisheries Commission (INPFC) statistical areas, the Shelikof area should be divided into two reporting areas (A and B) (Figure 4.3). The two reporting areas will be divided along the longitudinal boundary between INPFC areas Kodiak and Chirikof at 154 degrees west longitude. This definition of INPFC areas Kodiak and Chirikof is consistent with the current reporting procedures used in the NWAFC observer database and the Pacific Fisheries Information Network (PacFIN) database.

4.2 The Alternatives

The alternatives to be considered include: (1) maintaining the status quo (i.e., maintain current management areas); and (2) the proposed action, which would require the establishment of a new Shelikof Strait management area.

4.2.1 Alternative 1: Status quo.

Under this alternative, the current management areas would be maintained. This alternative does not provide a method for regulating fishing on the spawning stock of pollock in Shelikof Strait.

4.2.2 Alternative 2 (Preferred): Establish a Shelikof Strait management area.

A new Shelikof Strait management area will be established. This alternative provides a provision for regulating harvest of fish in Shelikof Strait. If Shelikof Strait continues to be an important spawning location for Gulf of Alaska pollock, adoption of this alternative will provide managers with an effective means of controlling the harvest of spawning pollock.

4.3 Background Information

Large spawning concentrations of pollock were discovered in the Shelikof Strait region in 1980 during a research survey conducted by the NWAFC. Subsequent hydroacoustic surveys conducted in 1983 and 1986 showed the largest concentrations of spawning pollock were located in Shelikof Strait. In 1983 the National Oceanic and Atmospheric Administration (NOAA) research vessels Miller Freeman and Chapman monitored survey track lines in Shelikof Strait, the western Gulf, and the east side of Kodiak Island (Anon., 1983). In 1986 hydroacoustic trawl surveys were conducted in Shelikof Strait using the NOAA vessel Miller Freeman, and in a major part of the eastern Gulf region outside of the Strait by the Soviet research vessel Gissar (Nelson and Nunnallee, 1987). In 1983, only trace amounts of pollock were found in regions surveyed outside the Shelikof Strait-Semidi Island area (Anon., 1983). In 1986, no large concentrations of adult (ages > 3) pollock were observed in the area between Kodiak Island and Yakutat (Nelson and Nunnallee, 1987).

The only significant midwater trawl catches of adults between Kodiak Island and Yakutat occurred southwest of Middleton Island and near Amatuli Trench (Nelson and Nunnallee, 1987).

Ichthyoplankton surveys conducted in the Gulf of Alaska also provide information on the location of spawning pollock. Ichthyoplankton surveys were conducted in 1972, 1978, 1979, 1981, 1982 and from 1984-88 (Kendall and Dunn, 1985; Bates and Clark, 1981; Dunn, et al., 1984; Incze, et al., In Press; A. Kendall, Northwest and Alaska Fisheries Center, Seattle, WA, pers. comm., November 1988). Sampling was restricted to stations near Kodiak Island and stations within Shelikof Strait were not included in 1972, 1978, 1979 and 1982 (Kendall and Dunn, 1985).

Kendall and Picquelle (in prep) summarized the egg and larval distributions of pollock in the Gulf of Alaska using data from ichthyoplankton surveys conducted in 1981, 1982, 1984, 1985 and 1986. In order to make comparisons of egg and larval abundances in various parts of the northern Gulf of Alaska, six strata were designated and data was accumulated in each by time period (April for eggs, May 16 - June 8 for larvae) and year (Figure 4.4). Although sampling was not completed in all strata, the largest number of eggs was consistently found in the Shelikof strata (Kendall and Picquelle, in prep.). Combining all of the years together, 89% of the eggs were found in the Shelikof strata while small concentrations of eggs were observed off the Kenai Peninsula and in the Davidsen Bank area near Unimak Island (Figure 4.5).

There is some speculation that substantial numbers of pollock spawn in areas outside of Shelikof. As indicated above, this hypothesis is not supported by surveys of adults or from an analysis of the ichthyoplankton data. However, the young-of-the-year pollock surveys conducted in 1985, 1986, 1987 and 1988 show some indication that substantial spawning occurred in areas north of Kodiak Island in 1985 and 1988 (Shippen, in prep.). Comparison of the young-of-the-year survey data shows strong concentrations of 0-age pollock on the northern tip of Kodiak Island in 1985 and again in 1988.

Estimates of the date and duration of the pollock spawning in Shelikof Strait are provided from: (1) information on the percent of ripe and running females observed in the hydroacoustic surveys, (2) the presence and abundance of pollock eggs observed in ichthyoplankton surveys, and (3) an examination of the hatch date distributions derived from daily growth increments on larval pollock otoliths. Based on these three sources of information it appears that pollock spawning begins in March and ends in early May.

A description of the migratory patterns of adult pollock is provided from hydroacoustic and trawl surveys, and commercial catch statistics. These sources indicate spawning pollock enter the Shelikof Strait from the southwest end of Kodiak Island. After spawning, the fish return to feeding grounds outside of Shelikof Strait. A small resident population of pollock has been observed in Shelikof Strait during summer bottom trawl surveys conducted by the NWAFC.

4.4 Biological and Physical Impacts

4.4.1 Alternative 1: Status quo. No change in management areas.

This alternative would continue to make it difficult for the Council to limit the catch of pollock in Shelikof Strait during the spawning season. The only mechanisms for limiting pollock catch in Shelikof Strait during periods of low pollock abundance would be: (1) an emergency order, or (2) substantially reducing the quota

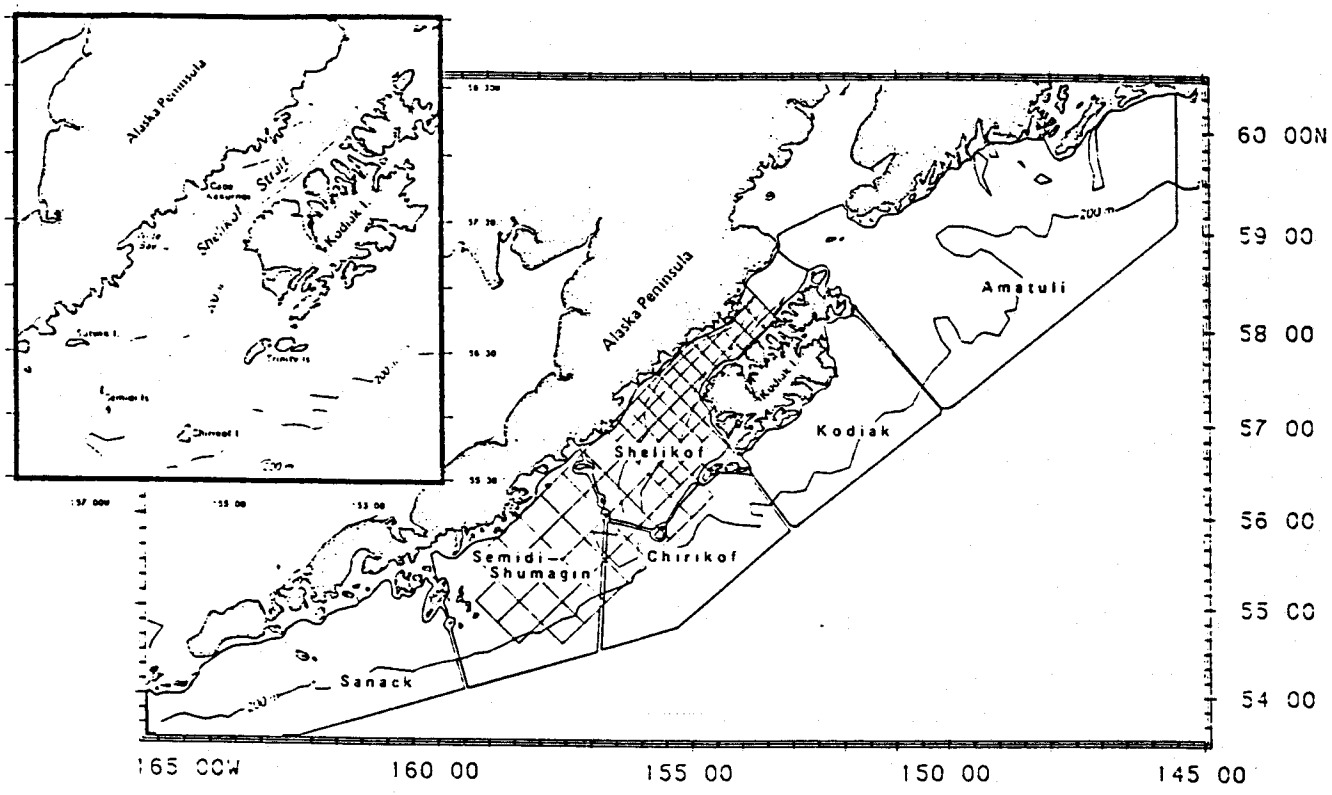


Figure 4.4 Gulf of Alaska showing the strata and the Shelikof Strait areas used to analyze the distribution of walleye pollock eggs and larvae.

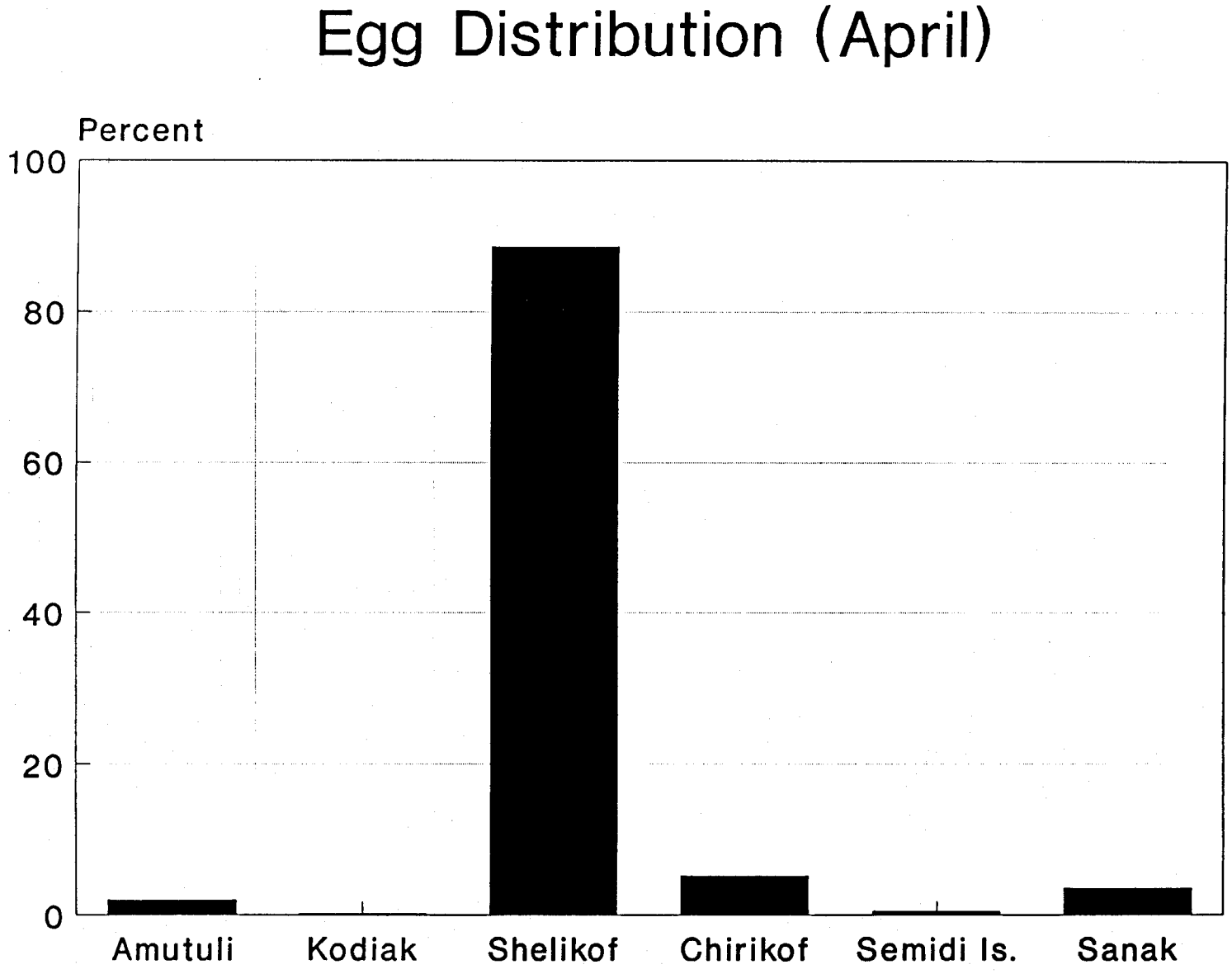


Figure 4.5 Distribution of walleye pollock eggs in the Gulf of Alaska. Based on combined data from surveys in 1981, 1982, 1984, 1985, and 1986 (Kendall and Picquelle in prep.).

for pollock in the Central regulatory area. If the second option were imposed, fishing on stocks of pollock that spawn outside of Shelikof Strait would be severely curtailed.

4.4.2 Alternative 2 (Preferred): Establish a Shelikof Strait Management Area.

A new Shelikof Strait management area will be established. This alternative provides a provision for regulating harvest of fish in Shelikof Strait. If Shelikof Strait continues to be an important spawning location for Gulf of Alaska pollock, adoption of this alternative will provide managers with an effective means of controlling the harvest of spawning pollock. Adoption of this option would allow the Council to set a separate quota for pollock in Shelikof Strait. The primary advantage of this alternative is that dense concentrations of spawning pollock could be protected from fisheries exploitation.

Protection of the spawning stock may be an effective management action if a relationship can be identified between the biomass of fish that spawn in Shelikof Strait and subsequent recruitment to the fishery. Certainly the size and availability of spawners (and hence the number of eggs) must influence recruitment at some level of abundance. However, it is often difficult to describe the relationship between spawners and recruits (Rothschild, 1986). At the current time there is some suggestion that a density dependent relationship between spawners and recruits exists for the Gulf of Alaska pollock stock (Megrey, 1988). If recruitment in future years continues to support a density dependent relationship then conservation of the spawning population of pollock when the stock is at a low level of abundance may be an effective management strategy.

It is important to realize that limiting the quota of pollock in Shelikof Strait to protect the spawning stock will be most effective if the catch of pollock in Chirikof is also limited during the spring. Since the spawning population of pollock enters Shelikof Strait from the southwestern end of Kodiak Island, substantial catches of pollock could be landed as the fish enter the Strait. This problem could be particularly important if pre-spawn concentrations of pollock were formed outside of Shelikof. Historical records of foreign catch provided evidence of possible pre-spawn concentrations of adult pollock outside of Shelikof. Large catches of pollock were taken by Japan from stations southwest of the Shelikof survey area in 1974, 1978, and 1980. Soviet fisheries recorded large catches from near the Trinity and Chirikof Islands in 1978 and 1980. Approximately 12,000 mt of pollock was taken by the Soviet fishing vessels during March and April in 1978 and again in 1980.

It is not likely that fisheries for groundfish species other than pollock would be impacted by a limited quota for pollock in Shelikof Strait. Historical records of landings of Pacific cod show large catches were taken within the proposed Shelikof Strait management area (Zenger, 1985). However, these cod landings were principally taken with longline gear (Zenger, 1985) and the incidental catch of pollock from longline fisheries for cod is minimal (Anon. 1987, Anon. 1988). The principal flatfish grounds in the Gulf of Alaska are not located within the Shelikof Strait management area (Tom Wilderbuer, Northwest and Alaska Fisheries Center, pers. comm., 1989). Furthermore, if pollock bycatch limits in Shelikof Strait became an issue, other fisheries would only be impacted during the spring since the abundance of pollock in Shelikof Strait is generally low during the other periods of the year.

4.5 Socioeconomic Impacts

4.5.1 Introduction

This section presents an assessment of the socioeconomic impacts of an alternative to the status quo which would establish for pollock a new Shelikof Strait management area, separate from the existing Gulf region west of 147 degrees west longitude. Adoption of Alternative 2 would allow the Council greater flexibility in establishing ABCs and quotas for pollock within the Western Gulf region. Most significantly, establishing such an area would allow the Council to regulate fishing on spawning aggregations within Shelikof Strait independently from fishing on those populations while outside the strait and from fishing on other pollock stocks in the region.

The principal economic impacts of Alternative 2 would be associated with: (1) the amount of additional harvest and revenue that is facilitated by the creation of an additional management area, (2) the degree to which harvest is shifted from roe-bearing pollock within Shelikof Strait to non-spawning fish outside the strait, and (3) the effects of temporally and spatially shifting harvest from inside the strait during the spring to outside the strait during the remainder of the year. In addition to the revenue to fishermen from such an outside fishery, there may be scheduling and market advantages to processors associated with a quota arrangement facilitating greater harvest in the fall. There may also be distributional impacts between shorebased and at-sea processors.

4.5.2 Overview of Fishery Costs and Benefits

Estimating the economic impact of Alternative 2 to fishery participants is made extremely difficult by the uncertain nature of several variables including stock assessment and behavior, fishing success and management philosophy, and by the fact that statistics for domestic and joint venture pollock harvest within the western Gulf region have typically been maintained by INPFC area, without special reference to Shelikof Strait. As a result, this analysis must focus on a predominantly qualitative discussion of the conditions under which adoption of the proposed alternative would leave fishery participants better or worse off than with provisions for a single quota for the entire region.

In recent years the largest concentrations of pollock available for harvest within the Gulf have occurred within Shelikof Strait, where large numbers of pollock have migrated to spawn. Mature females within this fishery will carry roe, which is of considerable economic value in itself. Because price information at the exvessel level does not differentiate between fish landed with roe and those without, it is difficult to assess with precision the comparative worth of roe, the flesh of spawners, and the meat of non-spawning fish. In general, the flesh content of roe-bearing females and spawning males is considerably poorer than that of fish harvested later in the year. The flesh is characterized by a higher percentage of free water, which promotes greater drip loss. While the flesh of spawning fish is still suitable for the production of surimi, once spawning has occurred, and the valuable roe is no longer available, there is very little processor interest in the fish for several months thereafter.

Annual average exvessel prices for pollock in the gulf have varied between $0.05/lb and $0.08/lb since 1984. Within a given year, domestic prices for landings during the early to mid-spawning season have been comparable or slightly higher than prices in the fall. While PacFIN does not maintain price records for

pollock roe, the annual export price for this product has averaged from $1.15-1.65/lb since 1984. Additionally, pollock roe exports during 1988 amounted to a record 4,600 mt, priced at $1.52/lb, though the available statistics do not reveal the regional origin of these exports. This figure may be compared with the 1988 price of $0.95/lb for exported pollock. Anecdotal information on roe prices during the 1989 fishery indicates price per pound for roe was greater than these values. While product form of these exports is not known it is likely that most fish have been headed and gutted, if not filleted.

The price of fish with roe, relative to those without, will depend upon the recovery rates for roe and meat, and the relative prices of these products after processing. NMFS estimates of the recovery rate for producing filets is 25%, though the actual percentage may be closer to 12%-14% during spawning and recovery periods. Eggs are thought to constitute 6%-7% of female body weight, or 3%-4% of total landed weight, including males. Anecdotal information suggests 1989 recovery rates were different from these values.

Harvesting roe has traditionally not been as high a priority for domestic operations as for the foreign and joint venture fleets, as the principal markets for roe are overseas. As has occurred with numerous Alaskan fisheries, however, the phase-out of the foreign and joint venture fisheries will increase foreign demand for the product from U.S. fishermen and processors. In several instances this increase in foreign demand has exerted a dramatic influence on exvessel prices.

In recent years the price of pollock roe in the Tokyo Central Wholesale Market has consistently exceeded $7.00/lb, though pollock roe represents the low end of the roe market, with prices that are only 50%-70% of comparably sized herring roe. As foreign countries have lost direct access to roe through their fisheries in the Bering Sea as well as the Gulf of Alaska, demand for roe from domestic fisheries will almost certainly increase. Such a development, coupled with recent reductions in the catch allowed within the strait, may place a higher premium on the roe component of this catch than has previously been the case.

The replacement of a single-region quota with two separate quotas for the areas identified in the proposed Alternative 2 could result in gains or losses for fishermen, depending upon underlying conditions and the approach adopted by the Council in allocating catch between areas inside and outside Shelikof Strait. Certainly in cases where the new quotas would lead to greater restrictions in the harvest taken from preferred fishing grounds some group will lose, at least in the short run. Comparison of some hypothetical conditions is presented as a means of highlighting the issues contributing to the potential for benefits and costs of Alternative 2.

If it is assumed, as one extreme, that the Western Gulf pollock quota under the status quo (single quota) would be set solely on the basis of desired harvest levels within Shelikof Strait, then Alternative 2 provides only additional opportunities for pollock fishing that would not otherwise exist. For example, this season's emergency rule set the inside Shelikof quota at 6,250 mt, with 60,000 allotted for the outside fishery. If the area-wide quota would have been set at 6,250 mt, in order to limit in-strait harvest, then the entire outside allotment under Alternative 2 is a benefit to fishermen, whenever harvest inside the strait is preferred. Naturally, if harvest outside the strait is preferred, then constraining fishermen to take a portion of their catch inside would lower returns. This extreme approach is unlikely, however, if the Council's interests in setting the current and future splits include: (1) protection for spawners inside the strait, and/or (2) facilitation of an outside-Shelikof fall fishery.

At the other end of the spectrum from a one-region allocation based solely on desired catch in Shelikof Strait would be one in which the single quota would be set without consideration of the Shelikof run, independent from other pollock populations in the region. Because of the potential for fishing effort to be concentrated within the strait, it also seems unlikely that the Council would set a single quota for the Western Gulf region which was not based prominently on its expectations of the share that would be taken within Shelikof Strait.

Given the unlikely nature of these extremes, it would seem most reasonable to assume that the determination of future allocations between areas could be envisioned as a two-stage process. In the first stage, harvest would be assigned to the inside and outside areas, according to the biomasses expected to be in each area during the spring. In the second stage, catch from within the strait would be transferred to the outside fishery, as appropriate for (1) protecting stocks during spawning, or (2) extending the length of the outside season, after the Shelikof spawners have returned to the outside area.

Such a process would not appear to provide fishermen with any less catch than a single quota, though it is possible that their catch could become less profitable. The degree to which profitability is affected will depend on the extent to which the Council chooses to substitute non-spawning catch outside the strait for spawners inside it and on the relative worth of the products from those fisheries.

While providing a potentially greater availability of product for shorebased processing on the east side of Kodiak Island, lower catch per unit of effort (CPUE) and the lack of roe could reduce returns to fishermen over those from an equivalent poundage taken inside the strait. Conversely, if there are fewer fishery alternatives for fishermen and processors in the fall, or if the presence of roe does not produce higher per-fish value in the inside fishery, then returns to fishermen could increase through a shift of harvest to the area outside Shelikof Strait.

It should also be noted that shifting catch to locations outside the strait is not a guarantee of supply for east-side shorebased processors. In addition to the possibility that at-sea processing vessels might compete "head-to-head" with shorebased plants in Kodiak for nearby catch, opportunities also exist in other areas within the western Gulf region for at-sea processors to significantly reduce the amount of pollock which would be available for a fall fishery to the east and south of Kodiak Island. Despite this possibility, the concentration of runs occurring inside the strait, combined with the lack of shorebased processing on the west side of Kodiak Island, suggests that Kodiak processors may have greater ease in securing deliveries from points outside the strait than from within it.

If the designation of two management areas for pollock allows harvest within the western Gulf to be safely increased, then the industry as a whole would be expected to receive more income under Alternative 2, assuming that the average value of spawning fish remains roughly equivalent to non-spawning fish. If at-sea processors did not aggressively pursue harvest opportunities outside the Strait, then shorebased processors in Kodiak, along with the fishermen supplying them, would be most likely to benefit from a shift in harvest emphasis to points outside of Shelikof Strait.

If fishermen and at-sea processors normally fishing inside the strait are not provided with inside harvest opportunities which meet their expectations, however, it is reasonable to assume that they will intensify their activities elsewhere. For this reason, Alternative 2 may simply result in a geographical relocation of effort,

with little difference in the distribution of catch or processing activities from the status quo. While the issue of harvest scheduling is also an important one, the comparative implications of the alternatives are not clear, since Alternative 2 provides no assurance that a fall pollock fishery outside Shelikof Strait will be preserved.

4.5.3 Management Costs

While management and enforcement costs are not expected to vary between the status quo and the proposed alternative, management agencies will need to devise appropriate means for accounting for bycatch, given the establishment of these new areas.

4.5.4 Consumer Impacts

It is not anticipated that adoption of Alternative 2 would have a significant impact on American consumers, relative to maintenance of the status quo. If roe production is reduced because of this measure, the greatest impact on consumers will occur in Japan.

4.5.5 Impacts on Small Businesses

Alternative 2 is not expected to have a significant impact on the operations of small vessels. Small vessels operating out of Kodiak may face improved opportunities for harvesting pollock if quotas are shifted from inside the strait to the outside area.

4.5.6 Review of Impacts for the Alternative

It is anticipated that Alternative 2 would result in equivalent or slightly higher amounts of harvested pollock in the Western Gulf region than with a continuation of the status quo. The principal impacts on this fishery will be felt through spatial and temporal changes in harvest scheduling. The most likely changes, particularly under current biological conditions, would involve shifting some harvest from inside Shelikof Strait during the spring spawning period to locations outside the strait, predominantly in the fall. Unless commercial quantities of spawning pollock are located outside of Shelikof Strait, this will result in a fishery which produces less roe and greater amounts of flesh.

Current prices suggest that the value of spring roe-bearing catch is roughly equivalent to fall catch, which has better quality flesh. Thus if relative prices remain stable, the substitution away from roe-bearing fish is not expected to reduce the total revenue available to fishermen from Gulf pollock.

Alternative 2 has the potential to affect efficiency in the pollock fishery in several ways. And while the magnitude of any potential change depends upon the abundance and distribution of the biomass, the actual efficiency impacts are not expected to be very great, relative to outcomes from the current management strategy.

Some effects are tied to the ability of Alternative 2 to promote fall harvest of pollock. To the extent that a greater number of alternative fishing opportunities exist for fishermen who would otherwise fish pollock inside the strait in the spring, the opportunity cost of a schedule which facilitates more pollock harvest in the fall will be lower than one which focuses harvest on the spring Shelikof spawning run. Thus, pollock fishermen

could be left with more revenue for the year, through increasing their participation in other fisheries, even if no additional revenue was received from pollock. Only if these alternate species are, at present, less than fully utilized, however, would this type of additional fishing activity increase the value of the nation's fisheries. In the processing sector, where the simultaneous occurrence of large fisheries can reduce product quality, real additions to the nation's economy may result from improved scheduling, even if there is no increase in the total amount of fish delivered. There is no guarantee, however, that Alternative 2 will result in a larger fall fishery than the status quo. Additionally, shifting harvest away from concentrated spring runs within the strait could also result in lowered catch per unit of effort, reducing efficiency and profitability.

In addition to its potential for affecting the efficiency of Gulf pollock and other fisheries, Alternative 2 could lead to small changes in the distribution of fishery benefits. The location of existing shorebased processors suggests that harvest within Shelikof Strait would be increasingly channelled to at-sea processing. If Alternative 2 were used as a means of shifting harvest on the Shelikof-spawning stock to locations outside the strait, it is likely that a larger portion of this catch would be processed by shoreside processors in Kodiak. If existing effort from the inside Shelikof fishery is redirected to a spring fishery outside the strait, there may be almost no change in the distribution of economic benefits derived from Gulf pollock. Under such circumstances, the major economic impact of adopting Alternative 2 will be derived from increases in harvest that are facilitated by use of two management areas.

5.0 ESTABLISH A GROUNDFISH FISHING CLOSED ZONE NEAR THE WALRUS ISLANDS AND CAPE PEIRCE IN THE BERING SEA/ALEUTIAN ISLANDS

5.1 Description of and Need for the Action

5.1.1 Issue

In 1987 and 1988 the number of walrus hauled out on Round Island (Walrus Islands State Game Sanctuary) and at Cape Peirce (Togiak National Wildlife Refuge) declined by more than 50%, coincident with the initiation of fishing for yellowfin sole in northern Bristol Bay. Personnel on Round Island reported frequent, loud noise on the island for the first time in 1987; the sounds heard were emanating from yellowfin sole fishing vessels. The frequency of other human related activities which are potentially disruptive to walrus (e.g., from other fisheries such as salmon, herring, etc.) have been relatively constant in northern Bristol Bay over the past few years. Conclusive data establishing a direct cause and effect between the sounds generated by the yellowfin sole fishery and the decline in walrus numbers are not available. However, Federal and State agencies, Native groups, and conservation organizations are concerned that these sounds are likely disturbing walrus to the point of adversely affecting their use of beaches in the region for hauling out. The circumstantial evidence is compelling enough to warrant proposing corrective measures. The following alternatives include proposals designed to reduce the intensity of noise associated with fishing-related activities.

5.1.2 Background

In the United States the major summer haulout areas of male walrus are in northern Bristol Bay. (Females and young move north following the edge of the pack ice.) The Walrus Islands State Game Sanctuary (Sanctuary) was established in 1960 to protect habitat important to walrus and other wildlife. It includes a group of seven islands and their surrounding state waters. Round Island is the most studied and regularly used haulout with the number of walrus exceeding 13,000 in some years. Visitor access is authorized by permit from the Alaska Department of Fish and Game and is only allowed from May 1 through September 1. In 1987, 255 visitors logged 752 visitor-days. The number of visitor days has increased about 20% each year; however, each year the sanctuary has imposed further restrictions to reduce the potential for disturbance to walrus. These include limiting the total daily visitation, rerouting of visitor activities, and establishing vessel approach corridors.

The peak number of walrus on Round Island has fluctuated over time. Numbers declined from over 13,000 in 1978 to about 6,000 in 1983. This decline was attributed to the development of the Togiak herring fishery and increased disturbances from arriving and departing visitors when aircraft were the primary method of access. Since 1983 over 80% of the visitors to Round Island have arrived by boat (Togiak National Wildlife Refuge staff, pers. comm.). Sanctuary regulations were made more restrictive in 1984 by increasing the Islands' controlled access area from 0.5 to two miles; the numbers of walrus hauled out on the island subsequently increased to a peak of 12,500 in 1986. However, daily counts and peak haulout counts declined dramatically in 1987 when peak haulouts never exceeded 4,900. Counts remained low in 1988 and never exceeded 4,500. The only obvious change in human activity in the area was a large fleet of vessels associated with the yellowfin sole fishery that appeared in the vicinity of Round Island for the first time in 1987 and returned in 1988.

In 1981 walrus began hauling out at Cape Peirce (about 60 miles west of Round Island). Numbers hauling out here increased steadily from 1983 through 1985, leveling out to about 12,000 in 1986. In 1987 numbers declined to about 6,300 and similar numbers were reported for 1988. Some disturbance occurs at Cape Peirce due to subsistence hunting, aircraft, and boats. The frequency of these events is thought to have been relatively consistent from year to year. Vessels associated with the yellowfin sole fishery were not observed in this area in 1987 or 1988.

The relationship between the numbers of walrus counted at Round Island, Cape Peirce, and other haulouts in the Bristol Bay area is unclear because of incomplete census data and because walrus movement patterns are not well known. Long-term trends cannot be determined accurately with the currently available data. It is generally thought that Round Island and Cape Peirce, as well as Cape Seniavin on the Alaska Peninsula, are used by a single group of walrus that feeds and rests in the Bristol Bay area in the late spring and summer. Thus frequent, intense disturbance to walrus in one region could be responsible for altering behavior at other locations farther away.

The most frequently cited explanations for changes in walrus abundance at Round Island and Cape Peirce are human related: disturbance to walrus from the yellowfin sole and herring fisheries, tour vessels, visitors, aircraft noise, hunting, and research activities. Walrus generally respond to human disturbance by leaving or avoiding disturbed areas.

In 1987 and 1988 the yellowfin sole fishery began operating in northern Bristol Bay as a result of the closure of waters south of 58° N. and because the yellowfin sole population is dense in this area and fishing opportunities are good. Areas south of 58° N. are closed by the National Marine Fisheries Service (NMFS) when the crab and halibut bycatch cap is attained. The regulation implementing this closure applied only to the 1987 and subsequent seasons. Most of the yellowfin sole fishery north of 58° N. occurs east of Round Island in May and June. In 1987 about 75 vessels (catcher boats 85-120 feet long and processor boats 300-600 feet long) operated in the area. In 1988 as many as 180 boats were visible from Round Island at one time. These sightings are from observers camping on Round Island. With the phase out of this joint venture fishery, it is unclear how many vessels will fish yellowfin sole in 1989. No vessels have been observed near Cape Peirce by onshore observers although NMFS fishery data indicate that a considerable amount of yellowfin sole is harvested west of Cape Peirce in Kuskokwim Bay.

There is no quantitative information on the hearing ability of walrus since audiograms have never been done. However, it is well known that walrus make a variety of sounds both in air and underwater. The sounds function in communication and provide important social and behavioral signals. Most calls occur within a frequency range of 50 to 4000 Hz. It is reasonable to assume that walrus hearing is sensitive to sounds occurring within the frequency range of their calls. No studies have been conducted to test the response or perception of walrus to industrial/fishing generated sounds.

Fishing trawlers and other vessels project sound both in air and underwater. Studies of sound examine two components: the level (frequency, measured in Hz) and the intensity (measured in dB). In order to make valid comparisons between sources, measurements are taken in a standardized manner. Thus, the measurements reported here were taken at 1 m from the source and with equipment of a standardized

sensitivity. The following sound level data are from Bolt, Beranek, and Newman (1988), LGL (1988), and Urick (1983).

Most underwater sounds associated with fishing vessels are generated from propeller cavitation and occur at relatively low frequencies (40-4000 Hz). One study of a medium-sized trawler showed sound source levels of 169 dB when transitting (at 10 knots) and 157 dB when trawling (at 5 knots). These values are comparable to the sound intensity of a Boeing 737 jet at takeoff (164 dB). A group of vessels operating in proximity would produce substantially higher sound levels. In contrast, sounds from a transitting (10 knots) 36-foot diesel fishing vessel were measured at about 100 dB (LGL, 1983) and shallow water ambient noise intensity has been reported between 70 and 90 dB; thus trawl vessel noise is roughly seven times louder than ambient. It is important to note that while sounds traveling in air may attenuate greatly as distance from the source increases, sounds traveling in water do not attenuate as rapidly; in fact, depending on the frequency and several hydrographic factors, sounds propagated underwater may travel about four times faster (and therefore farther) than those traveling though air. In general, lower frequency sounds (such as those generated by propeller cavitation) travel much farther than higher frequency sounds. Airborne sounds associated with fishing activities have not been studied, but they would result from a variety of sources (engines, generators, hydraulic systems, deck activities, etc.) and probably cover a wide frequency range.

Sounds produced by the fishery may impact walrus in two ways. Airborne sounds, which can be clearly heard by people on Round Island, may influence the behavior of animals hauled out on the beaches. Fewer walrus may choose to haul out, and those that do may remain ashore for shorter periods of time. Also, walrus will encounter intense and unusual underwater and airborne sounds produced by fishing activity as they approach Round Island from sea. They may choose to avoid this strongly ensonified area and swim to haulouts elsewhere or spend long, energetically expensive, periods at sea.

A related concern is the possible effect of onbottom trawling on benthic communities and walrus food supply. Pacific walrus consume mostly benthic invertebrates, particularly clams. Large groups of walrus such as occur in Bristol Bay require abundant food resources. The effects of groundfish fisheries on walrus food availability both through physical impacts on animals and substrates and through changes in the structure of biological communities caused by harvesting of certain species are unknown.

Given the observed significant decline in walrus numbers in northern Bristol Bay coincident with a considerable increase in groundfish bottom trawling in the area, walrus management agencies, Native Alaskan groups, and other entities believe it desireable for the Council to consider measures to reduce the reported fishery-related disturbance to walrus within Bristol Bay.

5.2 The Alternatives

A variety of alternatives, including a no action alternative or status quo, were examined during the development of this proposed amendment. Various Pacific walrus haulouts are utilized in the Bering Sea area, including Cape Newenham, Cape Peirce, the group of islands called Walrus Islands (which include the Twins, Round Island, and four others), Cape Constantine, Hagemeister Island, and Cape Seniavin on the Alaska Peninsula. An appropriate protection measure was examined for each site. Several of these sites are used more heavily than the others, and were judged important enough to merit protection from vessel disturbances. Several different distance closures around these important haulout locations were evaluated

initially, including three-mile and six-mile buffer zones. None of these shorter-distance closures were believed to be effective in reducing disturbance to walrus and therefore were not fully developed as alternatives. Since sound travels great distances underwater, especially low frequency sounds, a long distance from sound-emitting sources was believed to be necessary to dampen vessel noises. More restrictive alternatives also were evaluated, including 12-mile closures around all of the capes and islands used by hauled out walrus; these alternatives were not developed further since current data indicate that several of these haulout sites are perhaps only used incidentally and by comparatively fewer walrus than the sites included in this amendment.

Possible effects of the groundfish trawl fishery on other components of the walrus ecosystem were considered also, especially effects of bottom trawling on walrus feeding grounds. This issue is of considerable concern to walrus management agencies; however, since no quantitative data are available to support analyses of this issue, it was not developed further.

Thus, four options are developed in the following sections: status quo, status quo with voluntary industry measures to reduce disturbance, a 12-mile time/area closure at three important walrus haulout locations, and a time/area closed zone in northern Bristol Bay.

5.2.1 Alternative 1a: No action - status quo.

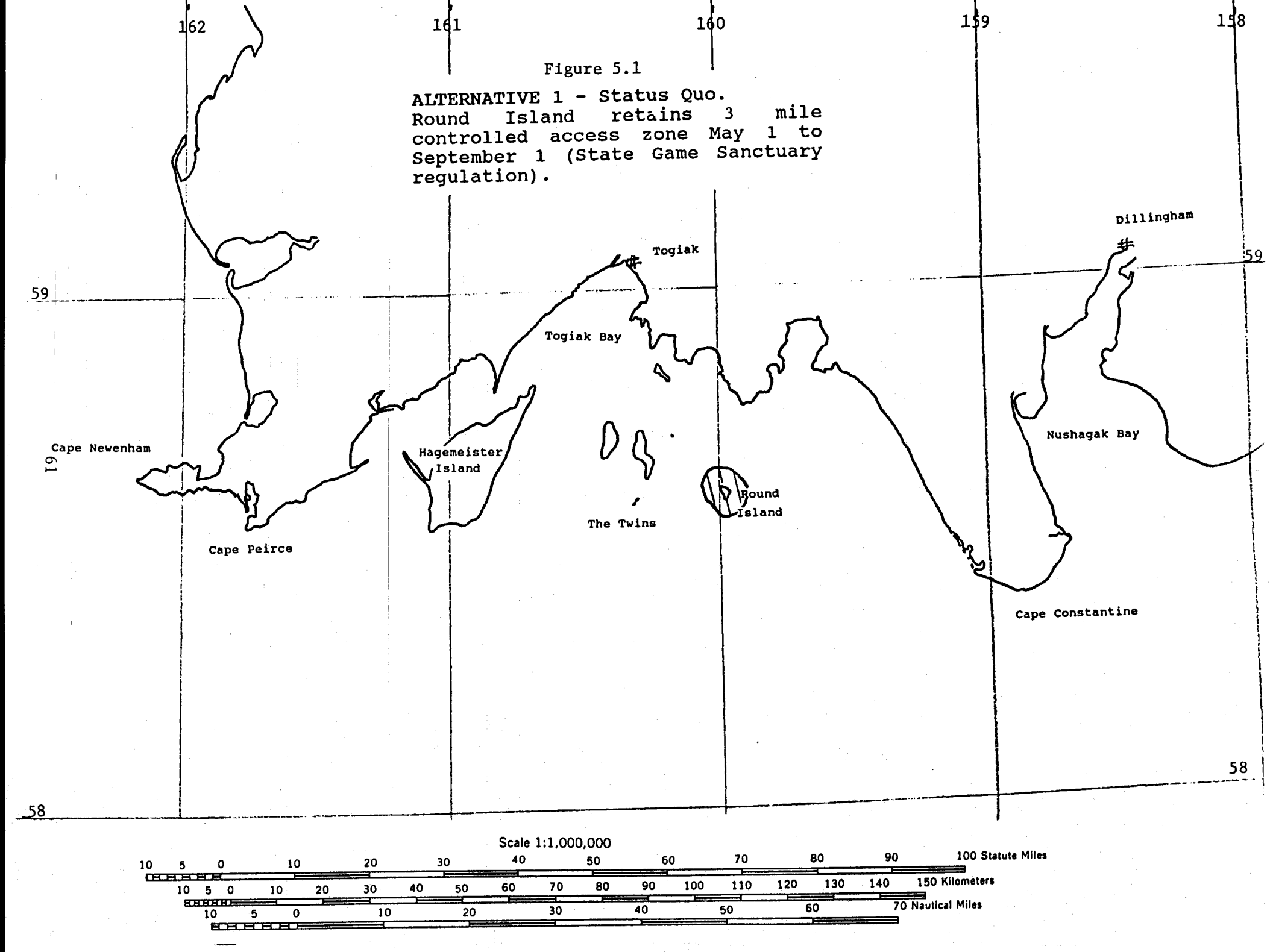
Under the status quo, the yellowfin sole fishery would continue to operate throughout Bristol Bay under existing regulations (Figure 5.1). Prior to 1987 most yellowfin sole fishing occurred outside of northern Bristol Bay. In 1987 a NMFS regulation established a seasonal closure of the groundfish fishery south of 58° once quota set for bycatch of crab and halibut were reached. In 1987, and again in 1988, vessels began fishing in northern Bristol Bay shortly after the bycatch closure was implemented. Fishing in northern Bristol Bay usually began in April and continued until the yellowfin sole quota was reached (June - July). In March 1989 NMFS closed the Bering Sea joint venture fishery for the remainder of the year. However, fishing effort in northern Bristol Bay may continue at previously reported levels due to wholly domestic operations. Therefore, under this alternative the reported disturbance to walrus due to "status quo" commercial fishing is expected to continue unless fishing patterns change due to other regulations or availability of target fish species.

5.2.2 Alternative 1b: No action, but develop a cooperative program, involving all concerned parties, with voluntary guidelines to minimize disturbance to walrus.

This alternative is similar to Alternative 1a in that no new regulatory action would be taken (Figure 5.1). However, an effort would be made to decrease any impact of commercial fishing activities on walrus through a cooperatively developed program involving Federal, State, and local government agencies, commercial fishermen, and other interested parties. Guidelines would be developed to decrease disturbance due to commercial fishing operations and practices. These would be implemented on a voluntary basis. The effectiveness of this alternative for decreasing walrus disturbance due to vessel noise is uncertain but would likely depend greatly on the availability of yellowfin sole outside of northern Bristol Bay and on what, if any, bycatch regulatory regime is in effect. Effectiveness of this alternative should be evaluated annually.

Figure 5.1

ALTERNATIVE 1 - Status Quo. Round Island retains 3 mile controlled access zone May 1 to September 1 (State Game Sanctuary regulation).



5.2.3 Alternative 2 (Preferred): Establish 12-mile radius groundfish fishing closure zones around walrus haulout sites with seasonal closures.

This alternative would close waters within 12 miles of Round Island, The Twins, and Cape Peirce to groundfish fishing activities (Figure 5.2). No closures would be in effect around other known haul-outs at Cape Constantine, Cape Seniavin, and High, Crooked, and Summit Islands. The closure zones would extend nine miles seaward from the State's three-mile limit. A 12-mile buffer would be consistent with the level of protection provided for walrus haulout sites in the Soviet Union, the only other country that shares the Pacific walrus population. A seasonal closure would be imposed from April 1 through September 30; this corresponds to the period of peak walrus utilization. Fishing would be permitted from October 1 through March 31 inside these zones, although sea ice conditions will prevent vessels from fishing during much of this time period. This alternative would provide a moderate level of protection to walrus because some fishing activity may still occur relatively close to haulouts but outside the closure zones. The fishing closures proposed by this alternative would sunset December 31, 1994. An evaluation of the closure addressing fishery effects to walrus would be completed prior to the sunset date to determine if the action was or was not effective, if it should be extended, or if additional corrective measures need to be taken. The evaluation would include, at a minimum, a review of Fish and Wildlife Service/Alaska Department of Fish and Game data reporting trends in the number of walrus using haulout sites in northern Bristol Bay. The results of proposed studies of (1) the acoustic environment surrounding walrus haulout sites and of sounds produced by assorted vessels operating in the region, and (2) of walrus response to human activities, would be included in the evaluation. These studies would provide information illuminating relationships between fishing activities, tourism, and other anthropogenic sources of potential disturbance to walrus and trends in the use of particular haulout sites by walrus. Funding for conducting these studies is uncertain as of the publication date of this proposed amendment.

The Council preferred this alternative, with an amendment that it would sunset on December 31, 1991. The Council noted the strong correlation between the decrease in walrus haulouts on Round Island, The Twins, and Cape Peirce, and the activity of the yellowfin sole fishery during the last two years. It also noted the lack of evidence establishing a clear relationship between those two factors. The Council also took into consideration (1) that the U.S. Fish and Wildlife Service, in cooperation with the Alaska Department of Fish and Game, is conducting acoustical studies at Round Island and at Cape Peirce this summer which will provide more information on levels of acoustical disturbance caused by vessels of various types and (2) that groundfish fishing in northern Bristol Bay is expected to be at much lower levels in 1989 and 1990 due to the decline of joint venture fisheries for yellowfin sole. Consequently, the Council felt this alternative, with a two-year sunset provision, provided additional protection for walrus in this region while also affording it the opportunity to revisit the issue with additional information.

5.2.4 Alternative 3: Seasonal groundfish fishing closure north of a line from Cape Constantine to the southernmost tangent of a 12-mile radius around Cape Peirce.

This alternative (a modification of that proposed by the Eskimo Walrus Commission) would close waters north of a line drawn from Cape Constantine to the southernmost tangent of a 12-mile radius centered at Cape Peirce (Figure 5.3). A seasonal closure would be imposed from April 1 through September 30; this corresponds to the period of peak walrus utilization. Fishing would be permitted from October 1 through March 31. Fishing also may occur during April through September outside the limits of the closure zone,

Figure 5.2

ALTERNATIVE 2 - Twelve-mile groundfish fishing closure around Round Island. The Twins, and Cape Peirce. (Closure extends 9 miles seaward from the State's three mile limit.)

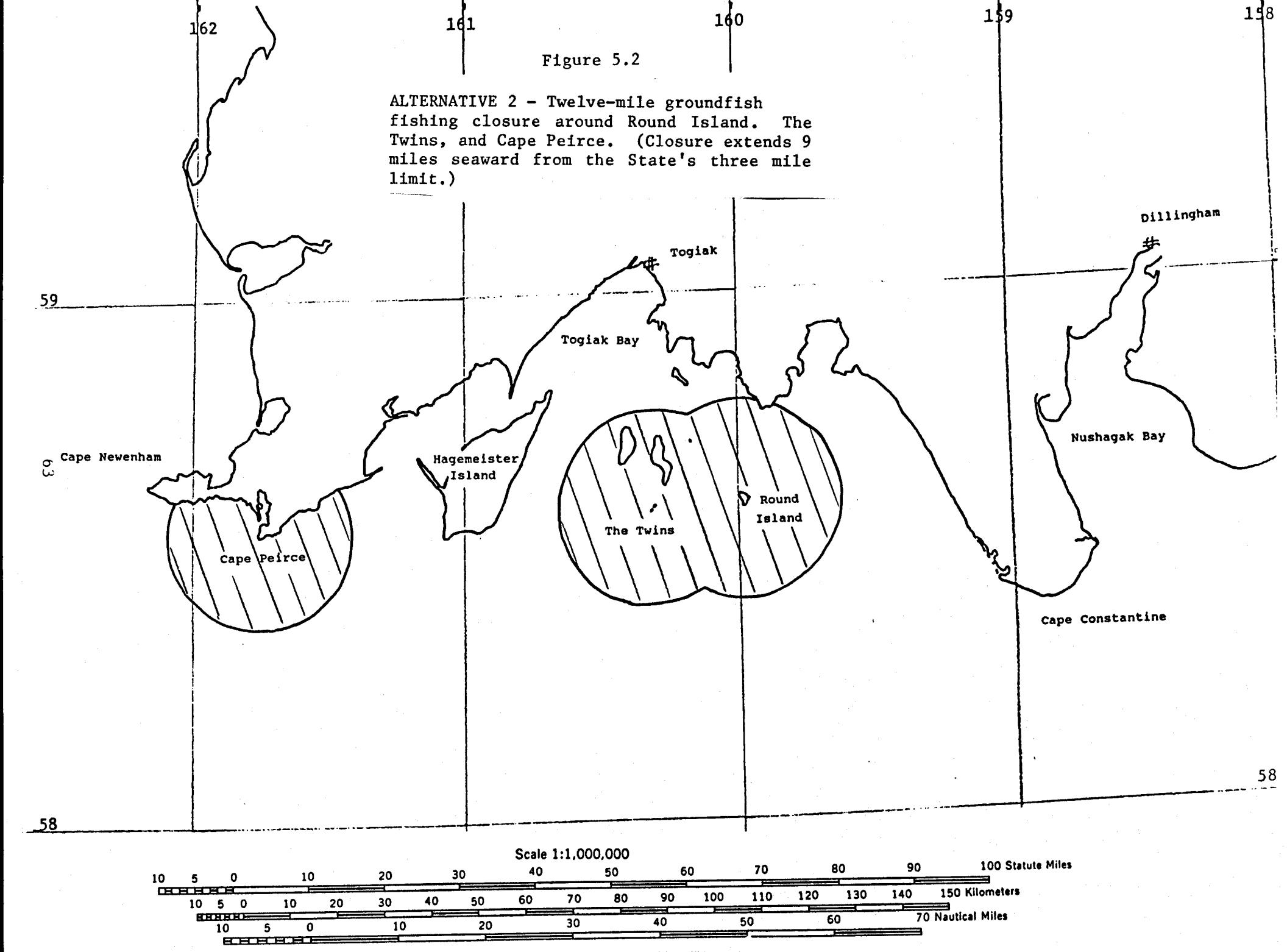
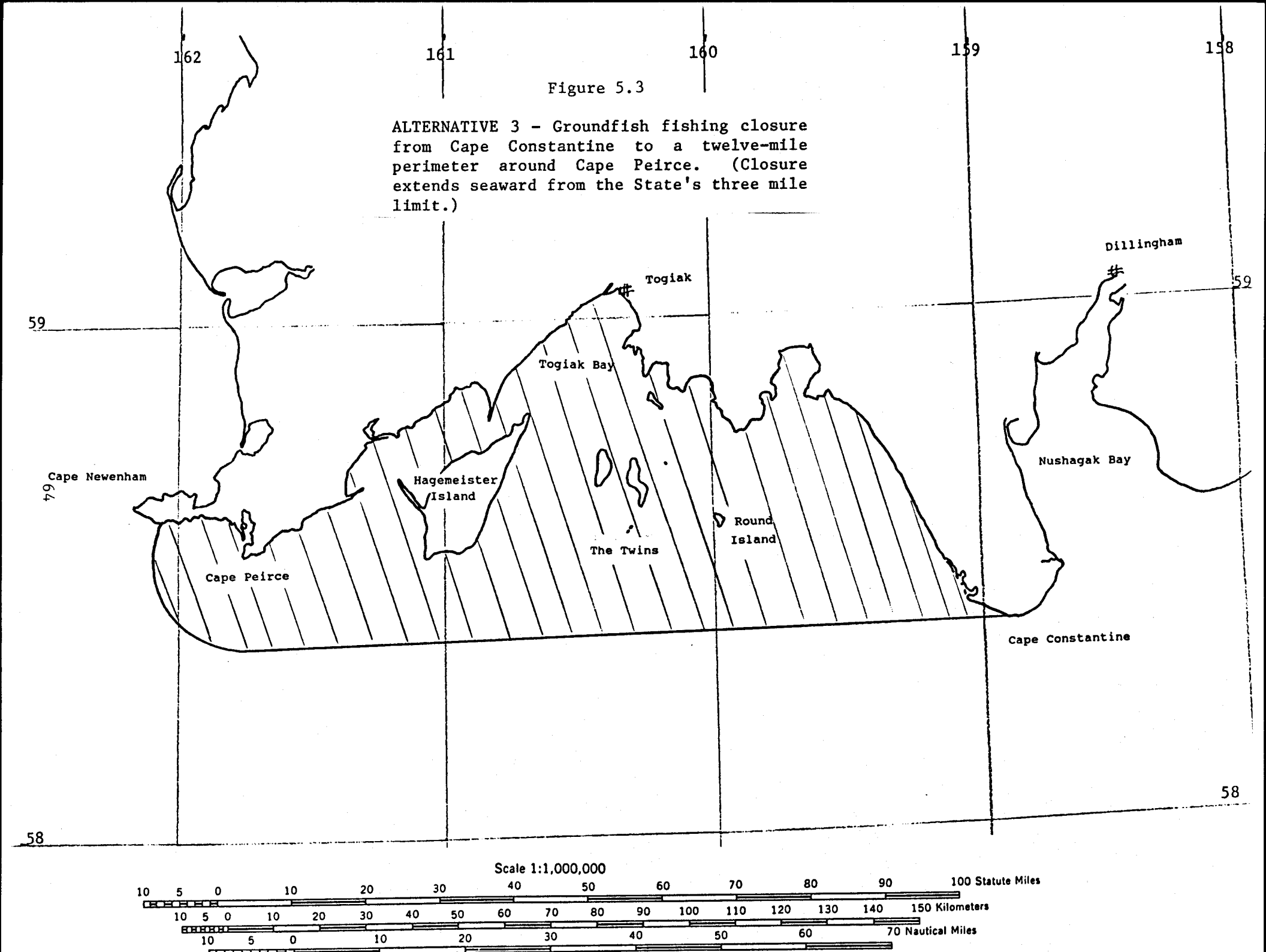


Figure 5.3

ALTERNATIVE 3 - Groundfish fishing closure from Cape Constantine to a twelve-mile perimeter around Cape Peirce. (Closure extends seaward from the State's three mile limit.)



although sea ice will prevent fishing during much of this period. The closure proposed by this alternative would sunset December 31, 1994. An evaluation of the closure addressing fishery effects to walrus would be completed prior to the sunset date to determine if the action was or was not effective, if it should be extended, or if additional corrective measures need to be taken. This alternative would provide a high level of protection to walrus that transit and haul out in northern Bristol Bay by moving the source of potential disturbance to the south of the important resting areas.

5.3 Biological and Physical Impacts

The likely impacts of doing nothing and of adopting either of the alternatives to the status quo are examined in the following sections (5.3 and 5.4). There are two parts to the analysis--environmental impacts and socioeconomic impacts.

Potential adverse effects to walrus from herring and salmon fisheries were considered in the process of developing this proposal. Most of the vessels fishing for these species are small and do not produce the intensity of sound generated by the much larger groundfish trawlers and factory vessels. These smaller vessels are restricted from fishing within two miles of Round Island and little effort is expended in the immediate vicinity of Cape Peirce. Some direct disturbance to walrus has been reported at Cape Peirce and at Round Island as a result of close approaches by sight-seeing herring or salmon crews during periods when the fisheries were closed (Togiak National Wildlife Refuge staff, pers. comm.). Walrus respond to these disturbances by moving off or staying away from preferred hauling areas. Such direct disturbances could be considered an illegal taking under the Marine Mammal Protection Act and can be regulated through the legal process. Because fishing activities within three miles are regulated by State statutes and plan amendments address only those activities beyond this distance, the alternatives discussed here only address measures designed to protect walrus from disturbance associated with fishing beyond three miles. Additional measures to protect walrus specific to other fisheries may be proposed to other management bodies in the future.

A review of the salmon and herring fisheries in northern Bristol Bay is included as Appendix 5-I to this chapter.

The principal fishery in the proposed groundfish fishing closure area is for yellowfin sole. Little information is presently available to evaluate the impact of the two proposed action alternatives on the Bering Sea yellowfin sole stock. The enactment of either management alternative would reduce the population removals in an area characterized by shallow waters where large, almost pure catches of yellowfin sole are obtained. Reports from observer sampling of the fishery in the Togiak Bay area indicate the dense aggregations of yellowfin sole are in spawning condition. What effect fishing has on this spawning stock is unknown, particularly in light of the widespread distribution of yellowfin sole throughout the Bering Sea shelf and their present high abundance level.

In 1988 the first estimation of the abundance of yellowfin sole (and other groundfish resources) in the area between Capes Constantine and Peirce was attempted as a part of the annual Bering Sea resource assessment trawl survey. Sampling density was sparse on this first survey and the resulting catches were small to moderate. Sampling occurred just at the completion of the yellowfin sole fishery (early July), at a time when 60,000 mt of fish were recently caught. Biomass estimates are unavailable at this time to discern

what portion of the total Bering Sea resource actually inhabits this area. Immigration, emigration, and residence time of yellowfin sole are also unknown for this area.

Observer sampling has indicated that trawl catches from this area are composed of 95-99% yellowfin sole. Retaining these grounds as part of the fishery could benefit bycatch species such as red king crab and C. opilio Tanner crab which are a bycatch of the yellowfin sole fishery in zones 1 and 2 of the Bering Sea.

A more detailed analysis of each alternative in terms of impact to Pacific walrus is provided in the following sections.

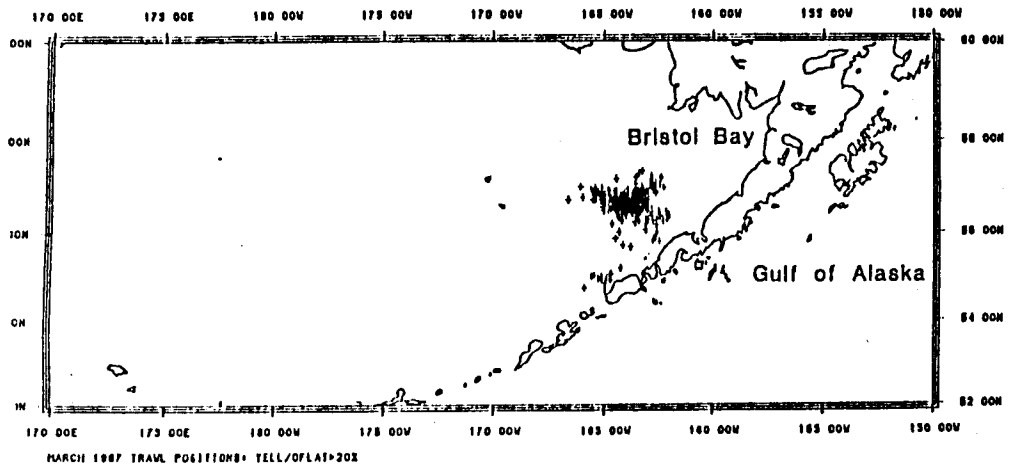
5.3.1 Alternative 1a: The status quo.

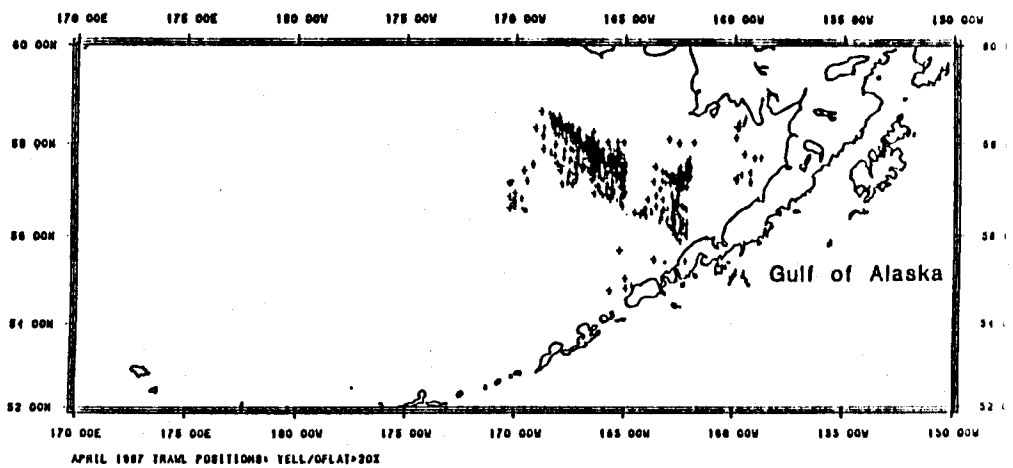
NMFS charts show a large number of trawls for yellowfin sole were made in the northern Bristol Bay area during May and June 1987 and 1988 (Figures 5.4 and 5.5) with most of the fleet moving west into Bering Sea waters in July and August. On March 1, 1989, NMFS closed the Bering Sea to the joint venture groundfish fishery for yellowfin sole. It is uncertain when or if domestic fishing in management zones south of 58° will be closed as a result of bycatch quotas. These variables will partially determine where the domestic fleet will focus its effort in 1989 and beyond and, therefore, the potential for fishery related walrus disturbance. Under any of these regimes it is likely that the airborne and waterborne noise associated with the fishing activities of this alternative could continue to disturb walrus both in the water and hauled out onshore. Without the proposed action it is possible disturbance could increase if fishing patterns change.

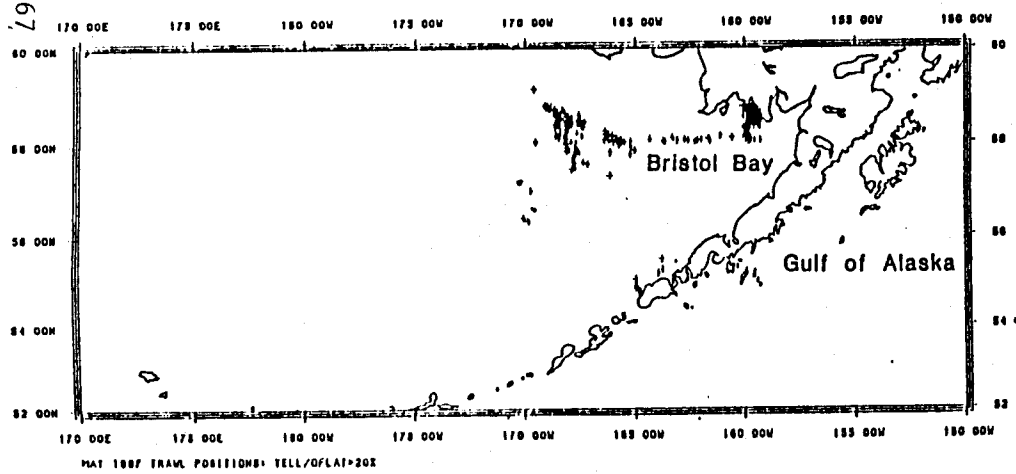
The effects of the reported disturbances to walrus are uncertain. If disturbance results in a redistribution of walrus on haulout sites within northern Bristol Bay or elsewhere to areas farther away, minor to major physiological impacts to individuals could result. If disturbance caused walrus to spend longer periods of time at sea or discouraged them from hauling out entirely, individuals would be subjected to the higher energetic requirements associated with at-sea thermoregulation, rest, physiological maintenance, and behavioral stress. Thus, a significant portion of the walrus population would incur physiological impacts with probable, but unknown, population level effects. This could lead to adverse impacts on human use and the subsistence economy of Alaskan Natives.

It is possible, although not probable, that a redistribution of walrus to haulout sites outside of northern Bristol Bay would result in beneficial effects on walrus. Walrus might move to formerly-used sites not now occupied. Such sites are located on the Alaska Peninsula and the Pribilof Islands. However, the areas suitable for hauling out by walrus are extremely limited and probably could not accommodate large numbers of animals. Reoccupation of formerly used sites might result in discovery and redistribution of walrus feeding locations. If walrus were able to obtain adequate prey in these new areas, the food resources of current feeding areas in central Bristol Bay would not be subjected to current levels of grazing and could experience recovery. However, it is considered highly unlikely that adequate food resources are available in close proximity to other sites because the bathymetry of waters surrounding such sites is not as reflective of preferred feeding habitat. If walrus had to travel from other, more remote areas back to central Bristol Bay to feed, they would incur additional physiological costs likely resulting in adverse population effects.

The continued presence of fishing activity and noise reaching Round Island would decrease the feeling of remoteness for visitors to the Island and possibly, if fishing moved inshore, at Cape Peirce. If disturbance







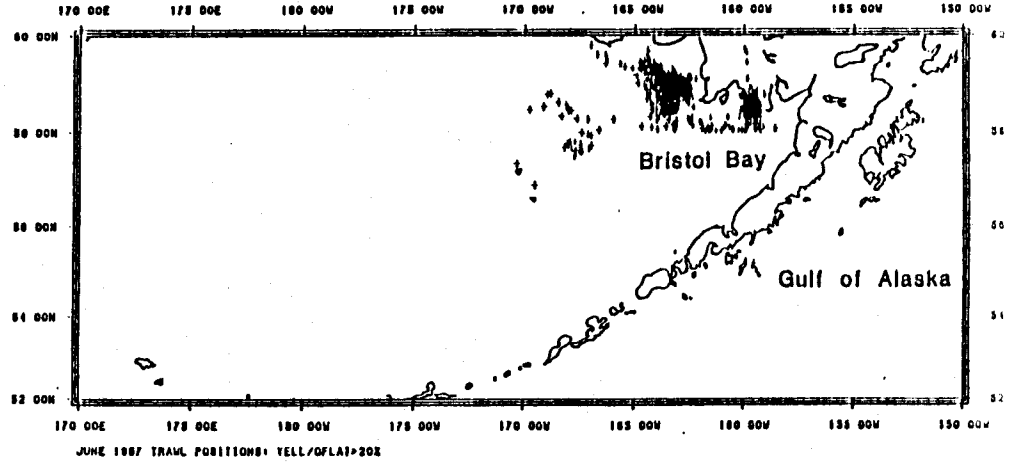


Figure 5.4 Figures showing the locations of joint venture catches where yellowfin sole comprised greater than 20% of the total catch weight during March-June 1987.

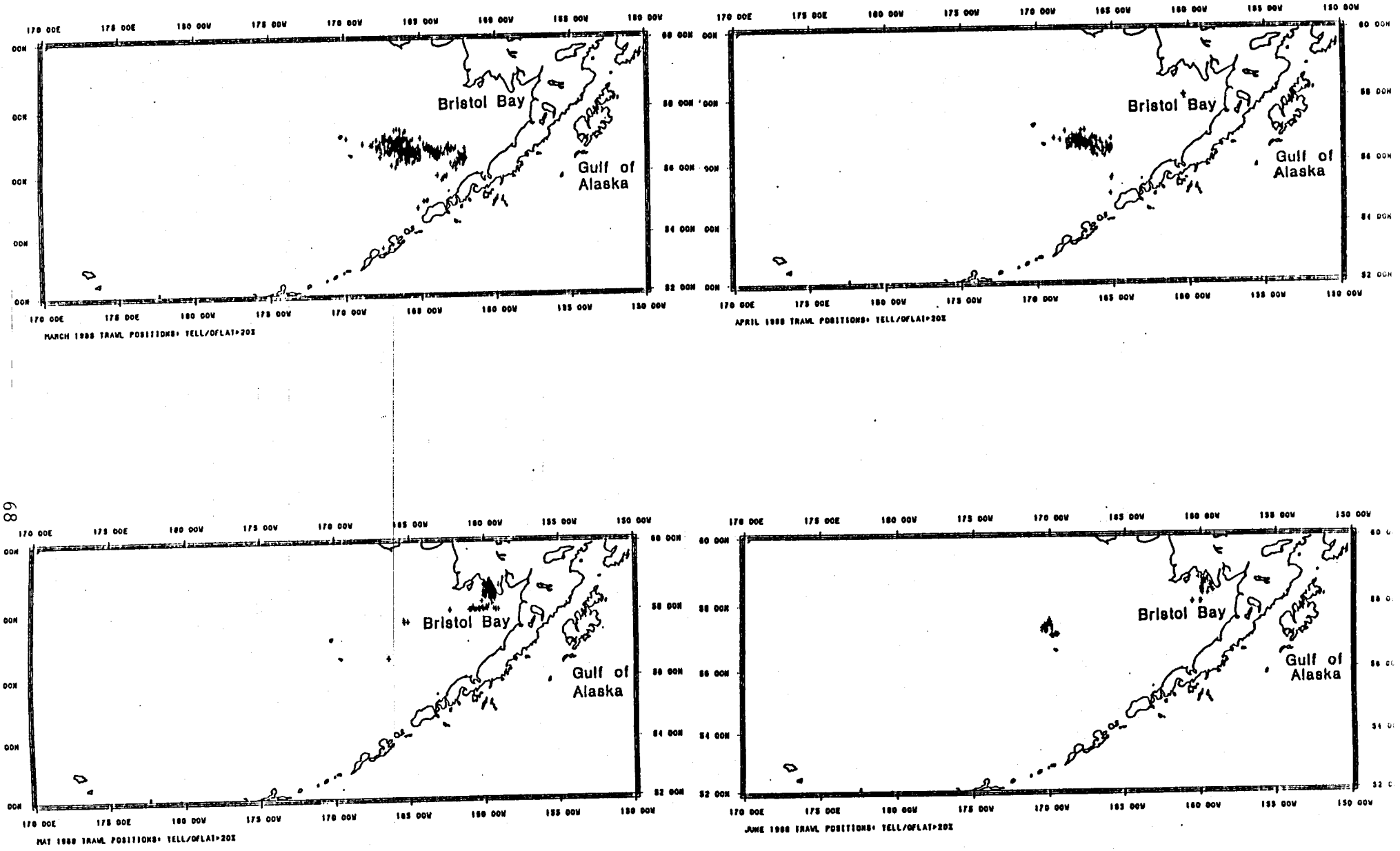


Figure 5.5 Figures showing the locations of joint venture catches where yellowfin sole comprised greater than 20% of the total catch weight during March-June 1988.

were affecting walrus haulout behavior, this would impact negatively the visitor's experience by decreasing the number of walrus on shore. Abandonment of these haulout sites is a possibility. These effects could have a major impact on visitor use of the Sanctuary and the Refuge, and the ability of the public to view walruses. Such an effect would have a fiscal impact on the Alaskan tourism industry, especially in Anchorage, Dillingham, and Togiak.

5.3.2. Alternative 1b: No action with a cooperative guideline.

The impact on walrus of this alternative range from that described above (Alternative 1a) to possible beneficial effects depending on the nature of the voluntary guidelines agreed upon. If voluntary guidelines similar to Alternative 2 or 3 were adopted, the reported disturbance to walrus might be reduced considerably depending upon compliance. Compliance would be influenced profoundly by the bycatch regulatory regime in effect, the availability of target fish species outside of northern Bristol Bay, and a variety of other factors such as weather, industry acceptance, public pressure, and the visibility of fishing vessels from shore.

There is little motivation for industry to adhere to protective guidelines other than acting out of concern for walrus. In the event compliance with this alternative was poor and walrus numbers remained low or declined further, no mechanism would be available to implement remedial measures quickly. The time required to implement protective regulation by either the emergency rule or the plan amendment process would delay protection until subsequent walrus haulout seasons. Thus, any adverse impacts would be expected to continue at least for one more season with adverse effects ranging from the individual to the population level.

5.3.3 Alternative 2 (Preferred): Seasonal 12-mile radius groundfish fishing closure zones around northern Bristol Bay walrus haulout areas.

This alternative would provide a moderate level of protection for walrus by reducing disturbance from commercial groundfish fisheries. The alternative establishes a 12-mile closure zone around the three major walrus haulout sites in northern Bristol Bay. Increasing the distance between fishing vessels and walrus haulout sites is predicted to reduce the amount of vessel-related airborne and waterborne sound reaching these locations through attenuation. The exact degree of attenuation is dependent on numerous variables (physical properties of air and water such as wind and current speed, salinity, thermoclines, initial sound intensity, etc.) and cannot be predicted accurately. It is assumed that a 12-mile buffer zone would adequately reduce sound intensity to a level acceptable to walrus at least on and near haulout sites. The possibility still remains that walrus may encounter unacceptably high levels of noise from the fishery when approaching haulout sites from sea. The 12-mile buffer would be consistent with the level of protection provided for walrus haulouts in the Soviet Union, the only other country which shares the Pacific walrus population.

Groundfish fishing has not been observed from shore at Cape Peirce to date, although considerable yellowfin sole trawling has occurred offshore in adjacent Kuskokwim Bay. However, walrus declined at Cape Peirce during the same period as at Round Island. Presumably the cause of the decline is the same or related at both locations as walrus are known to move between these sites. Protection for Cape Peirce is proposed also because if restrictions were applied only to the Walrus Islands Sanctuary area, it is likely that fishing effort (and therefore acoustic disturbance) would increase adjacent to Cape Peirce.

As walrus approach northern Bristol Bay, they would encounter zones where fishing sounds were intense and concentrated and other areas where sounds were not as intense. The buffers proposed by this alternative would result in certain underwater areas having lower levels of fishery-related sounds; these would be larger than those that now occur due to the current distribution of fishing effort close to the walrus haulouts. This would likely reduce disturbance to walrus moving through the region as they approach haulout sites and could result in increased numbers of walrus hauling out.

Some fishing activities are likely to continue during April through September relatively close to walrus haulouts but outside the closure zones (in particular over the canyon between Round Island and the Nushagak Peninsula). Enforcement of the restriction on fishing the 12-mile zones would be complex because of their circular configuration. Fishing and enforcement vessels would have to monitor positions closely through radar or other means on a frequent basis. Vessels fishing in northern Bristol Bay may be tempted to "fish the curves" around each of the haulout sites in order to maximize the fishing area. This would result in point source sound propagation from locations immediately adjacent to the 12-mile closures. These activities and noise could affect movement patterns of walrus returning to haulouts and the resultant numbers hauling out. These activities could have an impact on individual walrus and on visitors to Round Island and Cape Peirce.

5.3.4 Alternative 3: Seasonal groundfish fishing closure north of a line from Cape Constantine to the southernmost tangent of a 12-mile radius around Cape Peirce.

This alternative would provide a high degree of protection to walrus frequenting northern Bristol Bay haulout sites. By closing most of northern Bristol Bay to groundfish fishing from April 1 through September 30, the amount of airborne sound reaching haulout sites and the size of subsurface area ensonified would be reduced greatly. Once walrus entered the northern portion of the Bay to approach traditional haulout sites, the intensity of sound would begin to attenuate.

By restricting groundfish fishing activities to a well defined, easily enforceable line, vessels would not be likely to approach haulout sites accidentally. Eliminating fishing activities from the previously heavily fished canyon area between Round Island and the Nushagak Peninsula would reduce the chance that fishery generated sounds would create an acoustic barrier to walrus moving toward Round Island or Cape Peirce from feeding areas in central Bristol Bay. Absence of fishing in this area would also mean processors and other fishery related activity likely would be located south of the closure line as well; that would reduce the chances that vessels would even enter the closure area to unload their catch. "Fishing the line" would result in the production of point source sounds spread out over a reasonably large area and emanating from locations more distant from important walrus haulouts.

5.4 Socioeconomic Impacts

As discussed above, the number of walrus observed hauled out at preferred sites (Round Island, Cape Peirce) has been declining in recent years. During the same time period, there has been increased incidence of human disturbance, one source being the commercial yellowfin sole trawl fishing near Round Island.

There is some uncertainty as to whether a cause-and-effect relationship even exists, or to what extent a decline in haulouts will affect the future health of the walrus stock. However, because the walrus population may be on the verge of a decline (Fay, Kelly, and Sease, 1989), the protection afforded by sanctuaries such as Round Island may become increasingly important.

As with many marine mammals, most of the social value of walrus may be composed of non-consumptive use value (e.g. observing them in their habitat) and existence or option value. There does exist a native subsistence harvest of these animals, but as the harvest is small relative to the total population of walrus, its impacts are not relevant to this analysis. The fact that legislation, such as the Marine Mammal Protection Act, forbids or severely restricts most commercial uses of marine mammals indicates that our society values the existence and non-consumptive uses more than the commercial value of the animals. The Round Island Sanctuary is the only site in North America which affords the general public relatively easy access for viewing walrus in their natural habitat.

5.4.1 Analysis of the Alternatives

Given that the cause-and-effect relationship has not been firmly established between the presence of fishing vessels, primarily the yellowfin sole trawl fleet, and the decline in observed walruses, it is not possible to quantify some of the factors pertinent to this issue. However, some qualitative analysis can be conducted on the value of long-term conservation of walrus in the face of uncertainty and of the value of the sanctuary as a rare recreational site. In addition, some of the costs that would be imposed under the various alternatives can be quantified.

Yellowfin sole were not harvested by domestic fishermen in significant quantities in the eastern Bering Sea until 1980 when joint ventures took approximately 11% of the harvest (Table 5.1). By 1985, joint ventures had become the dominant operations, with a harvest of 126,401 mt. DAP catch was 7,771 mt in 1988 and the DAP allocation for 1989 is 45,274 mt.

In 1986 a small percentage of the Bering Sea yellowfin sole catch was taken inside Bristol Bay between Capes Peirce and Constantine (Table 5.2). However, this became an increasingly important area in 1987 and 1988 as the fleet was prohibited from other traditional fishing areas and the yellowfin sole fishing in this area was good.

5.4.1.1 Costs

To date, the principal groundfish fishery in northern Bristol Bay has been for yellowfin sole. It is difficult to predict the net cost to the yellowfin sole fishery from various fishing closure proposals because it is uncertain how the fishery will respond to a closure of a particular area. At one extreme, if the trawl fleet can shift the harvest to another area and suffer no increase in effort to do so or if the TAC is taken in future years prior to vessels moving into northern Bristol Bay, then the costs would be zero.

At the other extreme, if the fleet is unable to redirect any of its effort to other areas, the catch would be reduced by the amount that would have been taken in the trawl closure area. This foregone catch will result in a loss of gross revenues and profits. The net loss to the trawl fleet will be less than the gross amount because the reduction of catch will also cause a reduction in fishing effort and costs.

Table 5.1--Annual catches (mt) of yellowfin sole in the eastern Bering Sea, 1977-89.

Year	Foreign	Domestic		Total
		JVP	DAP	
1977	58,373		0	58,373
1978	138,433		0	138,433
1979	99,017		0	99,017
1980	77,768	9,623	0	87,391
1981	81,255	16,046	0	97,301
1982	78,331	17,381	0	95,712
1983	85,874	22,511	0	108,385
1984	126,762	32,764	0	159,526
1985	100,706	126,401	0	227,107
1986	57,197	151,400	0	208,597
1987	1,811	179,613	4	181,428
1988[1]	0	200,900	5,800	206,700
1989[2]	0	110,000	71,675	181,675

[1] Catch reported through October 1988.
[2] Recommended allocations as of December 8, 1988.

Sources: NPFMC, Bering Sea/Aleutian Islands Groundfish Plan Team. 1988. Final Resource Assessment Document for the 1989 Bering Sea/Aleutian Islands Groundfish Fishery. 236 pp.
Jerry Berger, 1989. Pers. Comm. NMFS, Observer Program, February 1989.

Table 5.2--Comparison of the harvest levels between Capes Peirce and Constantine to the total Bering Sea harvest of yellowfin sole, 1986-88, in metric tons.

Year	Catch in subarea	Total harvest Bering Sea	Percentage of Total harvest
1986	2,813 mt	208,597 mt	1.3%
1987	40,689 mt	181,428 mt	22.0%
1988	84,785 mt	250,000 mt	34.0%

Note: 1988 catch data are preliminary estimates based upon data available from the Observer Program as of 2/13/89.

The intermediate, and most likely, case is that perhaps the fleet could modify its behavior and harvest the total TAC in the remaining open areas but at a higher cost. The existence of fishing activity currently occurs inside the proposed trawl closure areas suggests that there is a preference to fish there based on CPUE and other cost considerations. If there exists an alternative that has lower costs to the fishery, the fleet would have already chosen to fish there because of cost effectiveness. The intermediate case and accompanying increase in cost were not analyzed due to insufficient data.

Alternative 1a: No action--status quo.

Under the status quo, the trawl fleet would continue to operate in this area during years when fishing patterns and allocation levels warrant such activity. There would be no new costs imposed on the fleet.

If the trawl fleet did exercise their option to continue fishing in this area for either yellowfin sole or possibly some other groundfish, then the presence of the vessels would diminish the suitability of this site to the walrus. This could contribute to a reduced ability of the population to maintain its current level.

If the number of walrus that haul out within this sanctuary continues to decline, then there could be a reduction in the value/appeal of Round Island as a site for the public to view walrus and the number of visitors would be expected to decrease. Tourists could still choose to visit the area in order to view seabirds, other marine mammals, or to engage in other recreational activities such as camping or fishing. It is assumed, however, that the main purpose of any visit is to view the walrus. A reduction in the number of visitors will mean fewer tourist dollars will be spent in local communities such as Dillingham and Togiak. Visitors' expenditures on food, lodging, and transportation had a direct impact on the tourism economy and an indirect impact on the overall economy of Alaska.

From 1980 through 1988, 2,984 visitor-days were recorded at the Sanctuary. There have been fluctuations in the annual number of days spent at this site, as noted in the following table:

Annual Number of Visitor-Days at the Walrus Sanctuary

1980	1981	1982	1983	1984	1985	1986	1987	1988
136	277	198	468	N/A	175	379	752	599

Alternative 1b: No regulatory action, but develop a cooperative program, involving all concerned parties, with voluntary guidelines to minimize disturbance to walrus.

If under the voluntary guidelines the groundfish fishing fleet, primarily trawl vessels targeting on yellowfin sole, agreed to change the area, timing, or magnitude of their operations, there could be increased fishing costs or decreased catch.

Alternative 2 (Preferred): Establish 12-mile radius groundfish fishing closure zones around walrus haulouts with seasonal closures.

Since the principal groundfish fishery in the area of the proposed closure is for yellowfin sole, under Alternative 2 there would be imposed costs of foregone catch of yellowfin sole if no comparable substitute fishing grounds can be found.

For the combined harvests of 1986-88 (the three years when yellowfin sole fishing occurred inside Bristol Bay), 28% of the observed harvest of 50,509 mt occurred within this proposed 12-mile closure during the months of April-June. If it is assumed that the JVP observer coverage provides a representative sampling of fishing patterns and that the catch occurring in this area could not be taken elsewhere then the foregone catch and revenue in each year would have been:

Year	Foregone Catch (metric tons)	Exvessel Price[1] (dollars/mt)	Foregone Revenue (millions $)
1986	788	134	0.1
1987	11,393	145	1.7
1988[2]	23,740	165	3.9

[1] Annual average prices as reported by Pat Peacock, NMFS, Alaska Region, Juneau, 2/89.
[2] 1988 catch figures are preliminary.

For 1989 the joint venture (JVP) yellowfin sole fishery utilized its entire initial allocation outside Bristol Bay, so unless there is a supplemental JVP allocation, there will probably be no JVP yellowfin sole fishery in Bristol Bay this year and the seasonal closure, if it had been in effect, would have no impact on their JVP activity.

But if it is assumed that the DAP fishery will harvest its portion of the 1989 TAC, then there is a possibility of a domestic yellowfin sole fishery in Bristol Bay during the summer. Using the same distribution of catch inside and outside the proposed closure areas, and assuming 1988 prices, then if the catch inside the closure cannot be taken elsewhere in the Bering Sea the foregone catch and gross revenue to the DAP fishery in 1989 from within the 12-mile limit would be 4,200 mt valued at $0.7 million.

If catch were foregone, then the fleet would also experience a drop in variable costs associated with fishing effort, and that reduction in costs would offset part of the loss in gross revenues so that the net loss to the fleet would be less than the gross estimates presented above.

Effects on both the JVP and DAP groundfish, primarily trawl, fleets in future years are unknown. Impacts would depend on how quickly the TAC is taken relative to the opening of this area. Fishing often cannot occur earlier than April or May in this area due to the presence of ice. In addition, vessels are still able to fish within Bristol Bay outside of the 12-mile sanctuary under this alternative, and, based on the observed trawl hauls from 1986-88 where the preliminary estimate of CPUE estimates outside the 12-mile limit is actually greater than or equal to the CPUE closer to the islands (Table 5.3), should be able to shift their entire fishing to this reduced area with little or no cost.

Table 5.3 Summary of Yellowfin sole joint venture catch information when observers were present, 1986-1988.

WITHIN 12 MILES OF WALRUS ISLANDS

Year	Total catch (t)	Mean CPUE (t/hr)*	CPUE Range	n
1986	684.1	4.8	1.25-8.3	43
1987	11,866.5	17.4	1.37-289.1	525
1988	1,736.1	7.9	1.23-33.2	96

*weighted by the size of the catch.

OUTSIDE 12 MILES OF THE WALRUS ISLANDS

Year	Total catch (t)	Mean CPUE (t/hr)*	CPUE Range	n
1986	533.7	6.1	2.3-13.4	30
1987	19,439.5	27.4	1.5-359.0	875
1988	3,586.5	7.9	1.8-27.1	181

*weighted by the size of the catch.

TOTAL BERING SEA FISHERY

Year	Mean CPUE* (t/hr)	CPUE Range (t/hr)	Catch Range (t)	n
1986	13.9	0.1-316.1	1.2-67.1	3,702
1987	18.7	0.1-359.0	2.2-78.4	4,047
1988	15.3	1.1-242.6	2.1-78.6	2,603

*weighted by the size of the catch.

In 1987 a large number of trawlers in the yellowfin sole fleet fished in the Kuskokwim Bay area west of Cape Peirce during the month of June (Figure 5.4). This is also a potential alternative harvesting area, which could help to offset any revenue lost from the 12-mile closure, if the fleet can successfully shift fishing to this area.

Benefits under Alternative 2 would be the potential positive effects on the walrus population and the recreational value associated with the reduction of one possible source of disturbance to the walrus near a preferred habitat. The potential would still exist for interaction between vessels fishing outside the 12-mile limit and walrus on feeding forays from the haulouts to central Bristol Bay.

In addition, in the absence of fishing activity around the islands, the public which visits the Walrus Islands Sanctuary would be able to view the activities of the animals in a setting that is more pristine and natural, which would presumably enhance their recreational experience.

If the 12-mile protection is sufficient to maintain site fidelity for the walrus, and if their recent decline is attributable to disturbance caused by the yellowfin sole fishery, then the number of observed walruses could remain level or increase in future years. However, if the additive impacts of fleet encounters with walrus outside this sanctuary (e.g. on the feeding grounds outside the 12-mile closure) are sufficient to disrupt the return of the walrus to the haulouts, or if there is no relationship between groundfish fishing activity and haulout declines, then there may be no benefits under this closure.

The State of Alaska has responded in recent years to concerns about the impact of other sources of human disturbance by placing progressively more stringent limitations on access to the island by vessels participating in the herring fishery and by tourists. There is an overall limit of 30 visitors on the island at one time with 15 of those allowed to stay over night. Most access in recent years has been by boat, as opposed to sea planes, in an attempt to reduce noise around the habitat.

The Soviet Union, the only other country in which the Pacific walrus is found, has established 12-mile closures around all Soviet coastal walrus haulouts. The implementation of this alternative, then, would place the United States in concert with international measures already in effect to protect Pacific walrus haulouts in the North Pacific. The benefits of the Soviet measures are unknown.

The establishment of this seasonal closure would affirm the U.S. commitment to the protection of marine mammals, as specified in the Marine Mammal Protection Act, and could generate some side benefits in future negotiations with other countries on the protection of other marine resources.

Alternative 3: Seasonal groundfish fishing closure north of a line from Cape Constantine to the southernmost tangent of a 12-mile radius around Cape Peirce.

Since the principal groundfish fishery in this area is for yellowfin sole, this trawl fishery would be the major fishing category affected by the closure. Given that a significant portion of the yellowfin sole fishery has occurred in northern Bristol Bay in past years, this area will probably remain good trawling grounds for the yellowfin sole fleet.

By closing this area and causing a forced relocation of the fishing fleet, costs will be imposed in the form of increased travel time to new areas (i.e., fuel costs, opportunity costs such as lost fishing time) and perhaps reduced fishing opportunities if the substitute grounds have lower CPUEs.

If this seasonal closure had been in effect over the past three years and the yellowfin sole fishing fleet had not modified its behavior to increase its catch of yellowfin sole in other areas, then the foregone catch and gross revenue to the fleet from this closure would have been:

Year	Foregone Catch (metric tons)	Exvessel Price[1] (dollars/mt)	Foregone Revenue (millions $)
1986	2,813	134	0.4
1987	40,689	145	5.9
1988[2]	84,785	165	14.0

[1] Annual average prices as reported by Pat Peacock, NMFS, Alaska Region, Juneau, 2/89.
[2] 1988 catch data are preliminary estimates based on observer data available as of 2/13/89.

Assuming that this fishery with its relatively high CPUEs and low bycatch remains attractive to the fleet, with approximately one-third of the DAP harvest coming from this area, then foregone catch would be 15,000 mt and lost gross revenues would be $2.5 million for 1989.

Again, net losses to the trawlers would be less if the catch is foregone and thus effort and fishing costs are reduced, or if the fleet was able to harvest its portion of yellowfin sole at an alternate area or time, but at increased cost.

Benefits would be of the same nature as under Alternative 2, but the potential for direct disturbance of walrus haulouts would be considerably lower.

5.4.2 Reporting Costs

No significant change in reporting or paperwork costs are anticipated under any of these alternatives.

5.4.3 Administrative, Enforcement, and Information Costs

Under Alternatives 2 and 3, added enforcement costs are expected to be negligible, as currently there exist ongoing aerial and sea surveys of this area, plus the sanctuary is already monitored by the State of Alaska for human visitor access to the islands.

5.4.4 Distribution of Costs and Benefits

To the extent that the costs and benefits can be measured, they apply to distinctly different groups under the various alternatives. Under Alternative 1, status quo, the benefit, if any, will be to the trawl fleet, which will retain access to these fishing grounds during the months of April through September. The costs under the status quo will be born by the walrus population and on human observers of walrus as a result of a negative externality (noise) from the trawl activity around the haulout sites.

Under Alternatives 2 and 3, the costs will fall directly on the commercial trawl industry in the form of either foregone catch and revenue or possibly increased costs due to the displacement from the fishing grounds to another area.

The potential benefits would accrue to the walrus population and to the users of this sanctuary for recreational and/or scientific purposes.

5.4.5 Benefit-Cost Conclusion

Currently, three main user groups compete for access to this area: the commercial trawl fleet, the walrus population, and the recreational visitors. The commercial trawl fleet is not significantly impacted by the presence of the other two groups. The recreational visitor is positively impacted by the presence of the walrus. The direct impact of the fleet on the visitors would be mainly in the form of increased noise/activity.

Indirectly, the fleet could also be contributing to a reduction of walrus hauling out. Both of these effects would be negative, from the viewpoint of the recreational user. Presumably, the presence of either human user group would diminish the attractiveness of the site to the walrus and could diminish their usage of the site.

The State of Alaska closely regulates the usage of this area by visitors in an attempt to balance the recreational demands of this user group with concern for the impact of their presence on the walrus population.

Given that this area is a relatively unique recreational site for the tourist, there may not exist a close substitute for the viewing experience afforded in the area. It is difficult to place a value on the experience of viewing wildlife in their natural setting with little indication of human interference. Given that the economic benefits which accrue from in situ conservation of a preserved natural area and a stock are hard to quantify, they are seldom acknowledged in benefit-cost analyses. As a result, usually the true economic value of the site is underestimated (Oldfield, 1984).

It is also hard to quantify what, if any, benefit will accrue to the walrus under the alternatives to the status quo. There are considerable difficulties with our monitoring of the walrus population (Gilbert, 1989), and thus, these monitoring efforts only provide general trends in population sizes, rather than reliable estimates of actual numbers.

Given the uncertainty of the impacts of the fishing fleet on the walrus, and given the risk of being unable to detect major fluctuations in the walrus population until after the fact, one must acknowledge that there is a cost attached to "guessing" wrong. Some benefit might be gained in erring on the side of conservation, if one can do so without imposing a substantial cost on the fishing industry. Given that the yellowfin sole fishery is in transition from a joint venture to a fully domestic fishery, there is a low likelihood of fishing activity in this area and the short-term cost of the protective measures may be low. By enacting these measures for a finite period of time (until December 31, 1991) future changes in the number of observed haulouts can be monitored and additional information generated as to the source(s) of the fluctuations.

APPENDIX 5A

Commercial Salmon and Herring Fisheries of Northern Bristol Bay

The following provides a synopsis of the salmon and herring fisheries in the Togiak area of northern Bristol Bay between Cape Constantine and Cape Newenham. Since these fisheries are wholly conducted within the State of Alaska's three-mile territorial zone, the Council has no regulatory authority over them. However, there are several hundred vessels associated with each of several herring and salmon fisheries, and the disturbance to walrus from these fisheries has not been included in this analysis. Since the vessels are much smaller than the trawlers discussed in previous sections of this analysis, the disturbance is therefore believed to be less. Nonetheless, it is recognized that even if the Council takes action to regulate trawling to minimize walrus disturbance, such action will not reduce or otherwise affect the conduct of the salmon and herring fisheries in the area.

Herring Fishery

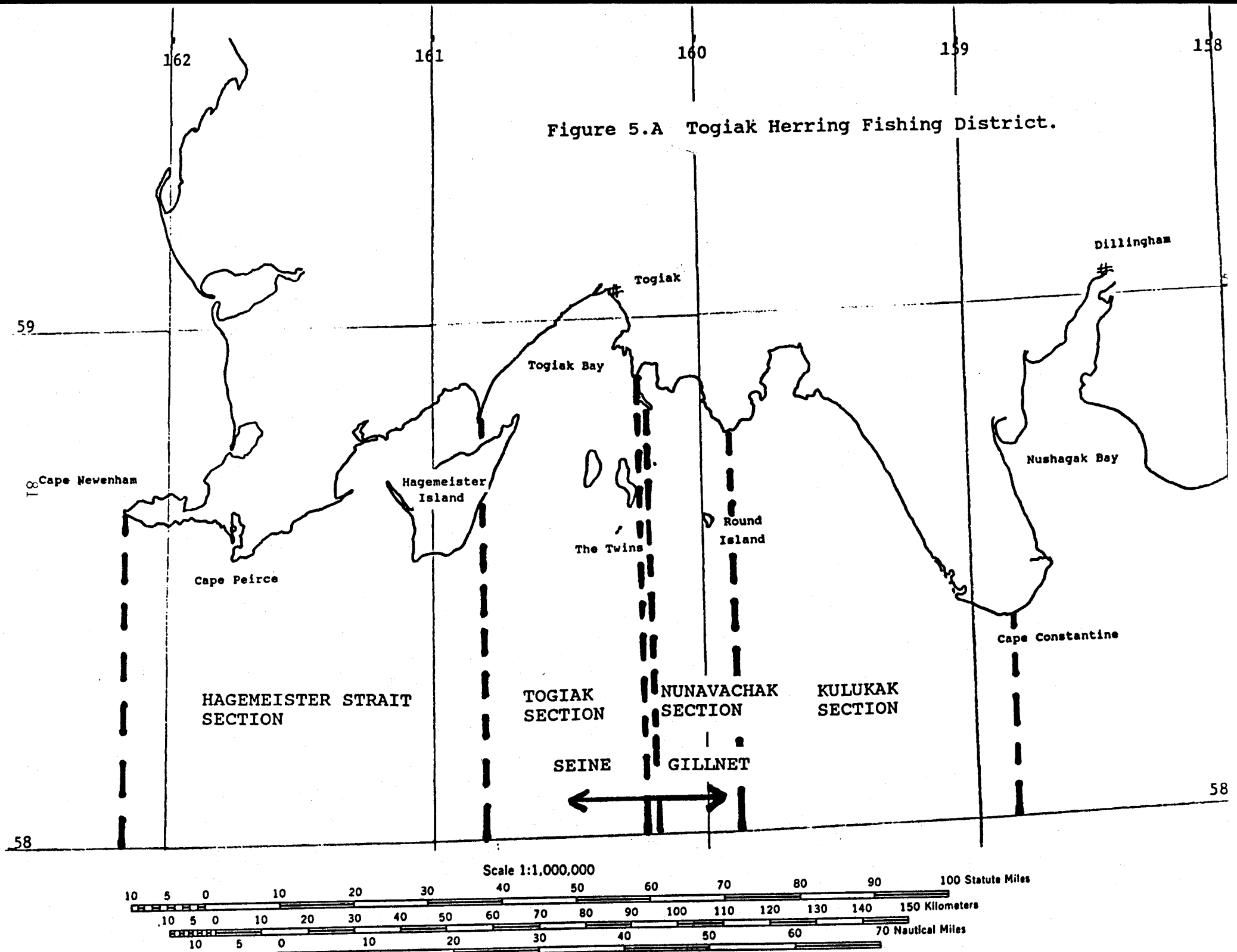
The Bristol Bay domestic commercial sac-roe and roe-on-kelp fisheries began in the 1960s, but remained at very low levels until passage of the Magnuson Fishery Conservation and Management Act provided the opportunity for these fisheries to expand by reducing foreign harvests. Prior to 1978, the domestic fishery was allowed to develop without regulatory restrictions imposed by the State of Alaska. Since then, regulatory measures have been adopted concerning seasons and fishing periods, gear specifications, boundaries, and catch reporting to ensure that harvests do not exceed quotas. Quotas are generally established at twenty percent of the available biomass. The fishery occurs over about a ten day period each Spring between late April and late May. The fishery has been managed via emergency order announcements since 1981. A regulatory management plan has been developed to take into consideration variable exploitation rates on young versus older year class herring and provide for a separation of gillnet and purse seine gear types (Figure 5.A). There is also a herring roe-on-kelp fishery conducted within designated intertidal areas.

The fishery is conducted in nearshore areas between Kulukak Bay and Cape Newenham. Beginning with the 1988 season, the gillnet fishery was restricted to the east of Togiak Bay and the seine fishery was restricted to Togiak Bay and areas to the west. Gillnet boats generally range in size from open skiffs to 32-foot "salmon" vessels. Seine boats range in size from 32-foot "salmon" vessels to 68-foot limit seiners.

This herring fishery is not a limited entry fishery. Fishing effort levels have remained relatively stable during the past five years while there has been a general decline in harvest which is expected to continue due to the present age structure of the population (high fraction of very old age herring with very low recruitment of younger fish). Fishing vessel effort and catch levels for the period 1984 through 1988 are as follow:

Year	Processors	Purse Seine	Gillnet	Catch (tons)
1984	25	196	300	19,300
1985	23	155	302	25,616
1986	23	209	209	16,260
1987	18	111	148	15,204
1988	22	239	300	13,986

Figure 5.A Togiak Herring Fishing District.



Salmon Fisheries

The Bristol Bay commercial salmon fishery began in the 1880s. Commercial fishing is limited to drift and set gillnet gear types fished in five discrete fishing districts (Figure 5.B) which are positioned off the mouths of major rivers. Approximately 1,800 drift and 900 set gillnet limited entry permits have been issued for Bristol Bay, essentially all of which are fished each year. Both gear types are allowed to move from district to district throughout the season, so effort levels within any single district vary within season and between years.

The commercial salmon fishery did not begin in the Togiak District until the 1950s. This district is characterized by smaller salmon runs. Consequently, both effort and catch levels are relatively low compared to other districts within Bristol Bay. Drift gillnet effort accounts for about 68% of the harvest. Drift gillnet peak effort levels are generally between fifty and one hundred vessels, although effort levels may reach nearly two hundred for very short periods. Drift gillnet boats range in size up to a maximum of 32 ft. There are about 36 setnet units which fish in Togiak District.

The primary salmon species caught are sockeye and chum, however, significant numbers of chinook, coho, and pink salmon are also caught during a season that typically extends from the first of June into mid September with peak catches occurring in July. Catches for the period 1984 through 1988 are as follows:

Year	Sockeye	Chinook	Chum	Pink	Coho
1984	319,000	22,000	339,000	21,000	171,000
1985	210,000	37,000	206,000	341	39,000
1986	304,000	20,000	270,000	25,000	48,000
1985	340,000	18,000	422,000	24	1,000
1988	822,000	16,000	471,000	57,000	19,000

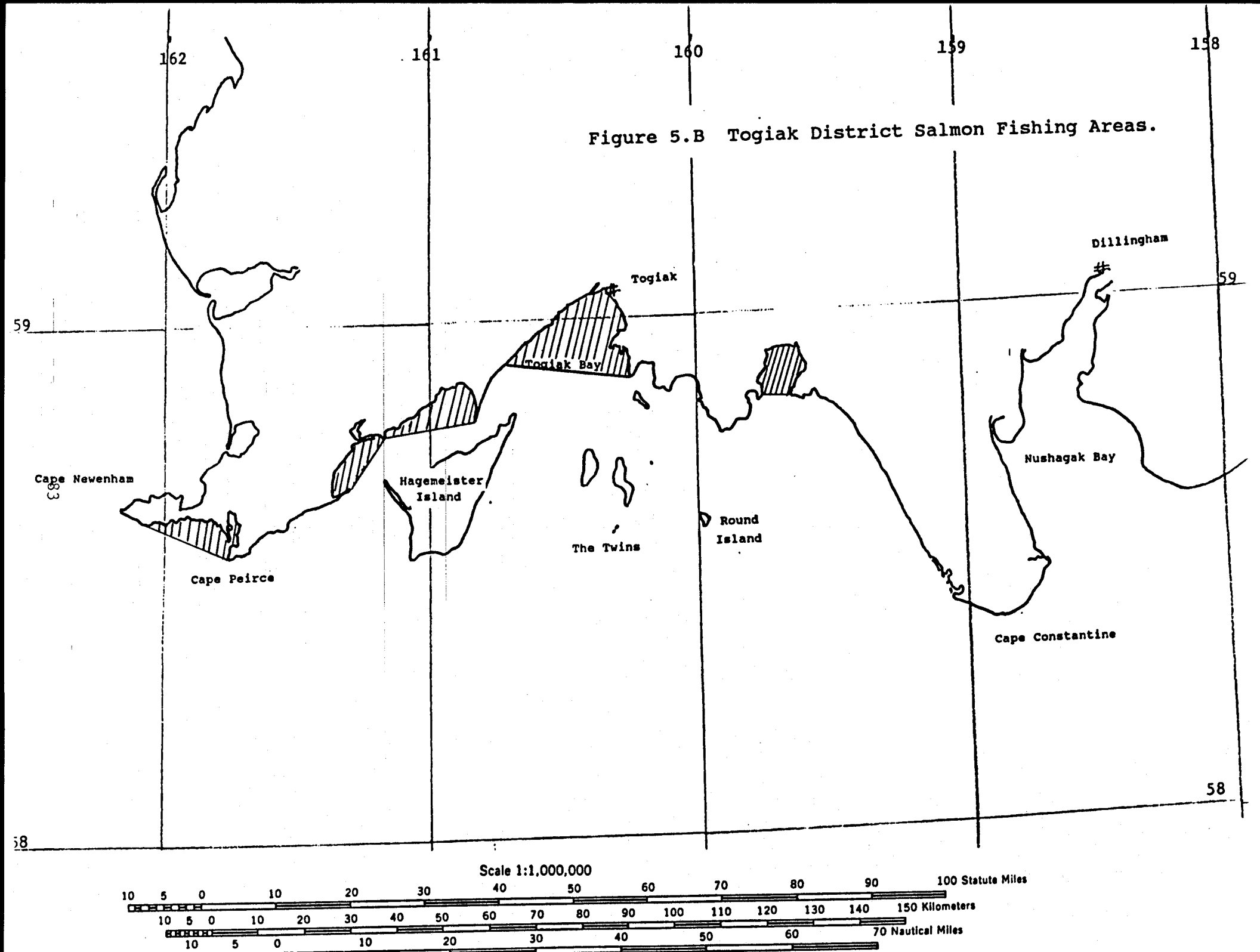


Figure 5.B Togiak District Salmon Fishing Areas.

6.0 REPLACE THE KING CRAB PROTECTION TIME/AREA CLOSURES AROUND KODIAK ISLAND AND MODIFY THE HALIBUT BYCATCH MANAGEMENT REGIME FOR THE GULF OF ALASKA

6.1 Introduction

Bycatch occurs because the fishing gear used in the Gulf of Alaska groundfish fisheries is not completely selective for target species. The gear used results in the catch of the target species or species groups as well as the bycatch of other species that are often not intended to be taken.

The bycatch of halibut in the groundfish fisheries will reduce the catch by halibut fishermen in the halibut fishery, and crab bycatch may similarly reduce catch in the crab fisheries if the bycatch is retained or subject to discard mortality. However, it may not be possible to decrease the expected level of bycatch in the groundfish fisheries without switching to less productive or more costly fishing techniques. Therefore, bycatch is principally an allocation issue between competing users of the crab and halibut resources. However, bycatch does have important conservation implications. Uncertainty in actual bycatch amount, especially underestimates, can lead to overharvest of the resource. Bycatch leads to reduction in recruitment for future years. Bycatch compounds the uncertainty of stock assessment and the effects of harvest, especially for declining or depressed stocks.

As with most allocation matters, bycatch is a very contentious issue. Much of the controversy results from the dispute concerning the cost associated with reducing bycatch rates in the groundfish fisheries, and the actual levels of bycatch. The crab and halibut interests believe that significant reductions are possible at little or no cost to the groundfish fisheries, whereas groundfish interests suggest that such costs can be very high. In the absence of a market mechanism that would generate a good estimate of the value of bycatch to the groundfish fisheries, it is very difficult to resolve this issue. The dispute concerning actual bycatch occurs because there has been only very limited observer coverage of the DAP fisheries and because the extent of unobserved mortality caused by on-bottom trawls during fishing operations is not known. Until these disputes are resolved, the bycatch issue will continue to place a large burden on the Council process, and the probability of providing one group with benefits that are substantially less than the costs imposed on others will remain high. Another contentious issue concerns the international implications of halibut bycatch in Alaska on the directed halibut fishery in Canada.

In recent years, the bycatch of king crab off Kodiak Island and the bycatch of halibut in the Gulf of Alaska have been major management issues. Amendment 14, adopted by the Council in 1985, established a halibut prohibited species catch (PSC) framework which has been used annually to establish halibut PSC limits. Amendment 15, adopted in 1986, established time and area closures near Kodiak Island to protect king crab resources that were at very low levels.

Additional action is being considered at this time because: (1) the king crab protection time and area closures will expire at the end of 1989 unless the FMP is amended; (2) the halibut PSC framework as specified in the FMP and its implementing regulations may not provide adequate protection for halibut, and the control measures may not be spread equitably among groundfish fisheries; and (3) the existing regulations requiring bycatch to be discarded result in waste that is more obvious when discard mortality rates are high.

The specifics of the need for action, description of alternative actions, and the analyses of those alternatives are presented separately for the closures to protect king crab and the halibut bycatch management regime.

6.2 Implement a Revised Time/Area Trawl Closure Plan to Protect King Crab Around Kodiak Island

6.2.1 Description of and Need for the Action

On January 1, 1990 a time/area closure scheme designed to protect king crab in the vicinity of Kodiak Island expires. This bycatch control measure was developed and implemented by the Council and the Secretary, respectively, in 1986 to provide an environment conducive to the recovery of king crab stocks around the island at a time of developing groundfish bottom trawl fisheries. The time/area closure scheme afforded protection to king crab in some areas during their molting or soft-shell period while in other areas it protected crab from bottom trawls year-round. These measures were considered vital if the severely depressed king crab stocks were to recover in this area. The stocks have experienced little or no recruitment in recent years, and are subject to high mortalities from bottom trawls while in the soft-shell condition. The expiration date was selected to necessitate a review of the status of the crab stocks, and determine whether these measures are effective and should be continued.

The Council's Bycatch Committee was assigned the task of reviewing the Kodiak time/area closure scheme and developing a "replacement amendment" if necessary. The Council also directed the Committee to broaden the focus of the measure to include bycatch concerns of other prohibited species, specifically, Tanner crab and halibut. The Committee has recommended that the Council consider modifying its existing program by adding a third type of closure to protect juvenile crab when significant recruitment occurs. The basis for such closures is the belief that the area inhabited by king crab would increase if there is particularly strong recruitment and that protection would, thus, be appropriate for larger areas. This modified time/area closure measure would be in effect for three years.

6.2.2 The Alternatives

6.2.2.1 Alternative 1: Status Quo - Do nothing.

Under the status quo there would be no specific bycatch controls for the groundfish fishery in the EEZ of the Gulf of Alaska to protect king crab after December 31, 1989. The current time/area closure scheme would expire. The retention of king and Tanner crab would remain prohibited in all domestic, joint venture, and foreign groundfish fisheries. This alternative would provide no specific protection to crab around Kodiak Island and, therefore, does not meet the Council's objective of continuing such protection in anticipation of king crab stock rebuilding in the Gulf of Alaska.

6.2.2.2 Alternative 2: Extend existing time/area closure measures for another three years.

This alternative would extend the Type I and II time/area closure implemented by Amendment 15 for another three years (until December 31, 1992). Type I areas are closed to bottom trawling year-round, and Type II areas are closed to bottom trawling during the crab soft-shell period identified as February 15 - June 15. While this alternative would partially enhance king crab stock rebuilding, the Council felt that additional

protective measures are necessary in the Gulf of Alaska and, therefore, this action is insufficient in meeting the Council's objective.

6.2.2.3 Alternative 3 (Preferred): Implement a modified time/area closure scheme for bottom trawling for three years.

This alternative renews the current time/area closures for another three years. It also modifies the existing closures by allowing limited expansion of a designated closed area when a significant recruitment event occurs. This additional provision will protect recruiting king crab in areas adjacent to the already closed areas which are known to have contained concentrations of juvenile king crabs or are important migratory pathways during periods of high abundance. These important juvenile crab areas are identified as Type III areas. As with Alternative 2, the current closed areas have also been determined to simultaneously afford a high degree of protection to depressed Tanner crab stocks. The Council has determined that this suite of protective measures is necessary to enhance the opportunity for crab stocks to rebuild in the Gulf of Alaska.

The alternative area designations and management actions are as follows:

Definitions of Crab Bycatch Areas

Area Type	Name and Definition
I	Type I areas are those king crab stock rebuilding areas where a high level of protection will be provided to the king crab by closing the area year-round to bottom trawling. Fishing with other gear would be allowed.
II	Type II areas are those areas sensitive for king crab populations and in which bottom trawling will be prohibited during the soft-shell season (February 15 - June 15). Fishing with other gear would be allowed and fishing with bottom trawl gear would be allowed from January 1 - February 14 and June 16 - December 31.
III	Type III areas are those geographic areas adjacent to a Type I or Type II area that have been identified as important juvenile king crab rearing or migratory areas. These areas only become operational following a determination that the "recruitment event criteria" has occurred. The NMFS Regional Director will classify the expanded area as either Type I or II depending on the information available.

Areas designated as Type I, II, or III are shown in Figure 6.1.

For purposes of implementing a Type III area, a "recruitment event" is defined as the appearance of female king crab in substantially increased numbers. A substantially increased number is defined as occurring when the total number of females estimated for a given district equals the number of females established as a threshold criteria for opening that district to commercial crab fishing. The threshold levels determined by the Alaska Department of Fish and Game for the four Kodiak red king crab management districts are: Northeast District - 3.3 fertilized female crab/pot (= 1.93 million crabs), Southeast District - 3.3 fertilized female crab/pot (= 0.72 million crabs), Southwest District - 7.1 fertilized female crab/pot (= 2.28 million

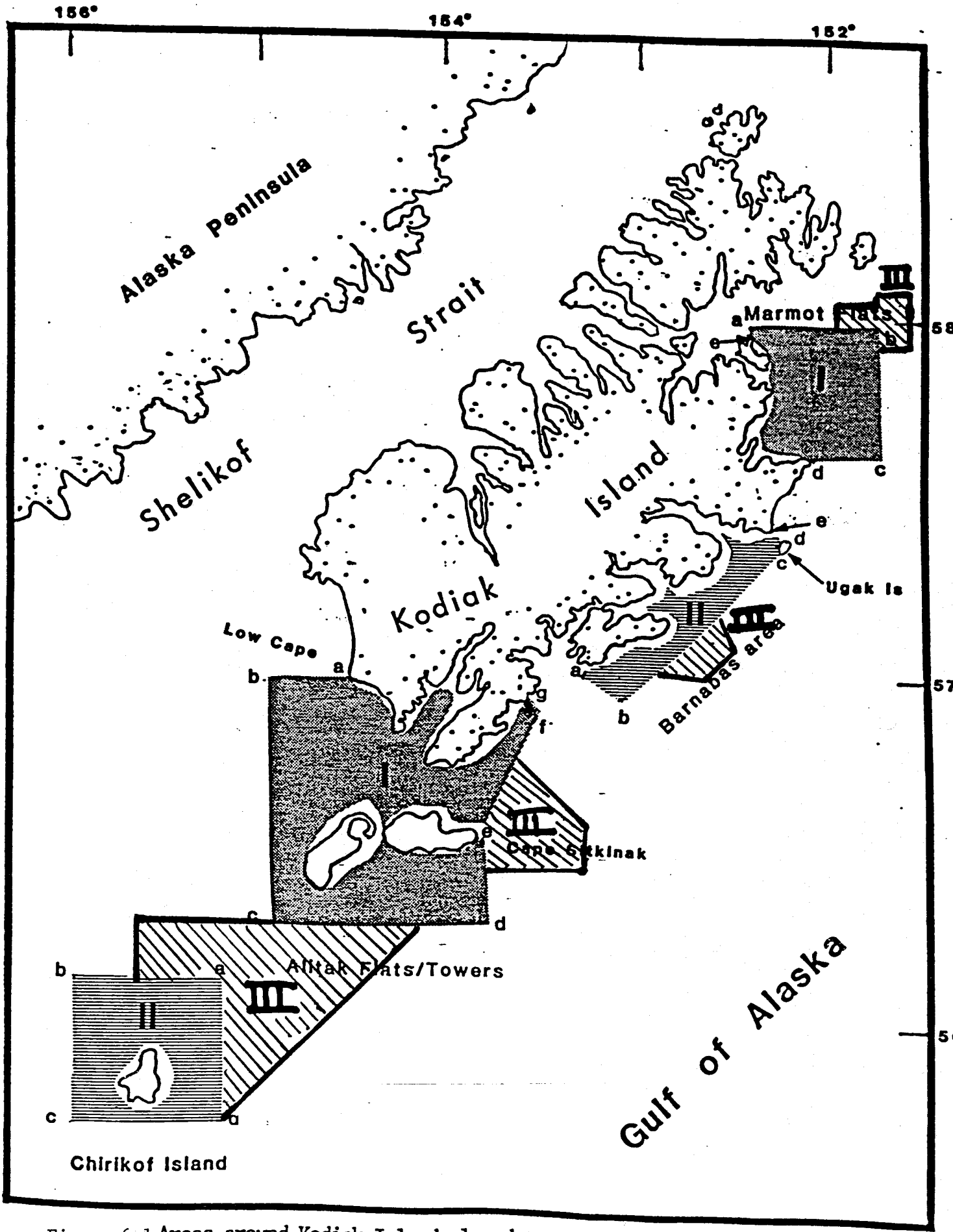


Figure 6.1 Areas around Kodiak Island closed to trawling except with pelagic trawls. TYPE I areas are closed year round. TYPE II areas are closed February 15 to June 15. Type III areas close when significant recruitment event occurs.

crabs), and Shelikof District - 1.5 fertilized female crab/pot (= 0.19 million crabs). In any given year a recruitment event may occur in one or more of the Kodiak management districts as indicated by the standardized Kodiak crab survey conducted by the Alaska Department of Fish and Game. A recruitment event closure will continue until either (1) a commercial crab fishery opens for that district, (2) the number of crab drops below the threshold level established for that district, or (3) the end of 1992 when the closures established by this alternative would expire. Implementation of the Type III area closures would be accomplished by regulatory amendment. ADF&G currently conducts annual surveys in the districts encompassing the proposed Type III areas. Typically the survey would detect a recruitment event two years prior to the time that it would result in the opening of a king crab fishery. Because some Type III areas are adjacent to both Type I and Type II areas, it is not clear which Type III areas would be closed all year.

In developing this alternative, the Bycatch Committee recognized that the future of the king and Tanner crab resource is dependent on the ability of existing brood stock to successfully produce crab. Scientific data show that Alternative 2 or 3 provides protection to 85% of the Kodiak red king crab stocks, protects about 75% of the Tanner crab stocks, protects the most highly concentrated crab areas all year round, yet may provide for groundfish fishing opportunities necessary to support the economic base of Kodiak communities. The Committee also recognizes that once areas have been closed to fishing, there is often a reluctance to open those areas when circumstances may have changed. Therefore, as with the Council's previous time/area measure, the closures presented in Alternatives 2 and 3 will be in effect for three years beginning January 1, 1990. Prior to expiration of the amendment, the Council will review the situation, the status of the crab resource, the effectiveness of the time/area closures, and any other relevant information, to determine whether this approach to the king and Tanner crab bycatch problem should be continued, abandoned, or replaced with a new alternative.

As requested by the Council, the Committee evaluated the time/area closures as a possible bycatch control measure for Tanner crab, halibut, and other prohibited species. The Committee discovered that the areas developed for protecting king crab also protect Tanner crab. The Committee found no reason to expand the closures outlined in Alternatives 2 and 3 for purposes of controlling Tanner crab bycatch. The Committee has determined that the proposed closures serve to protect both king crab and Tanner crab without further modification.

The effectiveness of time/area closures for halibut were also evaluated. Due to halibut being so widespread in the Gulf of Alaska, the closed areas would have to be very large, which is not practicable if other fisheries are to be prosecuted. Other forms of bycatch controls such as bycatch limits may be more effective in managing halibut bycatch. The staff of the International Pacific Halibut Commission has concurred with this assessment.

Salmon bycatch in the Kodiak Island area was also examined by the Committee. As with halibut, time/area closures would have to encompass much of the Gulf during certain times of the year, making this type of bycatch control undesirable. Salmon bycatch, which has been a problem in the groundfish fisheries in the past, has been significantly reduced through modifications in fishing operations. Continuing this approach was determined as the preferable method for controlling salmon bycatch in the short term.

6.2.3 Biological and Physical Impacts

The number of red king crab in the waters around Kodiak Island are at historically low levels, with most being old, sexually mature animals. There has been no sign of significant recruitment in 10 years. As a result, the Kodiak commercial king crab fishery has been closed since 1983 in an attempt to rebuild the stocks. During this same period a developing domestic groundfish fishery using a variety of gear has displaced most foreign fisheries. While the cause for the decline of king crab is not known, most researchers believe that the decline can be attributed to a variety of environmental factors which independently or in combination led to the depressed condition of the resource. Whether the king crab decline is due in part to commercial fishing, either directed or incidental, is unknown.

King crab are known to concentrate in certain areas around Kodiak Island during the year. In the spring they migrate inshore to molt and mate. Approximately 70% of the female red king crab stocks are estimated to congregate in two areas, known as the Alitak/Towers and Marmot Flats. The Chirikof Island and Barnabas areas also possess concentrations of king crab but in lesser amounts. Past studies have shown that most king crab around Kodiak mate and molt in the March-May period, although some molting crab can be found during late-January through mid-June. Adult female king crabs must molt to mate and extrude eggs. After molting, their exoskeleton (shell) is soft, and crabs in this stage are known as soft-shell crabs. The new exoskeletons take 2-3 months to harden fully. During the soft-shell period, the crabs are particularly susceptible to injury and mortality from handling and from encounters with fishing gear. Because many of the present and potential groundfish trawling grounds overlap with the mating grounds of king crab, the potential exists for substantial king crab mortality.

While it is generally assumed that king crab mortality during the soft-shell phase can be high with any gear type, incidental mortality of hard-shell crab as a result of encounters with fishing gear is not known. Trawl fishing could kill or injure king crab in two ways. First, crabs caught in the net can be crushed during the tow or injured as the catch is unloaded in the fishing vessel. Recent observer studies estimate that about 70% of the crabs caught by nonpelagic (or bottom) trawls in the Bering Sea are killed. Second, crabs might be struck with parts of the gear (e.g., trawl doors, towing cables, groundlines, roller gear) as the trawl is towed along the bottom.

On January 1, 1990 time/area closures designed to protect king crab in the vicinity of Kodiak Island expire. This bycatch control measure was developed and implemented by the Council and the Secretary, respectively, in 1986 to provide an environment conducive to the recovery of king crab stocks around the island at a time of developing groundfish bottom trawl fisheries. The time/area closure scheme afforded protection to king crab in some areas during their molting or soft-shell period while in other areas protected crab from bottom trawls year-round. These measures may be necessary to permit the severely depressed king crab stocks to recover in this area. The stocks have experienced little or no recruitment in recent years, and are subject to high mortalities from bottom trawls while in the soft-shell condition. The expiration date was selected to necessitate a review of the status of the crab stocks, and determine whether these measures are effective and should be continued.

6.2.3.1 Alternative 1: Status Quo - Do nothing.

With this option, no specific management measure would be implemented in this plan for the control of king crab bycatch in the nonpelagic trawl groundfish fisheries within the EEZ of the Gulf of Alaska after December 31, 1989. Incidental catches and subsequent mortalities would continue wherever concentrations of king crab occur, and at all times of the year when nonpelagic trawling is conducted. This alternative affords very limited protection to the king crab resource in the EEZ. It is not known whether this would prevent a recovery of the king crab resources. Fewer king crab in the system would be present as a prey species for predators. Known predators include halibut, Pacific cod, and sculpins that feed on juvenile king crab; herring and capelin feed on larval king crab.

Predators also include marine mammals. Interaction between king crab and marine mammals is generally minimal. Exceptions are interactions with sea otters. The sea otter feeds on any size of king crab, including commercial sized crab. The sea otter is also a benthic feeder and regularly dive to 30 fathoms in search of food and have been recorded at depths as great as 50 fathoms. No documentation exists on the importance of king crab in the sea otter diet and sea otter mortality resulting from interactions with the crab fisheries is believed to be rare.

Also under this alternative, fewer king crab would be in the system to feed on other marine life. King crab are bottom foragers, feeding on a wide range of food items, including dead organisms. Crab larvae feed on sponges, hydroids, and algae during the transition to their demersal mode of life. Brittle stars are an important food item for newly molted king crab. King crab also feed on mollusks, polychaete worms, isopods, young Tanner crab, starfish, and sea urchins. With fewer king crab, more of these organisms would be available for consumption by other organisms.

With the status quo, commercial fishing for groundfish would be conducted in the areas proposed to be closed seasonally or year-round by Alternatives 2 and 3. More groundfish will thus be removed from those areas, relative to Alternatives 2 and 3. Therefore, the long-term predator/prey relationships that exist in local areas which have adjusted to the low abundance of king crab and current level of groundfish fishing would not be expected to change. The overall environmental impacts of this alternative compared with Alternatives 2 and 3 are not well understood but are believed to be insignificant. The Gulf of Alaska ecosystem is so complex that the environmental impacts as a result of this amendment are undetectable given the background variability of the system.

6.2.3.2 Alternative 2: Extend existing time/area closure measures for another three years.

Adoption of this alternative would provide the positive benefits of protecting the majority (85%) of Kodiak Island king crab resource from nonpelagic trawls during their soft-shell period (February 15-June 15), protect the most concentrated king crab areas (Alitak Flats and Towers), or 70% of the existing resource year-round, while still providing nonpelagic trawl fishing opportunities close to established processing and support facilities (Dana Schmidt, ADF&G, personal communication). Injury or mortality as a result of nonpelagic trawling would be reduced.

Compared to the status quo alternative, Alternative 2 would increase the probability of a king crab population recovery. A review of 1985 nonpelagic trawl groundfish harvests indicate that only 1% of the

harvest would have been lost if the time/area closures had been in effect during that year. It is likely that the foregone groundfish catch consisting of sablefish, Pacific cod, and flounder would have been taken from other areas around Kodiak Island. Therefore, the impacts of this alternative on groundfish stocks is insignificant.

As king crab stocks recover more king crab will enter the ecosystem. The predator/prey relationship in the closed or restricted areas would change. More king crab would consume prey species that otherwise may have been consumed by other species. In turn, more king crab will be available to be preyed on by other predators, including marine mammals. Local fishing mortality would be reduced as groundfish fishing is closed or restricted.

Fewer or no groundfish would thus be removed from the system, which would then contribute to the current food web in these areas. The balanced predator/prey relationships that has adjusted to the low abundance of king crab and current level of groundfish fishing would change. The overall environmental impacts of this alternative compared with the status quo alternative are not well understood but are believed to be insignificant compared to natural perturbations in the environment.

This alternative would also afford protection to 75% of the known Tanner crab stocks in the Kodiak vicinity. This resource is also depressed, and only limited fisheries have been allowed. To the degree that time/area closures benefit Tanner crab, a more rapid rebuilding of this valuable resource might occur.

6.2.3.3 Alternative 3 (Preferred): Implement a modified time/area closure scheme for bottom trawling for three years.

Adoption of this alternative would have all the conservation benefits as described for Alternative 2 with the addition that following evidence of significant recruitment, juvenile king crab would be protected in areas which have been noted as important rearing areas or migratory pathways. Similarly, this alternative would increase the probability of a king crab population recovery.

6.2.4 Socioeconomic Impacts

The alternatives to the status quo will affect those who harvest and process groundfish and other species including king crab.

If areas in which bottom trawlers would normally fish are closed, fishermen would have to alter their fishing patterns. If we assume that the unconstrained distribution of effort is optimal for the bottom trawlers, they would face a potential decrease in profits as the result of not being able to fish in the most preferred areas. The closure of preferred fishing areas will decrease profits if cost per unit of catch is higher in the areas that remain open and/or if the catch that is foregone in the closed areas is not completely offset by increased catch in other areas.

The largest reduction would occur if none of the catch that would have been taken in the closed areas can be taken elsewhere. In this case gross exvessel revenue would be reduced by an amount equal to that which would have been earned in the closed areas. However, profits would decrease by less than this because the cost of harvesting groundfish in the closed areas would also be foregone. There is not

sufficient harvesting cost information to estimate to what extent the reduction in gross exvessel earnings would overstate the reduction in profits in this extreme case.

If the Types I and II closures had been in effect in 1985, the last year uncontrolled bottom trawling was allowed around Kodiak Island, and if the catch from these areas could not have been made up elsewhere, approximately $17,000 of gross exvessel earnings would have been foregone (Table 6.1).

In 1988 domestic groundfish catch and exvessel value in the Central Regulatory Area were 880% and 1,464% greater than in 1985. If the catch and value in the Type I and Type II areas had increased at these rates, the foregone catch and value would be 666 mt and $263,000.

Had the Type III closures been in effect during 1988 and had bottom trawl fishermen been unable to make up the catch from these areas, the additional foregone catch and value would have been approximately 2,200 mt and $692,000 (Table 6.2).

The catch figures used to estimate the potential reductions in catch and value are based on catch data by Alaska Department of Fish and Game Statistical Area. Because the proposed closures include only part of some statistical areas, and because catch is often not accurately reported by statistical area, the estimates of catch in the proposed closures may be very rough approximations of the actual catch.

As noted above, the potential foregone catch and value assuming no redirection of fishing effort to the areas that remain open are upper bounds on the adverse effects of the proposed closures. At the other extreme, all the catch would be made up in other areas without increasing fishing costs and the closures, therefore, would have no adverse effects on the bottom trawl fisheries. It is not known where the actual effects would be within this range.

It is even more difficult to determine the probable benefits of the proposed closures. The closures will tend to provide protection for king and Tanner crab stocks; however, it is not known how the probability or timing of recoveries by these stocks would be affected by these closures. The benefits of the closures would be minimal if the probability of recovery is very low whether or not the closures are implemented or if a similar recovery would occur regardless of the closures. Conversely, the benefits would be substantial if a full recovery of the stocks would only be prevented by the absence of the proposed closures. The factors affecting the potential for stock recoveries are not sufficiently well understood to determine which case is more likely. The types of information needed to make more specific statements concerning the expected benefits of the closures include the following:

(1) The bycatch rate of king and Tanner crab in the bottom trawl fishery by area and season.

(2) The percent mortality of that bycatch as it is returned to the sea by area and season.

(3) The natural mortality and growth rates, migration patterns, reproductive potential of these "saved" crab.

(4) The natural mortality (including susceptibility to predation), growth rates, migration patterns, and recruitment of these offspring.

Table 6.1 1985 weight and value of groundfish harvested in proposed Type I and Type II trawl closures in the vicinity of Kodiak Island.

Species	Quantity (mt)	Value ($)
Sablefish	2	$1,460
Pacific Cod	27	7,799
Rock Sole	39	7,568
		$16,827

Catch figures in the area were provided by ADF&G and prices used were 1985 annual average trawl prices in the Central Gulf of Alaska as reported in the May 12, 1986 PacFIN report.

Table 6.2 1988 weight and value of groundfish harvested in proposed Type III bottom trawl closures in the vicinity of Kodiak Island.

Species	Quantity (mt)	Value ($)
Pollock	416	71,000
Pacific Cod	1,341	438,000
Flatfish	224	63,000
Rockfish	192	111,000
Other	27	9,000
		$692,000

Catch figures in the area were provided by ADF&G and prices used were 1988 annual average trawl prices in the Central Gulf of Alaska as reported in the February 10, 1989 PacFIN report. The PacFIN prices do not include the value added by at-sea processing. It was assumed that among the Type III areas, only those of Marmot Flats would be closed all year.

We are unable to estimate any of these four items with any precision, but can only infer that protection of some stocks of younger crab will eventually lead to additional recruitment.

A historical perspective implies that there are significant benefits should the red king crab stocks recover to past levels of abundance. During the last five years that the fishery was open in the Kodiak region (1978-1983), annual catch averaged about 16 million pounds which at $4/lb. (exvessel) was worth $64 million. The extent to which the proposed closures would have a positive effect on that recovery cannot be ascertained given our current knowledge of crab biology.

6.2.4.1 Reporting Costs

The proposed alternatives to the status quo would not increase the reporting burden on fishermen or processors. The closed areas will be enforced using at-sea enforcement, not by catch reporting. Therefore, relative to the status quo, the proposed time/area closures should not change the reporting costs of any participant in the fishery.

6.2.4.2 Administrative, Enforcement, and Information Costs and Benefits

The proposed alternatives close areas to bottom trawling year-round or during part of the year. In response to this change, enforcement officials can do one of two things: (1) obtain an increase in funding to maintain the status quo enforcement capability by increasing surveillance flights and cruises, or (2) reallocate enforcement activity from other areas and thus, decrease the enforcement capabilities elsewhere.

6.2.4.3 Impacts on Consumers

The potential decrease in trawl catches is such a small percentage of the Alaska total that consumer prices should not be affected by the closures. If the closures contributed to the return of healthy red king crab and Tanner crab stocks around Kodiak, there would be benefits to consumers who purchase these crab, the benefits would be in terms of lower prices and/or increased availability.

6.2.4.4 Redistribution of Costs and Benefits

The costs of the proposed time and area closures are borne by the harvesters and processors of bottom trawl caught groundfish. There may also be increased enforcement costs from the adoption of this regulation. The benefits will accrue to those who harvest, process, market, and consume king or Tanner crab.

6.2.4.5 Benefit-Cost Conclusion

There will be costs to the bottom trawl fisheries in terms of increased operating costs or lower catches if current effort patterns are optimal. The benefits associated with the time/area closures depend upon the level of bycatch of prohibited species associated with the redistributed effort. Benefits also depend on the ability of the red king crab and Tanner crab stocks to recover given the protection afforded by the closures. The magnitudes of the potential costs and benefits are only known within large ranges.

The closures would be in effect for three years only and will be reevaluated at the end of that period. If, at that time, the Council takes no further action with regard to the problem of king crab bycatch by nonpelagic trawlers in the vicinity of Kodiak Island the provisions of Alternative 2 or 3 will expire at the end of 1992. The benefits and costs of the closures that were established for 1987 through 1989 are difficult to evaluate. Although there are no clear signs for improved recruitment, such improvements may not be measurable for several years.

6.3 Amend the Halibut PSC Framework for the Gulf of Alaska

6.3.1 Description of and Need for the Action

The incidental catch of halibut is a major bycatch management issue in the Gulf of Alaska. Halibut are distributed throughout the Gulf of Alaska and are taken as bycatch by all gear groups. In 1985 the Council adopted Amendment 14 to the Gulf of Alaska Groundfish Fishery Management Plan which included a halibut bycatch management regime.

The amendment established the halibut PSC framework, which defined the process through which the NMFS Regional Director (RD), in consultation with the Council, could manage halibut bycatch. Specifically, the framework allowed the RD to annually determine:

(1) The areas for which PSC limits would be established.

(2) The number of PSC limits per area and fishery.

(3) The level of each PSC limit.

(4) Whether PSC limits will be allocated to individual operations.

(5) The method of allocation to be used.

(6) The types of gear or modes of operations to be prohibited once a PSC limit is taken.

The regulations that implemented the PSC framework resulted in significantly less flexibility. Specifically, the regulations do not provide for the annual determinations of items (2), (4), (5), or (6).

The omission of item (2) from the regulations means that the halibut PSC framework cannot be used to establish separate PSC limits for distinct DAP fisheries. The problem this creates is that one fishery can close another or, in the extreme case, prevent another fishery from occurring.

The omission of items (4) and (5) from the regulations greatly diminishes the ability to reduce halibut bycatch at the lowest possible cost and, perhaps, in the most equitable manner. For example, the possibility of allowing vessels with observers to fish against a PSC limit reserve is precluded unless the regulations are amended.

Although item (6) is not specifically omitted from the regulations, the current regulatory provisions state that only fishing with trawl gear other than off-bottom gear will be prohibited once a PSC limit is reached. This results in two problems: (1) an equity problem, in that one fishery may close another fishery without being closed itself; and (2) a bycatch control problem, in that not all fisheries close upon attainment of the PSC limit, thereby allowing the PSC limit to be exceeded by those fisheries which are allowed to continue. The magnitude of each problem has grown with the expansion of the longline sablefish fishery. The future development of the longline fishery for Pacific cod will further add to these problems.

The Council currently manages the incidental catch of halibut in the Gulf by annually determining a halibut PSC mortality limit. Since 1985 the Council has usually set the PSC limit at 2,000 mt. The Council manages fisheries which catch halibut incidentally by setting TACs at levels which account for the fishery's halibut bycatch mortality rates and the overall halibut PSC limit. As a result, the TAC for some fisheries, notably Pacific cod and flatfish, are constrained below ABC for the purpose of halibut bycatch management. However, to date this has probably not reduced DAP catch.

The Council's Bycatch Committee has identified two additional problems: (1) the difficulty of monitoring the PSC limits without at-sea observers; and (2) the waste associated with discarding halibut taken as bycatch.

The Bycatch Committee has recommended that the Council consider the following measures in response to the aforementioned problems:

(1) Maintain the status quo.

(2) Set the groundfish TACs independent of halibut bycatch considerations.

(3) Permit the use of pot gear which will fish with little or no halibut bycatch.

(4) Set separate halibut PSC limits for trawl and longline fisheries.

(5) Apportion the longline PSC limit by area.

(6) Apportion the trawl PSC limit by fishery.

(7) Have a reserve for each PSC limit which would be used by vessels with at-sea observers and adequately low bycatch rates once the initial portion of the PSC limit is reached.

(8) Permit limited retention of halibut bycatch in the longline fisheries.

These measures are not intended to be mutually exclusive alternatives, i.e. the Council may select a combination of these measures as its preferred alternative. Additionally, some of them may be implemented without amending the FMP or its implementing regulations.

6.3.2 Description of the Alternatives

6.3.2.1 Alternative 1: Maintain the status quo.

Under this alternative, the following will continue:

(1) The existing halibut PSC framework can be used by the Council and RD to annually establish separate DAP and JVP PSC limits and to apportion the limits among regulatory areas and districts.

(2) Pot gear is only prohibited in the sablefish fishery, but the type of pots permitted in other groundfish fisheries may not necessarily minimize bycatch.

(3) Halibut bycatch must be discarded.

Therefore, the following measures recommended by the Bycatch Committee can be implemented under the status quo and will not be evaluated in this document:

(1) Set TACs independently of halibut bycatch considerations.

(2) Apportion a PSC limit by area.

Note that although the Council and RD may set TACs independently of halibut PSC limits and apportion PSC limits by area, they have not chosen to do so.

The Council determined that the status quo situation is unacceptable because when the 2,000 mt halibut PSC cap is attained, only trawl fisheries are closed by the Regional Director, leaving pot and longline fisheries open to continue fishing. The Council determined that this inequity needs to be addressed and that other halibut bycatch management options be considered.

6.3.2.2 Alternative 2 (Preferred): More fully implement the existing halibut PSC framework and/or permit limited retention of halibut bycatch. The Council chose two measures from the options listed below, one of which will be implemented by regulatory amendment and is not part of this amendment package. The Council chose to approve for FMP amendment setting halibut PSC limits for trawl and fixed gear groups.

Five of the measures recommended by the Bycatch Committee cannot be implemented without an FMP or regulatory amendment. Alternative 2 is an unspecified combination of measures similar to those defined by the Bycatch Committee. These measures are as follows:

(1) Permit the use of pot gear that minimizes halibut bycatch.

(2) Set separate halibut PSC limits for each major gear group, e.g. longline, pot, and trawl fisheries.

(3) Apportion the PSC limit of each gear type by target fishery.

(4) Have a reserve for each PSC limit which would be used by vessels with at-sea observers and adequately low bycatch rates once the initial portion of the PSC limit is reached.

(5) Permit limited retention of halibut bycatch in the longline fisheries.

As previously stated these measures are not mutually exclusive, and a single bycatch control program can be constructed by combining measures. Each of these measures is more fully defined and evaluated in comparison to the status quo in the following section. Two options are considered for the second measure and four are considered for the fourth measure.

The Council chose to implement a measure that will permit the use of pot gear in Gulf groundfish fisheries (except for sablefish) only if equipped so that halibut bycatch is minimized. Since this measure can be implemented by regulatory amendment, it, therefore, is not part of this FMP amendment document.

The Council also chose to approve a specific FMP amendment to set halibut bycatch mortality limits at 2,000 mt for trawl fisheries and 750 mt for fixed gear fisheries for the 1990 fishing year only. The Council approved suspending the existing PSC framework in the FMP (Section 4.2.3) for the period January 1 through December 31, 1990, and reinstituting the PSC framework commencing January 1, 1991. Thus, the 2,000 mt trawl gear and 750 mt fixed gear bycatch limits will sunset on December 31, 1990. The Regional Office will prepare a regulatory amendment prior to 1991 that will more fully implement the halibut PSC framework to allow halibut PSC specification by gear type commencing with the 1991 fishing year.

The Council rejected further consideration of items 3, 4, and 5 above, but indicated these management options should be reevaluated during the 1990 amendment cycle.

6.3.3 Analysis of the Alternatives

6.3.3.1 Background Information

Halibut taken as bycatch in the trawl fisheries are primarily juveniles, aged 3 to 7 years old. These fish are smaller than those caught by the directed fishery. The subsequent effect of bycatch is to reduce the recruitment to the exploitable biomass available to the directed fishery. The juvenile fish would normally experience growth in weight per individual and also a loss in the total number of fish due to natural mortality. The International Pacific Halibut Commission (IPHC) estimates that the combined effect of these two factors results in yield lost by the directed fishery of 1.58 times the amount of bycatch mortality. There are currently insufficient data to accurately estimate the size composition of halibut taken as bycatch in the domestic longline fisheries.

Based on this bycatch weight to adult equivalent weight adjustment factor, the IPHC has adopted the policy of reducing quotas in the commercial halibut fisheries by about 2,600 lbs for each metric ton of estimated halibut bycatch mortality in the groundfish fisheries. This amount is the product of one mt of bycatch mortality in pounds round weight, the round weight to dressed weight conversion factor, and 1.58, (2,205 lbs X 0.75 X 1.58 = 2,613 lbs). Although the IPHC has used the 1.58 factor in recent years, it is currently under review. A new value or set of values that are dependent on the size of halibut taken as bycatch is expected to be presented by the IPHC later this year.

Due to this policy, estimated bycatch mortality results in a readily identifiable and immediate effect on the halibut fishery. If the IPHC adjustment policy accurately accounts for the effects of bycatch on the halibut resources, there is no long-term effect on the stocks. The IPHC is currently evaluating its adjustment policy. However, until the policy has changed, it is appropriate to assume that, to the extent that bycatch is correctly estimated, bycatch primarily affects quotas for the commercial halibut fisheries, not halibut stocks.

The effect of halibut bycatch in the Gulf of Alaska must be considered in a wider context than is the case for crab. The juvenile halibut most vulnerable to bycatch are highly migratory and undergo migrations from

the Gulf of Alaska (and the Bering Sea) to British Columbia and Washington-Oregon-California. Nearly all exploitable halibut in British Columbia migrated through Alaskan waters. High bycatch can severely reduce the harvest in Canadian and Washington-Oregon-California waters. The actual yield loss to the British Columbia halibut fishery depends on the migration rate, which is currently under investigation by the IPHC.

Since 1985 the Council has usually adopted an annual goal for halibut mortality of 2,000 mt. This amount was based on a then-recent five-year average of bycatch mortality in the Gulf of Alaska (1,800 mt) and also allowed for some growth in DAP fisheries and their resulting bycatch needs.

DAP longline fisheries were developing when the PSC framework was added to the plan and the bycatch associated with these fisheries was believed minimal. However, longline fisheries for Pacific cod and sablefish are now only prosecuted by DAP, and limited observer data and anecdotal information suggests halibut bycatch in these fisheries has increased. Consequently, past levels of longline fishery bycatch mortality are not useful in determining a longline PSC limit.

In their recommendations for PSC limits for specific fisheries, the Bycatch Committee recommended that the PSC limits reflect 2,000 mt of mortality in trawl fisheries and 750 mt of mortality in longline fisheries. The recommended mortality limit for the trawl fishery is a continuation of the mortality goal adopted by the Council since 1985. To determine a longline PSC mortality limit recommendation, the Bycatch Committee assumed the longline fleet could potentially take 75,000 mt of cod in the Gulf, but recognized the industry is still a few years away from this level of harvest. The Committee then apportioned the assumed harvest by area, based on information from the 1987 Resource Assessment Document, and applied the current bycatch and mortality rates used by the Team against each area to determine total mortality:

Area	Pacific cod TAC	Bycatch Rate	Total Bycatch	Mortality Rate	Total Mortality
Eastern Gulf	5,000 mt	9.15%	458 mt	25%	114 mt
Central Gulf	55,000 mt	9.15%	5,033 mt	25%	1,258 mt
Western Gulf	15,000 mt	5.23%	785 mt	25%	196 mt
TOTAL	75,000 mt		6,276 mt		1,568 mt

The Bycatch Committee chose to recommend a longline PSC mortality limit of approximately one-half the 1,568 mt, or 750 mt. The Committee recognized that this represented an increase in the overall PSC limit from what has been experienced during the past few years and a direct reallocation of halibut from retained harvest by the directed longline fishery to discards by other longline fisheries.

Halibut bycatch mortality rates used in the analyses of the alternatives were 25% for longline fisheries and 50% for all trawl fisheries. Although trawl catcher/processors may exhibit rates higher than shorebased vessels, fishing effort by catcher/processors in the Gulf is low, thereby allowing the use of a 50% mortality rate for all trawl operations in the Gulf of Alaska.

The current management regime which results in fishermen racing each other to harvest fish increases the cost to fishermen of taking actions to reduce bycatch mortality. This problem can in part be offset by bycatch management measures that provide individual operations an incentive to control bycatch. Allowing vessels that have demonstrated lower than expected bycatch rates to continue to fish after a fishery has been closed to other vessels is an example of such a measure. However, it may be difficult to offset all the adverse effects on bycatch of the race for fish.

Each of the measures that the Bycatch Committee has recommended to the Council for consideration is evaluated in terms of its ability to resolve problems associated with the status quo. The problems associated with the existing halibut bycatch management regime are summarized below.

(1) It is not equitable. One fishery can close another and those who make an effort to reduce bycatch are not treated differently than those who do not.

(2) It is not effective. It does not prevent the desired level of bycatch from being exceeded.

(3) It is not efficient. It results in unnecessary costs, including those associated with both discard waste and an arbitrary distribution of the effort among the fisheries to reduce bycatch rates.

(4) Its implementation has been limited by the absence of adequate monitoring capabilities. Bycatch is difficult to monitor with only very limited observer coverage of the DAP fisheries.

(5) It has not equitably distributed the cost to the groundfish fisheries of reducing bycatch rates.

(6) It has not provided reliable estimates of the actual levels of bycatch and bycatch mortality.

6.3.3.2 Prohibit the use of pot gear that does not minimize halibut bycatch (Preferred, to be implemented by regulatory amendment).

The Council approved this management measure and recommended it be implemented by regulatory amendment. Thus, it is not an approved FMP amendment.

Currently regulations allow pot gear for the harvest of groundfish other than sablefish. Although it has been suggested that pot gear can be modified so that it results in little or no halibut bycatch, fishermen are not currently required to make such modifications. A regulatory amendment is required to prohibit the use of pots that do not minimize halibut bycatch.

As with all DAP fisheries, very limited information is available concerning expected halibut bycatch rates in the pot groundfish fishery. However, data from a small sample indicate that crab pots fitted with both cod triggers to prevent cod from escaping from a pot and devices to inhibit halibut from entering a pot, can result in very low bycatch rates.

ADF&G had observers on four trips out of Kodiak in which such gear was used. During these trips, there were 58 sets, 36.4 mt of groundfish were retained and landed, and 44 halibut with a total weight of 135 kg

were taken as bycatch. The bycatch rate was 0.37%. It is not known what the bycatch rate would have been without the device to inhibit the entry of halibut or what it would have been if pots designed specifically for groundfish had been used. And it is not known whether such low bycatch rates would be expected for a year-round and Gulfwide fishery.

The importance of reducing halibut bycatch rates in pot groundfish fisheries is expected to increase as these fisheries expand. In 1988, about 2,000 mt of groundfish catch was reported for pot gear in the Gulf of Alaska (EEZ and State waters). About 1,400 or 70% of the catch was Pacific cod. Most of the remainder was sablefish taken in State waters. Although dramatic growth may occur in this fishery due to the availability of underutilized cod resources, it is difficult to project the rate of growth of this fishery and the savings in halibut bycatch that would occur if high bycatch pots are prohibited.

A regulation that restricts the type of pot gear that can be used can result in a variety of costs being imposed. There is the cost of modifying gear or replacing gear if existing pots cannot be modified to meet the new regulation. These costs can be reduced by allowing fishermen to replace existing gear over time as it wears out or is lost; however, for fishermen who use the same pots in other fisheries, the phase in is of less benefit. Pots designed to reduce bycatch may be more expensive to make or purchase and maintain. The use of such pots may affect harvesting efficiency. If the new gear is more efficient, the other costs associated with using it will be at least partially offset. As with most any gear regulation, there will be enforcement costs.

Insufficient information is available at this time to accurately predict the benefits and costs of such a regulation. If reasonable estimates of the differences in bycatch rates, operating efficiency, and pot prices were available, much of the uncertainty concerning the merits of such a gear restriction could be eliminated.

6.3.3.3 Set separate halibut PSC limits for each major gear group (e.g., longline, pot, and trawl) (Preferred).

A regulatory amendment to more fully implement the current FMP would provide the Council and RD with the authority to annually establish separate halibut PSC limits for each major gear group. Such authority would eliminate the current situation in which bycatch in the longline and trawl fisheries counts against the PSC limit which triggers a closure of only the on-bottom trawl fisheries. This situation is inequitable and it also prevents control over bycatch in the longline fisheries. The expected growth of the longline fisheries increases the severity of both problems. The Council also could amend the FMP and specify halibut PSC limits by gear group. Either option would enhance the Council's ability to minimize the problems stated above.

The Bycatch Committee has stated that the Pacific cod longline fishery could potentially harvest 75,000 mt of cod, resulting in approximately 1,600 mt of halibut discard mortality. If these projections are correct, the lack of a separate longline fishery PSC limit that would close the longline fisheries once it is taken could have a range of adverse effects on the trawl fisheries and on total halibut bycatch.

Under the status quo, in terms of bycatch mortality, the upper limit would occur if the cod longline fishery occurs after the trawl fishery has taken the overall bycatch mortality limit, which in recent years has usually been set at 2,000 mt. This would result in bycatch mortality exceeding the 2,000 mt limit by 1,600 mt. This could decrease catch in the halibut fishery by almost 4.2 million pounds (1,600 mt x 2,205 x 0.75 x 1.58; the

factors of 0.75 and 1.58 are to convert from round weight to dressed weight and from bycatch weight to an adult equivalent weight; the values of both factors were provided by the IPHC). Using the 1988 coastwide average halibut exvessel price of $1.23 per pound, the associated reduction in gross exvessel value in the halibut fishery would be about $5.1 million.

The other extreme would occur if the cod longline fishery occurs before the bottom trawl fishery. Under the status quo, this would result in 1,600 mt of the limit being taken prior to the trawl fishery and the on-bottom trawl fishery being closed after taking only 400 mt of bycatch assuming the PSC limit remains at 2,000 mt. This could decrease the catch and exvessel value of the on-bottom trawl fishery. If the Plan Team's estimates of the bottom trawl halibut bycatch rate (4.5%) and the trawl discard mortality rate (50%) are used to calculate the reductions, the 1,600 mt reduction in the amount of halibut bycatch mortality that could be taken in the bottom trawl fishery would reduce groundfish catch by 71,100 mt (1,600 mt of halibut bycatch mortality/(0.5 x 0.045)). The associated reduction in gross exvessel value would depend on the catch composition. The reduction could be about $12 million if the catch included primarily pollock priced at $0.074 per pound round weight or about $23 million if it included mostly Pacific cod priced at $0.148 round weight. If the dominance of pollock in the Gulf is reflected in the catch composition, the reduction would be toward the lower end of this range.

The estimates of the changes in exvessel value presented in this report are not adjusted for changes in exvessel prices associated with changes in landings. This introduces an upward bias in the estimates. The size of the bias depends on how responsive exvessel prices are to changes in landings. There is no bias if prices are not at all responsive. However if prices are sufficiently responsive, a decrease in landings will actually increase exvessel value. Halibut and most groundfish prices are probably not this responsive. It is not known how this bias affects the estimated tradeoffs between the halibut and groundfish fisheries.

6.3.3.3.1 Bycatch Committee options.

The Bycatch Committee presented two options for establishing separate longline and trawl fishery PSC limits. They are: (1) allow separate PSC limits to be annually determined within the PSC framework, and (2) establish fixed PSC bycatch mortality limits of 750 mt and 2,000 mt, respectively for the longline and trawl fisheries. These two options are evaluated below.

6.3.3.3.1.1 Framework PSC limits by gear group (This suboption was not adopted).

The option of allowing the Council and RD to annually determine the PSC limits by major gear group within the PSC framework permits a rapid and efficient response to changes in the conditions that determine the appropriate PSC limits. These conditions include halibut bycatch and discard mortality rates, the bycatch weight to adult equivalent weight adjustment factor, the demand for Gulf of Alaska groundfish, the cost to each fishery of reducing its bycatch rate, and the condition of the halibut resource. The authority to allocate specific PSC limits to gear type is included in the current FMP but is not included in the existing regulations; therefore a regulatory amendment can be used to implement this part of the plan. The Council intends to utilize the PSC framework to set halibut PSC limits by gear group commencing with the 1991 fishing year. However, the Council rejected this suboption for this current amendment.

The probability that many of these factors will change significantly during the next several years is very high. The estimates of bycatch rates and discard mortality rates are subject to change for the following reasons. Current estimates are based on data from the foreign and joint venture fisheries or on relatively small samples from the domestic fisheries. The fisheries are now exclusively domestic. The rates may be quite different for the domestic fisheries because the domestic fisheries are not identical to the fisheries they replaced and relatively small differences in fishing operations can result in large changes in bycatch and discard mortality rates. For example, there is insufficient observer data for the domestic longline fisheries to accurately estimate bycatch rates. The data that are available indicate that the rates may be substantially higher than those currently being used to estimate bycatch in these fisheries. The IPHC has provided funding for expanded observer coverage of the longline fisheries and as more data become available from at-sea observer programs, different estimates will probably emerge. NMFS and industry are providing funding of additional observer coverage of all sectors of the fleet in 1989.

The bycatch weight to adult equivalent weight adjustment factor is a critical variable in estimating the effect of bycatch on the halibut fishery and, therefore, in determining the appropriate level of bycatch. The IPHC has used a factor of 1.58 in recent years. However, this value is currently under review by the IPHC. A new value or a set of values that are dependent on the size of halibut taken as bycatch is expected to be presented by the IPHC later this year. If size-dependent factors are used, the average factor will be subject to periodic change as changes occur in the size distribution of the halibut resource and the nature of the domestic fisheries.

The demand for Gulf of Alaska groundfish by the domestic fisheries has increased rapidly in the last few years, resulting in the complete displacement of foreign and joint venture fisheries in 1988. Additional changes will occur as the domestic fisheries continue to expand, but the nature of those changes is not known. The potential rate of increase in the demand for flounder by the trawl fishery or for Pacific cod by the longline and pot fisheries is unknown.

Neither the groundfish fisheries nor the techniques to reduce bycatch rates are fully developed. Therefore, the costs of reducing bycatch mortality rates are expected to change.

The halibut resources are also in a period of transition. After a long recovery and typically annual increases in halibut catch, the IPHC has established 1989 quotas below those of 1988 and further reductions are expected over the next few years as the result of declining recruitment. However, the magnitude and direction of expected changes are speculative as are the resulting changes in the appropriate PSC limits. Halibut bycatch in the trawl fisheries is mainly made up of juveniles, while the directed fishery is limited to adults. No good estimates of juvenile abundance are currently available. Therefore, basing changes in halibut bycatch on adult halibut fluctuations may be misleading.

The benefit of a mechanism that permits rapid and efficient changes in PSC limits increases as the probability increases that the appropriate limits will change. The cost of not being able to rapidly change a PSC limit that has become outdated can be high. If a plan amendment is required to change a limit, only partial year changes via emergency orders are possible in less than a years time. The information concerning the demand for groundfish and other factors determining the appropriate PSC limits is often not available until just prior to the beginning of a fishing year when the Council and RD are establishing ABCs, TACs, and their apportionments. Therefore, this is an appropriate time to consider PSC limits.

The disadvantage of such flexibility is that there is less regulatory stability. That is, something that is easy to change may be changed more often and there are costs associated with making any change. However, since the implementation of the halibut PSC framework in 1985, the Council has not demonstrated a propensity to overuse this flexibility.

6.3.3.3.1.2 Fixed trawl and fixed gear PSC limits (Preferred).

The Bycatch Committee's second option with respect to separate PSC limits for the trawl and fixed gear fisheries is to establish fixed limits of 2,000 mt and 750 mt, respectively, which could only be changed with an FMP amendment. An FMP amendment would be required to establish these fixed PSC limits. The Council chose this option as an FMP amendment, but the measure would only be in effect for the period January 1, 1990 through December 31, 1990. The existing halibut PSC framework will be suspended for the 1990 fishing year and reinstituted commencing on January 1, 1991.

The 2,000 mt limit for the trawl fisheries is equal to the all-gear halibut bycatch mortality goal established for the 1986, 1988, and 1989 groundfish fisheries. In 1987 the goal was set at 1,340 mt based on the expected bycatch demand that year. It is estimated that on average, the trawl fisheries have taken about 75% of the overall limit. The 750 mt fixed gear PSC limit would be approximately half of the halibut bycatch mortality that would occur in a 75,000 mt Pacific cod longline fishery with a bycatch rate and a discard mortality rate equal to those currently being used by the Plan Team.

The relative merits of frameworked PSC limits and fixed limits were discussed above. The merits or implications of the specific limits will now be considered using some simple numerical examples.

If the bycatch rate and discard mortality rate in the bottom trawl fishery are 4.5% and 50%, respectively, as estimated by the plan team, each one mt increase in the bottom trawl PSC halibut mortality limit allows a 44.4 mt increase in groundfish catch.

This is because with 50% discard mortality, the rate of bycatch mortality is half the rate of bycatch or 2.25% (0.5 x 4.5%) so there are 0.0225 mt of halibut killed for each metric ton of groundfish taken or equivalently 44.4 mt (1/0.0225) of groundfish harvested for each metric ton of halibut bycatch mortality.

If the bottom trawl fishery cannot reduce its bycatch mortality rate (i.e., bycatch rate x discard mortality rate), a 2,000 mt halibut bycatch mortality limit would limit bottom trawl groundfish catch to about 89,000 mt. It also means that if bottom trawl catch is constrained by this limit, each one mt increase in the limit would permit a $7,250 to a $14,500 increase in gross exvessel value in the fishery for exvessel prices ranging from $0.074 per pound round weight for pollock to $0.148 for Pacific cod. Such increases in catch and value in the bottom trawl fishery are at the expense of 2,600 lbs of halibut catch (2,205 x 1.58 x 0.75) with an exvessel value of $3,200 (2,600 lbs x $1.23/lb).

In this comparison, the assumption that the bycatch rate is fixed and cannot be reduced is critical. If the bottom trawl fishery can reduce its bycatch rate by changing its fishing techniques, the value of a one mt increase in the halibut PSC limit to the bottom trawl fishery is equal to whichever is lower, the cost of reducing bycatch mortality by one mt or the value of 44.4 mt of groundfish. The former can result from

using less productive or more costly fishing techniques and the information required to estimate this cost is typically not available to fishery managers. Therefore, it is difficult to determine the extent to which the estimated tradeoff between $3,200 in halibut fishery exvessel value and $7,250 to $14,500 in bottom trawl exvessel value overstates the relative value of halibut to the bottom trawl fishery.

Similar comparisons can be made for the sablefish and Pacific cod longline fisheries. The plan team estimates of halibut bycatch rates in the sablefish and Pacific cod longline fisheries, respectively, are 1.2% and 5.23% to 9.15% depending on the area. The discard mortality rate used by the plan team is 25% in all longline fisheries. This means that the tradeoffs are 333 mt of sablefish or 43.7 to 76.5 mt of Pacific cod per metric ton of halibut mortality. With longline sablefish and Pacific cod prices of $0.979 and $0.214 per pound round weight, respectively, the tradeoffs in terms of gross exvessel value are $719,000 of sablefish or $20,600 to $36,100 of Pacific cod for $3,200 of halibut.

The bycatch Committee suggested that the longline cod fishery can decrease its bycatch rate by 50%. If it is not quite able to do so, the increases in groundfish catch and exvessel value for each one mt increase in the PSC limit above 750 mt would be almost twice that estimated above. For the reason stated above in the bottom trawl example, these estimates may substantially overstate the relative value of halibut to the groundfish fisheries.

For the stated bycatch rates, discard mortality rates, and exvessel prices, the actual value of halibut to a groundfish fishery may range from zero to the values stated above. The low end of the range is valid only if bycatch rates can be reduced at no cost to the groundfish fishery. This is probably not the case. In the absence of a mechanism that will accurately reveal the value of halibut to individual groundfish fisheries, it will be difficult to determine either the actual values within these wide ranges or the appropriate PSC limits.

If the PSC limit for a major gear group constrains the amount of groundfish taken with that gear, the PSC framework is also a framework for allocating groundfish by gear. Conversely, if a fishery can reduce its bycatch rate to a level at which its groundfish catch is not constrained, the PSC framework is a framework for allocating the cost of controlling bycatch.

6.3.3.4 Apportion the PSC limit of each major gear group by target fishery (Not adopted).

A regulatory amendment to more fully implement the halibut PSC framework would provide the Council and the RD with the authority to apportion the PSC limit of each major gear group among target fisheries. This would, for example, allow the Council and RD to establish separate PSC limits for the pollock and flatfish bottom trawl fisheries or for the sablefish and Pacific cod longline fisheries.

In the absence of separate PSC limits, bycatch in one fishery can either close another fishery or, in the extreme case, prevent another fishery from occurring at all. Such a result may be undesirable in terms of equity, the ability of individuals to plan for the year, regional economic stability, or the net value of the groundfish. For example, a low value fishery with a high bycatch rate which occurs early in the year may preclude a high value fishery with a relatively low bycatch rate from occurring late in the year.

If the PSC limit established for a particular target fishery actually constrains the groundfish catch in that fishery, the PSC framework functions as a framework for allocating groundfish catch among fisheries. If

groundfish catch is not constrained because the fishery is able to reduce its bycatch rate sufficiently, the PSC framework allocates the cost of controlling bycatch among target fisheries. The Council and RD will typically not have sufficient information to determine the appropriate allocations for all fisheries. There may be instances in which there is sufficient information to determine that some action is justified.

An additional problem is that there is a limited ability to adequately define distinct fisheries when many fisheries are characterized by multispecies targeting strategies. With the current regulations, a vessel is considered to be targeting on any species which makes up 20% or more of its catch. This means that, in the limit, a vessel could simultaneously be in five target fisheries. This problem can be reduced, but probably not eliminated, by redefining target fisheries. Note that such changes are currently being considered. The fact that many vessels would participate in a variety of target fisheries regardless of how the fisheries are defined, reduces both the equity problem associated with not having separate PSC limits by target fishery and the degree to which separate limits would increase bycatch accountability within each fishery. Any effect on accountability is expected to be small because unless each fleet is very small or very well organized, the accountability of an individual vessel is minimal when fishing with a fleet wide PSC limit.

6.3.3.5 Have a reserve for each PSC limit which would be used by vessels with at-sea observers and adequately low bycatch rates once the initial portion of the limit is reached (Not adopted).

Our limited ability to monitor bycatch in the absence of at-sea observers makes the use of PSC limits less effective and less equitable, and it also makes bycatch a more contentious issue. Because actual bycatch is not known, a fishery may be closed well before or well after the time that the PSC limit would have been reached. Additionally, all operations are forced to stop fishing at the same time, including both those that have made a substantial effort to reduce bycatch rates and those that have taken no efforts to control bycatch.

The Bycatch Committee designed a mechanism for reducing both problems. It consists of a 20% PSC limit reserve which could be used by vessels with observers and sufficiently low bycatch rates. The objective is to provide vessels with an incentive to have observers and to develop techniques that reduce bycatch rates. A regulatory amendment to more fully implement the FMP PSC framework would provide the Council and RD with the authority to implement such a reserve.

The Bycatch Committee presented three options: (1) allow any vessel with an observer to continue to fish until the PSC or TAC is taken ~~or until the weekly bycatch rate of the~~ vessel exceeds the published rate, whichever occurs first; (2) assign equal portions of the reserve to each vessel that would qualify to fish against the reserve once the initial 80% of the limit was taken and allow each vessel to fish against its allotment until its weekly bycatch rate exceeded the published rate or until its allotment was taken, whichever comes first; and (3) allow each vessel that qualifies to fish to do so until 50% of the reserve is taken and then eliminating the vessels that had bycatch rates above the fishery average. With either option, a vessel would qualify by demonstrating that its bycatch rate is below the published rate.

Each of these three options would provide vessels with only a minimal incentive to have observers on board until the initial 80% of a PSC limit is taken. Having limited observer coverage during the initial but major phase of the fisheries may reduce the credibility of the bycatch estimates. These options would result in the very difficult and costly problem of meeting the sudden demand for an unknown number of observers for

an unknown period of time; and the vessels would have the additional expense of returning to port to pick up an observer once the initial 80% is taken.

A fourth option noted by the plan team would be to close a fishery when the product of the published bycatch rate and reported catch equals the PSC limit but allow each vessel that had demonstrated a lower bycatch rate to continue to fish until it has exhausted the bycatch savings it demonstrated while the fishery was open to all vessels. This option provides the greatest accountability or reward for each vessel and as such may rank highest in terms of both being equitable and providing an incentive to have an observer on board and to develop techniques to reduce bycatch rates. Therefore, this option would tend to result in greater observer coverage and increased credibility of bycatch estimates, and be less of a problem in terms of meeting the demand for observers. This option also eliminates the possibility that much of the reserve would go unused if no vessels are able to fish below the published bycatch rates. If this did occur, it might indicate that most vessels were actually fishing above the published rates and that the PSC limit had already been taken.

The fourth option could be expanded to allow for the transferability of the individual bycatch quotas earned by vessels that fished below the published rates. This would: (1) provide an even greater incentive for a vessel to have an observer and reduce its bycatch rate; (2) encourage the most efficient use of the earned quotas; (3) provide information to fishery managers concerning the value of bycatch to specific fisheries; and (4) provide vessels that cannot physically accommodate an observer an opportunity to continue to fish once the fishery is limited to those who have earned or purchased the right to continue to fish. Such vessels would be assumed to continue to fish at the published bycatch rates.

A problem associated with any of these options is that they tend to discriminate against smaller vessels due to their limited physical and financial ability to accommodate an observer. Some vessels cannot physically accommodate an observer, and for those vessels that can, the ability to financially accommodate an observer tends to increase with the catch rate of the vessel. The latter problem is of course eliminated if the vessel is not responsible for any of the costs of an observer.

The discriminatory effect is less with the fourth option because unlike the other three options, it does not decrease the amount of a PSC limit that is available to vessels that cannot or for other reasons do not have observers. The fishery is not closed to such vessels until the full PSC limit is estimated to have been taken based on the published bycatch rates. And this adverse effect is reduced even further with the fourth option if the earned individual bycatch quotas are transferable and vessels without observers are allowed to use such quotas.

The Bycatch Committee was aware of the discrimination problem and suggested that perhaps an "approved data gathering program" could be used in-lieu of observers on small vessels. However, it is not clear what an acceptable alternative would be.

Although each of these options would tend to provide better bycatch information and increased accountability for some vessels, it is not clear that this information could be used to estimate the bycatch of an unobserved vessel. Relatively small differences in fishing techniques can have substantial effects on both bycatch rates and catch rates, bycatch rates can be highly variable from year to year, and it is reasonable to assume that having an observer on board may affect the actions of a vessel. It can be very

misleading to assume that bycatch rates for vessels with observers are similar to those of vessels without observers. However, it may be possible to determine whether fishing techniques differ significantly between observed and unobserved vessels by examining differences in the landed catch and effort. If the differences are not significant, the bycatch rates can be assumed to be similar.

6.3.3.6 Permit limited retention of halibut bycatch in longline fisheries (Not adopted).

Retention of halibut bycatch has been prohibited in order to eliminate the potential incentive to target on halibut, a high priced species in comparison to most groundfish species. The prohibition is an effective but costly method of preventing covert targeting on halibut. The removal of the prohibition on retention for the longline fishery would require an FMP amendment and changes to State of Alaska and IPHC regulations. In this section, there are discussions of: (1) the benefits and costs of prohibiting retention, and (2) the implications of permitting alternative levels of retention.

6.3.3.6.1 Benefits and costs of prohibiting retention.

The cost of prohibiting retention has two components. They are:

(1) The value foregone when dead halibut are discarded rather than retained and sold.

(2) The cost associated with recapturing the discarded halibut that would have survived.

The first component of the cost can be estimated in the following manner. Halibut handling or discard mortality is estimated to be 25% in the longline fisheries; therefore, for every mt of halibut bycatch discarded in these fisheries, 413 lbs net weight of halibut (2,205 x 0.25 x 0.75) is foregone. The foregone exvessel value is $508 if the halibut taken as bycatch can be sold at the same price as halibut taken in the halibut fishery.

Assuming that only halibut that would be of legal size in the halibut fishery could be retained, the cost of discarding dead halibut is dependent on the size composition of the halibut taken as bycatch. For example, if only half of the bycatch by weight was of legal size, the foregone exvessel value per mt of halibut bycatch discard would be $254 rather than $508. In the extreme case, none of the bycatch is of legal size and none would be retained. In this case the legal size limit would be a de facto prohibition on retention.

The second component of the cost of prohibiting retention is more difficult to estimate because it depends on marginal fishing costs in the halibut fishery. Marginal fishing costs are the changes in total fishing costs that occur as fishing effort is increased to capture more halibut in the halibut fishery. For example, marginal costs would include increased fuel, bait, and labor costs. Until better estimates are available, it is assumed that marginal costs are from 25% to 50% of exvessel value. An effort will be made during the public comment period to provide a better basis for estimating the marginal cost. The cost of recapturing the discarded halibut that survive discard mortality can be estimated in the following manner. For every mt of halibut bycatch discard in the longline groundfish fishery, the amount that can be recaptured in the halibut fishery is 1,240 lbs net weight (2,205 x 0.75 x 0.75) which, at 1988 prices, would have an exvessel value of $1,525 and a recapture cost of between $381 and $762.

The total of these two components of the cost of prohibiting retention is, therefore, from $889 to $1,270 per mt of halibut bycatch discard if all of the discarded halibut could have been sold at $1.23 per pound net weight.

These costs can be offset to some degree by the growth forgone if the average size of halibut taken as bycatch is less than that of halibut taken in the halibut fishery. The IPHC has estimated that for the groundfish fishery as a whole, there is a 58% growth potential due to the difference in average sizes. Sufficient data are not available to provide accurate estimates of the size distribution of halibut taken as bycatch in the longline fisheries; however, based on differences in the size specific gear selectivity of groundfish trawl gear and the longline gear used in the DAP sablefish and cod fisheries, the growth potential might be substantially lower than 58% and in some cases may approach 0. If the potential growth is 58%, $885 of exvessel value (2,205 x 0.75 x 0.75 x 0.58 x $1.23) is forgone for each mt of halibut bycatch when retention is permitted. In this case, the estimated cost of prohibiting retention per mt of bycatch is $5 to $385 rather than $889 to $1,271.

In summary, the net effect of the retention prohibition for each mt of halibut bycatch in the longline groundfish fishery is from $5 to $1,270. The actual effect is in the higher end of the range, about $890 to $1,270, if the halibut taken in the halibut and groundfish fisheries are of comparable size, or it is at the lower end of the range if substantially smaller fish are taken as bycatch. However, for the ranges of marginal fishing costs and foregone growth potentials considered, the estimated joint exvessel value of halibut in the halibut and groundfish fisheries was never higher when retention was prohibited.

The plan team's halibut bycatch projection for the 1989 longline fishery is 1,273 mt and if the Pacific cod longline fishery expands to take 75,000 of cod within a few years, halibut bycatch could exceed 6,500 mt in the longline fisheries. The estimated cost of prohibiting retention with bycatch of 1,273 mt ranges from $6,365 to $1.6 million. For 6,500 mt of halibut bycatch, the corresponding range is from $32,500 to $8.3 million.

Other factors concerning the benefits and costs of prohibiting retention cannot be readily quantified. These include the effects of retention on: (1) enforcement costs or capabilities, (2) halibut product quality, and (3) the distribution of benefits between those who longline for halibut and those who longline for other groundfish. Retention of halibut may also result in high grading and an increase in halibut fishing mortality, some of which may not be accounted for.

The halibut openings or seasons are very short. To assist in the enforcement of these short seasons, the possession of fresh halibut on a vessel or at a processing plant has been prohibited during much of the year. If retention of halibut bycatch is permitted, other means of enforcing the halibut seasons would have to be relied upon. It might become very difficult to enforce a fair start and finish to the halibut seasons. Therefore, permitting the retention of halibut bycatch would probably decrease enforcement capabilities and, perhaps, decrease equity within the halibut fishery.

There are two reasons that the quality of halibut taken as bycatch in a longline groundfish fishery might be higher than that taken in the halibut fishery. First, it has been suggested that the quality of halibut in the halibut fishery has been adversely affected by the frantic pace of what has become a "derby fishery". If the fisheries in which halibut is taken as bycatch proceed at a less rapid pace, the opportunity cost of taking

the steps necessary to assure the delivery of a high quality product would be lower; this could result in higher quality. Second, it would be possible to deliver fresh halibut, which is often considered a higher quality product, during much of the year when the halibut fishery is closed. However, the quality of halibut taken as bycatch could be lower if an inferior method of preserving halibut is used. It is not known what the net effect on quality would be. The retention of halibut bycatch in the longline groundfish fisheries would have an adverse effect on quotas in the halibut fisheries because it would result in 100% bycatch mortality rather than the 25% discard mortality that is currently assumed to occur. This would be to the benefit of longline fishermen in the groundfish fishery and at the expense of those in the halibut fishery. Even though, as noted above, there would probably be net benefits to these fishermen as a whole, the large number of halibut fishermen who do not longline for groundfish would be disadvantaged by the retention of halibut bycatch.

If retention is permitted up to some specific rate, high grading may occur. That is, lower valued halibut might be discarded and replaced with higher valued halibut, perhaps through covert targeting on halibut. The condition and size of the halibut can affect its value. In 1988 there was not a size specific price differential that could have provided an incentive to discard smaller fish in favor of larger fish. However, the potential for a price differential that favors a specific size exists. In the absence of such a price differential high grading may still occur due to differences in the condition of halibut when taken aboard or after being on board for some time. To the extent that high grading would occur, some marketable halibut would be wasted and additional unaccounted for fishing mortality would occur.

6.3.3.6.2 Implications of alternative retention rates.

The Bycatch Committee recommended that the Council consider a retention rate of 1% to 1.5%. The DAP longline fishery bycatch rates currently used by the plan team are 1.2% in the sablefish fishery and from 5.23% to 9.15% in the Pacific cod fishery. Therefore, the Committee's retention range would allow for the retention of all the halibut currently expected to be taken as bycatch in the sablefish fishery, but it would permit retention of only about 11% to 29% of the halibut bycatch in the Pacific cod fishery.

The Committee's recommendation is based on the bycatch rates stated above, a discard mortality rate of 25%, and the assumption that only 75% of the halibut taken as bycatch would be of marketable size and quality. The Committee's proposal would permit a vessel to retain the marketable proportion of the 25% of the bycatch that would be subject to the discard mortality. If in fact only halibut that would otherwise die would be retained, retention would ~~not increase the mortality~~ associated with bycatch. It is highly unlikely that fishermen could or would select the right 18.75% of halibut for retention.

If, in the absence of that ideal situation, it makes sense to allow the retention of any halibut bycatch in a longline groundfish fishery, it is difficult to justify a level of retention below that of the expected bycatch rate. That is, it is difficult to explain why, for example, only one out of three halibut can be retained if the expected bycatch rate is 4.5% but the allowed retention rate is 1.5%. The reason for having a low retention rate is to limit covert targeting on halibut. However, having a retention rate below the expected bycatch rate diminishes the net benefits of permitting retention. In the case of the cod fishery, the net benefits, which could exceed $8 million, would be reduced by 71% to 89%.

The expected differences in the bycatch rates between the longline sablefish and cod fisheries and between the cod fisheries in different areas suggest that it may be appropriate to have the retention rates differ by target species and/or area. This would certainly be the case if the objective of allowing limited retention is to permit retention of halibut bycatch without encouraging significant covert targeting.

If the plan team's bycatch rates are correct and if the Pacific cod fishery does expand to become a 75,000 mt fishery in several years, bycatch in the sablefish and cod longline fisheries could exceed 6,500 mt of halibut. If all of this bycatch is retained rather than discarded with a 25% discard mortality rate, quotas in the halibut fishery would be reduced by an additional 12.7 million pounds (6,500 mt x 2,205 lbs/mt x 0.75 x 0.75 x 1.58). Both the discard survival rate and round weight to net weight factor equal 75% and 1.58 is the IPHC bycatch weight to adult equivalent weight adjustment factor. Although this is a substantial reduction for halibut quotas that are currently expected to decrease from more than 60 million lbs in 1988 to less than 40 million lbs by 1991, it is a transfer of halibut landings from the halibut fishery to the longline groundfish fishery that can result in net benefits to these fisheries as a whole.

Because the halibut PSC goals are in terms of bycatch mortality and because retention would increase bycatch mortality, except in the unlikely case that only dead halibut are retained, the decisions on allowing retention and setting PSC limits are not independent. If retention is permitted, a higher PSC limit for the longline fisheries would probably be appropriate.

6.3.4 Biological and Physical Impacts

The biological impacts result from the amount of halibut being taken as bycatch which is unaccounted for in the PSC mortality cap. Currently, when the annual PSC cap is reached, the bottom trawl fisheries are shut down, but the longline fisheries are allowed to continue. If the longline fisheries continue to catch halibut incidentally and survival of the discarded halibut is less than 100%, the PSC mortality cap will be exceeded. The International Pacific Halibut Commission (IPHC) recommends halibut quotas which are reduced by the estimated amount of halibut bycatch mortality from the non-directed fisheries. The amount by which the PSC cap is exceeded is unknown and therefore unaccounted for in setting the halibut quotas. The possibility of overharvesting the halibut resource exists under the current regime.

The true extent of the halibut bycatch mortality is currently unknown. Therefore, it is not possible to determine if the implementation of Alternative 2 (i.e., approval of one or more of the proposed measures) would provide for a decrease or an increase in the bycatch mortality of halibut, although the change is not expected to be large. There may also be increased or decreased perturbation of the physical environment due to the activity of fishing gear. The extent to which these perturbations occur is speculative at best and impossible to measure against the normal variability of factors affecting marine life in the epibenthos and water column.

Implementation of Alternative 2 could affect the amount of groundfish taken in fisheries which catch halibut incidentally. Some fisheries may be prevented from attaining their full TAC due to the PSC caps. This would reduce the fishing mortality on these stocks. There would be more groundfish available, which could affect predator-prey relationships. Improvements in the environment may occur due to decreased fishing activity. The extent to which changes could occur are unknown and probably negligible compared to the normal variability of the ecosystem.

6.3.5 Socioeconomic Impacts

6.3.5.1 Fishery Costs and Benefits

Regulations that restrict the type of groundfish pot gear that can be used to those that result in little or no halibut bycatch would probably reduce halibut bycatch mortality in the groundfish pot fisheries but would probably impose costs on pot fishermen. The reduction in bycatch would benefit halibut fishermen or other groundfish fishermen, depending on whether the bycatch savings are used to reduce total bycatch or to allow more bycatch in other groundfish fisheries. At this time there is not sufficient information to accurately estimate either the benefits or costs of such regulations.

The establishment of separate PSC limits by major gear groups would eliminate two problems. During the fishing year, the estimated bycatch in the longline and pot fisheries could not result in the closure of bottom trawl fisheries, and bycatch in the longline and pot fisheries would be limited. This would tend to benefit the bottom trawl fisheries and/or the halibut fishery, at the expense of the longline and pot groundfish fisheries. In the absence of an accurate estimate of the value of an increase in a PSC limit for each groundfish fishery, it is difficult to determine whether a reallocation of bycatch from one fishery to another will result in positive or negative net benefits. If groundfish fishing techniques are changed or if catch is limited, and bycatch mortality is less due to the PSC limits, there will be costs imposed on the groundfish fishery and benefits provided to the halibut fishery. The benefit to the halibut fishery measured in terms of increased gross exvessel value per mt reduction in halibut bycatch mortality was estimated to be $3,200. The estimated cost to the groundfish fishery per mt reduction in halibut bycatch mortality ranged from $0 to $14,500 for the bottom trawl fishery, from $0 to $36,100 for the Pacific cod longline fishery, and from $0 to $719,000 for the sablefish longline fishery. The high end of each range is based on an estimate of the gross exvessel value that would be foregone if the bycatch rates and discard mortality rates used by the Plan Team are correct and cannot be decreased. The low end of each range is based on the assumption that bycatch rates can be reduced sufficiently without imposing any costs on the groundfish fisheries. In the absence of a market mechanism that indicates the value of an increase in a PSC limit to a groundfish fishery, it is difficult to determine what the actual costs would be within these broad ranges. If the PSC limits affect the groundfish fisheries, the limits will either allocate groundfish or will allocate the cost of limiting bycatch mortality among the groundfish fisheries. The information necessary to determine the optimal allocations of either often would not be available to fishery managers.

The establishment of separate PSC limits by target fishery for each major gear group would eliminate the possibility that during a fishing year the bycatch in one fishery will close another fishery or prevent it from occurring. This will provide benefits to those in the latter fisheries at the expense of those in the former. There will not always be sufficient information available to fishery managers to determine whether the benefits will exceed the costs. If the PSC limits by target fishery affect the groundfish fisheries, the limits will either allocate groundfish or the cost of limiting bycatch mortality among the groundfish fisheries. The information necessary to determine the optimal allocations of either often would not be available to fishery managers.

The establishment of a PSC limit reserve can be used to provide an incentive for vessels to have observers on board and to develop techniques for reducing bycatch rates. If each vessel with an observer bears the

full cost of the observer, the cost to the vessel could be in excess of $7,500 per month. This would be a large burden for some vessels. However, it would be a voluntary burden that a vessel would only be willing to pay if it provided net benefits to the vessel in terms of an increased opportunity to harvest groundfish. With the first three options, there would be costs imposed on vessels that could not continue to fish into the 20% reserve after the first 80% of a PSC limit is taken. This would not occur with the fourth option. By increasing observer coverage compared to the status quo, each option would tend to increase the credibility and equity of bycatch management and reduce the controversy concerning bycatch. The fourth option probably ranks highest in terms of these benefits; and if the fourth option includes transferability of the right to fish against bycatch savings, it would probably provide greater benefits of these types in addition to providing an increased opportunity for an optimal distribution of bycatch among the groundfish fisheries.

Allowing limited retention of halibut bycatch in the longline fisheries would result in some benefits and costs that can be quantified within ranges and other benefits and costs that cannot be. The benefit of allowing retention in terms of both capturing the value of halibut that would have been subject to discard mortality and eliminating the cost of recapturing discarded bycatch not subject to discard mortality was estimated to range from about $890 to $1,270 per mt of halibut bycatch of a size suitable for retention. The two estimates are based on the assumption that marginal fishing cost in the halibut fishery is between 25% and 50% of gross exvessel value. The cost of retention in terms of foregone growth was estimated to range from $0 to $885 per mt of retained bycatch. If the halibut taken in the groundfish fishery and the halibut fishery are about the same size, no growth is foregone. If growth of 58% is foregone, the cost is about $885 per metric ton of retained bycatch. Although some information suggests that the foregone growth may be less than 58%, and perhaps close to 0, there is not sufficient size composition data for the longline groundfish fisheries to narrow the range presented above. Therefore, the net benefit of allowing retention, in terms of these benefits and costs, is estimated to be from $5 to $1,270 per mt of halibut bycatch. Differences in the quality of halibut from the groundfish and halibut fisheries could increase or decrease the net benefit of allowing retention. Retention could result in high grading with associated waste and unaccounted for mortality that would impose unknown costs on the halibut fishery.

6.3.5.2 Reporting Costs

The only measure being considered that would affect reporting costs is establishing a reserve for each PSC limit. The observer costs borne by fishing vessels can be considered reporting costs. As noted above, these are voluntary costs that a vessel would pay if it provides an adequate opportunity to harvest additional groundfish. The cost would tend to be higher with the fourth option than with the other two because a vessel would have to have an observer to earn the right to continue to fish once bycatch estimated based on the published bycatch rates and reported catch equals the PSC limit. With the other options, vessels would just be required to have observers when fishing against the 20% reserve. However, the savings associated with having observers only after the initial part of a PSC limit is taken, would be offset, at least to some extent, by the cost of being prepared to meet a sudden demand for observers of an unknown number and duration once the initial part of the limit is taken. This cost would include those associated with: (1) either having a large number of observers on hand to serve for perhaps very few days or having vessels return to port until observers are available; and (2) the cost of returning to port for an observer. The cost per observer day could increase from about $250 per day for a three to four week trip to perhaps $750 per day for a one week trip. The increase in cost per day occurs because the fixed costs per observer trip are

quite high. They include round trip travel costs, pre-trip briefing costs, post-trip debriefing costs, and perhaps a minimum guaranteed payment for the observer.

6.3.5.3 Administrative, Enforcement, and Information Costs and Benefits

The implementation of an additional gear regulation will result in increased administrative, enforcement, and information burdens. These include those associated with determining the specifics of the gear restrictions and both implementing and enforcing the regulations.

The use of gear specific PSC limits would result in increased administrative and information burdens but would not affect enforcement. The information required to determine the appropriate PSC limit for each gear group is difficult to collect and, therefore, tends to be costly. In the absence of credible information concerning the value of an increase in the PSC limit for each fishery, the issue of allocating limits among fisheries will continue to be very contentious and as a result the process of allocating limits will place a large burden on the Council process.

The administrative and information costs of apportioning PSC limits by target fishery would be similar to those of apportioning limits by major gear group.

The four options to allow specific vessels to fish against a PSC limit reserve would increase the administrative and information burdens because it would be necessary to keep track of observer data for each individual vessel. This burden could be reduced by providing each vessels with a strong incentive to monitor its own bycatch and continue to fish only as long as it had the right to. It would probably cost $10,000 to administer/monitor such a program. If the fourth option includes transferable rights, it would provide information that could be very beneficial in identifying the value of additional bycatch to each fishery and, therefore, in eliminating one of the major controversies concerning bycatch management.

Allowing the retention of halibut bycatch in the longline fisheries would result in additional administrative, enforcement, and information burdens. The administrative and information burdens would be associated with determining the appropriate level of retention to permit. The appropriate levels are expected to differ by target species, area, and perhaps season. They are also expected to change over time. The additional enforcement burden would result because it would become more difficult to enforce the very short halibut seasons that are now in place.

6.3.5.4 Impacts on Consumers

Because neither halibut nor groundfish from the Gulf of Alaska is a major item in many household budgets and because there are relatively good substitutes for both, none of the measures being considered is expected to have a significant impact on individual consumers. However, consumers as a whole would be affected by changes in the quantity, quality, and prices of halibut and probably to a less extent groundfish.

If the bycatch savings that would result from limiting the types of pot gear that can be used are used to decrease total halibut bycatch rather than allow increased bycatch in other fisheries, some benefits would be received by those who consume halibut.

Similarly, allocating PSC limits to major gear groups would only benefit consumers to the extent it reduced total bycatch mortality and, therefore, increased halibut fishery quotas.

The allocation of PSC limits by target fishery would probably not affect total bycatch. Therefore, it would probably not affect consumers.

PSC limit reserves are not expected to affect consumers.

The retention of halibut taken as bycatch in the longline groundfish fisheries could affect the quantity and quality of halibut available to consumers. The quantity available would increase unless the halibut loss associated with discarding dead halibut is less than or equal to the foregone growth potential. The growth potential depends on the differences in average size between halibut taken in the halibut and groundfish fisheries. The probable effect on quality is also ambiguous.

6.3.5.5 Redistribution of Benefits and Costs

Restrictions on the types of pots that can be used are expected to impose costs on pot fishermen and provide benefits to other groundfish fishermen and/or halibut fishermen.

Gear specific PSC limits are expected to change the distribution of net benefits among the groundfish and halibut fisheries. Because a frameworked measure is being considered, the probable winners and losers depend on how this authority would be used. In the absence of adequate information, the possibility exists of making a change that will decrease the total net benefits of the groundfish and halibut fisheries combined.

Target fishery specific PSC limits can have similar effects on the distribution of benefits and costs.

The establishment of PSC reserves would tend to benefit vessels that can physically and financially accommodate an observer at the expense of those that cannot. This would be less of a problem with option four, particularly if vessels without observers could purchase and use the right to fish during the reserve fishery.

Permitting limited retention of halibut bycatch in the longline groundfish fisheries would benefit those fisheries at the expense of the halibut fishery. Although this redistribution of benefits is diminished by the fact that many individuals participate in both types of fisheries, there are some individuals who are involved with halibut but not groundfish. This could increase the combined net benefits of the groundfish and halibut fisheries.

7.0 CLARIFY SECRETARY'S AUTHORITY TO SPLIT OR COMBINE SPECIES GROUPS WITHIN THE TARGET SPECIES MANAGEMENT CATEGORY BY A FRAMEWORK PROCEDURE FOR THE GULF OF ALASKA AND THE BERING SEA/ALEUTIAN ISLANDS

7.1 Description of and Need for the Action

At times the Council may wish to establish total allowable catches (TACs) for additional target species within the "target species" category for purposes of managing smaller stock components. This action would clarify the procedure to accomplish this objective by amending FMP/regulatory text to state specifically that any changes to split or combine target species within the "target species" category would be accomplished by the framework procedure that is now in place for establishing the annual TACs. The need for this action is as follows.

Four categories of species and species groups are now specified in the FMPs. They are: target species, "other species", prohibited species, and non-specified species. For each of these categories, species and species groups are listed, as shown below.

Area	Target	"Other"	Prohibited	Non-specified
GOA & BSAI	Pollock Pacific cod Sablefish Other rockfish	Sculpins Sharks Skates Eulachon Smelts Octopus Capelin	Halibut Salmon Steelhead trout Herring King crab Tanner crab	Species or species groups of no economic value. Records not required.
BSAI only	Arrowtooth flounder Greenland turbot Yellowfin sole Rock sole Atka mackerel Pacific ocean perch Squid Other flatfish			
GOA only	Pelagic shelf rockfish Thornyhead rockfish Demersal shelf rockfish Flatfish	Atka mackerel Squid		

Each January 1 - December 31 fishing year, the Council recommendS TACs and apportionments thereof among DAP, JVP, TALFF, and reserves for each of the above target species and the "other species" category. Subject to his approval, the Secretary implements the new TACs and apportionments. These actions are provided for by a procedure summarized below and set forth in the FMPs and implementing regulations, and are normally accomplished within a four-month (September - December) time frame.

Under this procedure, the Council recommends to the Secretary at its September meeting of each year preliminary specifications for TACs and apportionments thereof for each of the target species and the "other species" category. The Secretary publishes these recommendations in the FEDERAL REGISTER and invites

public comments for 30 days. The Council, at its December meeting, reviews comments received and other available information and recommends to the Secretary initial specifications and apportionments thereof for the new fishing year. Subject to Secretarial approval, these recommendations are then published in the FEDERAL REGISTER for purposes of managing the groundfish fisheries during the new fishing year.

Prior to 1988, the Council had split some of the target species groups into individual species and had established separate TACs for the individual species during the process of developing TACs for the upcoming fishing year. Reasons for establishing TACs for additional target species included fostering management of smaller components of the groundfish stocks to prevent overharvesting any one component. Examples of these actions in the BSAI included: (1) splitting the "other flatfish" group into "other flatfish" and turbot; and (2) splitting the turbot group into arrowtooth flounder and Greenland turbot. Examples in the GOA included splitting "other rockfish" into pelagic shelf rockfish, slope rockfish, and demersal shelf rockfish. The Council took these actions in previous years after being advised by General Counsel that the Secretary is authorized under the FMPs to split species groups within the four discrete categories without amending the FMPs. General Counsel also advised, however, that moving species or species groups among the four categories, for example redesignating a target species as a prohibited species, would require an FMP amendment.

Nonetheless, the Council recommended that a rock sole TAC be split from the "other flatfish" TAC as part of a 1988 amendment package to the BSAI FMP. The Secretary implemented this measure as Amendment 12 to the FMP. This process of using an FMP amendment to split a species from a target species group by FMP amendment is inconsistent with previous Council actions listed above, whereby the Council simply incorporated such changes during the development of initial TAC amounts. Furthermore, measures addressed under the amendment process take approximately one year to become effective, whereas the development and implementation of TAC amounts for an upcoming fishing year take about four months.

This amendment proposal is intended to clarify the appropriate procedure. The framework procedure used to establish TACs and apportionments as provided in the FMPs and implemented by regulations at 50 CFR Parts 672 and 675 can be amended to clarify the procedure.

7.2 The Alternatives

7.2.1 Alternative 1: Take no action to clarify the status quo, which might cause future confusion as to the appropriate procedure for splitting additional species within the target species category.

Under this alternative, no clarifying changes would be made to the proper procedure for splitting or combining target species within the "target species" group. As a result, a future action by the Council to specify a new target species might be initiated as an FMP amendment instead of the more timely framework procedure. An FMP amendment would take about a year to become effective.

7.2.2 Alternative 2 (Preferred): Clarify the Secretary's authority to split or combine species groups within the target species category by a more timely framework procedure.

Under this alternative, appropriate changes to regulations and/or the FMPs would be implemented to clarify the Secretary's authority. A TAC for a new target species would be established following the same framework procedures used for specifying TACs and apportionments thereof among target species as provided currently by the FMPs and implementing regulations.

For any species to be declared a target species, it has to (1) be commercially important, (2) be targeted on by the groundfish fishery, and (3) have a sufficient data base to be managed on its own biological merits. The first step in the FMP procedure is to specify an acceptable biological catch (ABC) for a target species. When the Council recommends preliminary TACs at its September meeting, it could also consider whether splitting or combining species in the target species category was desireable. New information on which to base a split in a species group would be necessary before this action was taken. The Council would then recommend that the Secretary publish the notice of preliminary specifications to include the TAC for the new target species and request comments in the FEDERAL REGISTER as he now does under framework procedures provided by the implementing regulations.

7.3 Biological and Physical Impacts

Actual impacts that result from either alternative are largely administrative. No biological or physical impacts would occur.

7.4 Socioeconomic Impacts

As stated under 9.3, Biological and Physical Impacts, actual impacts that result from either alternative are largely administrative. Whether splitting a target species into additional species is done by the same framework procedure employed by the Council in setting annual TACs or is done through amendments to FMPs imposes different administrative costs. The framework procedure would be more efficient, and expected results could be conveyed to the fishing industry in time to be of use in an upcoming fishing year. Using FMP amendments would take at least a year, which might obliterate the benefits that the Council and the industry had expected in the first place.

No net increase in costs in terms of labor to establish additional TACs for the target species are likely, because the same numbers of agency personnel would be involved in either case. That same labor, of course, could be freed and redirected at other services if the more efficient framework procedure were used to split TACs rather than the more laborious FMP amendment procedure. Some additional labor costs in monitoring catches of those species for which new TACs had been established and implementing additional inseason adjustments would occur, but again the costs are not real increases, because the number of agency personnel would not increase.

The real issue is whether the results of splitting TACs are expected for an upcoming fishing year or a year later. As an example, the Council might wish to split the deeper water flounder species from the "other flounder" category in the Gulf of Alaska for purposes of managing smaller components to prevent overharvesting anyone of the species making up the flounder complex. If procedures provided in

FMPs/regulations are not clearly written, the Council might inadvertently recommend that additional flounder TACs be established by FMP amendment, which would take a year, when the Council had the option of accomplishing its objectives through the existing framework procedure. FMPs and regulations that provide clear direction to the Council and management agencies convey a benefit in terms of promoting more efficient use of administrative resources.

8.0 IMPLEMENT A SYSTEM OF OBSERVER COVERAGE AND RECORDKEEPING AND DATA REPORTING REQUIREMENTS FOR THE GROUNDFISH FISHERIES OF THE GULF OF ALASKA AND THE BERING SEA/ALEUTIAN ISLANDS AREAS

8.0.1 Description of and Need for the Action

The comprehensive fishery data gathering program considered below for the groundfish fisheries of the Gulf of Alaska and the Bering Sea/Aleutian Islands areas consists of two parts:

(1) An augmented system of industry recordkeeping and reporting requirements.
(2) A comprehensive domestic observer program.

The purpose of this program is to provide the Council and NMFS with adequate and reliable fishery data on which to (1) base inseason and inter-season management decisions; (2) efficiently carry out their resource management responsibilities; and (3) measure fishery performance against existing and proposed management measures. Historically, the U.S. Foreign Fisheries Observer program has been the primary source for these data. Foreign groundfish operations have been curtailed in recent years with the rapid expansion of domestic groundfish industry. As a result, fishery managers have lost access to much of the resource and fishery performance data that was formerly gathered from the foreign fishery.

Alaskan groundfish harvests by U.S. fishermen grew from 8,600 mt in 1979 to over 2.2 million mt in 1988. Domestic trawlers fishing in joint ventures with foreign processors were responsible for most of the initial growth in the U.S. groundfish industry. In 1988, however, catches from vessels involved in wholly domestic operations comprised over a third of the total groundfish harvest off Alaska. In 1989, domestic operations are expected to take over 80% of the groundfish harvest. The rapid expansion in the wholly domestic fishery coupled with the lack of a comprehensive domestic observer program and inconsistent, inadequate, or unenforceable reporting requirements has placed new demands on management and enforcement agencies, at a time of limited management resources. The growing contentiousness of fishery management issues, including resource allocation among competing domestic user groups, compels managers to take steps to regain some of the fishery information previously gathered from foreign fleets and to consider reliable catch, resource, and economic information when evaluating potential management measures.

The need for fishery managers to consider reliable biological, economic, and other fishery performance information is explicit in the management goals and objectives established by the Council, as well as in the MFCMA, Executive Order 12291, the Regulatory Flexibility Act, and other relevant Federal regulations. These Federal regulations mandate, for example, that concise biological and economic analyses be completed to assess all relevant effects of proposed changes in management measures. These regulations place specific burdens upon the Council and NMFS to consider the biological, economic, and social implications of, not only the preferred alternative, but of all reasonable options available to them. Attainment of this level of assessment is highly dependent upon the quality and timeliness of the biological and economic data available for analysis.

These data are not currently collected in sufficient detail, nor on an adequately consistent basis, to provide guidance to decision makers in the increasingly complex circumstances which prevail in the groundfish fisheries off Alaska. The cost of making decisions based on inadequate information is no longer principally

borne by foreign fisheries. Rather, it will soon be completely imposed on the domestic groundfish industry. Such costs can adversely affect the viability of the domestic groundfish industry in the very competitive world groundfish markets. The lack of adequate information also results in the fishery management decision making process being less objective, more political, and potentially less equitable. This can decrease the credibility of the fishery management process and result in an unnecessarily costly and ineffective management system.

The changes contemplated for the fishing industry's recording and recordkeeping requirements involve the collection of adequate effort, catch, and economic information for which the industry is the best source. These requirements would be augmented by a domestic observer program that would provide more accurate collection of catch and effort information, in addition to other biological data that would be too burdensome for the industry to compile and record. Fishery information collected from the groundfish industry and from a comprehensive observer program would be complied and maintained in a fisheries information data base that would be accessed by fishery managers and used (1) for inseason enforcement and catch verification; (2) to evaluate existing and proposed management measures; and (3) as a secondary index of stock assessment.

Section 8.1 discusses current recordkeeping and reporting requirements, the specific need for the changes being considered, how modifications to current requirements relate to existing and ongoing data collection programs, and how the additional information collected from the industry will be used. Section 8.2 discusses the need for a comprehensive domestic observer program, including a discussion of the status quo, and examines several alternatives for such a program.

8.1 Recordkeeping and Reporting Requirements

Existing regulations do not allow for adequate catch, effort, and economic data to be collected from the fishing industry. The changes in recordkeeping and reporting requirements discussed below are intended to reduce this problem with respect to information for which the industry is the best or only source. In general terms, this information includes the following: (1) fishing effort, (2) retained groundfish catch, (3) discard amounts, (4) production, (5) employment, (6) costs, and (7) product value. In evaluating proposed changes to the data collection program, it is important to recognize that fishery management consists of two interdependent activities. They are: (1) obtaining and using information to evaluate alternative management measures, and (2) obtaining and using information to implement the preferred measures.

To make the best use of the limited management resources that are available, there must be an effective mix of these two types of activities. Therefore, increasing inseason management capabilities sufficiently to assure that catch does not exceed a quota by more than 100 mt makes little sense if the correct quota can only be determined within a range of 5,000 mt. Similarly, increasing research capabilities sufficiently to be able to determine the correct quota within a range of 100 mt would be inappropriate if inseason management is only able to assure that a quota is not exceeded by more than 5,000 mt. A balance is also needed among the various types of efforts expended within each of these two types of activities. For example, enforcement efforts to assure increased accuracy in catch reporting need to be balanced with efforts to increase the timeliness of catch reporting and efforts to obtain better biological information need to be balanced with efforts to obtain better economic information. Therefore, giving an absolute priority to either type of activity

or to the collection of one type of information will decrease both the effectiveness of fishery management and the benefits that can be obtained from the use of fishery resources.

Much of the information described in this section is useful for multiple fishery management purposes. For example, accurate catch data are used both to monitor the attainment of quotas and to assist in developing biological models that can aid in determining the correct quotas. Therefore, the discussions of existing data problems and solutions to these problems are organized in terms of data collection mechanisms and data items rather than in terms of data collection purposes.

8.1.1 The Alternatives

Two alternatives are considered:

> Alternative 1 is the status quo.
> Alternative 2 consists of modifications and additions to current recordkeeping and reporting requirements.

A discussion of the existing recordkeeping and reporting requirements, including their deficiencies, is followed by a discussion of the changes being considered.

8.1.1.1 Alternative 1: Maintain the status quo.

Under this alternative, the existing recordkeeping and reporting requirements and their deficiencies would be maintained. Efficient inseason management of species quotas, gear quotas, and area closures would continue to be thwarted by the use of incompatible, incomplete, and unenforceable catch reporting requirements. Furthermore, management of the fishery would continue to be based on inadequate biological and economic information. The specifics of each of these problems is presented in this section in terms of the deficiencies of the existing recordkeeping and reporting requirements. The section is organized by type of reporting instrument.

Catch Reporting Requirements

Currently, all fishing vessels are required to report landings (i.e., retained catch) on a State of Alaska fish ticket or on a similar document. Catcher/processor and mothership vessels are also required to provide weekly catch reports to the NMFS.

Fish Tickets

Federal and State of Alaska regulations require U.S. fishing vessels to report all landings on either an Alaska fish ticket or a comparable document. The fish ticket is to be completed at the time of delivery. State regulations require that the processor who receives the fish submit a fish ticket within a week of receipt of catch for shoreside processors and within a week of landing at port for at-sea processors.

NMFS has used State fish ticket information to verify catches for enforcement purposes, but has often been unable to use catch information from fish tickets as a timely inseason management tool. This is because

fish ticket data are often not available in a sufficiently timely manner to support inseason management actions. For example, at-sea processors may remain at sea for weeks at a time before they land at port and submit fish tickets. This problem has been addressed for catch in at-sea processing operations by also requiring catcher/processor and mothership vessels to submit a weekly catch report directly to NMFS.

Information concerning the area of catch is required on a fish ticket; however, it may be difficult to verify the accuracy of such information. Therefore, NMFS has a limited ability to enforce those regulations, such as area quotas and area closures, that require an accurate accounting of catch by area. It is also difficult to verify the catch data reported on fish tickets when landings are not observed or when there is not sufficient documentation to permit less direct verification.

There are additional limitations of the fish tickets with respect to reporting exvessel prices and values, the effort associated with catch, and discards. It is a State and, therefore, Federal requirement that exvessel prices and values be entered on the fish ticket. However, this requirement is often not met. Fish tickets reporting catch from at-sea processing operations seldom include price and value information because typically the fish are not sold at the time they are off-loaded and without a sale there are not actual prices and values to report. In other instances, a sale does occur so prices and values could be reported, but they are not. The latter problem can be reduced by increased efforts to assure full compliance.

The groundfish fish tickets were designed to collect only very limited effort data. The fish ticket items that can be used to measure some aspects of effort are: (1) the date the trip began, (2) the date landed, and (3) the number of days in which fishing occurred. Although additional effort data are collected on fish tickets for other fisheries, they are not for the groundfish fishery. For example, in the crab fisheries the number of pot lifts is required on the fish ticket.

The fish ticket was designed to report landed weight and discards of groundfish, but there is no provision for reporting discards of prohibited species such as crab, halibut, and salmon. Futhermore, the landed groundfish product reported on fish tickets often differs from the product type placed in inventory by the processor. This situation can frustrate attempts by enforcement personnel to verify product receipt with product inventory.

Finally, fish tickets are not easily modified to reflect changes in Federal reporting requirements that are necessary to account for species by species quota management.

Catcher/Processor Weekly Catch/Receipt & Production Reports

Operators of U.S. catcher/processor and mothership processor vessels are currently required to submit to NMFS a weekly catch report. Information from these reports is used for inseason management of the fishery and after it is checked against less timely State fish ticket information, it is used as a basis for the catch estimates used for inter-season management purposes.

Information concerning the area of catch is required in the weekly catch report; however, it may be difficult to verify the accuracy of such information. Therefore, as with fish tickets, NMFS has a limited ability to enforce those regulations, such as area quotas and area closures, that require an accurate accounting of

catch by area. The problem of verifying the catch data in the weekly catch reports is also similar to that for fish tickets.

Current regulations require that the weekly catch reports submitted to NMFS contain catches by species in round weight. This requires the vessel or processor operator to convert from finished product weight back to round weight. This places an additional burden on the industry and may result in catch being inconsistently estimated because the conversion factors used are determined by the individuals who prepare the reports.

Species discard information is also currently required on the weekly catch report, as is limited effort data. The latter consists of the number of days in which fishing occurred in each area. This is of limited use as a measure of effort because it does not indicate the number of days fishing occurred if a vessel fished in multiple areas on the same day. Even if it is accurately reported, the number of days in which fishing occurred is not by itself an adequate measure of effort for purposes of stock assessment or evaluation of management measures.

A number of problems occur because weekly catch reports are not required from shoreside processors. There have been recent confidentially problems with respect to the State releasing some fish ticket information to NMFS (this problem should be taken care of during the State's current legislative session or through the use of joint State and Federal fish tickets which began in 1989). There are also inconsistencies which arise when comparing catches reported on Federal and State reporting systems. The fish ticket information is typically less timely than that received directly from at-sea processors; this limits inseason management ability. Furthermore, catches reported on weekly catch reports and on State fish tickets often encompass incompatible time periods, and problems can arise when comparing catch information from these two sources, with the result that some catches can be counted twice. In summary, the use of inseason management information that is often neither timely nor accurate can result in less effective inseason management and the over or under harvesting of quotas. This situation can impose substantial costs on the industry.

Transfer Logbooks

At-sea processors often off-load processed catch at sea for direct transport to foreign or domestic destinations, and they are required to keep a transfer log recording the amount of product off-loaded and submit a report for each transfer. However this is not sufficient for verifying the catch reported in the weekly catch reports or on fish tickets because products may never come ashore where NMFS can verify the accuracy of reported catch for catcher/processor and mothership vessels.

Existing regulations do not require shoreside processors to maintain transfer logs and NMFS enforcement personnel do not have the authority to inspect shoreside facilities to verify reported groundfish landings. Verification of shoreside landings are further hampered by the inability of NMFS enforcement personnel to monitor the off-loading of catch at each shoreside facility. As a result, NMFS is unable to effectively guard against gross under reporting of catch or misrepresentation of the species caught.

State of Alaska Commercial Operators Annual Report

State of Alaska regulations require shoreside processors and at-sea processors that process in State waters to submit an annual report on the quantity and value of their sales by species and product form. There are a number of deficiencies with this reporting requirement. Catcher/processor and mothership vessels that do not process fish in State waters are not required to submit this information; monthly information is not reported; State confidentiality regulations prevent this information from being made available to NMFS; the April 1 submission date decreases its timeliness; and, with respect to groundfish, it suffers from being primarily designed to collect information on salmon and herring.

With the exception of timeliness and the absence of monthly data, these problems could be eliminated by a Federal regulation requiring all processors that process groundfish harvested off Alaska to submit a copy of this report to NMFS and by a joint Federal and State effort to assure that the form is adequate for groundfish.

The lack of monthly data is a significant problem for two reasons. It prevents the consideration of either seasonality or intra-year trends in prices and sales. It also greatly reduces the numbers of observations that will be available for statistical analyses of factors affecting prices. The timeliness is also a significant problem. Data that are not submitted until April 1 will typically not be in a form that will be useful for analyses before late June. Given the current groundfish amendment cycle schedule, this means, for example, that 1988 data would not be available for use until the 1990 cycle for the 1991 fishery. The data could be available for the 1989 cycle if the submission of data were required earlier.

Export Declarations

U.S. Department of Commerce regulations require that an export declaration form be submitted for each shipment of goods, including fishery products, out of the United States. The forms include both quantity and value data and indicate the date of the shipment. Summary data from these forms are readily available in a timely manner. However, there are deficiencies with these data. They necessarily exclude information on products that are not exported and the level of detail in terms of species or product form is often inadequate.

Other Reporting Requirements

There are other Federal and State reporting requirements. Some are specifically for fisheries and others are for a broad range of industries. These other reporting requirements provide useful information but do not solve the fishery management data deficiency problems discussed above.

8.1.1.2 Alternative 2 (Preferred): Modify existing recordkeeping and reporting requirements to provide better fishery management information.

The information problems associated with Alternative 1 (i.e.,the status quo) can be eliminated with modifications and additions to existing recordkeeping and reporting requirements. The changes being considered are listed below.

Changes in Recordkeeping Requirements

Each catcher/processor, mothership processor, and shoreside processor utilizing groundfish harvested off Alaska would be required to maintain a daily cumulative production log (DCPL).

Each vessel 5 net tons and larger that harvests groundfish off Alaska would be required to maintain a daily fishing log (DFL).

Each shoreside processor would be required to maintain a transfer log (TL) similar to that currently required of at-sea processors.

Changes in Reporting Requirements

Each processor required to maintain a transfer log would be required to submit to NMFS a weekly summary of their transfer log entries for each week in which transfers ccurred.

The weekly catch report in round weight for each at-sea processor would be replaced with a weekly production report (WPR) in product weight.

Each shoreside processor would also be required to submit a weekly production report (WPR).

Each processor and catcher vessel required to maintain a DCPL and/or DFL would be required to submit quarterly to NMFS a copy of their DCPL and/or DFL records.

Each processor (i.e., at-sea and shoreside) or its parent company would be required to submit annually a monthly product value report (MPVR) that would summarize sales in quantity and value by species and product form.

The NMFS will provide logbooks to the industry. Logbooks will be printed on 2-part carbonless paper so that vessel operators and plant owners may simply tear out copies of their daily logs when making their quarterly submissions to NMFS.

To lessen the cost to the industry of meeting the recordkeeping and reporting requirements, logbooks have been designed so that each sector of the industry receives a logbook form tailored to meet its specific needs. For example, a logbook will be made available to catcher/processor vessels that: (1) may be used for meeting the requirements for both the daily cumulative production log and the daily fishing log; and (2) will provide the information required in the weekly production report.

The logbook and reporting programs developed for the groundfish industry have also been designed to compliment reporting requirements and would consolidate, to the extent practicable, other recordkeeping requirements to lessen the paperwork burden on vessel and processor operators. For example, a proposed marine mammal logbook program contains recordkeeping requirements mandated by recent amendments

to the Marine Mammal Protection Act of 1972 (MMPA) that could be easily incorporated into the groundfish logbook program. Management agencies and the fishing industry would benefit from this.

Most of the information specified in the recordkeeping requirements is currently maintained by the industry for internal business reasons. To minimize the recordkeeping costs associated with fishery management requirements, the logbooks were designed to provide a convenient form in which to enter information that serves both the business needs of those who maintain them and the reporting requirements being considered.

Examples of the logbook forms are presented in **Appendix 8.1.I.** These forms have been developed for discussion purposes and may not include all of the data fields discussed below. The groundfish industry is encouraged to review the forms and comment on how they may be improved to meet the needs of the industry. Appendix 8.1.I also presents an example of the type of marine mammal interaction information that may be required of groundfish vessel operators under the MMPA.

Table 8.1.1 summarizes the type of information that would be recorded and reported by the groundfish industry and some of the more important uses of the information collected. The specifics of the proposed changes in the recordkeeping and reporting requirements are included in the following discussions of the individual logs and reports.

Daily Cumulative Production Log (DCPL)

Catcher/processors, mothership processors, and shoreside processors would be required to maintain a daily cumulative production log (DCPL). The log would include daily, weekly, and year to date production information. The logs would remain on the vessels or at the processing plants during the fishing year and would be made available to observers and enforcement officers. Copies of the DCPLs would be submitted to NMFS on a quarterly basis to allow for timely data entry and analyses.

The processors' DCPL records would be used by enforcement officers to assist in verifying information reported in the weekly production reports and on fish tickets. It could also assist processors in preparing their weekly production reports (WPR).

Daily Fishing Log (DFL)

Each vessel 5 net tons or over harvesting groundfish off Alaska would be required to maintain a daily fishing log (DFL). The log would include: (1) vessel and gear specifications; (2) haul by haul or set by set information; (3) daily information on discards; and (4) information on daily vessel activity.

Vessel and gear specifications may include such information as engine power, crew size, type of gear used (longline, bottom trawl, midwater trawl, pot, or other), and other specific information on fishing gear used. The crew size information would be broken out by fishing and processing crews where appropriate. For longline and pot gear, information may be collected on the average number of hooks or pots per skate, size of hooks used, and average length of skates. Specific trawl information may include size of net opening, codend mesh size, and average speed of tow.

Table 8.1.1 General purposes of information collected in the recordkeeping and reporting requirements considered under Amendments 18 and 13.

	Use of Data Collected		
	Enforcement/ inseason catch verification and management	Effort/product data for evaluation of management measures and stock assessment	Economic Data for evaluation of management measures
Information Collection:			
A. Data fields in logbook forms[1]:			
-date; vessel or plant name; fishing area; gear type; operator name	X		
-crew size or employment			X
-trawl or set number; set and haul time; set and haul position	X	X	
-trawl depth; haul or set duration; number of skates or pots		X	
-estimated catch or catch-receipt weight	X	X	
-daily species discard information		X	
-retained product information	X	X	
-fish ticket #; ADF&G Vessel #; catch receipt time	X		
B. Weekly product report	X		
C. Transfer log	X		
D. Monthly product value report			X

1/ Data fields for recording information on the incidental take of marine mammals will likely be included once an information gathering system for the marine mammal program is approved and implemented. Collection of this information is mandated by the MMPA.

The haul by haul information would include the date, time, location, sea depth, trawl depth, hail weight, duration of haul or soak time, and number of units of gear fished for fixed gear vessels. The discard information would be for groundfish and for prohibited species. The estimated daily discards of halibut, crab, and salmon would be reported in numbers and by species if possible. All other species discard estimates would be reported by weight. Fishing vessels delivering to mothership processors and shoreside processors would be required to provide their discard estimates to the processors so that the processors can report these discards in their weekly production reports.

The effort information would be used for inseason enforcement and for biological and economic evaluations of existing and proposed fishery management measures. The former would consist primarily of activities associated with verifying information reported in weekly production reports and fish tickets.

Discard data would be used to obtain information relating to total fishing mortality resulting from groundfish operations. Although a comprehensive observer program would provide groundfish and prohibited species discard information from a significant portion of the industry, all catcher vessels and processors must be given the opportunity to record discard information. In addition to total mortality estimates, this information would be used to derive estimates of bias resulting from intentional or unintentional misreporting of data or collecting non-representative data. Furthermore, requiring recording of groundfish and prohibited species discard amounts will focus attention on bycatch issues and elevate the consciousness of the industry to the problem.

On a daily basis, the vessel operators may be required to record vessel time (to the nearest hour) spent on the following activities: (1) searching for fish; (2) fishing; (3) time in transit to a fishing area; and (4) down time. This information would be used to evaluate fishing effort and associated costs.

The logs would remain on the vessels and would be made available to both at-sea and shoreside observers and to enforcement officers. Mothership processor vessels would be required to make the daily fishing log information for its catcher vessels available to an at-sea observer. At-sea and shoreside observers would collect the effort data and use other information in the logs to assist in meeting their data collection responsibilities. The discard information maintained in the logs would assist those responsible for completing the weekly production reports which include estimates of discards.

Copies of the DFLs would be submitted to NMFS on a quarterly basis. As mentioned above, this information, along with that recorded in the DCPLs, would be maintained in a NMFS data base that would be accessed to evaluate existing and proposed management measures.

Product Transfer Logs

Shoreside processors would be required to maintain a product transfer log similar to that currently required of at-sea processors. This log would record all shipments or transfers of product by species and product type, the name of the company or person transporting the product, the date of shipment, and the destination of the product.

This information is necessary to verify the accuracy of reported groundfish catches received by a processor. Verification of groundfish catches received by shoreside processors would also require that enforcement

personnel be given the authority for on-site inspection of shoreside facilities so that product inventories can be compared to DCPLs and transfer logs.

Species product amounts recorded in the DCPL and transfer log are expected to be accurate to the nearest 0.1 mt (220 lbs). Because enforcement personnel are mainly interested in preventing intentional gross under logging of valuable groundfish species, some enforcement discretion will be necessary when encountering minor discrepancies between reported and observed product weights.

Weekly Transfer Report (WTR)

Each processor required to maintain a transfer log would be required to submit to NMFS a weekly summary of their transfer log entries for each week in which transfers occurred. These summaries would assist enforcement officers in verifying data reported on fish tickets and in weekly production reports. This would replace the current requirement that a transfer report be submitted for each transfer.

Weekly Production Report

There would be some changes in what catcher/processor and mothership vessels would report weekly and a similar report would now be required for shoreside processors. The reports would summarize (1) weekly production by species and product form, and (2) estimated discards of prohibited species and other species.

For catcher/processor and mothership vessels, the principal change is that they would report product weight rather than round weight. This simplifies reporting because product weights are maintained for business purposes. It also eliminates any inconsistencies that can occur when standard conversion factors by species and product form are not used to estimate round weight equivalents of product weight.

NMFS would publish a list of standard product conversion rates prior to the beginning of the year which would be used to convert the product weights in weekly production reports to round weights for the purpose of monitoring overall quotas for gear types and regulatory areas. These rates may be adjusted based on observer data or industry input. This requirement will contribute to better enforcement and more accurate catch reporting by removing any incentive to vessel operators to manipulate product conversion rates in order to "stretch" quotas of valuable groundfish species.

By also requiring that shoreside processors submit weekly production reports, the inseason management problems that arise from using dissimilar sources of catch data would be eliminated. These problems were discussed in Section 8.1.1.1. This would result in more timely and accurate catch estimates.

Species discard information is currently required on the weekly catch report. This information would continue to be required in the weekly production report for the same reason it is included in the proposed daily fishing log. That is, to account for total fishing mortality and to focus the attention of groundfish harvesters on both bycatch and discards and elevate the consciousness of the fishermen to bycatch problems when an observer is not on board. Mothership processors and shoreside processors would be expected to collect and report at-sea discard information from the fishing vessels that deliver groundfish to them and also report their own discards of landed fish.

Monthly Product Value Report (MPVR)

Each catcher/processor, mothership processor and shoreside processor or its parent company would complete a monthly product value report (MPVR) for any month during which groundfish harvested off Alaska were sold. The report would consist of quantity and value data summarized by species and product form for all sales transactions for the calendar month. The report would be submitted to NMFS annually, at the conclusion of the fishing year. By providing monthly information on an annual basis, valuable data on seasonal price fluctuations will be obtained without placing domestic processors in a position of disclosing sensitive proprietary information during the fishing season.

Similar data are currently reported on fish tickets for fishing vessels delivering to shoreside processors. Typically a transaction does not occur when catcher/processor or mothership vessels off-load their product; therefore, there are not prices and values to be reported on a fish ticket at the time it must be submitted. Therefore, an alternative mechanism is required to collect price and value data for this important and rapidly growing component of the groundfish fishery. And to have comparable data from shoreside processors, it is necessary to extend this requirement to all processors.

This information would be used in monitoring the economic performance of the groundfish fisheries and in conducting economic analyses of existing and proposed management measures. The requirements for such activities were discussed earlier.

8.1.2 Biological and Physical Impacts

The two alternatives considered for recordkeeping and reporting requirements differ in the quantity, quality, and type of data collected from the domestic groundfish industry. This information is provided to managers to derive and monitor inseason and inter-season management decisions influencing fishery resources and the fisheries that depend upon them. Overall management of the groundfish fishery is therefore limited by the quantity and quality of information managers have at their disposal to make informed, objective, management decisions.

Total fishing mortality resulting from domestic groundfish operations is currently derived from catch and discard information reported by the industry. The accuracy of this data influences how this information is used and how responsive management agencies can be to fluctuations in the groundfish resource as a result of fishing mortality and/or natural environmental perturbations.

8.1.2.1 Alternative 1: Maintain the status quo.

Under this alternative, current recordkeeping and reporting requirements would be maintained. Estimates of fishing mortality would continue to be based on reported catch and discard amounts without a system available to managers and enforcement personnel to verify such information. Existing requirements do not provide a strong incentive to the industry to report accurate catch information, and under reporting of valuable groundfish catch or discard amounts likely occurs. This situation increases the probability of overharvesting selected elements of the groundfish complex and undermining the biological considerations that underlie the derivation of the total allowable catch amounts for groundfish species and species groups. These considerations include (1) status of groundfish stocks; and (2) effects of total fishing mortality on the

stocks and predator/prey relationships within the groundfish complex itself and on the trophic interactions between groundfish and piscivorous seabirds and marine mammals.

8.1.2.2 Alternative 2 (Preferred): Modify existing recordkeeping and reporting requirements to provide better fishery management information.

The recordkeeping requirements considered under this alternative would provide an auditing procedure sufficient for effective monitoring of reported and observed catch by enforcement personnel. Participants in the U.S. groundfish industry who might be tempted to under report valuable groundfish species, fish in closed areas, or misrepresent the amount of species product produced or transferred will have less incentive to do so if their daily fishing and production activity were recorded in a DCPL, DFL or transfer log. As a result, reported harvest amounts of target and bycatch groundfish species will be more accurate and inseason management of area and gear quotas will be enhanced. Because annual harvest levels should more closely reflect area and gear quotas established for groundfish species, the biological premises that support total allowable catch amounts would be more fully maintained. The probability for overharvesting a species will be reduced and adverse impacts on the biological environment as a result of excess removals of groundfish from the ecosystem will be minimized.

8.1.3 Socioeconomic Impacts

8.1.3.1 Alternative 1: Maintain the status quo.

Under this alternative, the recordkeeping or reporting burden to groundfish fishermen or processors would not increase. Furthermore, no additional administrative, enforcement, or information costs would occur and inseason and inter-season management decisions would continue to be based on inadequate catch, fishery performance, and economic data.

The importance of having adequate fishery management information has increased with the growth of the domestic groundfish industry and accompanying decline of foreign fishing operations. In the absence of adequate biological, effort and economic data from the domestic industry, the risk of error associated with any given management decision is increased. The costs of such errors will soon be assumed completely by the domestic fishing industry and may adversely affect the efficiency and economic viability of domestic operations.

Fishery managers recognize the existing inadequacy of fishery information and are often forced to make excessively conservative management decisions to compensate for the lack of biological and economic information available to them. As a result management decisions such as TACs, area closures, bycatch levels, and gear restrictions tend to err on the side of the resource, thus reducing the amount of groundfish potentially available to the fishery. Attempts to avoid overharvesting of quotas through conservative regulation of fishing activity have, in the past, resulted in premature closures of fishing areas and entire fisheries. In the future, these and other management actions based on inaccurate or incomplete catch or performance information, could impose significant costs on the industry in terms of unharvested surplus resource. Depending upon the management measure implemented for the protection of the resource, reduced supplies of fisheries products potentially could affect the price and availability of fish in the domestic

retail market. Participation by the domestic industry in world markets could also be adversely affected if supplies were inappropriately reduced due to overly conservative management actions.

Furthermore, the lack of adequate biological and economic information together with the growing contentiousness of fishery management issues (including resource allocation among competing domestic user groups), could result in the fishery management decision making process being less objective, more political, and potentially less equitable. This can decrease the credibility of the fishery management process as a whole and result in an unnecessarily costly and ineffective management system.

In summary, fishery management decisions under the status quo alternative, based as they are on inadequate fishery information, could have adverse impacts on (1) the long-term biological stability and economic yield of the groundfish resource; (2) the efficiency and economic viability of the domestic groundfish industry; and (3) the credibility of the fishery management process itself. While these impacts cannot be quantified, the potential implications for the domestic industry must be recognized.

8.1.3.2 Alternative 2 (Preferred): Modify existing recordkeeping and reporting requirements to provide better fishery management information.

Effort, production, and value information are normally maintained by groundfish vessel operators and processing plant owners for their own business purposes. The costs associated with the preferred alternative pertain to the additional burden assumed by the groundfish industry to transfer this information to the required logbook or report and to submit this information to NMFS. Additional administrative costs associated with the maintenance of a logbook database and post-analyses of data would also be incurred by NMFS. The benefits associated with this action stem from the overall enhancement of fishery management decisions affecting the groundfish resource and fishing industry.

Table 8.1.2 lists the additional recordkeeping and reporting burden associated with Alternative 2. The estimated burden hours are based on industry averages. Individual elements of the industry may incur a greater or lesser burden depending on actual annual participation in the groundfish fishery. For example, the average amount of time that the operator of a catcher/processor or mothership processor could expect to spend in maintaining a DCPL is about 10 minutes per day or about 24 hours per year. This figure is based on an average of 142 processing days per year. In 1988, however, groundfish processing vessels operated as few as two days or as many as 301 days and the recordkeeping burden of these vessel operators could range from less than one hour to over 50 hours per year, respectively. A similar situation exists for shoreside processors; based on 1988 groundfish processing activity, shoreside facilities average about 57 processing days per year and would spend about 14 hours per year maintaining the DCPL. Some shoreside facilities, however, received only one delivery of groundfish during 1988, while others received groundfish on almost a daily basis. The DCPL recordkeeping burden to these plants would range from about 15 minutes to nearly 100 hours per year.

All catcher vessels equal to or larger than 5 net tons that harvest groundfish off Alaska would be required to maintain a Daily Fishing Log (DFL). In 1988, on average, catcher vessels fished 33 days for EEZ groundfish and would have spent an average of 5.5 hours maintaining the DFL. Many vessels (over 20% of all catcher vessels) spent less than 5 days fishing for groundfish in 1988 and would have incurred a recordkeeping burden of less than one hour for the year. A few catcher vessels may harvest groundfish for

Table 8.1.2. Estimate of additional recordkeeping and reporting burden associated with Alternative 2 (numbers in brackets represent burden associated with existing regulations).

	Industry Respondents				
	Catcher/ Processors	Mothership Processors	Shoreside Processors	Catcher Vessels	Total
No.potential respondents[1]	156	19	85	1,576	1,836
DCPL					
Ave. recording time/processor/day					
- effort & production	5 min	5 min	5 min	0	
- discard information	5 {5 min/wk}[2]	5 {5 min/wk}[2]	10 min[3]	0	
Ave.no.processing days/processor/year	142[4]	142[4]	57[5]	0	
Total processor burden hours/year	3,692 {624}	450 {76}	1,211	0	5,353 {700}
Daily Fishing Log					
Ave.recording time/vessel/day					
-effort information	0	0	0	5 min	
-discard information	0	0	0	5 min[6]	
Ave.no.fishing days/vessel/year	0	0	0	33[7]	
Total vessel burden hours/year	0	0	0	8,668	8,668
Product Transfer Log					
Ave no.transfers/ processor/year	24[8]	17[8]	24[9]	0	
Ave.recording & reporting time/transfer	{10 min}[10]	{10 min}[10]	10 min	0	
Total processor burden hours/year	{624}	{54}	340	0	340 {678}

Table 8.1.2-Continued. Estimate of additional recordkeeping and reporting burden associated with Alternative 2 (numbers in brackets represent burden associated with existing regulations).

	Industry Respondents				
	Catcher/ Processors	Mothership Processors	Shoreside Processors	Catcher Vessels	Total
No.potential respondents[1]	156	19	85	1,576	1,836
Weekly Product Report					
Ave. reporting time/week	10 min	10 min	10 min	0	
Ave.no.reporting weeks/year	{48}[11]	{48}[11]	24[12]	0	
Total processor burden hours/year	{1,248}	{152}	340	0	340 {1,400}
Monthly Product Value Report					
Ave.reporting time/month	30 min[13]	30 min[13]	30 min[13]	0	
Ave.reporting months/year	12	12	12	0	
Total processor burden hours/year	936	114	510	0	1,560
Total Additional Burden to Respondents	4,628 {2,496}	564 {282}	2,401	8,668	16,261 {2,778}

1/ Based on the number of 1989 Federal vessel permits issued as of April 17, 1989 and on 1989 NMFS survey results on Alaska groundfish utilization by U.S. processors. In past years, some vessels issued permits have not conducted fishing operations. Thus calculations of reporting burden based on the number of permits issued during a year should be viewed as maximum estimates.

2/ Effort and groundfish production records are normally maintained by processors for their own business purposes, and recording this information in the DCPL would take less than 5 minutes/day. Existing regulations also require processors to report weekly discard information; recording discard information in the DCPL may take an additional 5 minutes/day.

3/ Assumes that catcher vessels have already recorded some species discard information and that shoreside processors need another 10 minutes/processing day to record additional discard information.

4/ In 1988, 67 catcher/processor and mothership vessels operated a total of 9,498 days. This suggests that, on average, this segment of the industry processed groundfish an average of 142 days/vessel in 1988.

5/ In 1988, 85 shoreside processors received a total of 9,766 groundfish landings. Assuming an average of two landings per day/facility, shoreside processors operated an average of 57 days in 1988.

6/ Assumes that vessel operators who do pre-sort catch prior to delivery to a processor would need about 5 minutes/day to record species discard information. The State of Alaska requires that groundfish discard information be recorded on State fish tickets.

7/ In 1988, 1210 vessels (5 net tons or larger) made 8,256 deliveries of groundfish to shoreside processors and averaged 5 days per trip for about 34 fishing days/vessel in 1988. Also in 1988, 139 vessels made 2,713 landings to floating processors, averaging 20 fishing days/vessel. The weighted average for total number of fishing days for all catcher vessels is 33 fishing days/vessel/year.

8/ Based on the average number of transfer reports received by NMFS in 1988.

9/ Several shoreside processors ship fresh or frozen product on a daily basis and would be required to submit a weekly summary of their transfer log entries. Most shoreside groundfish operations are seasonal, however, and would report groundfish product shipments 24 weeks/year or less.

10/ Catcher/processors and motherships are currently required to maintain a product transfer log and to submit to NMFS a weekly summary of transfer information during those weeks such activity occurs. Records of product transfer or shipment are normally maintained by processors for their own business purposes.

11/ Assumes that catcher/processors and mothership processors would not be in operation for a minimum of four weeks per year due to annual maintenance requirements. Because the weekly product report would replace the existing weekly catch report, the burden hours associated with the submission of the former represents no additional burden to these vessels.

12/ Most shoreside facilities process groundfish on a seasonal basis and would report groundfish production 24 weeks/year or less.

13/ Most processors record the sale of their product by date, product type, weight, and value for their own business purposes. Summarizing and transferring this information to the monthly product value report would take less than 30 minutes per month.

as long as a processor is available to receive its catch. A catcher vessel that fished EEZ groundfish for 300 days would incur a DFL recordkeeping burden of 50 hours per year.

All groundfish processors and catcher vessels would incur the costs associated with submitting copies of their DCPL and/or DFL to NMFS on a quarterly basis. Assuming an average cost of $2.50 per submission (priority mail), and that all processors and catcher vessels would submit records to NMFS four times a year, the total annual cost to the groundfish industry would be about $18,360.

Existing regulations require catcher/processors and mothership processors to maintain product transfer logs and to submit a separate product transfer report summarizing weekly transport activity. Under Alternative 2, the burden to these processors may actually be reduced, because submission of a separate transfer report would no longer be required. Rather, vessel operators will simply submit a copy of their transfer log entry or other similar documentation showing amount of product transferred. Current regulations do not require shoreside operators to maintain transfer logs and this would be an additional recordkeeping and reporting requirement under Alternative 2. On average, a shoreside operator would spend about 4 hours per year maintaining a product transfer log and submitting copies of logbook entries to NMFS.

Existing regulations also require catcher/processors and mothership processors to submit to NMFS a weekly catch report detailing retained and discarded catch amounts. This requirement is maintained under Alternative 2, except that retained catch would be reported as product weight rather than round weight. This should facilitate the vessel operator's submission of weekly reports. Alternative 2 would place an additional reporting burden on shoreside operators to submit weekly product reports. Because the information required on weekly product reports would be summarized in the DCPL, little additional time would be required to fill out the weekly product report. On average, shoreside processors would spend about 10 minutes a week filling out the form and submitting it to NMFS. Assuming shoreside plants process groundfish an average of 24 weeks per year or less, the annual burden to a shoreside plant would average 4 hours or less.

Monthly product value reports would be required from all processors for those months when they recorded sales of groundfish products. Assuming about .5 hours per report and a maximum of 12 reports per year gives an estimated annual burden of about 6 hours per groundfish processor. These monthly reports would be compiled and submitted annually to NMFS.

The costs to catcher/processors and motherships associated with submitting weekly product transfer logs entries or other similar documentation and weekly product reports would not differ from current costs associated with submitting transfer reports and weekly catch reports. Shoreside processors, however, would incur the additional cost of submitting to NMFS weekly summaries of product log entries and weekly product reports. The cost of submitting this information via Fax machine, the most common mode of transmitting this type of information, would be about $2.40 per transmission. Assuming that shoreside plants would submit an average of 24 weekly product reports per year and about the same number of product transfer summaries (Table 8.1.2), the cost to a shoreside plant to comply with these reporting requirements would be about $115 per year. Given these assumptions the total annual cost to the 85 shoreside processors who would be required to comply with these reporting requirements could total $9,775.

All groundfish processors would incur an additional annual cost associated with submitting copies of their monthly product value reports to NMFS. These costs would depend on the mode of transmission used and could range from less than $2.00 to send the reports by mail to about $10 if a processor's home office transmitted 12 monthly reports via Fax machine. The total cost incurred by groundfish processors as a result of annually submitting these reports by mail would be about $520 and about $2,600 if all the reports were submitted by Fax from shorebased company representatives.

Enforcement and administrative costs:

Certain costs would be incurred by management agencies in administering and enforcing the recordkeeping and reporting requirements considered under Alternative 2. Current enforcement costs include salaries of enforcement personnel and costs associated with utilizing support platforms, e.g, U.S. Coast Guard vessels. No additional enforcement personnel or U.S. Coast Guard vessels would be required under this alternative because (1) enforcement personnel are already hired to support the conservation and management role of NMFS, and (2) U.S. Coast Guard vessels are already in place to carry out search-and-rescue and fisheries enforcement missions off Alaska. The decline in foreign fishing operations off Alaska has released sufficient enforcement resources to monitor domestic compliance with recordkeeping and reporting requirements. NMFS estimates that the amount of time to inspect a catcher/processor, mothership vessel, or shoreside processor, including auditing DCPLs and transfer logs, would average about 4 hours. If each processor were inspected quarterly, which is the frequency foreign motherships are boarded and inspected, then a maximum of 4,160 hours would be required to inspect 260 floating and shoreside groundfish processors.

Sufficient administrative support is already in place to handle weekly catch reports and transfer reports received from at-sea processors. The modifications to these reporting requirements considered under Alternative 2 would not pose any additional burden to NMFS personnel. Additional time would be required to process the additional weekly product reports and transfer log summaries received from shoreside operators, but current personnel levels are considered sufficient to process this information.

The annual processing of the monthly product value reports received from groundfish processors would not require the hiring of additional personnel. It would, however, likely entail a short-term restructuring of administrative support to handle the additional data entry and processing needs.

The collection of DCPLs and DFLs by NMFS, the timely input of the data recorded in these logbooks into a fisheries information data base, the analyses of the data and maintenance of the data base would require hiring two additional full-time employees (GS-5 and 9) at an annual cost of about $50,000. In addition, another $120,000 per year would be required for data entry and maintenance.

Appendix 8.1.I

Collection of Suggested Data Forms Associated With the Proposed Recordkeeping and Reporting Requirements

The following data forms are included in this appendix:

1. Catcher/processor daily cumulative production log.
2. Mothership vessel catch receipt and daily cumulative production log.
3. Shoreside processor catch receipt and daily cumulative production log.
4. Catcher vessel daily fishing log.
5. Shoreside processor product transfer log.
6. Floating processor product transfer log.
7. Alaska groundfish processor weekly production report.
8. Alaska groundfish processor monthly product value report.
9. An example of marine mammal interaction information that may be required of the groundfish industry under the MMPA.

CATCHER/PROCESSOR DAILY CUMULATIVE PRODUCTION LOG

Crew Size	
Fishing	
Processing	
Other	
Total	

PAGE	YEAR-MON-DAY	VESSEL NAME/ADF&G #	FEDERAL STATISTICAL AREA	GEAR TYPE	OPERATOR

TRAWL OR SET NO.	SET TIME	SET POSITION	SEA DEPTH	TRAWL DEPTH	HAULING TIME	HAULING POSITION	HAUL OR SET DURATION	NUMBER OF SKATES OR POTS	NUMBER OF HOOKS OR POTS PER SKATE	ESTIMATED CATCH WEIGHT (MT)
TOTAL										

DISCARDED SPECIES

SPECIES											
DAILY DISCARD AMOUNT											

RETAINED PRODUCT INFORMATION

SPECIES/ PRODUCT TYPE[1]											
BALANCE FORWARD											
DAILY TOTAL											
CUMULATIVE TOTAL FOR WEEK											

1/ Refer to instructions for product type codes

MOTHERSHIP VESSEL CATCH RECEIPT AND DAILY CUMULATIVE PRODUCTION LOG

PAGE	YEAR-MON-DAY	VESSEL NAME	FEDERAL STATISTICAL AREA	GEAR TYPE	OPERATOR	Crew Size: Processing / Other / Total

CODEND NO.	RECEIPT TIME	RECEIPT POSITION	VESSEL NAME	ADF&G VESSEL NO.	ESTIMATED CATCH RECEIPT WEIGHT (MT)

DISCARDED SPECIES

SPECIES											
DISCARD AMOUNT											

RETAINED PRODUCT INFORMATION

SPECIES/ PRODUCT TYPE[1]											
BALANCE FORWARD											
DAILY TOTAL											
CUMULATIVE TOTAL FOR WEEK											

1/Refer to instructions for product type codes

SHORESIDE PROCESSOR CATCH RECEIPT AND DAILY CUMULATIVE PRODUCTION LOG

PAGE	YEAR-MON-DAY	PLANT NAME/AK ST.PROC.CODE	FEDERAL STATISTICAL AREA	GEAR TYPE	EMPLOYMENT Processing: _____ Other :

FISH TICKET NUMBER	VESSEL NAME	ADF&G VESSEL NO.	RECEIPT TIME	ESTIMATED CATCH RECEIPT WEIGHT (MT)

DISCARDED SPECIES

SPECIES											
DAILY DISCARDS											

RETAINED PRODUCT INFORMATION

SPECIES/ PRODUCT TYPE[1]											
BALANCE FORWARD											
DAILY TOTAL											
CUMULATIVE TOTAL FOR WEEK											

1/ Refer to instructions for product type codes

CATCHER VESSEL DAILY FISHING EFFORT LOG

PAGE	YEAR-MON-DAY	VESSEL NAME/ADG&G #	FEDERAL STATISTICAL AREA	GEAR TYPE	OPERATOR	CREW SIZE

TRAWL OR SET NO.	SET TIME	SET POSITION	SEA DEPTH	TRAWL DEPTH	HAULING TIME	HAULING POSITION	HAUL OR SET DURATION	NUMBER OF SKATES OR POTS	NUMBER OF HOOKS OR POTS PER SKATE	ESTIMATED CATCH WEIGHT (MT)
TOTAL										

DISCARDED SPECIES

SPECIES											
DAILY DISCARD AMOUNT											

ALASKA GROUNDFISH

SHORESIDE PROCESSOR PRODUCT TRANSFER LOG

National Marine Fisheries Service
P.O. Box 21668, Juneau, AK 99802
Telex: RCA 45-377 NMFS AKR JNU
Rapicom: 907-586-7131
Telephone: 907-586-7229

Page #	
Receive	
Shipment	

Representative Phone Number Fax or Telex Number

Plant Name Plant location Alaska State Processor Code

A. Name of other agent involved in transfer (if a vessel, list port of landing in Part C, below).

B. Date and Time of Product Transfer

Start: Date_____ Time_____(GMT)

Finish: Date_____ Time_____(GMT)

C. Intended designation of agent receiving product (including port of landing of vessel receiving product transfer):

D. Products and quantities offloaded:

SPECIES	PRODUCT CODE	NO. OF CARTONS	*CARTON WT. KG OR LBS	TOTAL WT. (MT)	SPECIES	PRODUCT CODE	NO. OF CARTONS	*CARTON WT. KG OR LBS	TOTAL WT. (MT)

ALASKA GROUNDFISH

FLOATING PROCESSOR PRODUCT TRANSFER/OFFLOADING LOG

National Marine Fisheries Service
P.O. Box 21668, Juneau, AK 99802
Telex: RCA 45-377 NMFS AKR JNU
Rapicom: 907-586-7131
Telephone: 907-586-7229

Page #	
Receive	
Offload	

Representative Phone Number Fax or Telex Number

Vessel Name Federal Permit Number Call Sign

A. Other vessel involved in transfer (if landed, list port of landing):

Name of other vessel Federal Permit Number Call Sign

B. Date and Time of Product Transfer

Start: Date_____ Time_____(GMT)

Finish: Date_____ Time_____(GMT)

C. Position Transfered

Latitude:_____N Longitude:_____W,E

D. Intended port of landing of vessel receiving product:

_____

E. Products and quantities offloaded:

SPECIES	PRODUCT CODE	NO. OF CARTONS	*CARTON WT. KG OR LBS	TOTAL WT. (MT)	SPECIES	PRODUCT CODE	NO. OF CARTONS	*CARTON WT. KG OR LBS	TOTAL WT. (MT)

ALASKA GROUNDFISH PROCESSOR WEEKLY PRODUCTION REPORT

Representative | Phone number | Fax or Telex number

Vessel name (or plant name) | Federal permit number (for shoreside plant, Alaska State Processor Code) | Call sign

Reporting period (indicate fishing week ending on Saturday) | Gear type (one per page)

	THIS SECTION FOR RETAINED AND PROCESSED CATCH						THIS SECTION FOR DISCARDED SPECIES			
	Federal statistical area: Days fished or received fish: Total estimated catch weight/receipt:			Federal statistical area: Days fished or received fish: Total estimated catch weight/receipt:			Allocated species		Prohibited species	
Species	Prod type	Prod wt	Prod type	Prod wt	Prod type	Prod wt	Prod type	Prod wt	Amount (0.1 mt)	Stat. area	Species name	Stat. Amount area (0.1mt or nos)
Pollock	/		/		/		/		/			/
Pacific cod	/		/		/		/		/			/
Sablefish	/		/		/		/		/			/
Yellowfin sole	/		/		/		/		/			/
Greenland turbot	/		/		/		/		/			/
Arrowtooth flounder	/		/		/		/		/			/
Rock sole	/		/		/		/		/			/
Other flatfish	/		/		/		/		/			/
POP complex (BSA)	/		/		/		/		/			/
Other rockfish (BSA)	/		/		/		/		/			/
Slope rockfish (GOA)	/		/		/		/		/			/
Pelagic shelf rockfish (GOA)	/		/		/		/		/			/
Demersal shelf rockfish (GOA)	/		/		/		/		/			/
Thornyhead	/		/		/		/		/			/
Atka mackerel	/		/		/		/		/			/
Squid	/		/		/		/		/			/
Other groundfish	/		/		/		/		/			/

1/ Refer to regulations for definition of species/species groups
2/ Refer to instructions for product type codes.
3/ Product weights should be reported to the nearest 0.1 metric ton (220 lbs.).

National Marine Fisheries Service
P.O. Box 21668, Juneau, AK 99802
Telex: RCA 45-377 NMFS AKR JNU

ALASKA GROUNDFISH PROCESSOR MONTHLY PRODUCT VALUE REPORT

Representative | Phone Number | Fax or Telex Number

Vessel Name(s) / Plant Name(s)

Federal Permit Number(s) / Alaska State Processor Number(s): | Month and Year:

Species	Product type	Product size or grade	Product wt	Product value	Product type	Product size or grade	Product wt	Product value	Product type	Product size or grade	Product wt	Product value
Pollock												
Pacific Cod												
Sablefish												
Yellowfin sole												
Greenland turbot												
Arrowtooth flounder												
Rock sole												
Other flatfish												
POP Complex (BSA)												
Other rockfish (BSA)												
Slope rockfish (BSA)												
Pelagic shelf rockfish (GOA)												
Demersal shelf rockfish (GOA)												
Thornyhead												
Atka mackeral												
Squid												

MARINE MAMMAL INFORMATION

PAGE	VESSEL NAME	VESSEL ADF&G NUMBER	MARINE MAMMAL EXEMPTION NUMBER

MARINE MAMMAL INTERACTIONS WITH GEAR OR CATCH							MARINE MAMMALS TAKEN (ENTANGLED, ENTRAPPED, HOOKED)		
YEAR-MON-DAY	HAUL OR SET NO.	SPECIES CODE	HARASSED Y/N	HARASSMENT METHOD	NO. INJURED	NO. KILLED	SPECIES CODE	TOTAL NO.	STATUS CODE

8.2 Observer Program

8.2.1 Description of and Need for the Action

Section 8.1 of the comprehensive data gathering program requires the industry to keep and report records, and is designed primarily to estimate landed catch, value, and fishing effort. However, some data for measuring the effects of fishing on the resources can only be reliably collected through an observer program, both shorebased and at-sea. An observer program should provide a scientifically-sound sampling of fishing and processing activities in the industry to provide data that cannot be accurately reported by fishermen or are too burdensome for them to collect.

The observers will be a uniformly trained group of scientists whose objectives are data gathering. They will be stationed aboard vessels and at shorebased processing plants to gather data according to a statistically-sound plan. Observers will perform multiple duties (see **Appendix 8.2.I**) including: estimating haul weight, sampling for species composition, estimating product recovery rates, estimating discards and catch of prohibited species (PSCs), collecting biological data and specimens, and collecting data on the operation and characteristics of the vessel and fishing effort.

The need for observer coverage is directly related to the desired quality and reliability of the data to be collected. There are two main reasons to have observers collect some data:

(1) to reduce the chance of bias in the data. Some fishery data, such as haul weight, amount of discards (e.g. undersized fish, undesired species, undesired quality), and amount of PSCs (e.g. Pacific halibut, king crab, and Tanner crabs), have a greater potential for bias than other data, such as landed catch. Bias can result from intentional or unintentional misreporting of data or collecting non-representative data. Deliberate under-reporting of PSCs to stay under a PSC cap and therefore prolong a fisheries opening is an example of intentional misreporting of data. Under- or over-reporting of discards, because the importance of such data collection is secondary to catching and processing target species, is an example of unintentional misreporting of data. Non-representative data may be gathered if a fishing crew aboard a vessel collects very good data on PSCs in one area (e.g. because catch is small and there is time to collect such data) but not in another (e.g. because catch is large and there is not time to collect data).

(2) to relieve industry from the burden of collecting data. Collection of data not normally gathered by fishermen or processors may be an inordinate burden if fishermen and processors were required to collect such data. For example, samples used to provide age data on some species are not normally collected in the prosecution of a fishery. Even collecting data on amounts of discard and PSC divert fishermen and processors from their primary responsibilities. In addition, gathering certain kinds of data may require specialized training, which could be an added burden if such training were required of industry.

Examples of data which, for one or both of these reasons, are best collected by onboard or onshore observers include:

* mortality rates for non-landed catch--e.g. PSC and discards.

* Species composition data--to determine species co-occurrence and interactions.
* Size/length and age composition data--to determine year class strength and as input data for age-structured cohort analyses models.
* Fish stomach samples--to determine predator-prey relationships.
* Viability of discards and PSC--to determine survival rate of PSCs and discards.
* Marine mammal interactions.
* Biological specimens and tag placement or recovery--to provide information for selected objectives, such as migration.
* Processing gear and techniques.
* Product recovery rates.

To provide a comprehensive sampling of the industry's activities over a wide geographical area and time period, the observer deployment will be devised so as to achieve a "statistically reliable" sampling of the fleet's fishing and processing activities.

8.2.2 The Alternatives

To achieve a target level of statistical reliability for the data collected, a minimum level of observer coverage of the fleet is required. The degree of coverage is dependent upon the type of data and their inherent variability. Three alternatives are proposed:

> Alternative 1: Maintain the status quo. Under this alternative, observer coverage is voluntary, except for coverage specifically required by the Council or the Marine Mammal Protection Act (MMPA).
>
> Alternative 2: Implement fixed percentage mandatory observer coverage (of up to 100%). This alternative proposes requiring 100% observer coverage on all vessels beyond a certain size, and at all shorebased plants. Vessels that are too small to accommodate an observer will be sampled during shoreside deliveries.
>
> Alternative 3 (Preferred): Implement mandatory observer program that is frameworked to allow less than 100% coverage. This is a frameworked approach which recognizes that there are considerable variabilities in the data collected from different segments of the fleet, and may assign different percentage levels of observer coverage to them in order to increase precision of the estimates. Levels of coverage would be determined by required precision of estimates and cost of obtaining the estimates.

A description of each of these alternatives follows.

8.2.2.1 Alternative 1: Maintain the status quo.

Observer coverage will continue to be voluntary and minimal. At present a number of ad hoc arrangements have been made to ensure some level of observer coverage on domestic fisheries. For 1988 these arrangements provided opportunities for observing only about 1% of the DAP catch in the Gulf of Alaska (1,500 mt observed out of 150,000 mt catch), and only 0.7% of the DAP catch in the Bering Sea/Aleutians

region (4,500 mt observed out of 668,000 mt catch). The table below summarizes these observer arrangements:

	Program	Managed by	Funded by
1.	ADF&G Groundfish Observer Program	ADF&G	ADF&G
2.	Port Moller Cod Fishery Observer Program	NWAFC & UW	Industry
3.	Gulf of Alaska Rockfish Observer Program	NWAFC	Industry
4.	Zone 1 BS/AI Flatfish Fishery Observer Program	NWAFC	Industry
5.	Pilot Domestic Observer Program	Alaska Sea Grant NWAFC	NPFMC
6.	Longline sablefish-killer whale Observer Program	NWAFC	NWAFC & Greenpeace

Appendix 8.2.II provides a discussion of the existing domestic observer programs and plans to augment them, including new observer requirements under the MMPA. In general, most of the above ad hoc arrangements of observer coverage are expected to be continued in 1989.

8.2.2.2 Alternative 2: Implement Fixed Percentage Mandatory Observer Coverage (of up to 100%).

This alternative proposes requiring 100% observer coverage on all vessels beyond a certain size, and at all shorebased plants. Vessels that are too small to accommodate an observer shall be sampled during shoreside deliveries.

In practice, it is impractical to achieve 100% coverage. The fleet is composed of vessels with wide variations in size/tonnage classes and gear types, some of which have limited physical capacity to take on observers. All shorebased processing plants are assumed to be capable of accommodating observers. **Appendix 8.2.III** discusses how many domestic vessels are capable of accommodating observers and the summary is provided as follows.

The table below summarizes the classification of vessels according to operations and 25 feet length increments. The NOAA data base that was updated through April 1989 showed that 1,855 vessels had Federal permits to fish off Alaska. Assuming that vessels larger than 50 feet are large enough to accommodate observers, the number of vessels capable of accommodating at least one observer are: 650 catcher vessels, 128 catcher/processor vessels, and 19 motherships.

Number of vessels by 25-foot length increments by operating mode.

Length(ft)	Catcher Trawl	Pot	LL	M*	Catcher/processor Trawl	Pot	LL	M*	Mothership
1- 25	2	0	47	1	0	0	1	0	0
26- 50	31	3	938	4	3	1	27	0	0
51- 75	53	2	346	2	0	0	10	0	0
76-100	78	9	63	0	4	1	10	0	0
101-125	51	4	14	0	2	1	4	0	0
126-150	6	2	2	0	8	1	8	0	3
151-175	9	0	2	0	12	7	15	0	2
> 175	7	0	0	0	38	1	6	0	13
Total>50	204	17	427	2	64	11	53	0	19
No. of vessels capable of taking an observer			650			128			19

* Denotes use of Multiple Gear

8.2.2.3 Alternative 3 (Preferred): Implement Mandatory Observer Program That Is Frameworked To Allow Less Than 100% Coverage.

This alternative is a frameworked approach to provide information applicable to the entire groundfish fishery, while sampling less than 100% of the fleet and shoreside processing plants. Because data obtained from a portion of the industry will be used to represent the entire industry, a sampling approach must be used which promotes representativeness and reliability of the data. The Council chose this alternative based on the necessity to maintian flexibility in the design and implementation of a new, unique program. The Council will work closely with NMFS in assessing the practicality of differing levels of observer coverage, and in establishing an administrative structure for the program.

Several types of data are most effectively collected by observers. Examples include prohibited species catch (PSC) and discards, species and age composition, food habits, and fishing effort. Established sampling techniques which provide the most statistically reliable information for the available funds can be used to assign observers to vessels to acquire the data.

Reliability of the data is judged, in part, by the variance of the estimates. Reliability is increased by decreasing the variance. Decreased variance means greater confidence that an estimate obtained by sampling a portion of the fleet, is closer to the actual value for the entire fleet. A goal of this alternative is to obtain estimates which have the lowest variance possible, given the available data collection resources. The goal can be achieved partly by identifying those factors which influence variability, and then assigning observers to vessels using an approach that accounts for those factors.

Application of this alternative involves three steps: (1) identifying the influential factors, (2) determining the appropriate number of observers, and (3) assigning observers to vessels.

Step 1. Identification of Influential Factors

The influence of a factor on any variable of interest (e.g. PSC) can be determined by examining the affect that factor has on the variane of the variable. Therefore, influential factors will be identified, in part, by determining which factors affect the variance of the variable. One approach will be to use regression models. Regression models are evaluated to determine which factors decrease variability in the parameter, when the various factors are included in the model. Once the influential factors have been identified, they are used to specify appropriate strata for observer deployment. Preliminary use of this regression method, using observer data from JV fisheries, indicates that for PSCs (especially PSC of halibut), the most influential factors are target species, month, and fishing area, in combination with species catch. (see **Appendix 8.2.IV** for a brief description of the method).

Step 2. Determination of the total number of observers.

Determining the appropriate number of observers is accomplished by specifying the desired precision (variance) in parameter estimates and/or specifying the funding level for the observer program.

(a) Precision. Specification of a level of precision in estimates will dictate the number of observers and therefore required funding. To help define an appropriate level of precision, estimates of attainable levels of precision can be plotted against levels of observer coverage required. Figure 8.2.1 shows such an example. Below a certain range, substantial improvements in precision could be achieved by a modest increase in the level of observer coverage. Above that range, little improvement could be gained by adding more observers.

(b) Funding. Specification of a level of funding, and therefore number of observers, will dictate the precision attainable.

Step 3. Assignment of Observers to Vessels

Observers can be assigned to vessels in two ways: one according to a stratified random sampling design, and the other according to proportion of catch or effort (see **Appendix 8.2.V**).

Stratification is used to decrease variance in the estimate. The strata may be defined from Step 1. Determination of the optimum deployment of observers (i.e. the number of observers assigned to each stratum) will require information of variances within each stratum, and perhaps the costs for deploying observers in each stratum. Once the formula in **Appendix 8.2.V** determines how many observers are assigned by strata, the observers can be assigned randomly to vessels within each stratum. Random assignment of observers is necessary to minimize bias in estimates and to allow testing for bias.

For Steps 2 and 3, some preliminary information is necessary on variances in the estimates and costs for observer deployment. There are two estimators that may be used to calculate the initial variance: (1) a

multi-variate ratio estimator, and (2) a multiple regression estimator (see **Appendix 8.2.IV**). The cost for observer deployment is generally well known (see **Appendix 8.2.III**). At present, variance estimates for most variables of interest in the domestic fishery are lacking. Although data from the joint venture and small domestic observer programs are available, their utility for estimating stratum-specific variance and deriving appropriate number of observers may not be representative of the entire domestic fishery. Therefore, prior to full implementation of this alternative, some preliminary sampling will be needed to supply the necessary data for deriving the overall precision desired, the appropriate number of observers needed, and the optimum deployment strategy for the observers.

First Year Observer Sampling--The level of observer coverage for Year 1 (i.e. preliminary sampling) can be determined using one of the two approaches described in Step 2., above.

Option One is to specify a funding level (e.g. $2 million), and therefore observer coverage (about 20% observer coverage).

Option Two is to assume that data from joint-venture operations are the best available data and somewhat representative of domestic operations. From these data, attainable precision for estimates can be plotted against increasing levels of observer coverage (see Figure 8.2.1) for an example pertaining to estimation of prohibited species catches. This type of graph will provide some indication of the expected benefits (in terms of increased precision) that may be achieved with increasing levels of observer coverage. For example, assuming 20% coverage of the fleet, there would be a 95% probability of obtaining bycatch estimates for halibut, bairdi Tanner and red king crab that were within $\pm$ 10, $\pm$ 19, and $\pm$ 28%, respectively, of their true total bycatch.

Figure 8.2.2 shows the estimated cost of the observer program with increasing levels of precision (based on $7,500 per observer month for a 6,000 vessel-week fishery) . The cost for a 20% observer program will be about $2,000,000. In general, it will cost $1,000,000 for each additional 10% of observer coverage. Ten million dollars are required at achieve 100% coverage. This estimate does not include observer cost for shoreside sampling for small vessel landings and processing plants.

Regardless of the approach used for the first year's sampling, the fleet should be stratified to assure more representative and equitable sampling of the fleet. Although a list of the preliminary strata may be identified for sampling, optimal deployment of observers among strata will not be attainable until sufficient data become available. Lacking such data, a first year deployment strategy would be to (1) stratify the fleet according to gear-vessel-species categories (see below), and (2) assign available observers to strata according to their expected proportion of the total catch (or proportion of the effort) for the year. A list of the preliminary strata follows:

A. Bering Sea-Aleutians Gear-Vessel-Species Categories

1. Midwater trawl fishery for pollock
2. Bottom trawl fishery for pollock
3. Bottom trawl fishery for Pacific cod
4. Bottom trawl fishery for flatfishes
5. Bottom trawl fishery for "other species"

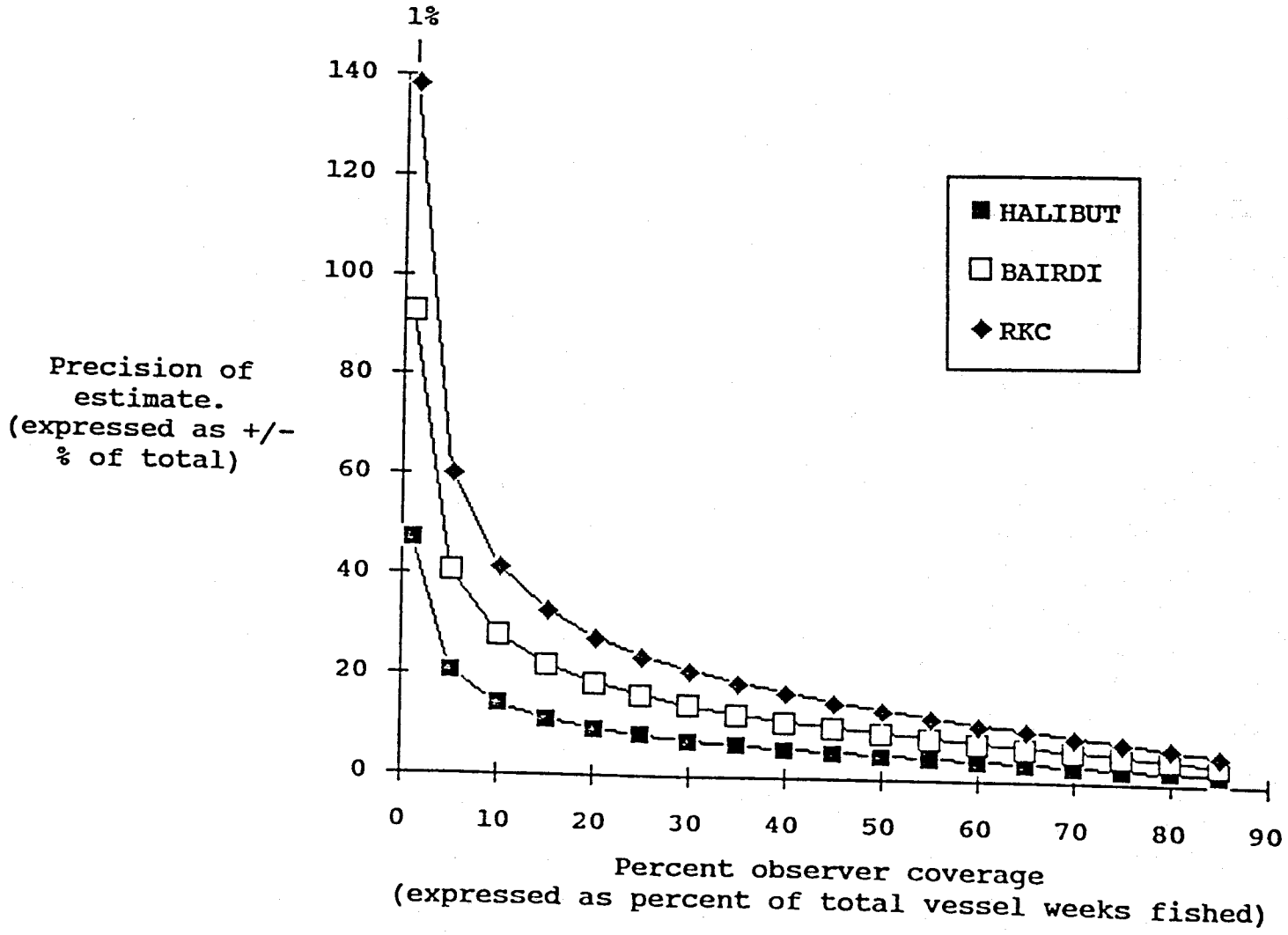


Figure 8.2.1. Example of a graph showing precision of bycatch estimates attainable with increasing levels of observer coverage in the eastern Bering Sea joint-venture fisheries.

(Note: These estimates are based upon the Bering Sea groundfish joint-venture fisheries data for 1986-88. Precision is expressed as plus or minus percent of the mean estimates of bycatch species: 776 kg/boat week for Pacific halibut, 59 crabs per boat week for red king crab, and 205 crabs per boat week for *C. bairdi* tanner crabs.)

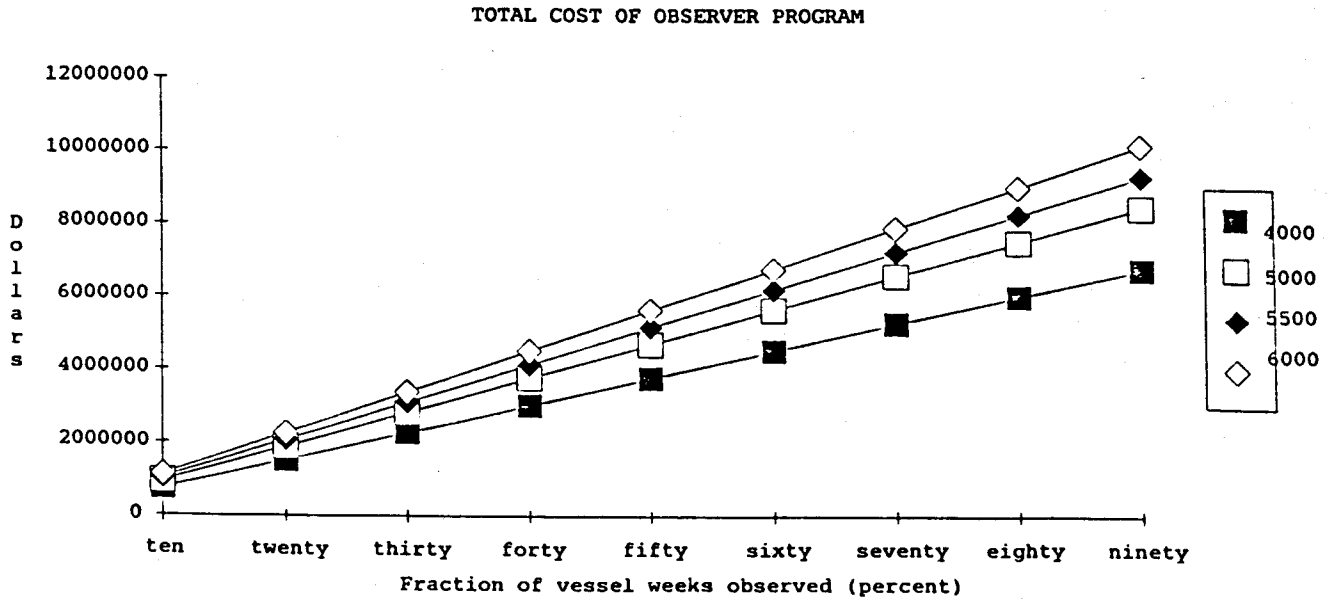


Figure 8.2.2. Graph showing the cost of running an observer program off Alaska with increasing levels of observer coverage.

(Note: Cost is based on $7,500 per observer month. Observer coverage is expressed as percent of a program involving 4,000 to 6,000 observer weeks to cover 100 percent of the fisheries.)

6. Longline fishery for sablefish or Pacific cod
7. Pot fishery for sablefish or Pacific cod

B. Gulf of Alaska Gear-Vessel-Species Categories

1. Midwater trawl fishery for pollock
2. Bottom trawl fishery for all species
3. Longline fishery for sablefish
4. Longline fishery for Pacific cod or rockfish
5. Longline fishery for Pacific halibut
6. Pot fishery for Pacific cod or other species

In addition, a separate observer deployment schedule will also have to be developed for sampling shore-side processors and landings of small vessels. The procedure for setting the level of coverage and assignment of observers would be similar to that described for sampling the fleet.

In practice, either of these approaches (i.e. arbitrarily setting observer coverage or using JV data to determine level of observer coverage) would only be used during Year 1. Based on data obtained Year 1 sampling, desired levels of precision for various parameters and stratum-specific variance estimates for those parameters may be obtained and used to apply stratified random sampling in subsequent years of observer coverage.

As indicated previously, data for a number of different variables will be collected by observers. However, optimum sampling strategies probably cannot be employed simultaneously for all estimates of interest. Some prioritization of estimates will be necessary. This prioritization can vary from year to year. For some variables, such as bycatches, the optimum level of observer coverage and pattern of observer deployment will probably be the same or similar (e.g. estimates of PSCs and other discards).

Variances associated with the highest priority estimate will largely dictate the number and deployment of the observers. If variances of other estimates (e.g. species and age composition) are less than variances of the higher priority parameters (e.g. PSCs and discards), estimates of those "other" variables will be more precise than the higher priority parameters.

8.2.3 Biological and Physical Impacts

The three alternatives for observer coverage differ mainly in the expected accuracy, precision and consistency of data provided by the alternative. Consistency of the data refers to the ability to maintain an adequate level of accuracy and precision in the data. Generally, as the level of observer coverage increases, the accuracy and precision of the data will improve. As these three characteristics improve, management decisions based on the data will improve and adverse biological and physical impacts resulting from those decisions will tend to be reduced.

These alternatives are expected to have minimal-to-no impact on the physical environment. Beyond potential data on marine debris, the observer program is not intended to yield data on factors which might affect the physical environment. Therefore, this analysis addresses mainly biological impacts.

The following general discussion emphasizes the potential influence of the groundfish fishery on groundfish and other biological components of the Bering Sea and Gulf of Alaska. Any adverse biological impacts related to these three alternatives will probably be associated with the relative adequacy of data provided under the alternatives, and the fishery management decisions based on the data. Following the general discussion, the three alternatives are evaluated with respect to the adequacy of the data provided and possible biological impacts related to the adequacy.

Inadequate estimates of fish mortality (specifically, mortality of non-landed fish) could have biological impacts. The three alternatives for observer coverage all influence the accounting of total fishing mortality. Accurate accounting of fishing mortality promotes conservation of all marine resources when harvesting of target groundfish species is limited to intended quotas and overharvesting is prevented. Any harvesting introduces changes in the ecosystem as the mortality of groundfish and other species varies.

Any fishing mortality causes changes in predator/prey relationships. These predator/prey relationships are part of a complex food web. Groundfish harvest can influence this food web in three major ways. First, harvest of fish which are landed (i.e. removed from the ecosystem) reduces the availability of prey to those predators which rely on the landed species as prey. Second, removal of fish (i.e. landed catch) from the ecosystem results in a decrease in the predator population, to the extent that harvested fish preyed on other species. Third, discard mortality associated with nonlanded fish or offal from fish processing, increases the availability of nutrients and energy to certain species. The influence of groundfish fisheries on this food web will vary depending on many factors including amount and species of biomass landed or discarded, geographic location, time of year, population levels of other organisms, physical changes in ocean chemistry, temperature, and weather conditions.

Examples of predator/prey relationships and the implications of these relationships on fish species, marine mammals, and seabirds are further discussed as follows:

Effects on groundfish species.

Predator/prey relationships have been evaluated for species such as yellowfin sole, Pacific herring, Pacific cod, and walleye pollock. Target fisheries tend to take the largest fish of any particular species. Other fish species and seabirds consume the youngest prey. Marine mammals tend to take slightly older (and larger)

prey. Since the most abundant and ecologically important species harvested are walleye pollock, Pacific cod, and yellowfin sole, the following discussions are categorized accordingly.

Adult pollock are cannibalistic and are the major source of mortality on young-of-the-year pollock. Fishery removals are small (18% by weight, 1% by number) compared to internal predation mortality (48% by weight, 84% by number). Since the fishery removes large, cannibalistic pollock it could have an initial short-term effect of releasing small pollock prey to other predators or to increased survival of small pollock for later recruitment to the fishery as adults. Other fish predators such as Pacific cod, Pacific halibut, Greenland turbot, arrowtooth flounder, sablefish, and flathead sole also consume young pollock.

Pacific cod are preyed on by few major fish predators. Occasionally, adult Pacific cod consume juvenile cod. Increased mortality on adult Pacific cod would likely have no short-term effect on fish predators which consume Pacific cod. Long-term effects on fish predators would occur only if a spawner-recruit relationship exists between number of adult Pacific cod and the number of Pacific cod spawned which become available to predators. Even these long-term effects would be slight as no fish predators rely heavily on Pacific cod as a food source. Other fish predators would tend to benefit as more Pacific cod are killed, because they consume the same prey species as Pacific cod. These predators included pollock, yellowfin sole, Pacific halibut, and sculpins. Pacific halibut consume pollock and Tanner crab of similar sizes to those consumed by Pacific cod. Similarly, sculpins consume small Tanner crab as do Pacific cod.

Small yellowfin sole are preyed on by Pacific cod and Pacific halibut. Since the fishery removes large yellowfin sole, no short-term impacts should occur on fish predators. Long-term impacts would occur only if there is a spawner-recruit relationship for yellowfin sole which would reduce the amount of subsequent young recruits available to fish predators. This has generally not been the case. In the short-term, removal of yellowfin sole by the fishery could increase prey species (e.g. benthic invertebrates) to other predators such as Pacific cod, other flatfish, crab, and small yellowfin sole.

Effects on seabirds.

Seabirds may compete with commercial fish species for prey and consume small fish. Because of this trophic interaction, the groundfish fisheries could have major impact on seabirds. While the effect of competition for prey and dependence on juvenile groundfish as prey is intricate, it has been suspected that survival rates of nestlings of some fish-eating seabirds may be correlated with the size of pollock year classes. In contrast, low abundance of juvenile pollock may benefit plankton-eating seabirds, such as auklets, due to reduced competition for invertebrates, e.g. copepods.

Food abundance may be responsible for variations in reproductive success among seabirds. Other factors that may affect the availability of food for seabirds include annual variation in current patterns, wind mixing of the water column, and the direct affect of wind on the foraging capability of adult birds. The commercial harvest of pollock could increase the abundance of piscivorous seabird prey by reducing the number of cannibalistic adult pollock.

Effects on marine mammals.

Several marine mammals, including northern fur seals, northern sea lions, and harbor seals, depend heavily on groundfish in their diet. Fur seals feed mostly on small (1-2 year old) pollock before their recruitment to the fishery. Sea lions and harbor seals are thought to depend on some fish that are smaller than those taken in commercial fisheries. Their dependance on some small fish may reduce direct competition with the groundfish fisheries.

Fur seals and sea lions are considered depleted under the Marine Mammal Protection Act (MMPA). Reasons for low abundance of these species are not understood, but competition with fisheries for the same food is one possible explanation. Under the MMPA, some form of observer program is expected on certain type of vessels. Thus, some information may be obtained about effect of fishing on marine mammals.

8.2.3.1 Alternative 1: Maintain Status Quo

In 1988 the status quo system of ad hoc observer coverage provided about 1% sampling of the DAP catch off Alaska. This level of coverage is probably too low to provide estimates (e.g. of PSC) with sufficient precision to adequately manage the fishery. Low precision in a parameter, such as halibut PSC, could result in higher-than-acceptable mortality of a species.

In addition to low precision from inadequate observer coverage, the accuracy of data acquired from voluntary programs may be low. The voluntary nature of some of these programs prevents random assignment of observers to vessels. This non-random assignment of observers can result in biased and thus inaccurate estimates of parameters needed to manage the fishery. For example, if estimates of King crab PSC are biased too low, unacceptably high mortality of King crab may occur.

Because the status quo observer programs are at least partially voluntary, coverage greater than the current 1% could be provided in the future. The precision of estimates from observer data would tend to improve with greater voluntary observer coverage. Under Alternative 1, the coverage of the fisheries, and therefore precision of estimates, might tend to fluctuate through time, depending upon the willingness of fishermen to take an observer aboard. However, even with sufficient numbers of observers to provide reasonably precise estimates, the estimates may be biased because of the voluntary (i.e. non-random) placement of observers aboard vessels.

The quality (i.e. precision, accuracy, consistency) of observer data acquired under this alternative would probably be lowest, compared to the other two alternatives. Thus, the potential for biological impact would be greatest under this alternative.

8.2.3.2 Alternative 2: Implement Fixed Percentage Mandatory Observer Coverage (of up to 100%)

Requiring 100% observer coverage will result in the most precise and accurate measurement of parameters from observer data. Among the three alternatives, this alternative will promote the minimal adverse biological and physical impacts from decisions based on observer data.

8.2.3.3 Alternative 3 (Preferred): Implement Mandatory Observer Program That Is Frameworked To Allow Less Than 100% Coverage

Under this alternative, precision and accuracy of estimates will tend to improve with increased observer coverage. Assuming that data acquired from observed vessels is representative (i.e. unbiased) of all vessels, reasonably accurate estimates may be obtained with Alternative 3. Under this alternative, it may be possible to determine the representativeness of data from the observed vessels. Accuracy will be enhanced by using a statistical sampling design which includes random assignment of observers to vessels. As observer coverage approaches 100% the probability of making erroneous decisions based on observer data will decrease. This will tend to minimize adverse biological and physical impacts. For example, it may be deemed sufficiently precise to achieve an estimate of crab bycatch that is within $\pm$ 40% of the true mean crab bycatch. The probability of making an erroneous decision, which could result in an adverse biological impact, would be greater with this level of precision than with a level equal to $\pm$ 20% of the mean.

This alternative is intermediate between Alternatives 1 and 2, in terms of potential for minimizing adverse biological and physical impacts.

8.2.4 Socioeconomic Impacts

8.2.4.1 Alternative 1: Maintain status quo.

Under the status quo alternative, the Council and NMFS would effectively be without the data necessary to efficiently carry out their resource management responsibilities, as set forth in the MFCMA, E.O. 12291, the Regulatory Flexibility Act, and other applicable Federal law. Historically, the U.S. Foreign Fisheries Observer Program has been the primary source for these data. With the elimination of foreign directed fishing and the dramatic decline in JVP activity in the EEZ, this means of acquiring fisheries data, crucial to management and enforcement, is no longer available.

As noted above, several ad hoc domestic observer arrangements have emerged. For some purposes, such as biological sampling of individual organisms, these programs may be adequate. Full implementation of the proposed Marine Mammal Protection Act (MMPA) Observer Program, with its expected 20% to 35% coverage of selected segments of the fleet, will yield reliable data on several additional aspects of the fishery. However, none of these alternatives to a well designed and specifically tailored Domestic Fisheries Observer Program provides the level or detail of coverage deemed minimally necessary to assure sustained productivity and efficient management of the fisheries resources of the EEZ off Alaska. Specifically, programs which are managed and/or sponsored by non-federal entities are, by definition, outside of the control and enforcement of the Council and NMFS. This presents a number of problems which reduce the usefulness of these programs. For example, such programs may prove to be temporary in nature; the level of observer coverage may be uncertain, making the statistical data unreliable; sample placement may be inadequate or inappropriate to the needs of the groundfish monitoring program; and confidentiality limitations may reduce or preclude access by the Council and NMFS to the raw data. The Council and NMFS should not be dependent upon private sector or state funded ad hoc programs for data necessary to carry out their mandated responsibilities. Neither should they be solely dependent upon programs with potentially uncertain funding and distinctly different objective, e.g., the MMPA Observer Program. Therefore, retention of the

status quo would result in a situation in which the Council and NMFS could be forced to seek alternative regulatory strategies to meet their management and conservation obligations.

Specifically, in the absence of adequate biological and economic data from the domestic fleet, the risk of error associated with any management decision would be significantly increased. This would tend to increase the conservatism with which fishery management decisions would be made. That is, in recognition of the potential cost to the long-term productivity of the resource of an error, for example, in setting a TAC or closing a fishing area, management decisions would increasingly tend to err on the side of the resource. This suggests that increasing dependence would be placed on management measures designed to reduce fishing efficiency, slow rates of harvest, redistribute effort, and, as a result, increase the cost to the domestic industry of catching fish.

It is also probable that management actions, based upon inadequate or incomplete data, would result in reduced total catches, as managers seek, for example, to avoid overharvesting of TACs or bycatch quotas through conservative regulation of fishing activity. Premature closures of fishing areas, or entire fisheries, to assure compliance with quota limits, could impose significant costs, in the form of unutilized harvestable surpluses, thus reducing total revenues of the domestic industry. In a purely hypothetical example, assume that due to a lack of adequate fisheries effort and catch data, restrictive management actions were undertaken to assure that TACs and/or bycatch quotas were not exceeded. If these actions resulted in an underharvesting of the groundfish OY by only 10%, the economic cost to the domestic groundfish industry, in the form of reduced exvessel earnings, could exceed $56 million, based upon 1989 projected exvessel value for BSAI and GOA groundfish fisheries. The corresponding decrease in the value of processed groundfish products would be over $100 million.

In a broader context, without adequate data on fleet effort, distribution, and performance, no meaningful estimation of the probable response to intra- and inter-seasonal management changes can be made. Thus, decision makers would be left with little definitive guidance on the outcome of their actions, and the nation's interest in the coherent, equitable, and efficient management of the fisheries resources of the EEZ would not be served. Adoption of the status quo alternative would, (1) reduce the long-term net benefit society would derive from these fisheries; (2) impose significant operational costs on the domestic industry in the form of reduced efficiency and loss of economic and operational flexibility; (3) potentially significantly reduce the total gross earnings of the domestic industry; and (4) increase the risk to the resource of overexploitation, thus potentially reducing its long-term productivity and economic value.

Under the status quo, depending upon the severity of management restrictions made necessary for the protection of the resource, the potential exists that reduced supplies of fisheries products could affect the price and availability of fish in the domestic retail market. Participation by the DAP industry in international markets could also be adversely affected if supplies were reduced due to conservative management actions. While no means of quantitatively measuring these adverse market effects is available, a priori, a recognition of their potentiality under the status quo alternative is appropriate.

There are no discernible net economic or socioeconomic benefits associated with adoption of the status quo alternative.

8.2.4.2 Alternative 2: Implement Fixed Percentage Mandatory Observer Coverage (of up to 100%)

A mandatory 100% observer program, intended to cover all aspects of the domestic groundfish fishery, would necessarily involve both at-sea and shoreside observers. As discussed above, a literal interpretation of the requirement for 100% observer coverage is impractical given the composition and characteristics of the domestic fleet. Many of the smaller vessels are assumed to be physically incapable of accommodating an observer. According to NOAA Fisheries' vessel registration files, updated through April 1989, 1,058 vessels out of the total 1,855 registered groundfish fleet are 50 feet or less in length, and thus assumed to be too small to carry observers. Of these, 76%, or 1,013 boats, are longliners, most in the 25- to 50-foot range. For the remaining 797 vessels over 50 feet in length, as well as the 85 shoreside processing facilities, an assumption has been made that each is capable of accommodating an observer. For this segment of the groundfish industry, a mandatory 100% observer coverage program could be required.

Shoreside processors may receive deliveries, at any time during their groundfish processing season, from vessels both over and under 50 feet in length. Therefore, it would be necessary, under Alternative 2, to have observers present at every shoreside facility on all operating days, to assure complete coverage, despite the fact that some vessels making deliveries to these facilities may also carry at-sea observers. To the extent that at-sea observers can collect and verify fishing data which a shoreside observer would be unable to directly observe, e.g., marine mammal encounters or handling of bycatch, and shoreside observes would have access to data at-sea observers could not provide, e.g., aggregate shoreside landings or plant discards, this would not constitute serious redundancy or duplication of effort.

The cost of a mandatory 100% observer program for that segment of the groundfish industry capable of accommodating an observer would vary with the level of fishing effort applied by the domestic fleet and the operational configurations adopted. For example, catcher vessels delivering cod-ends to a mothership would probably not be required to carry an onboard observer, because the catch could be monitored and sampled by an observer on the mothership.

The daily cost of observers, including all training, transportation, overhead and support services, as well as salary and benefits, is estimated to be $250. This is based upon a budgeted cost of $200 per day for foreign observers (USDOC, MFCMA Operations Handbook, 1985) adjusted for inflation and other cost increases. Actual wages paid to observers are estimated at just under $100 per day.

In 1988, the last full fishing year of record, the DAP catcher/processor fleet fishing groundfish in the EEZ reported 9,498 fishing days. This fleet was composed of 39 factory trawlers, 3 motherships, 18 longliners, and 7 pot boats; a total of 67 vessels. This suggests that, on average, this segment of the fleet fished a total of approximately 142 days, per vessel, in 1988. This must be regarded as a minimum estimate because it does not account for transit time to and from port, nor for any "lay-up" time at sea.

In 1989 an estimated 147 vessels of this category were registered to operate in the groundfish fisheries in the EEZ off Alaska. Assuming this number were to participate in the mandatory observer program, and each fished, on average, 142 days during the fishing year, a total of 20,874 observer days would be required, at a cost of approximately $5.2 million.

In 1988 a total of 85 shoreside processing facilities recorded landings of groundfish from the EEZ. Based upon the aggregate number of shoreside groundfish landings made, i.e., 8,388 deliveries, and assuming an average two landings per day, per facility, on average each of the 85 plants operated approximately 49.5 days per year processing groundfish. Clearly, some plants operated many more days than 49.5, while others processed groundfish for many fewer days in the fishing year. However, on average in 1988, these plants received and processed groundfish for 49.5 operating days. This suggests that, if all 85 facilities were included in the mandatory 100% observer coverage program, 4,208 additional observer days would be required, at an estimated cost of $1.1 million, annually.

Based upon the 50 foot minimum length criteria for inclusion in the 100% coverage program, and utilizing 1988 landings data, 232 longliners, (i.e., 32 BSAI, 200 GOA) and 108 trawlers, (i.e., 40 BSAI, 68 GOA) delivering groundfish from the EEZ to shoreside facilities would be required to carry observers. Trawlers, over 50 feet in length, operating in the Bering Sea/Aleutian Islands region averaged 27 deliveries per vessel, in 1988. The same class of vessel operating in the Gulf averaged 21 deliveries. Assuming an average of four days per trip in both the Gulf and BSAI, this suggests that 100% coverage of these operations would require 4,320 observer days in the BSAI, and 5,712 observer days in the GOA region. For longliners over 50 feet in length, delivering shoreside in the BSAI in 1988, each vessel average two deliveries. In the GOA, this segment of the fleet averaged 5 deliveries per year. Assuming an average 8-day trip length, this suggests that 512 observer days would be required in the BSAI and 8,000 observer days would be needed in the GOA for 100% coverage of this fleet. The aggregate cost of this level of coverage for the groundfish fleet delivering shoreside is estimated to be approximately $4.6 million.

Lack of equivalent information on other segments of the groundfish fleet, including vessels registering as multiple-gear operations, precludes a precise calculation of all observer needs. Furthermore, data on levels of domestic effort are incomplete. It is perhaps instructive to note that independent estimates made by researchers at the NMFS, Northwest & Alaska Fisheries Center, project a need for approximately 1,400 observer months of coverage to meet the requirements of 100% coverage, as defined above. The estimated cost of this level of coverage was $10.5 million. This estimate agrees reasonably well with the results of the above analysis, i.e., $10.9 million. Nonetheless, both should be regarded as a first approximation of the total cost of a comprehensive mandatory observer program.

The distribution of these costs cannot be described until the Council determines the funding mechanism it will adopt to support this program. At an estimated $10.5 million, the cost of 100% coverage represents approximately 1.9% of the projected 1989 exvessel value or 1% of the processed value of the groundfish fisheries of the EEZ off Alaska.

One direct benefit of adoption of this alternative is the reduced risk associated with bycatch quota and TAC management decisions. The ability to assess attainment of TAC or PSC apportionments is dependent, in part, upon the mechanism employed for reporting the observed data. However, with 100% observer coverage of the groundfish fleet, management of harvest levels, whether in terms of directed catch or bycatch, could be controlled with greater precision than under an observer program with lesser coverage. This would reduce the risk of overharvesting and, thus, the likelihood that significant amounts of harvestable surplus would be made unavailable to the domestic industry for lack of complete and accurate management information. Attainment of the fullest possible harvests, within conservation and management constraints, would maximize domestic industry gross revenues. In the example presented under the status quo analysis,

the difference of as little as 10% of the total OY in the domestic annual groundfish catch could result in a change of approximately $56 million in exvessel revenues, with a processed product value estimated at over $100 million. Mandatory 100% observer coverage would also effectively preclude undesirable and potentially destructive practices such as "topping off" and "high grading" of catches, both actions which tend to subvert efficient management of fisheries resources. These savings cannot, however, easily be quantified.

Another direct benefit of adoption of an effective mandatory observer program may accrue in the area of bycatch. That is, with observer coverage on the fishing grounds the rate of bycatch will likely be lower than would be the case in the absence of observers, and appropriate levels of bycatch interception may be established and enforced. During the period 1984 through 1988, for example, PSC bycatch in the joint venture and foreign groundfish fisheries reduced the total exvessel revenues of domestic halibut and crab fisheries, on average, by an estimated $20 million, per year (source: REFM Division, NWAFC, 1989). Most of this loss accrued to the halibut fishery. In the absence of the observer coverage that existed during the 1984-88 period, this bycatch loss probably would have been significantly greater. In addition to PSC bycatch losses, non-target groundfish fishing mortality imposes costs through reduced future groundfish stock productivity. To the extent that observer coverage can be expected to reduce both types of bycatch losses, these savings represent a direct benefit attributable to adoption of a mandatory observer program.

All resource management relies upon the cooperation of those utilizing the resource. The credibility of the management process, and the decisions it produces, depends upon adequate, timely, and comprehensive data. In their absence, the resulting management system is necessarily less efficient and more costly.

8.2.4.3 Alternative 3 (Preferred): Implement Mandatory Observer Program That Is Frameworked To Allow Less Than 100% Coverage

Implementation of a mandatory observer program with less than 100% coverage is a frameworked approach to providing information applicable to the entire groundfish fishery, while sampling only a subset of the total fleet. Any sampling scheme depends upon the assumption that the population from which the sample is drawn behaves, within known probability limits, in the same manner as the observed sample. In this case, one must assume that the fishing activity of any given vessel in the domestic groundfish fleet will be the same, whether an observer is onboard or not. Otherwise, anything less than 100% coverage will not assure reliable, unbiased statistical data.

The validity of this basic assumption has significance for the economic and socioeconomic impacts of this alternative. If this basic statistical assumption cannot be made, perhaps because vessel operators engage in strategic behavior to compensate for the presence of an observer, e.g., they avoid areas they would have fished had no observer been present because they anticipate unacceptable PSC bycatches there, then some means of detecting and measuring the presence of sampling bias must be incorporated into any observer program which relies on less than 100% coverage. Methods of detecting and measuring this sampling bias could include the following. First, it may be possible to use "spot" or "unannounced" observer coverage, in which a vessel would be required to accept an observer for a short period of time, without advanced notification. This could be done, for example, by at-sea placement of observers for a relatively brief duration. In this way, there would be less opportunity for strategic behavior on the part of vessel operators and observations could be assumed to be relatively free from this source of bias. Also, vessels which are presumed to be "too small" to carry observers for the entire duration of their trip could, nonetheless, be

included in the sample, while other vessels, large enough to accommodate an observer, could be randomly sampled on an unannounced basis to assess the validity of the basic statistical assumption of the sampling scheme. The added transportation expense of placing unannounced observers on vessels while at sea could increase the cost of the observer program proposed under Alternative 3. Its actual impact would depend upon the level of use made of these at sea placements, but in any case would be below the cost of 100% coverage. Any additional costs would have to be weighed against, and offset by, the expected benefits from acquisition of unbiased data on fleet behavior.

The second method, which could be used in conjunction with the first, relies upon the DFL and DCPL. These logbooks could be important factors in assessing the statistical reliability of any sampling strategy, if sampling bias is suspected. By comparing catch and effort log entries with observed data, identification and measurement of statistical sampling bias may be made and adjustments undertaken to compensate for this error. This increases the value of, and need for, comprehensive recordkeeping and reporting requirements. These requirements could reduce observer costs, to the extent that the logbook program makes an observer program of less than 100% coverage possible.

If it can be assumed that observer coverage of less than 100% would produce reliable, unbiased estimates of the biological and economic parameters necessary for the efficient management of the resource, then potentially significant cost savings over Alternative 2 may be realized by adoption of a framework sampling alternative. For example, it has been estimated that a mandatory 100% observer program could cost approximately $10.5 million annually to produce the data necessary to meet Council and NMFS management obligations. Because the relationship between cost and percent coverage is approximately linear, this suggests that 75% coverage would cost approximately $7.9 million annually; 50% coverage would cost roughly $5.25 million; 25% coverage $2.63 million, etc. Clearly, the statistical confidence surrounding estimates increases with sample size, but beyond some discernible level of coverage below 100% the marginal increase in statistical confidence from an additional unit of coverage is not justified by its cost. This suggests that, given acceptance of the basic assumption about the fleet's expected behavior in the presence of partial observer coverage, or some strategic measures to correct for sample bias, a statistically reliable sample of the total fleet can yield the necessary data, within known confidence limits, at a smaller cost than a mandatory 100% observer program would entail.

Because sample size may vary from year to year, under Alternative 3, no precise measure of the economic cost of this alternative can be projected. As suggested above, the annual cost of this alternative will vary with the size of the selected sample, depending upon the expected variance in the principal parameters of interest and/or funding availability. Costs for various levels of coverage are approximately linear, starting from the estimated $10.5 million annual cost of 100% coverage.

The level of first year coverage is somewhat arbitrary under this alternative. One option available to the Council is to explicitly specify a funding level for the first year of the program. By definition, this will fix the initial percentage of observer coverage. Alternatively, an assumption may be made that historic JVP observer data are sufficiently representative of the current DAP fishery to serve as a basis for setting the first year coverage levels. Based upon these data, estimates of the attainable sampling precision for parameters of interest can be made, and necessary sample size and stratification defined, within known statistical confidence limits. After the first year, sample size would be re-evaluated based upon desired statistical precision, as measured by first year results, and funding availability.

The distribution of program costs cannot be determined until the Council adopts a funding mechanism to support its chosen alternative. Until and unless the Magnuson Act is amended to permit the assessment of fees on the industry to fund the program, the cost of observers will necessarily be borne by the vessels and plants hosting them. This will be a factor in determining which vessels are "capable" of hosting an observer. The Council expects that there will be some degree of industry cooperation to distribute costs more evenly (e.g. pools of funds established by vessel owners associations, etc.).

Assuming that the potential sampling bias question is satisfactorily resolved, benefits attributable to this alternative are expected to include all those identified above for Alternative 2. In addition, to the extent that this alternative achieves all the biological and economic data objectives set forth for a mandatory observer program, but does so at a lower cost than a 100% coverage program, the difference in cost between the two coverage levels is a direct benefit of adoption of Alternative 3. The size of this cost savings is expected to vary from year to year. If, in the first year, a decision is made, for example, to employ a fixed 20% coverage program, the savings, in that year, over a mandatory 100% coverage program, would be approximately $8.4 million. Should a higher initial level be specified, the cost savings would be commensurately lower. These savings may be partially offset as a result of less adequate data being available.

Appendix 8.2.I

List of Possible Sampling Duties for Domestic Fisheries Observers

Haul, Delivery, or Set data:

1. Sample for species composition of catch.
2. Estimate catch weight by the most accurate method.

Biological data from prohibited species:

3. Sex and identify to species, all the salmon, king and Tanner crab in your sample (haul, delivery, or set) if possible, or take a random subsample for sexing.
4. Take length measurements of all halibut, salmon, king and Tanner crab in sample. Subsample if necessary when incidence rates are high.
5. Determine the viability of all halibut, king and Tanner crab in sample.
6. Collect scales from salmon in your samples for species confirmation.
7. Check salmon for missing adipose fins, and other fish and crab for tags.

General Data:

8. Take length measurements of randomly selected fish.
9. Collect otolith/scale for ageing.

Per Cruise:

10. Collect species and viability data from any captured/contacted marine mammals.
11. Evaluate the accuracy of the vessel's catch weight estimations and report on their method.
12. Describe the fish processing products. Obtain product recovery rates.
13. List species discards.
14. Make gear, factory and weather deck diagrams.
15. Detail incidents of net discarding; obtain net samples if possible.
16. Calculate radio report messages; phone in at end of trip or transmit weekly.
17. Complete report including itinerary sheet, vessel diagram, and map of areas fished.

Appendix 8.2.II

Discussion on Domestic Fisheries Observer Program Funding, Administration, and Insurance

CURRENT FUNDING

There is currently no central funding source for the domestic fisheries observer program. Under the MFCMA and other applicable legislation, the foreign fisheries observer program is run by NOAA Fisheries and the cost of the program is billed to the foreign operators on a cost-recovery basis. A similar arrangement for cost recovery is not in place for the domestic program. Instead, a number of ad hoc arrangements have been made to ensure some level of observer coverage on domestic operators. The table below summarizes these arrangements:

	Program	Managed by	Funded by
1.	ADF&G Groundfish Observer Program	ADF&G	ADF&G
2.	Port Moller Cod Fishery Observer Program	NWAFC & UW	Industry
3.	Gulf of Alaska Rockfish Observer Program	NWAFC	Industry
4.	Zone 1 BS/AI Flatfish Fishery Observer Program	NWAFC	Industry
5.	Pilot Domestic Observer Program	Alaska Sea Grant NWAFC	NPFMC
6.	Longline sablefish-killer whale Observer Program	NWAFC	NWAFC & Greenpeace

Through 1988, NOAA Fisheries did not designated specific funding to pay for an observer program. It has, however, allowed the NPFMC to use some of its programmatic funds to fund a pilot observer program via contracts with the University of Alaska Sea Grant Program. The total amount of funding was $200,000. The pilot program began in 1987 and the last $70,000 of the total has been designated to fund an observer program for the Shelikof Straits pollock fishery in 1989. The Alaska Department of Fish and Game has been funding an observer program on domestic fishing vessels that volunteers to take on observers. This funding has been supplemented by IPHC, AFDF and Eagle Fisheries, Inc. The program also includes some shoreside sampling.

The industry has also been a source of observer funding. The Council had required the industry to fund an approved observer program in the Port Moller Pacific cod fishery. This requirement expired in December 1988 and an emergency interim rule has been published in the Federal Register to carry on the program through June 13, 1989. This emergency rule will actually extend the fishing area by an additional 1° longitude, but again will require industry-funded observer coverage. The Council has also required that industry fund other observer programs in other groundfish fisheries as shown in the above table.

In addition to the above observer programs, two new programs could enhance coverage in 1989. The first is required by a recent amendment to the Marine Mammal Act which mandates 20% observer coverage on vessels that are expected to have direct impacts on marine mammals. The source and amount of funding for this program is being worked out by NOAA Fisheries. While the primary purpose of the program is to monitor fisheries-marine mammal interactions, it will provide useful information for fisheries purposes as well.

The second new program is an industry funded program. The Alaska Factory Trawlers Association (AFTA) has pledged $100,000 to fund a voluntary observer program for 1989. It has also pledged to match any contribution, up to $400,000, from other sectors of the fishing industry. To date over $105,000 has been contributed with several fishing organizations volunteering to self-assess itself during the year as fisheries are conducted. NOAA Fisheries has agreed to provide $125,000 in matching money to help fund this observer program in 1989.

FUNDING ALTERNATIVES

A key consideration in determining the level of observer coverage will be the costs of observers, and from where and how those costs will be met. The current funding sources as described above may provide minimal coverage but may prove an unreliable funding option. A comprehensive data gathering program will only be successful if a fishery data base can be maintained over a series of years and that will require a reliable source of funds and at sufficient enough levels to meet the data gathering objectives.

The following are several funding alternatives identified by the Groundfish Data Committee for purposes of public review. The Council specifically requests public comment on these and any other funding options that should be considered. An analysis of these alternatives will be conducted at a future date.

Alternative 1: A Voluntary Funding Program

There are two options which fit within this alternative. The first consists of monetary contributions made into one or several accounts, with the money contributed used to fund an observer program. The second involves management actions which encourage the voluntary employment of observers as a means of generating data which can provide additional harvest opportunities to the vessels choosing to participate.

Option 1: Strictly Voluntary

Under this option fishermen, harvesting and processing companies, industry associations, and other entities could contribute to one or several accounts established for the purpose of funding an observer program. This option best describes the 1989 funding situation.

Option 2: Economic Incentives

This option involves the use of management measures to encourage voluntary funding and placement of observers by creating economic incentives. An example of how this approach could work would be the scenario where the Council and NOAA Fisheries project the bycatch for a fishery and announce closure of the fishery when the bycatch limit is assumed to be reached. If vessels participating in the fishery carried observers that showed a lower bycatch than the rate assumed by the Council, the fishery or group of vessels

carrying observers would be allowed to continue fishing. The economic benefit is the value of target catch that would have been foregone had the fishery closed prematurely. Another example could be the use of a management reserve where a percentage of bycatch species is held back from the fleet until a bycatch threshold for the fleet is reached. Once at the threshold only vessels willing to take and fund observers would receive additional bycatch amounts to allow further fishing. This second example is a proposed bycatch management option for the Gulf of Alaska and is described in detail in Chapter 6.3.

Alternative 2: Government Funding

This alternative anticipates that the federal government will provide funding for the data gathering program. However, in light of Congress's recent failure to specifically fund the Marine Mammal Protection Act, it is unlikely that the federal government will serve as the sole source for observer funding.

Government funding is not limited to appropriations from Congress. NOAA Fisheries has contributed to observer programs. The State of Alaska and the International North Pacific Halibut Commission have also contributed. It is difficult to describe the extent of future funding levels from government agencies, although given the importance of at least limited observer coverage, it is likely that some level of funding will continue.

Alternative 3: Mandatory Industry Funding

Under this alternative the fishing industry would provide the funds necessary to support the data gathering program. The Council has proposed an amendment to the Magnuson Fishery Conservation and Management Act that would authorize the collection of funds from the users of the resource to help support fishery management programs when so requested by a regional fishery management council. Other legislative proposals to meet the same objective have also been submitted before Congress. It is unclear when Congress will take action on these proposals.

A funding scheme where industry is required to fund an observer program as a cost of utilizing a public resource could be implemented in several ways. One method would be to require a payment of a flat fee when registering for a federal fishing permit. The fee could be based on a share of the estimated cost for the observer program. The current estimate for one observer-month of coverage is about $7500. One approach could be to require payment of this flat fee by all vessels participating in the fishery. While it may appear to be a fair approach, such a high fee may be difficult to accommodate by small fishing vessels while more easily met by larger vessels. An alternative approach could take the form of a sliding scale where based on the same calculation of observer cost, smaller vessels would pay less than large vessels with the total contribution from the fleet being equal to the flat fee approach.

An alternative method of collecting mandatory funds could be to require payment of a fee that is based on a percentage of the projected value of the vessel's catch.

Alternative 4: Sale of prohibited species catch.

Millions of pounds of halibut, sablefish, and other valuable species are discarded dead every year in the North Pacific as prohibited species catch. Although some of the discards are of poor quality, others are marketable. This option contemplates allowing certain amounts of PSC to be retained, processed, and sold

as a means of generating funds to pay for an observer program. There are two basic options, each with several possible variations:

Option 1: Allow vessels which have observers on board to retain and sell a defined amount of PSC on a monthly basis.

The money generated from the sale of the PSC would be kept by the vessel to offset the expense incurred by having the observer on board.

Option 2: Allow or require all vessels to retain and process certain amounts of PSC.

The product would be sold and the vessel would be reimbursed only for the cost of handling. Revenues in excess of processing costs would be deposited into a general observer account which would be used to fund an observer program.

The benefits of this option include a reduction in resource waste and the generation of revenue to fund an observer program.

There are, however, several major problems associated with this option. Chief among them is politics. The PSC species which would fit naturally into this alternative are highly prized species targeted by traditional fisheries. It is unlikely these gear groups would be supportive of allowing their target species to be retained by other gear groups.

There are other practical problems. The average size of halibut taken as bycatch in the 1988 Bering Sea joint venture trawl fisheries was 3.57 pounds. Many of these fish were of poor quality when brought to the surface. Whether or not the value of these fish would be sufficient to justify this approach economically, and the extent to which the sale of these fish would adversely impact existing markets, have not been evaluated. Additionally, allowing the retention of bycatch ensures the mortality of the bycatch.

Implementation of this alternative would require plan amendments to both the Gulf of Alaska and Bering Sea/Aleutian Islands groundfish plans. Given the Council's amendment cycle, the earliest this alternative could be implemented would be January 1, 1991.

Alternative 5: Mandatory Self-Payment Plan

This alternative would require all vessels to pay the costs of the observer program unless alternative funding sources can be identified. For example, if Alternative 1 generates sufficient voluntary contributions from the fishing industry and government to support half the data gathering program, this alternative would require the balance to be met by a mandatory payment of a fee that would be sufficient to meet the total cost of the program. This approach would only be necessary if Alternatives 1,2 and 4 were insufficient to satisfy funding requirements.

ADMINISTRATION AND UNIT COST

The unit cost for observers can be computed according to the following components: salary and overtime, travel and per diem, administration, and data analysis. Observers may be hired through universities, private companies or fisheries agencies. The NWAFC and industry-funded programs have relied on universities and/or private companies to supply observers. Observers in the Alaska Department of Fish and Game (ADFG) program are temporary or permanent employees.

For 1989 it will generally cost about $7,500 per observer-month if the program is run via contract personnel with universities and private companies. This estimate ($6,500 plus 15% overhead) is based upon a typical January-March 1989 observer cost billed by a contract observer provider (Frank Orth, Inc). Travel and per diem costs can vary, depending on where the observer is required to be deployed. The cost of travel to Dutch Harbor for observer deployment in the Bering Sea-Aleutians fisheries can be $1,000 higher than deployment in the Gulf of Alaska.

Some or all of these costs might be reduced depending on the management organization involved, point of hire for observers, standardization in training, and other aspects. Prior to final implementation of the data gathering program, these and other program costs will have to be examined and justified to allow for the most cost effective program possible.

INSURANCE AND LIABILITY

Insurance and liability are some of the greatest concerns for vessels taking on observers. This applies to shorebased sampling in processing plants as well. The problems are primarily cost and legal liability. Adequate and affordable insurance appears to be available at this time, and can be purchased by the vessels. The cost appears to be nominal--about $100 per month. However, like all insurance policies, liabilities are limited. Such limitations are obviously of great concern to the industry. In addition, the possibility of losing insurance coverage or higher premiums in case of any observer claims are of concern as well. While the industry is understandably cautious about taking on more insurance and legal responsibilities for the observer, it appears that affordable insurance is available at this time to do so.

Appendix 8.2.III

Procedure for Estimating Number of Vessels That are Capable of Taking on Scientific Observers

The NOAA data base on vessels with Federal permits to fish off Alaska was examined to determine the number of vessels that may be able to accommodate observers. The data base was updated through April 1989 and had more than 1,855 vessels registered.

Vessel lengths and net tonnages were used as the primary criteria for determining if a vessel is physically able to take an observer. Other information, however, must be considered as well. For example, information about deck and bunk space relative to crew size would be needed to determine whether an observer can be accommodated. Lengths of fishing trips are also relevant. An observer may be accommodated on a small fishing vessel during a short trip, but observer prescence may hinder fishing operations during longer trips. According to the Kodiak office of the Alaska Department of Fish and Game (ADF&G), vessels longer than 50 feet may be considered to be sufficiently large enough to accommodate an observer. This determination is based on recent experience in ADF&G's observer program.

The vessel's operations can be categorized as: harvesting only, harvesting and processing, processing only, and support. The latter type of operation includes transporting fishermen, fuel, groceries, and other supplies to other vessels.

Of the total number of vessels, 95% are 5 net tons or larger. Five percent are less than 5 net tons. The rest of this discussion addresses only the larger vessels, i.e., those that are 5 net tons or larger. Vessels involved in harvesting only (catcher vessels) employ mostly three types of gear: hook-and-line (longline), trawls, or pots. Most of them are hook-and-line vessels (see Table 1 below). They are also the smallest vessels fishing groundfish.

Table 1. Numbers and statistics of CATCHER VESSELS by gear type that are Federally permitted to fish off Alaska.

	Number	Average Net Tons	Average Length (ft)
HOOK-AND-LINE	77	176	97
POTS	12	76	140
TRAWL	67	656	184

Table 2 below summarizes the classification of vessels according to operations and 25 feet length increments. Assuming that vessels larger than 50 feet are large enough to physically accommodate observers, the number of vessels capable of accommodating at least one observer are: 650 catcher vessels, 128 catcher/processor vessels, and 19 motherships.

Table 2. Number of vessels by 25-foot length increments by operating mode.

Length(ft)	Catcher Trawl	Pot	LL	M*	Catcher/processor Trawl	Pot	LL	M*	Mothership
1- 25	2	0	47	1	0	0	1	0	0
26- 50	31	3	938	4	3	1	27	0	0
51- 75	53	2	346	2	0	0	10	0	0
76-100	78	9	63	0	4	1	10	0	0
101-125	51	4	14	0	2	1	4	0	0
126-150	6	2	2	0	8	1	8	0	3
151-175	9	0	2	0	12	7	15	0	2
> 175	7	0	0	0	38	1	6	0	13
Total>50	204	17	427	2	64	11	53	0	19
No. of vessels capable of taking an observer			650			128			19

* Denotes use of Multiple Gear

Appendix 8.2.IV

Estimators of Parameters from Observer Data

One or more estimators may be used to estimate means, totals and variances for the parameters derived from observer coverage. Since prohibited species catches (PSCs) are currently of most interest, the examples provided are oriented toward obtaining minimum variance estimates of PSCs. The same approach, however, may be used for many of the other parameters. The most appropriate estimator for different parameters will be determined once sufficient data becomes available (i.e. following Year 1 of an observer program).

Estimator A - Multivariate Ratio Estimator

This estimator may be used to estimate parameters such as PSCs and discards. An example for estimating PSCs, using a multivariate ratio estimator, is provided here.

Consider a given time period and a given subarea. A boat week will refer to the event that a boat fishes for a week in the given time period in the given subarea. Let

N	represent the total number of boat weeks,
$Y_1, \ldots, Y_N$	represent the catches of a given prohibited species for the N boat weeks,
$X_{11}, \ldots, X_{1N}$	represent the pollock catches for N boat weeks,
$X_{21}, \ldots, X_{2N}$	represent the Pacific cod catches for the N boat weeks,
$X_{31}, \ldots, X_{3N}$	represent the yellowfin sole catches for the N boat weeks, and
$X_{41}, \ldots, X_{4N}$	represent the other flatfish catches for the N boat weeks.

Set $T_{X_i} = \sum_{h=1}^{N} X_{ih}$, for i = 1,2,3, and 4

Assume that observers are present for n of the N boat weeks. For the j-th observed boat week, j=1, ..., n, let y_j represent the given prohibited species catch, x_{1j} represent the pollock catch, x_{2j} represent the Pacific cod catch, x_{3j} represent the yellowfin sole catch, and x_{4j} represent the other flatfish catch.

If $T_y = \sum_{h=1}^{N} Y_h$

(that is T_y represents the prohibited catch for the N boat weeks in the given time period and subarea), a (multivariate ratio) estimate of T_y is

$$\hat{T}_y = w_1 T_{X_1} \frac{\sum_{j=1}^{n} y_j}{\sum_{j=1}^{n} x_{1j}} + w_2 T_{X_2} \frac{\sum_{j=1}^{n} y_j}{\sum_{j=1}^{n} x_{2j}} + w_3 T_{X_3} \frac{\sum_{j=1}^{n} y_j}{\sum_{j=1}^{n} x_{3j}} + w_4 T_{X_4} \frac{\sum_{j=1}^{n} y_j}{\sum_{j=1}^{n} x_{4j}}$$

where w_1, w_2, w_3, and w_4 are constants whose values depend upon the prohibited species of interest. If the w_i's are chosen so as to minimize the variance of the T_y estimate, they may be expressed in terms of variances and covariances of the prohibited species and groundfish species catches (of pollock, cod, yellowfin sole, other flatfish).

The 1986, 1987, and 1988 joint venture observer data were used to get estimates of the variances and covariances involved in the expressions for the w_i's. It turns out that estimates of w_1, w_2, w_3, and w_4 are respectively:

0.1273, 0.5131, 0.1477, 0.2119 for Pacific halibut
0.1285, 0.3771, 0.1735, 0.3209 for C. bairdi crab
0.1849, 0.1098, 0.4201, 0.2851 for red king crab

From the T_y expression above, if the three parameters (w_i's, the amount of target species catch, and sample bycatch rates) are known, total bycatch amounts can then be computed.

The variance for the above PSC equation can be determined by the following expression:

$$\text{Var}(T_y) = N (1/f - 1) \; 1 / (eA^{-1} e')$$

where f = n/N = fraction of observer coverage

From this variance expression, graphs depicting the variance of PSCs versus the percentage level of observer coverage can be drawn. These graphs for each of the 3 major prohibited species are shown in Figure 8.2.3 (for Pacific halibut PSC), Figure 8.2.4 (for king crab PSC) and in Figure 8.2.5 (for C. bairdi PSC). The desired levels of observer coverage can then be picked from these graphs according to desired variabilities.

Estimator B - Multiple Regression Estimator

This type of estimator can be used to determine rates such as PSCs and discards. A general regression estimator can be expressed as:

bycatch = rate(month + target + area) x (species catches)

The term, "rate(month + target + area)" refers collectively to the individual parameters representing each of 12 months, 5 target species and 8 areas. Assuming there are 5 major species in the catch (i.e. pollock, cod, other roundfish, yellowfin sole and other flatfish) there would be 125 [(12 months + 5 target + 8 area) x 5 species catches = 125] parameter estimates (i.e. bycatch rates) for the most complex model. Less complex models that have fewer time periods, species, and area divisions may be sufficient to estimate bycatch, depending upon the desired precision of bycatch estimates.

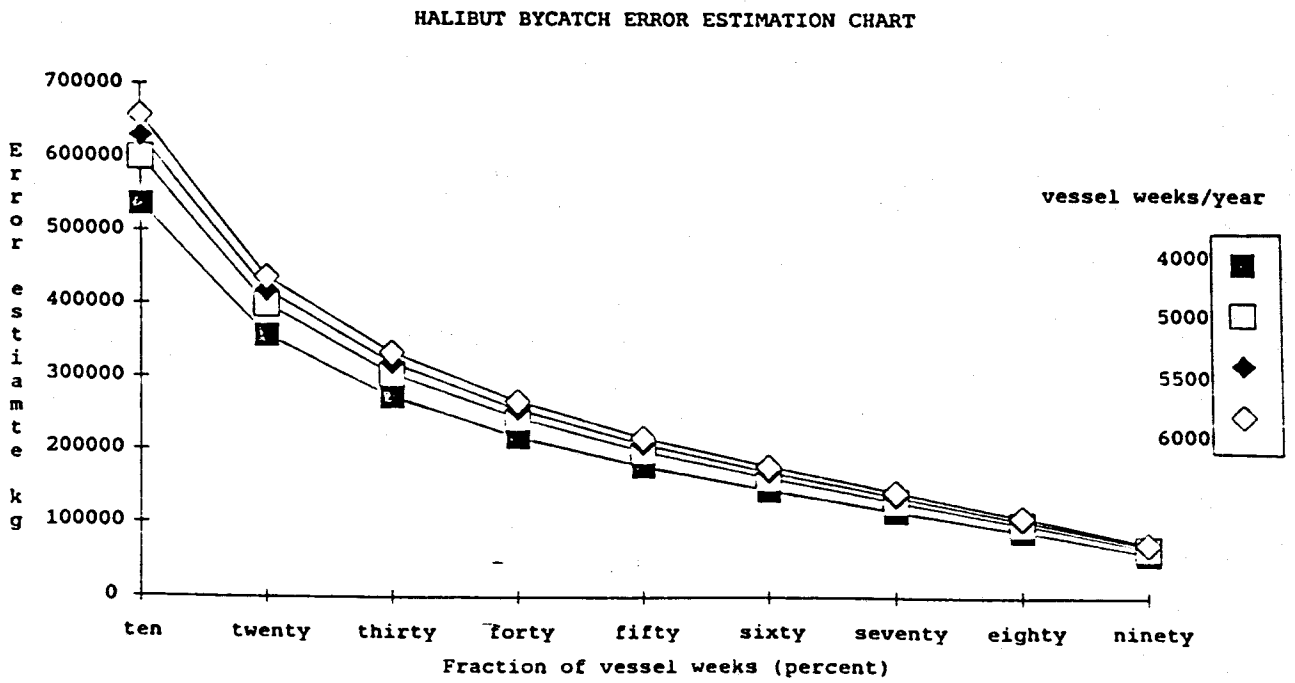


Figure 8.2.3. Estimated errors associated with the mean PSC estimate for Pacific halibut in the 1986-88 Bering Sea joint-venture fisheries versus increasing levels of observer coverage. The mean PSC estimate was 776 kg halibut per boat-week.

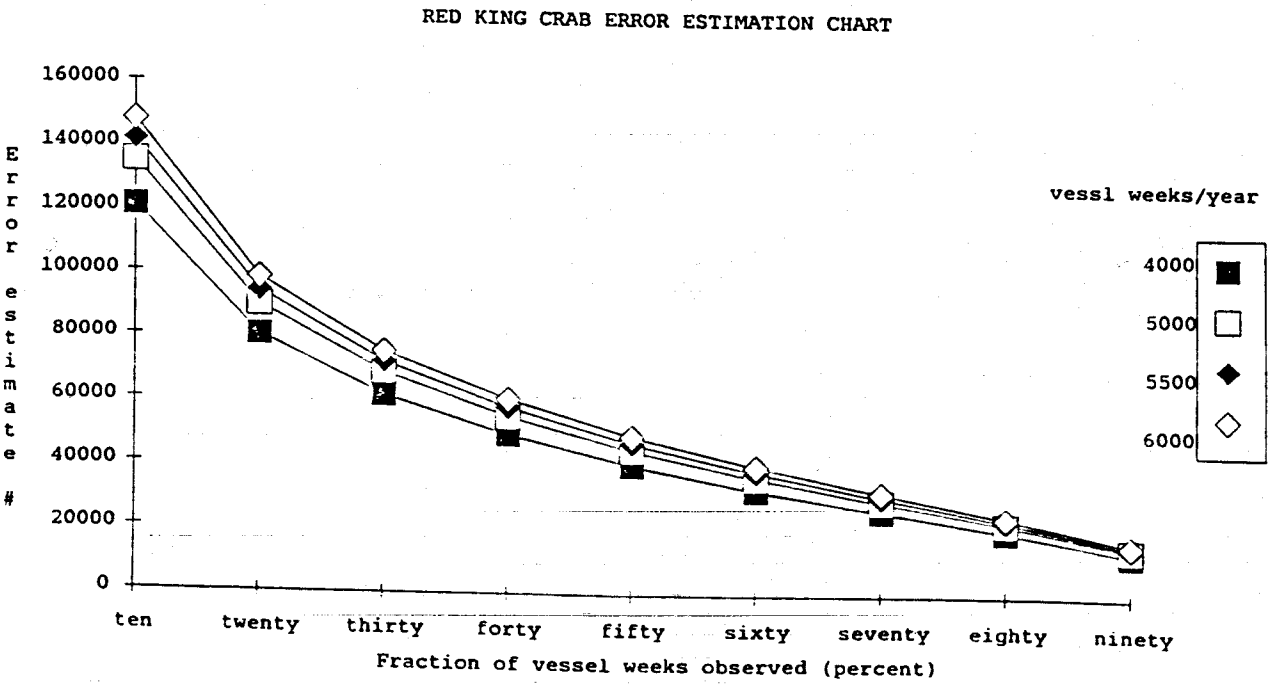


Figure 8.2.4. Estimated errors associated with the mean PSC estimate for red king crab in the 1986-88 Bering Sea joint-venture fisheries versus increasing levels of observer coverage. The mean PSC estimate was 59 crabs per boat-week.

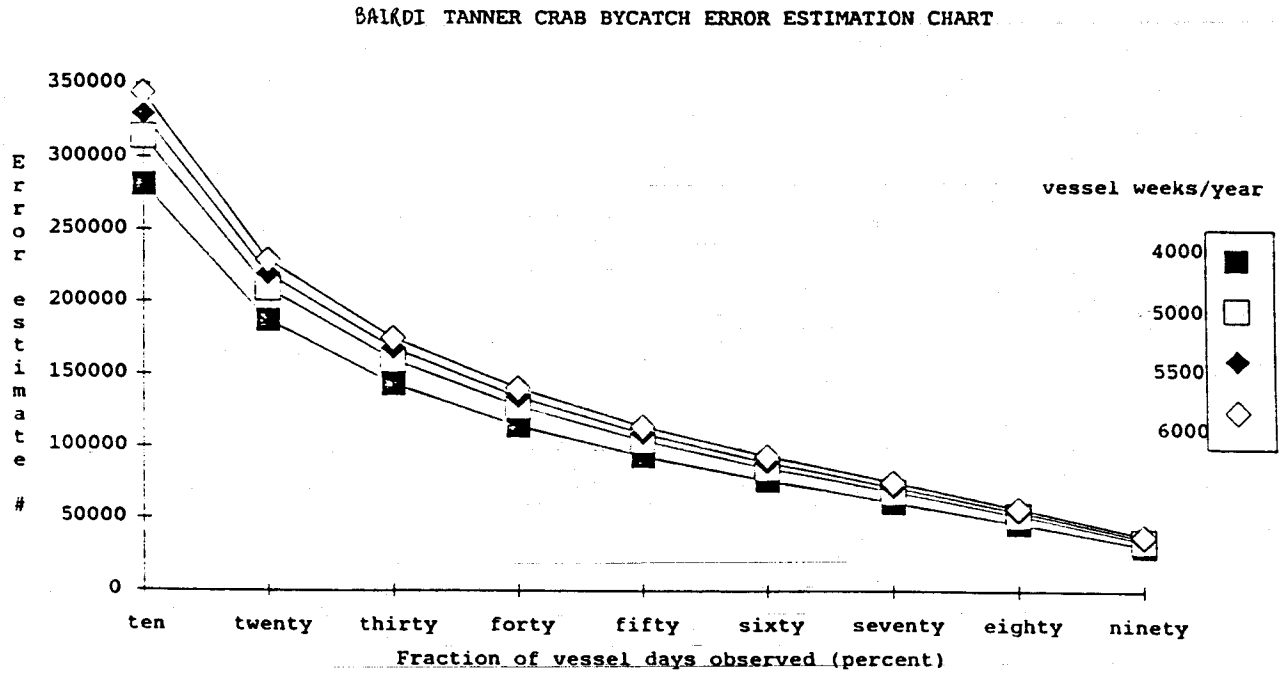


Figure 8.2.5. Estimated errors associated with the mean PSC estimate for C. bairdi tanner crabs in the 1986-88 Bering Sea joint-venture fisheries versus increasing levels of observer coverage. The mean PSC estimate was 205 crabs per boat-week.

Appendix 8.2.V

Procedures for Estimating Total Number of Observers and Observer Deployment

Number of Observers

Assuming that the total number of observers (n) will be estimated based on a desirable level of precision (e.g. from graphs showing precision vs. level of observer coverage), n may be estimated from the equation:

$$n_o = \frac{t^2 \Sigma W_h s_h}{r^2 y^2} \qquad (1)$$

and

$$n = \frac{n_o}{1 + (n_o/N)} \qquad (2)$$

where: n_o = a preliminary estimate of sample size

t = the value from the normal distribution corresponding to a specified alpha level (e.g. $t = 1.96$ when alpha = 0.05).

W_h = the proportion of the fleet represented by stratum h (i.e. N_h/N).

s_h = the estimated variance in the parameter of interest in stratum h.

r = the desired relative precision of the parameter estimate (e.g. if desired precision is $\pm$ 10 % of the mean, then $r = 0.10$)

y = the mean of the parameter of interest.

n = a final estimate of sample size

N = the total number of vessels in the entire fishing fleet.

Deployment of Observers

Given an estimate of the appropriate total number of observers, the numbers of observers to be assigned to each stratum has to be determined. One of two methods can be used for observer deployment: one according to proportional allocation, and another according to optimal allocation.

As the name implies, with proportional allocation observers would be deployed to the various strata in proportion to the size of the strata. The number of observers within each stratum (n_h), would be determined as:

$$n_h = \frac{nN_h}{N} \qquad (3)$$

With optimal allocation, varying precision and cost of acquiring estimates for different segments of the fleet would be accounted for. Using optimal allocation, the number of observers assigned to a particular segment or stratum of the fleet can be calculated as:

$$n_h = n\left[\frac{N_h S_h / \sqrt{C_h}}{\Sigma(N_h S_h / \sqrt{C_h})}\right] \qquad (4)$$

where: c_h = the cost of an obsevers for stratum h

This method for determining the distribution of observers among various strata accounts for the number of vessels within each strata, the variance in the estimates (e.g. PSC) from each stratum and the cost of obtaining estimates for each stratum. There will be an overhead cost (c_o) associated with each observer trained and deployed. This cost will be constant across the strata. The cost associated with individual strata (c_h) will vary with factors such as differential travel costs for assignment of observers to different ports. For example, costs for observers for the shore-based vessels in Dutch Harbor may be higher than those based in Kodiak, due to greater travel costs for observers to Dutch Harbor. The 1989 estimated cost for contract observers hired through NOAA's Foreign Fisheries Observer Program is $7,500 per observer-month. This cost includes a 15% overhead.

An alternative approach to using N_h would be to substitute W_h, where W_h is a weighting factor other than the number of vessels within each stratum. One possible weighting factor (W_h) which may be more appropriate than N_h, is total landed weight of groundfish or, for example, the bycatch rates from vessels within each stratum. The most appropriate variance (S_h) to use in calculating observer deployment will probably be the vessel-to-vessel or among-observer-trip variance in the variable of interest (e.g. halibut PSC).

Either proportional or optimal allocation of observers could be used for an observer program. Optimal allocation may provide more efficient utilization of funds since stratum-specific costs are accounted for with this type of allocation. Proportional allocation will provide a more even distribution of observers among the strata which may be more desirable if different types of data collected by observers are of equal importance. In addition, proportional allocation may be the easiest method to use for deploying observers among vessels.

9.0 EFFECTS ON ENDANGERED SPECIES AND ON THE ALASKA COASTAL ZONE

None of the alternatives would constitute actions that "may affect" endangered species or their habitat within the meaning of the regulations implementing Section 7 of the Endangered Species Act of 1973. Thus, consultation procedures under Section 7 on the final actions and their alternatives will not be necessary.

Also, for the reasons discussed above, 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.

10.0 OTHER EXECUTIVE ORDER 12291 REQUIREMENTS

Executive Order 12291 requires that the following three issues be considered:

(a) Will the amendment have an annual effect on the economy of $100 million or more?

(b) Will the amendment lead to an increase in the costs or prices for consumers, individual industries, Federal, State, or local government agencies or geographic regions?

(c) Will the amendment have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S. based enterprises to compete with foreign enterprises in domestic or export markets?

Regulations do impose costs and cause redistribution of costs and benefits. If the proposed regulations are implemented to the extent anticipated, these costs are not expected to significant relative to total operational costs.

The amendment will not have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S. based enterprises to compete with foreign enterprises in domestic or export markets.

The amendment should not lead to a substantial increase in the price paid by consumers, local governments, or geographic regions since no significant quantity changes are expected in the groundfish markets. Where more enforcement and management effort are required, costs to state and federal fishery management agencies will increase.

This amendment should not have an annual effect of $100 million, since although the total value of the domestic catch of all groundfish species is over $100 million, this amendment is not expected to substantially alter the amount or distribution of this catch.

11.0 IMPACT OF THE AMENDMENTS RELATIVE TO THE REGULATORY FLEXIBILITY ACT

The Regulatory Flexibility Act (RFA) requires that impacts of regulatory measures imposed on small entities (i.e., small businesses, small organizations, and small governmental jurisdictions with limited resources) be examined to determine whether a substantial number of such small entities will be significantly impacted by the measures. Fishing vessels are considered to be small businesses. A total of 1,271 vessels may fish for groundfish off Alaska in 1989, based on Federal groundfish permits issued by NMFS through February 21, 1989. While these numbers of vessels are considered substantial, regulatory measures will only affect a smaller proportion of the fleet.

12.0 FINDINGS OF NO SIGNIFICANT IMPACT

For the reasons discussed above, neither implementation of the status quo nor any of the alternatives would significantly affect the quality of the human environment, and the preparation of an environmental impact statement on the final action is not required by Section 102(2)(c) of the National Environmental Policy Act or its implementing regulations.

_____ _____

Assistant Administrator for Fisheries Date

13.0 COORDINATION WITH OTHERS

The Gulf of Alaska Groundfish Plan Team and the Bering Sea/Aleutian Islands Groundfish Plan Team consulted extensively with representatives of the Alaska Department of Fish and Game (ADF&G), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), members of the Scientific and Statistical Committee and Advisory Panel of the Council, and members of the academic and fishing community.

Terry Smith and Dick Tremaine, Economists with the North Pacific Fishery Management Council, reviewed this amendment package. Kathy Frost, ADF&G, Fairbanks, and Jim Brooks, NMFS, Juneau, provided professional input and advice on the section dealing with trawl closures to protect Pacific walrus.

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15.0 REFERENCES

Anonymous. 1983. Cruise Results NOAA RV Miller Freeman and RV Chapman Cruise MF 83-01, Leg III and IV and CH 83-02, Leg II Shelikof Strait and Western Gulf of Alaska Echo Integrator-Midwater Trawl Survey of Spawning Pollock (Theragra chalcogramma). Northwest and Alaska Fisheries Center, Resource Assessment and Conservation Engineering Division, 7600 Sand Point Way NE, Seattle, WA 98115-0070.

Anonymous. 1987. Cruise Report F/V Prowler Cruise No. 87-01 Longline Survey of the Gulf of Alaska July 15 to September 21, 1987. Auke Bay Laboratory, P.O. Box 210155, Auke Bay, Alaska, 99821-0155.

Anonymous. 1988. F/V Prowler Cruise Report 88-01 Longline survey of the Gulf of Alaska July 6 to September 17, 1988. Northwest and Alaska Fisheries Center, Resource Assessment and Conservation Engineering Division, 7600 Sand Point Way NE., Seattle, WA 98115-0070.

Bates, R.D. 1987. Ichthyoplankton of the Gulf of Alaska near Kodiak Island, April-May 1984. NWAFC Proc. Rept. 87-11. 53p.

Bates, R.D. and J. Clark. 1983. Icthyoplankton off Kodiak Island and the Alaskan Peninsula during Spring 1981. NWAFC Proc. Rept. 83-09. 105p.

Bolt, Beranek, and Newman. 1988. Draft Report 6945: Analysis and ranking of the acoustic disturbance potential of petroleum industry activities and other sources of noise in the environment of marine mammals in Alaska. MMS Contr. No. 14-12-0001-30365.

Braham, H.W., R.D. Everitt, B.D. Krogman, D.J. Rugh, and D.E. Withrow. 1977. Marine Mammals of the Bering Sea: A preliminary report on distribution and abundance, 1975-76. U.S. Dept. Comm., NOAA Processed Report, April 1977. 90 p.

Coachman, L. K. 1986. Circulation, water masses, and fluxes on the southeastern Bering Sea shelf. Continental Shelf Research 5:23-108.

Dunn, J.R., A.W. Kendall Jr., and R.D. Bates. 1984. Distribution and abundance patterns of eggs and larvae of walleye pollock (Theragra chalcogramma) in the western Gulf of Alaska. NWAFC Proc. Rept. 84-10. 66p.

Fay, F.H., B.P. Kelly, and J.L. Sease. 1989. Managing the Exploitation of Pacific Walruses: A Tragedy of Delayed Response and Poor Communication. Marine Mammal Science, Vol. 5 No. 1, January 1989. 10 p.

Gilbert, J.R. 1989. Aerial Census of Pacific Walruses in the Chukchi Sea, 1985, Marine Mammal Science, Vol. 5 No. 1, January 1989. 18 p.

Hare, S. R. 1988. Report on the Port Moller Pacific cod trawl fishery, summer 1988. NWAFC Processed Report 88-25, 22 p. Northwest and Alaska Fish. Cent., Natl. Mar. Fish. Serv., NOAA, 7600 Sand Point Way N.E., Bin C15700, Bldg. 4, Seattle, WA 98115-0070.

Incze, L.S., A.W. Kendall Jr., J.D. Schumacher, and R.K. Reed. In Press. Interactions of a mesoscale patch of larval fish (Theragra chalcogramma) with the Alaska Coastal current. Cont. Shelf. Res.

Kendall, A.W. and J.R. Dunn. 1985. Icthyoplankton of the continental shelf near Kodiak Island, Alaska. NOAA Tech. Rept. NMFS 20, 89p.

Kendall, A.W. and S.J. Picquelle. In Prep. Egg and larval distributions of walleye pollock Theragra chalcogramma in Shelikof Strait, Gulf of Alaska. Northwest and Alaska Fisheries Center, 7600 Sand Point Way NE, Seattle, WA 98115.

Kinder, T.H. and J.D. Schumacher. 1981. Hydrographic structure over the continental shelf of the southeastern Bering Sea. In D. W. Hood and J. A. Calder (editors), The eastern Bering Sea shelf: Oceanography and resources, vol. 1, p. 31-52. Univ. Washington Press, Seattle, WA 98105.

LGL Ecological Research Associates. 1988. Draft Report. Synthesis of information on the effects of noise and disturbance on major haulout concentrations of Bering Sea pinnipeds. MMS Contr. No. 14-12-0001-30361.

McMurray, G., A.H. Vogel, P.A. Fishman, D.A. Armstrong, and S.C. Jewett. 1984. Distribution of larval and juvenile red king crabs (Paralithodes camtschatica) in Bristol Bay. Final report, OCSEAP contract no. 83ABC00067, research unit no. 639, 145 p. (plus appendices). Available VTN Oregon, Inc., 25115 SW Parkway, Wilsonville, OR 97070.

Megrey, B.A. 1988 a. Gulf of Alaska walleye pollock: Population assessment and status of the resource as estimated in 1988. In Condition of the groundfish resources of the Gulf of Alaska in 1988. Unpl. rep., 255p. Northwest and Alaska Fish. Center, Natl. Mar. Fish. Serv., NOAA, 7600 Sand Point Way NE., Seattle, WA 98115 (submitted to the International North Pacific Fisheries Commission in September 1988).

Megrey, B.A. 1988 b. Population Dynamics of Walleye Pollock (Theragra chalcogramma) in the Gulf of Alaska. Ph.D. Dissertation, University of Washington, Seattle, WA. 385p.

Meyers, C.J. and A.D. Tarlock. 1971. Selected legal and economic aspects of environmental protection. The Foundation Press, Inc., Mineota, N.Y. 410 p.

Nelson, M.D. and E.P. Nunnallee. 1987. Results of acoustic surveys for walleye pollock in the Gulf of Alaska in 1986. In R.L. Major (editor), Condition of groundfish resources of the Gulf of Alaska region as assessed in 1986, p. 15-38. Dept. Commerce, NOAA Tech. Memo. NMFS F/NWC-119.

North Pacific Fishery Management Council. 1988. Final Resource Assessment Document for the 1989 Bering Sea/Aleutian Islands Groundfish Fishery. Prepared by the Bering Sea/Aleutian Islands Groundfish Plan Team. 236 pp.

Oldfield, M.L. 1984. The Value of Conserving Genetic Resources. U.S. Dept. Interior, National Park Service, Washington, D.C., 1984. 267 p.

Reeves, J. and J. Terry. 1986. A biological and economic analysis of the bycatch of prohibited species in the Bering Sea Area I joint venture flounder fishery. Unpubl. manuscr., 57 p. Northwest and Alaska Fish. Cent., Natl. Mar. Fish. Serv., NOAA, 7600 Sand Point Way N.E., Bin C15700, Bldg. 4, Seattle, WA 98115-0070.

Rothschild, B.J. 1986. Dynamics of Marine Fish Populations. Harvard University Press, Cambridge, Massachusetts. 277p.

Schumacher, J.D., T.H. Kinder, D.J. Pashinski, and R.L. Charnell. 1979. A structural front over the continental shelf of the eastern Bering Sea. J. Physical Oceanography 9:79-87.

Shippen, H.H. In Prep. Progress report on the young of the year project, 1984-1987. Northwest and Alaska Fisheries Center, Seattle, WA 98115.

Urick, M. 1983. Principles of Underwater Sound. 3rd Edition. McGraw-Hill, N.Y.

Zenger, H.H., Jr. 1985. Summaries of Japanese reported longline catches of Pacific cod and sablefish in the Gulf of Alaska, 1978-1983. NOAA Tech. Memo. NMFS F/NWC-82. 67p.

ADDENDUM TO THE

ENVIRONMENTAL ASSESSMENT/REGULATORY IMPACT REVIEW/
INITIAL REGULATORY FLEXIBILITY ANALYSIS

FOR AMENDMENTS 18 AND 13

TO THE FISHERY MANAGEMENT PLANS FOR
GROUNDFISH OF THE GULF OF ALASKA AND THE
BERING SEA/ALEUTIAN ISLANDS

Prepared by the Plan Teams for the
Groundfish Fisheries of the Gulf of Alaska
and the Bering Sea/Aleutian Islands and the
Staff of the North Pacific Fishery Management Council

Anchorage, Alaska

July 21, 1989

1.0 INTRODUCTION

On May 3 the 1989 Groundfish Amendment Document was made available for public review. Specifically, the document contains a draft Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR/IRFA) for the proposed Amendments 18 and 13 to the Gulf of Alaska and Bering Sea/ Aleutian Islands Groundfish Fishery Management Plans. In response to comments received from the Council during its April meeting, plan team discussion, and public comments on the draft document, some additional analyses have been conducted which are relevant to the information contained in the amendment document. This addendum provides additional analyses for three of the eight FMP amendment topics.

The first part of this addendum addresses the proposal to allocate sablefish total allowable catch (TAC) in the BSAI (Chapter 2.0 in the EA/RIR/IRFA). It provides an extended socioeconomic analysis of the projected sablefish discards and total gross earnings from groundfish fisheries in the BSAI for two gear allocations and under a variety of sablefish TACs.

The second part of this document provides additional information on the cost of reharvesting discarded halibut. This analysis relates to the alternative which would permit retention of halibut in the Gulf of Alaska longline fisheries (Chapter 6.0 in the EA/RIR/IRFA).

The third part of this document provides a suggested change to the Weekly Production Report printed on page 138 of the EA/RIR/IRFA (Chapter 8.0). Proposed is a Weekly Catch and Production Report which would be used for reporting of weekly total estimated catch. The plan teams believe this correction to the draft reporting requirements chapter is necessary for catch monitoring purposes.

The GOA and BSAI groundfish plan teams believe that the information presented in this addendum is important to understanding the implications of the various alternatives presented for these FMP amendment topics. However, this information does not appreciably alter any findings or conclusions in the EA/RIR/IRFA, but merely expands and clarifies the original analyses.

2.0 ALLOCATE SABLEFISH TOTAL ALLOWABLE CATCH IN THE BERING SEA/ALEUTIAN ISLANDS -- ADDITIONAL ANALYSIS

2.1 Introduction

This report extends the socioeconomic analysis of Section 2.5 (sablefish gear allocation) of Amendment 13 to the Fishery Management Plan for groundfish of the Bering Sea/Aleutian Islands. Projections of sablefish discards and total gross earnings from groundfish fisheries in the Bering Sea and Aleutian Islands are presented for two different gear allocations under a variety of sablefish TAC allocations.

Comparisons of the two fixed allocations were made for a variety of sets of assumptions because there is some uncertainty as to the proportion of pollock that will be taken in the midwater fishery, sablefish bycatch rates, and the response of the Regional Director (RD) once a gear group has taken its allocation of a sablefish TAC. The assumptions are described below.

The proportion of the pollock TAC that is taken in the midwater fishery is an important factor in determining expected sablefish bycatch for two principal reasons. The sablefish bycatch rate in the midwater pollock fishery is substantially less than that in the on-bottom pollock fishery and the pollock fisheries are so large that even a small difference in bycatch rates can result in a large difference in bycatch. Alternative assumptions are: (1) 30% of the pollock TAC is taken in the midwater fishery, and (2) 70% is taken in the midwater fishery. The expected sablefish bycatch in the trawl fisheries is naturally much larger with the former assumption.

The bycatch rates used to estimate expected sablefish bycatch are critical to the outcome of the model. Therefore, in addition to estimating bycatch using mean rates, estimates were also made using the mean rates plus and minus two standard deviations. In each instance, the mean bycatch rate minus two standard deviations was less than zero and the lower end of the range was set equal to zero. Therefore, with the low bycatch rate assumption, expected sablefish bycatch is naturally equal to zero. A confidence interval was also constructed using plus and minus 1 standard deviation from the mean as well, but again the lower end values were negative and these results are not reported here.

Another assumption that is varied is that concerning what the RD would do once a gear group has taken its sablefish allocation. The two possibilities considered are that the RD would: (1) allow fisheries of that gear group to remain open but require that sablefish be discarded or (2) close all fisheries of that gear group that are expected to take sablefish as bycatch.

The levels of the sablefish TACs were also varied. As with the sablefish bycatch rates and the proportion of pollock taken in midwater trawl fisheries, the sablefish TACs were varied to provide a comparison of the two allocation options for different static situations as well as for the situation in which the parameter values are not expected to remain constant. The former is useful because there is some uncertainty as to what the correct values are and the latter is useful in evaluating the usefulness of fixed allocations when bycatch rates and the proportion of pollock taken in midwater trawl fisheries are not expected to remain constant.

2.2 Comparison of fixed sablefish allocation in terms of estimated differences in gross exvessel earnings and sablefish discards.

Because the action of the RD once a gear group has taken its sablefish allocation is such an important factor in determining the effects of the fixed gear allocation options 1 and 2 on both gross exvessel earnings in the groundfish fisheries as a whole and sablefish discards, the comparison of the options under the two responses considered are presented in separate subsections. Option 1 is the proposed 70% trawl allocation for the sablefish TACs in both the Bering Sea and Aleutian Islands. Option 2 allocates 70% of the Bering Sea sablefish TAC to the longliners and 90% of the Aleutian Islands sablefish TAC to the longliners.

2.2.1 Impacts if the RD prohibits retention of sablefish but does not close the fisheries.

If the RD prohibits retention of sablefish in the fisheries of a gear group that has taken its sablefish allocation but does not close such fisheries, the catch of other species is not constrained by the allocation option selected. Therefore, the landed catch of sablefish and other groundfish for the groundfish fishery as a whole would be the same with either option 1 or 2. However, total exvessel earnings (excluding the value added by at-sea processing) would be higher with option 2 because this option allocates more sablefish to the fixed gear fisheries and sablefish exvessel prices, again excluding the value added by at-sea processing, tend to be higher for fixed gear fisheries than for trawl fisheries. The higher prices in the fixed gear fisheries occur because these fisheries, on average, catch larger fish and land more of their catch dressed than do the trawl fisheries. To the extent that the additional processing results in increased costs as well as increased prices, the exvessel price differential tends to overstate the relative benefit of having sablefish taken with fixed gear as opposed to trawl gear. If prices which include the value of at-sea processing had been used, that relative benefit would tend to be understated because the at-sea processing that occurs for much of the sablefish landed by the trawl fishery also increases landed prices but probably at an even greater increase in cost.

The advantage of option 2 in terms of short-term gross exvessel earnings for the groundfish fishery as a whole should be balanced against the disadvantage of increased sablefish discards. With the exception of the low bycatch rate (i.e., rates=0) cases, the estimated sablefish discards are typically higher with allocation 2 (Tables 2.1 and 2.2). The difference in estimated sablefish discards with option 2 compared to option 1 increases as the sablefish TACs decrease, the bycatch rates increase, or the proportion of pollock taken in the midwater trawl fishery decreases. Using the trawl fishery exvessel prices (Table 2.3), the loss in gross exvessel earnings associated with the difference in discards from the BSAI regions ranges from $0 to $4.2 million. This loss more than offsets the advantage of allocation option 2 in terms of gross exvessel earnings in most cases (Tables 2.4 and 2.5).

In the Bering Sea the amount discarded under option 2 differs from the amount under option 1 by 0 mt to 1,360 mt, depending on the TAC and bycatch rate assumed. In the Aleutian Islands region, the difference ranges from 0 to 1,176 mt. However, while the differences are comparable in each area, the absolute number of expected discards are considerably higher in the Bering Sea due to the relative availability of the other groundfish species in this area. In the Bering Sea estimates of the total amount of discards range from 0 to 6,518 mt while in the Aleutian Islands projected discards vary from 0 to 1,336 mt.

These estimates represent projections of sablefish discards under the various assumptions for a given year. If the RD continued this policy for a number of years, allowing substantial discards to occur, then long-run earnings

from the sablefish fishery could be reduced as future TACs decline to reflect the impact on the stock, especially in the Bering Sea.

Note that for the cases in which sablefish discards occur with option 1, the differences in discards between options 1 and 2 equal the differences in sablefish allocations to the trawl fishery. This difference depends on the level of the TAC but is not dependent on the sablefish bycatch rates or the proportion of pollock taken in the midwater fishery.

2.2.2 Impacts if the RD closes the fisheries that take sablefish as bycatch.

If the RD closes all the fisheries of a gear group that take sablefish as bycatch once it has taken its sablefish allocation, there would be no difference in discards between allocation options 1 and 2. However, gross exvessel earnings for the groundfish fishery as a whole would differ. The size and direction of the difference depends on the assumptions made with respect to sablefish bycatch rates, the sablefish TACs, and the proportion of pollock taken in the midwater trawl fishery. If the values of these parameters are such that the trawl fisheries will not be closed prior to fully utilizing all the groundfish TACs, option 2 results in greater gross exvessel earnings for the groundfish fishery as a whole for the same reasons as above (higher exvessel price for longline sablefish). However, as bycatch rates increase, the sablefish TACs decrease, or as the proportion of pollock taken in the midwater fishery decreases, the advantage of option 2 decreases and, for some combinations of higher catch rates, lower TAC and lower proportions of pollock taken in the midwater fishery, option 1 is preferred to option 2.

Again, because of the relative size of the other groundfish fisheries to the sablefish fishery, the potential for foregone revenue and the magnitude of the lost gross earnings are greater in the Bering Sea region than in the Aleutian Islands.

2.3 Comparison of Alternative 3 (Fixed sablefish allocations) with Alternatives 1 and 2 (status quo or bycatch preference).

The advantage of fixed allocations is that industry is provided a more stable regulatory environment in which to operate. The disadvantage is that the appropriateness of a specific allocation depends on the values of variables which can fluctuate substantially from year to year. For example, a 70% allocation to the trawl fisheries may be appropriate if the mean bycatch rates accurately reflect the bycatch harvest of sablefish and the RD is likely to close other groundfish fisheries once a sablefish TAC allocation is taken. A smaller allocation percentage to the trawlers would probably be correct if expected discards are quite low and the sablefish TAC is relatively high, but a larger trawl allocation (i.e. more than 70%) might be justified if the total amount of bycatch demands increased due to increases in the TACs of other groundfish fisheries or if the high bycatch rates more accurately reflect the current bycatch harvest of sablefish.

2.4 Historical Data

A time series of landed catch from 1982-88 (Table 2.6) provides additional insight into the possible implications of the model scenarios.

Total landed catch in the Bering Sea has varied from 2,314 mt to 4,118 mt during this time period, with an average annual catch of 3,060 mt. The model presents possible sablefish discards and foregone groundfish catch for sablefish TACs of 2,200 mt, 2,800 mt, and 3,400 mt.

In the Aleutian Islands, sablefish landings have varied from 644 mt in 1983 to a high of 3,822 mt in 1987. The model scenarios range from 1,800 mt to 5,000 mt.

In addition, landings are presented for foreign, joint venture and domestic totals as a percentage of total catch. The domestic annual sablefish landings are also presented by gear type. For any given year, the percentage harvested by a certain fleet or gear type will vary in response to market conditions for sablefish and other groundfish, other harvesting opportunities, and management regulations. If the RD continues to intercede under the status quo or if Alternative 2 or 3 is enacted, the fleet's fishing pattern will shift to adjust to the new fishing regime. For instance, if an allocation shift towards bycatch fisheries occurs, then it is likely vessels under all gear types will shift their sablefish harvesting toward a bycatch mode.

3.0 REPLACE THE KING CRAB PROTECTION TIME/AREA CLOSURES AROUND KODIAK ISLAND AND MODIFY THE HALIBUT BYCATCH MANAGEMENT REGIME FOR THE GULF OF ALASKA -- ADDITIONAL ANALYSIS

3.1 Introduction

This provides additional information relevant to the halibut bycatch management section of Chapter 6.0 in the EA/RIR/IRFA. This information specifically addresses the assumption originally used to calculate the cost of reharvesting discarded halibut and as such relates to the amendment alternative which would permit retention of halibut in longline fisheries.

3.2 Benefits and Cost of Prohibiting Retention

The estimate of the cost of reharvesting halibut released from longline groundfish fisheries was assumed to range from 25% to 50% of its exvessel value. Estimates of the exvessel earnings and costs per vessel for a one-day halibut opening were obtained for seven operations with vessels ranging in length from 58 feet to 90 feet. The average earnings and costs for these operations were used to calculate cost per trip (excluding annual fixed costs) as a percentage of exvessel earnings. Because crew shares are the dominant cost and because crew shares may overstate the opportunity cost of labor, harvesting cost as a percentage of exvessel earnings was estimated for the cost of labor ranging from 10% to 100% of the crew shares. The cost and earnings used are as follow:

Average Gross Exvessel Earnings and Costs per Vessel
for a 24-hour Halibut Opening
(Based on Estimates for 7 Operations)

Exvessel earning	$39,300
Expenses (excluding labor)	
ice	320
fuel	1,700
groceries	230
gear loss	300
subtotal	2,550
Crew shares	18,500

Using these data, harvesting cost is 54%, 30%, 18%, and 11% of exvessel earnings, respectively, when 100%, 50%, 25%, and 10% of the crew share is included as the cost of labor. This suggests that the assumption used to calculate the cost of reharvesting discarded halibut is probably reasonable.

4.0 IMPLEMENT A SYSTEM OF OBSERVER COVERAGE AND RECORDKEEPING AND DATA REPORTING REQUIREMENTS FOR THE GROUNDFISH FISHERIES OF THE GULF OF ALASKA AND THE BERING SEA/ALEUTIAN ISLANDS AREAS -- ADDITIONAL ANALYSIS

4.1 Introduction

The plan teams believe that the Weekly Production Report presented in Chapter 8.0 of the EA/RIR/IRFA should be modified as outlined below.

4.2 Require Reports of Weekly Total Estimated Catch

The data recordkeeping portion of the amendment requires that the weight of daily catches or receipt of groundfish be recorded. These gross catches are currently not asked to be reported in the amendment. A correction is suggested. The correction requires that the daily catch and receipt of groundfish be totaled for the week and reported with the "weekly production report". The weekly data will be required to assess the accuracy of reported discard amounts and accuracy of using predetermined product conversion rates to back-calculate total catch weight.

This suggested change to the amendment would alter the subtitle on page 138 (of the EA/RIR/IRFA) to "Weekly Catch and Production Report". The reports would summarize (1) weekly production by species and product form, (2) weekly total estimated catch, and (3) estimated discards of prohibited species and other species. Each catcher/processor would be required to report its weekly total estimated catch to the nearest metric ton. Each mothership and shoreside processor would be required to report its weekly total catch receipt amount to the nearest metric ton. The data form entitled, "Alaska groundfish processor weekly catch and product report" would be revised to include a new field to report the total tonnage of weekly catches.

Table 2.1 -- Comparison of the projected sablefish discards (mt) by area under different allocation and bycatch rates assuming that only 30% of the pollock TAC is taken midwater.

BERING SEA

	TAC: BS=3,400 mt			
	option 1	option 2	difference mt	difference 10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	211	211	.37
high bycatch rates	4,798	6,158	1,360	2.40

	TAC: BS=2,800 mt			
	option 1	option 2	difference mt	difference 10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	391	391	.69
high bycatch rates	5,218	6,338	1,120	1.98

	TAC: BS=2,200 mt			
	option 1	option 2	difference mt	difference 10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	571	571	1.00
high bycatch rates	5,638	6,518	880	1.55

Table 2.1 -- continued

ALEUTIAN ISLANDS

	TAC: AI=5,000 mt			
	option 1	option 2	difference mt	difference 10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	0	0	0
high bycatch rates	0	1,016	1,016	1.80

	TAC: AI=3,400 mt			
	option 1	option 2	difference mt	difference 10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	127	127	.22
high bycatch rates	0	1,176	1,176	2.08

	TAC: AI=1,800 mt			
	option 1	option 2	difference mt	difference 10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	283	283	.50
high bycatch rates	256	1,336	1,080	1.91

Note: option 1--70% allocation in both areas to trawlers
option 2--70% allocation in Bering Sea to longliners;
90% allocation in AI to longliners

Table 2.2 -- Comparison of the projected sablefish discards (mt) by area under different allocation and bycatch rates assuming that 70% of the pollock TAC is taken midwater.

BERING SEA

	TAC: BS=3,400 mt			
	option 1	option 2	difference	
			mt	10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	0	0	0
high bycatch rates	2,990	4,350	1,360	2.40

	TAC: BS=2,800 mt			
	option 1	option 2	difference	
			mt	10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	0	0	0
high bycatch rates	3,410	4,530	1,120	1.98

	TAC: BS=2,200 mt			
	option 1	option 2	difference	
			mt	10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	174	174	.31
high bycatch rates	3,830	4,710	880	1.55

Table 2.2 -- continued

ALEUTIAN ISLANDS

	TAC: AI=5,000 mt			
	option 1	option 2	difference	
			mt	10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	0	0	0
high bycatch rates	0	959	959	1.70

	TAC: AI=3,400 mt			
	option 1	option 2	difference	
			mt	10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	103	103	.18
high bycatch rates	0	1,119	1,119	1.98

	TAC: AI=1,800 mt			
	option 1	option 2	difference	
			mt	10^6
low bycatch rates	0	0	0	0
mean bycatch rates	0	263	263	.47
high bycatch rates	199	1,279	1,080	1.91

Note: option 1--70% allocation in both areas to trawlers
option 2--70% allocation in Bering Sea to longliners;
90% allocation in AI to longliner

Table 2.3 -- Exvessel prices ($/lb round weight) used in the model projection of gross earnings by species and area.

	Bering Sea	Aleutian Islands
Pollock	.076	.079
Cod	.133	.162
Flatfish	.171	.171
Rock sole	.126	.085
Atka mackerel	.119	.119
Greenland turbot	.213	.246
Rockfish	.092	.093
Sablefish		
trawl	.800	.803
longline	.875	1.007

Note: Prices are at the exvessel level and therefore do not include the value added by at-sea processing.

Source: 1988 domestic exvessel prices from PacFIN database.

Table 2.4 -- Projected exvessel value (in millions of dollars) of Bering Sea/Aleutian Islands groundfish landings for two allocation options, three sets of sablefish TACs, three sets of sablefish bycatch rates, and two alternative assumptions concerning what will happen once a TAC allocation is taken, assuming that only 30% of the pollock TAC is taken in the midwater fishery.

If the RD allows continued fishing with discards once a sablefish TAC allocation is taken:

BERING SEA/ALEUTIAN ISLANDS

TAC: BS=3,400 mt; AI=5,000 mt

	option 1	option 2	difference
low bycatch rates	441.9	443.5	1.6
mean bycatch rates	441.9	443.5	1.6
high bycatch rates	441.9	443.5	1.6

TAC: BS=2,800 mt; AI=3,400 mt

	option 1	option 2	difference
low bycatch rates	437.8	438.9	1.1
mean bycatch rates	437.8	438.9	1.1
high bycatch rates	437.8	438.9	1.1

TAC: BS=2,200 mt; AI=1,800 mt

	option 1	option 2	difference
low bycatch rates	433.7	434.3	.6
mean bycatch rates	433.7	434.3	.6
high bycatch rates	433.7	434.3	.6

Table 2.4 -- continued

If the RD closes other groundfish fisheries once a sablefish TAC allocation is taken:

BERING SEA/ALEUTIAN ISLANDS

TAC: BS=3,400 mt; AI=5,000 mt

	option 1	option 2	difference
low bycatch rates	441.9	443.5	1.6
mean bycatch rates	441.9	372.4	-69.5
high bycatch rates	164.6	80.0	-84.6

TAC: BS=2,800 mt; AI=3,400 mt

	option 1	option 2	difference
low bycatch rates	437.8	438.9	1.1
mean bycatch rates	437.8	304.1	-133.7
high bycatch rates	136.2	63.8	-72.4

TAC: BS=2,200 mt; AI=1,800 mt

	option 1	option 2	difference
low bycatch rates	433.7	434.3	.6
mean bycatch rates	433.7	235.0	-198.7
high bycatch rates	105.9	47.6	-58.3

Note: option 1--70% allocation in both areas to trawlers
option 2--70% allocation in Bering Sea to longliners;
90% allocation in AI to longliners

Prices are from PacFIN for 1988 domestic exvessel value and do not include the value added by at-sea processing.

Table 2.5 -- Projected exvessel value (in millions of dollars) of Bering Sea/Aleutian Islands groundfish landings for two allocation options, three sets of sablefish TACs, three sets of sablefish bycatch rates, and two alternative assumptions concerning what will happen once a TAC allocation is taken, assuming that 70% of the pollock TAC is taken in the midwater fishery.

If the RD allows continued fishing with discards once a sablefish TAC allocation is taken:

BERING SEA/ALEUTIAN ISLANDS

TAC: BS=3,400 mt; AI=5,000 mt

	option 1	option 2	difference
low bycatch rates	441.3	442.9	1.6
mean bycatch rates	441.3	442.9	1.6
high bycatch rates	441.3	442.9	1.6

TAC: BS=2,800 mt; AI=3,400 mt

	option 1	option 2	difference
low bycatch rates	437.2	438.3	1.1
mean bycatch rates	437.2	438.3	1.1
high bycatch rates	437.2	438.3	1.1

TAC: BS=2,200 mt; AI=1,800 mt

	option 1	option 2	difference
low bycatch rates	433.1	433.7	.6
mean bycatch rates	433.1	433.7	.6
high bycatch rates	433.1	433.7	.6

Table 2.5 -- continued

If the RD closes other groundfish fisheries once a sablefish TAC allocation is taken:

BERING SEA/ALEUTIAN ISLANDS

TAC: BS=3,400 mt; AI=5,000 mt

	option 1	option 2	difference
low bycatch rates	441.3	442.9	1.6
mean bycatch rates	441.3	442.9	1.6
high bycatch rates	210.7	99.9	-110.8

TAC: BS=2,800 mt; AI=3,400 mt

	option 1	option 2	difference
low bycatch rates	437.2	438.3	1.1
mean bycatch rates	437.2	435.7	-1.5
high bycatch rates	174.1	80.2	-93.9

TAC: BS=2,200 mt; AI=1,800 mt

	option 1	option 2	difference
low bycatch rates	433.1	433.7	.6
mean bycatch rates	433.1	340.5	-92.6
high bycatch rates	136.1	60.4	-75.7

Note: option 1--70% allocation in both areas to trawlers
option 2--70% allocation in Bering Sea to longliners;
90% allocation in AI to longliners

Prices are from PacFIN for 1988 domestic exvessel value and do not include the value added by at-sea processing.

Table 2.6 -- Annual sablefish landed catch (in mt and percentage) in the Bering Sea and Aleutian Islands by area, fleet, and gear type, 1982-88.

Bering Sea

Year	Foreign	JV	Domestic				Total
			TWL	HKL	POT	TOTAL	
1982	3,030	5	151			151	3,183
1983	2,603	44	90			90	2,737
1984	1,198	76	1,025	15		1,040	2,314
1985	242	47	86	1,536	437	2,059	2,348
1986	109	350	1,337	1,376	355	3,068	3,527
1987	33	68	1,924	1,973	120	4,017	4,118
1988		9	2,164	959	62	3,185	3,194

Aleutian Islands

Year	Foreign	JV	Domestic				Total
			TWL	HKL	POT	TOTAL	
1982	809	118				0	927
1983	574	70				0	644
1984	724	272	2		TR	2	988
1985	70	63	123	172	1,019	1,314	1,447
1986		83	424	1,582	939	2,945	3,028
1987		55	480	2,796	491	3,767	3,822
1988		6	346	2,821	243	3,410	3,416

Bering Sea/Aleutian Islands

Year	Foreign	JV	Domestic				Total
			TWL	HKL	POT	TOTAL	
1982	3,839	123	151			151	4,113
1983	3,177	114	90			90	3,381
1984	1,922	348	1,027	15	TR	1,042	3,312
1985	312	110	210	1,708	1,457	3,375	3,797
1986	109	433	1,761	2,962	1,294	6,017	6,559
1987	33	123	2,404	4,769	611	7,784	7,940
1988		14	2,509	3,780	305	6,594	6,608

Table 2.6 -- continued

Bering Sea

Year	Foreign	JV	Domestic				Total
			TWL	HKL	POT	TOTAL	
1982	95.2%	0.2%	100.0%			4.7%	100.0%
1983	95.1	1.6	100.0			3.3	100.0
1984	51.8	3.3	98.6	1.4		44.9	100.0
1985	10.3	2.0	4.2	74.6	21.2	87.7	100.0
1986	3.1	9.9	43.6	44.9	11.6	87.0	100.0
1987	0.8	1.7	47.9	49.1	3.0	97.5	100.0
1988	0.0	0.3	67.9	30.1	1.9	99.7	100.0

Aleutian Islands

Year	Foreign	JV	Domestic				Total
			TWL	HKL	POT	TOTAL	
1982	87.3	12.7				0.0	100.0
1983	89.1	10.9				0.0	100.0
1984	72.5	27.3	100.0			0.2	100.0
1985	4.8	4.4	9.4	13.1	77.5	90.8	100.0
1986	0.0	2.7	14.4	53.7	31.9	97.3	100.0
1987	0.0	1.4	12.7	74.2	13.0	98.6	100.0
1988	0.0	0.2	10.1	82.6	7.1	99.8	100.0

Bering Sea/Aleutian Islands

Year	Foreign	JV	Domestic				Total
			TWL	HKL	POT	TOTAL	
1982	93.3	3.0	100.0			3.7	100.0
1983	94.0	3.4	100.0			2.7	100.0
1984	58.0	10.5	98.6	1.4		31.5	100.0
1985	8.2	2.9	6.2	50.6	43.2	88.9	100.0
1986	1.7	6.6	29.3	49.2	21.5	91.7	100.0
1987	0.4	1.4	30.9	61.3	7.8	98.0	100.0
1988	0.0	0.2	38.0	57.3	4.6	99.8	100.0

Notes: TR Trace, landed catch less than 0.5 mt
TWL trawl
HKL hook-and-line
POT pot gear
Column totals may not sum between areas due to rounding
Trawl, hook-and-line, and pot percentages are reported as percentage of domestic total. Domestic total percentage indicates the percentage of total catch taken by all three domestic gear groups.

Source: PacFin report #111 as of 6-6-89.

BERING SEA/ALEUTIAN ISLANDS GROUNDFISH
FISHERY MANAGEMENT PLAN

AMENDMENT 13

CHANGES TO THE FMP

Summary

Amendment 13 will make the following changes to the FMP:

(a) Allocate sablefish in the Bering Sea and the Aleutian Islands Management Subareas.

(b) Establish a procedure to set fishing seasons on an annual basis by regulatory amendment.

(c) Establish groundfish fishing closed zones near the Walrus Islands and Cape Peirce.

(d) Establish a new data reporting system.

(e) Establish a new observer program.

(f) Clarify the Secretary's authority to split or combine species groups within the target species management category by a framework procedure.

Changes to the Relevant Sections of the Bering Sea/Aleutian Islands FMP

A. In Section 11.3, delete the first three paragraphs, renumber Sections 11.3.1 and 11.3.2 on page 11-4 as 11.3.2 and 11.3.3, add new text in Section 11.3, and add a new Section 11.3.1 The Stock Assessment and Fishery Evaluation (SAFE), as follows:

Add the following text:

"The Secretary, after receiving recommendations from the Council, will determine TACs and apportionments thereof among DAP, JVP, TALFF, and reserves for each target species and the "other species" category by January 1 of the new fishing year, or as soon as practicable thereafter, by means of regulations implementing the FMP. Notwithstanding designated target species and species groups listed in Section 14.2.B.2 on page 14-1, the Council may consider whether splitting or combining species in the target species category for purposes of establishing new TACs is desirable based on commercial importance of a species or species group and whether sufficient biological information is available to manage a species or species group on its own biological merits.

"Prior to making recommendations to the Secretary, the Council will make available to the public for comment as soon as practicable after its September meeting, a preliminary Stock Assessment and Fishery Evaluation

(SAFE) and preliminary specifications of ABC and TAC for each target species and the "other species" category, and apportionments thereof among DAP, JVP, TALFF, and reserves. At a minimum, the SAFE will contain information listed in Section 11.3.1

"At its December meeting, the Council will review the final SAFE and comments received. The Council will then make final recommendations to the Secretary."

"11.3.1 The Stock Assessment and Fishery Evaluation

"For purposes of supplying scientific information to the Council for use in utilizing the above procedure, a The Stock Assessment and Fishery Evaluation (SAFE) is prepared annually. The SAFE will, at a minimum, contain or refer to the following:

(1) Current status of Bering Sea and Aleutian Islands area groundfish resources, by major species or species group.
(2) Estimates of maximum sustainable yield (MSY) and acceptable biological catch (ABC).
(3) Estimates of groundfish species mortality from nongroundfish fisheries, subsistence fisheries, and recreational fisheries, and difference between groundfish mortality and catch, if possible.
(4) Fishery statistics (landings and value) for the current year.
(5) The projected responses of stocks and fisheries to alternative levels of fishing mortality.
(6) Any relevant information relating to changes in groundfish markets.
(7) Information to be used by the Council in establishing prohibited species catch limits (PSCs) for prohibited species and fully utilized species with supporting justification and rationale.
(8) Any other biological, social, or economic information which may be useful to the Council.

B. Replace text in Section 14.3 on page 14-4 with the following:

"Fishing seasons are defined as periods when harvesting groundfish is permitted. Fishing seasons will normally be within a calendar year, if possible, for statistical purposes, but could span two calendar years if necessary. In consultation with the Council, the Secretary will establish all fishing seasons by regulations that implement the FMP to accomplish the goals and objectives of the FMP, the Magnuson Act, and other applicable law. Season openings will remain in effect unless amended by regulations implementing the FMP.

"The Council will consider the following criteria when recommending regulatory amendments:

- Biological: spawning periods, migration, and other biological factors.
- Bycatch: biological and allocative effects of season changes.
- Exvessel and wholesale prices: effects of season changes on prices.

- Product quality: producing the highest quality product to the consumer.
- Safety: potential adverse effects on people, vessels, fishing time, and equipment.
- Cost: effects on operating costs incurred by the industry as a result of season changes.
- Other fisheries: possible demands on the same harvesting, processing, and transportation systems needed in the groundfish fishery.
- Coordinated season timing: the need to spread out fishing effort over the year, minimize gear conflicts, and allow participation by all elements of the groundfish fleet.
- Enforcement and management costs: potential benefits of seasons changes relative to agency resources available to enforce and manage new seasons.
- Allocation: potential allocation effects among users and indirect effects on coastal communities."

C. Within subsection 14.4.3.1, page 14-6, General, strike "None" and insert:

"Waters seaward of the State of Alaska three-mile limit, out to twelve miles surrounding (1) Round Island and the Twins, and (2) Cape Peirce, are closed to fishing for groundfish from April 1 through September 30 (Figure 27b depicts the closed waters). This measure is effective through December 31, 1991."

D. In Section 14.4.5 "Reporting Requirements", page 14-10, replace all text under Subsection A "Domestic" with the following:

"The Council and NOAA Fisheries must have the best available biological and socioeconomic information with which to carry out their responsibilities for conserving and managing groundfish resources, as well as other fish resources, such as crab, halibut, and salmon, that are incidentally caught in the groundfish fishery. This information is used for making inseason and inter-season management decisions that affect these resources as well as the fishing industry that utilize them. This information is also used to judge the effectiveness of regulations guiding these decisions. The Council will recommend changes to regulations when necessary on the basis of such information.

"The need for the Council and NOAA Fisheries to consider the best available information is explicit in the goals and objectives as established by the Council and contained in the FMP. They are also explicit in the Magnuson Act, Executive Order 12291, the Regulatory Flexibility Act, the National Environmental Policy Act, and other applicable law. The Secretary, therefore, will require segments of the fishing industry to keep and report certain records as necessary to provide the Council and NOAA Fisheries with the needed information to accomplish these goals and objectives. The Secretary may implement and amend regulations at times to carry out these requirements after receiving Council recommendations to do so, or at other

times as necessary to accomplish these goals and objectives. Regulations will be proposed and implemented in accordance with the Administrative Procedure Act, the Magnuson Act, and other applicable law.

"Information on catch and production, effort, and price. In consultation with the Council, the Secretary may require recordkeeping that is necessary and appropriate to determine catch, production, effort, price, and other information necessary for conservation and management of the fisheries. Such requirements may include the use of catch and/or product logs, product transfer logs, effort logs, or other records. The Secretary may require the industry to submit periodic reports or surveys of catch and fishery performance information derived from the logs or other recordkeeping requirements. Recordkeeping and reporting would be required of operators of catcher vessels, catcher/processor vessels, mothership processor vessels, and by responsible officers of shoreside processor plants. Such requirements will be contained in regulations implementing this FMP.

"Information on processing expectations. In consultation with the Council, the Secretary may require U.S. processors and persons delivering U.S.-caught fish to foreign processing vessels to submit information to the Regional Director that is necessary and appropriate to reassess the adequacy of DAP and JVP specifications. Such information may be collected by means of written or telephone surveys. Such requirements will be contained in regulations implementing this FMP.

"Information on catching and/or processing activity. The Secretary may require catcher/processor vessels and mothership processor vessels to submit check-in and check-out reports for any Federal statistical area and the Territorial Sea adjacent to the Federal Statistical area. Such requirements will be contained in regulations implementing this FMP."

E. In Section 14.4.6 "Domestic Observer Program", page 14-12, replace all text with the following:

"As in the need for reporting requirements, the Council and NOAA Fisheries must have the best available biological and socioeconomic information with which to carry out their responsibilities for conserving and managing groundfish resources. To augment this information, the Secretary, in consultation with the Council, will require each U.S. fishing vessel that catches groundfish from, or receives groundfish from the EEZ, and each shoreside processor that receives fish caught in the EEZ, to accommodate a observer certified by NOAA Fisheries. Such accommodation may be exempt from this requirement under an Observer Plan prepared by the Council according to regulations implementing this FMP. The purpose of the at-sea observer requirement is to verify catches, including those discarded at sea, and collect biological information of types required in the Observer Plan, which will include information on marine mammals and birds and.

"Observers associated with the Marine Mammal Protection Act Observer Program will be considered to be observers for purposes of the Observer

Plan if they meet requirements of observers for this Program."

F. Add a new section 14.4.9, as follows:

"14.4.9 Gear allocations

"The following gear allocations are specified by this plan:

"Bering Sea Subarea

"Starting in 1990, vessels using fixed gear, including hook-and-line and pot gear, shall be permitted to harvest no more than 50 percent of the TAC specified for sablefish. Vessels using trawl gear shall be permitted to harvest no more than 50 percent of the TAC specified for sablefish.

"Aleutian Islands Subarea

"Starting in 1990, vessels using fixed gear, including hook-and-line and pot gear, shall be permitted to harvest no more than 75 percent of the TAC specified for sablefish. Vessels using trawl gear shall be permitted to harvest no more than 25 percent of the TAC specified for sablefish."

G. Annex I, page AI-1, replace the term Resource Assessment Document with Stock Assessment and Fishery Evaluation Report using the same definition. Where the acronym (RAD) has been used in the plan, replace with the acronym (SAFE).

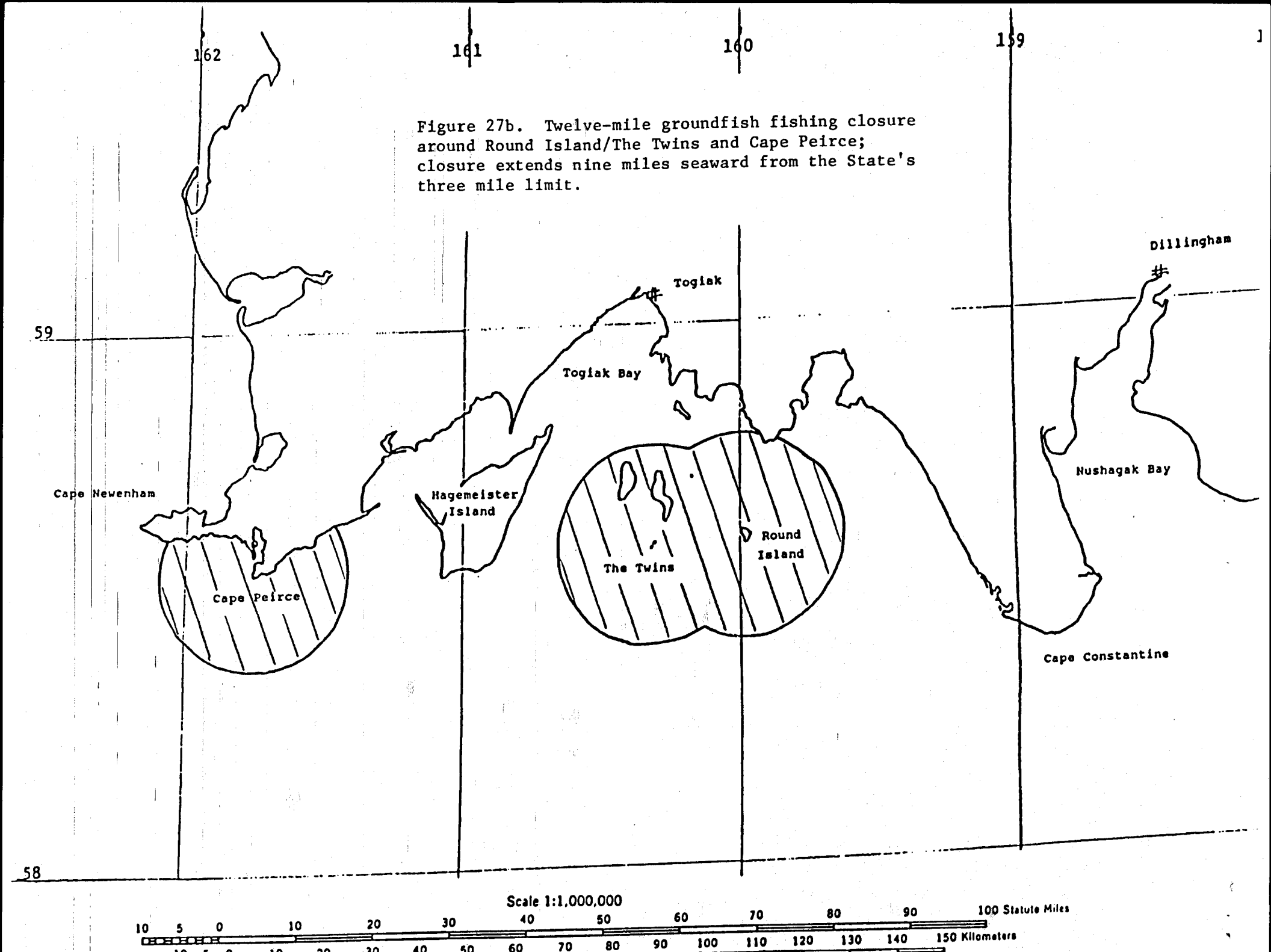


Figure 27b. Twelve-mile groundfish fishing closure around Round Island/The Twins and Cape Peirce; closure extends nine miles seaward from the State's three mile limit.

GULF OF ALASKA GROUNDFISH
FISHERY MANAGEMENT PLAN

AMENDMENT 18

CHANGES TO THE FMP

Summary

Amendment 18 will make the following changes to the FMP:

(a) Establish a procedure to set fishing seasons on an annual basis by regulatory amendment.

(b) Establish a Shelikof District in the Central Regulatory Area.

(c) Implement revised bottom trawl closures around Kodiak Island to protect crab.

(d) Establish halibut PSC limits for fixed gear and trawl gear.

(e) Establish a new data reporting system.

(f) Establish a new observer program.

(g) Clarify the Secretary's authority to split or combine species groups within the target species management category by a framework procedure.

Note that one measure to control halibut bycatch in the Gulf is included in Amendment 18. This measures is already part of the FMP and, therefore, only requires implementing regulations be in force. This measure is:

Prohibit the use of pot gear that does not minimize halibut bycatch. Pot gear is allowed (except for sablefish) in the FMP in Section 4.3.1.3 (p. 4-13).

Changes to Relevant Sections of the FMP

A. In Section 2.2, "Operational Definitions of Terms," page 2-3, replace the term Resource Assessment Document (RAD) with Stock Assessment and Fishery Evaluation Report (SAFE) using the same definition.

B. In Section 3.0, second paragraph on page 3-1, insert after the first sentence, "For purposes of managing pollock, the . . . of the pollock resource.", the following:

> "To provide for regulating the harvest of pollock in Shelikof Strait, an important spawning area and the location of a concentrated fishing effort during late winter and early spring, a Shelikof District is specified within the Central Regulatory Area."

At the end of the third paragraph on page 3-2, after the sentence, "West of Kodiak Island and . . . and rough again.", add the following sentence:

"Figure 3.2 illustrates the Shelikof District of the Central Regulatory Area."

After page 3-1 (Figure 3.1), insert a new Figure 3.2 Shelikof District of the Central Regulatory Area in the Gulf of Alaska. The new Figure 3.2 is attached to this summary of FMP changes.

C. Add the following sentence after the first sentence in Section 3.1 Species Managed by this Plan on page 3.4, as follows:

"Species may be split or combined within the Target Species category according to procedures set forth in Section 4.2.1.1, without amendments to this FMP, notwithstanding the designations listed below under Target Species."

D. In Section 4.2.1.1 on page 4-2, replace text with the following:

"The Secretary, after receiving recommendations from the Council, will determine TACs and apportionments thereof among DAP, JVP, TALFF, and reserves for each target species and the 'other species' category by January 1 of the new fishing year, or as soon as practicable thereafter, by means of regulations implementing the FMP. Notwithstanding designated target species and species groups listed in Section 3.1, the Council may recommend splitting or combining species in the target species category for purposes of establishing new TACs if such action is desirable based on commercial importance of a species or species group an whether sufficient biological information is available to manage a species or species group on its own biological merits.

"Prior to making recommendations to the Secretary, the Council will make available to the public for comment as soon as practicable after its September meeting, a preliminary Stock Assessment and Fishery Evaluation (SAFE) and preliminary specifications of ABC and TAC for each target species and the 'other species' category, and apportionments thereof among DAP, JVP, TALFF, and reserves. At a minimum, the SAFE will contain information listed in Section 4.2.1.4.

"At its December meeting, the Council will review the final SAFE and comments received. The Council will then make final recommendations to the Secretary."

E. Retitle Section 4.2.1.4, "The Resource Assessment Document," page 4-6, with the title Stock Assessment and Fishery Evaluation. Where the acronym (RAD) has been used in the plan, replace with the acronym (SAFE).

F. Under Section 4.2.3, "Prohibited species catch limits and adjustments to control Pacific halibut bycatch," page 4-8, delete paragraph #3 and insert the following paragraphs:

"Halibut that are taken as bycatch in the trawl and fixed gear fisheries result in fishing mortality even though the FMP requires that these species be discarded. Bycatch survival rates of halibut are typically less than 100% and may approach zero for some fisheries and some gear.

"Notwithstanding framework procedures for setting prohibited species catch (PSC) limits in Section 4.2.3.1, specific interim PSC limits of 2,000 mt and 750 mt are established for trawl and fixed gear, respectively, to control halibut bycatch during the 1990 fishing year.

"If the 2,000 mt PSC limit established for trawl gear is reached, further fishing with bottom trawl gear may be prohibited in the Gulf of Alaska management area for the remainder of the 1990 fishing year. If the 750 mt PSC limit established for fixed gear is reached, further fishing with hook-and-line or pot gear may be prohibited in the Gulf of Alaska for the remainder of the 1990 fishing year."

Under Section 4.2.3.1, "Procedure for setting prohibited species catch limits", change the first sentence to read as follows:

"Except for the provisions set forth in Section 4.2.3 for the 1990 halibut PSC limit, PSC limits will be determined annually by the Secretary in consultation with the Council using the following framework procedures:"

G. In Section 4.3.1.3 (pages 4-13 and 4-14), heading Central Area, subheading Time/area closures and gear restrictions to control king crab bycatch, replace the last paragraph of this subsection ("Two area designations . . . expire on December 31, 1989.") with the following:

"Three area designations have been established for purposes of protecting king crab stocks and are described in Figure 4.1 and Table 4.3. This management measure and accompanying regulations will expire on December 31, 1992."

Replace Figure 4.1 on page 4-15 with a new Figure 4.1 (attached). Replace Table 4.3 on page 4-16 with a new Table 4.3 (attached). Add Tables 4.3.1, 4.3.2, and 4.3.3 (attached).

H. Delete Section 4.3.1.2.1 Sablefish fishing seasons on page 4-13. On page 4-23, renumber Section 4.3.3 Generic as Section 4.3.4 and insert a new section 4.3.3 Fishing Seasons, as provided below:

"Fishing seasons are defined as periods when harvesting groundfish is permitted. Fishing seasons will normally be within a calendar year, if possible, for statistical purposes, but could span two calendar years if necessary. Changes to fishing seasons can be recommended by the Council at any time. In consultation with the Council, the Secretary will establish all fishing seasons by regulations that implement the FMP to accomplish the goals and objectives of the FMP, the Magnuson Act, and other applicable law. Season openings will remain in effect unless amended by regulations implementing the FMP.

"The Council will consider the following criteria when recommending regulatory amendments:

- Biological: spawning periods, migration, and other biological factors.
- Bycatch: biological and allocative effects of season changes.
- Exvessel and wholesale prices: effects of season changes on prices.
- Product quality: producing the highest quality product to the consumer.
- Safety: potential adverse effects on people, vessels, fishing time, and equipment.
- Cost: effects on operating costs incurred by the industry as a result of season changes.
- Other fisheries: possible demands on the same harvesting, processing, and transportation systems needed in the groundfish fishery.
- Coordinated season timing: the need to spread out fishing effort over the year, minimize gear conflicts, and allow participation by all elements of the groundfish fleet.
- Enforcement and management costs: potential benefits of seasons changes relative to agency resources available to enforce and manage new seasons.
- Allocation: potential allocation effects among users and indirect effects on coastal communities."

I. Delete the text in Section 4.3.1.4 Recordkeeping and Reporting Requirements and add new text provided below:

"The Council and NOAA Fisheries must have the best available biological and socioeconomic information with which to carry out their responsibilities for conserving and managing groundfish resources, as well as other fish resources, such as crab, halibut, and salmon, that are incidentally caught in the groundfish fishery. This information is used for making inseason and inter-season management decisions that affect these resources as well as the fishing industry that utilize them. This information is also used to judge the effectiveness of regulations guiding these decisions. The Council will recommend changes to regulations when necessary on the basis of such information.

"The need for the Council and NOAA Fisheries to consider the best available information is explicit in the goals and objectives as established by the Council and contained in the FMP. They are also explicit in the Magnuson Act, Executive Order 12291, the Regulatory Flexibility Act, the National Environmental Policy Act, and other applicable law. The Secretary, therefore, will require segments of the fishing industry to keep and report certain records as necessary to provide the Council and NOAA Fisheries with the needed information to accomplish these goals and objectives. The Secretary may implement and amend regulations at times to carry out these requirements after receiving Council recommendations to do so, or at other times as necessary to accomplish these goals and objectives. Regulations will

be proposed and implemented in accordance with the Administrative Procedure Act, the Magnuson Act, and other applicable law.

"Information on catch and production, effort, and price. In consultation with the Council, the Secretary may require recordkeeping that is necessary and appropriate to determine catch, production, effort, price, and other information necessary for conservation and management of the fisheries. Such requirements may include the use of catch and/or product logs, product transfer logs, effort logs, or other records. The Secretary may require the industry to submit periodic reports or surveys of catch and fishery performance information derived from the logs or other recordkeeping requirements. Recordkeeping and reporting would be required of operators of catcher vessels, catcher/processor vessels, mothership processor vessels, and by responsible officers of shoreside processor plants. Such requirements will be contained in regulations implementing this FMP.

"Information on processing expectations. In consultation with the Council, the Secretary may require U.S. processors and persons delivering U.S.-caught fish to foreign processing vessels to submit information to the Regional Director that is necessary and appropriate to reassess the adequacy of DAP and JVP specifications. Such information may be collected by means of written or telephone surveys. Such requirements will be contained in regulations implementing this FMP.

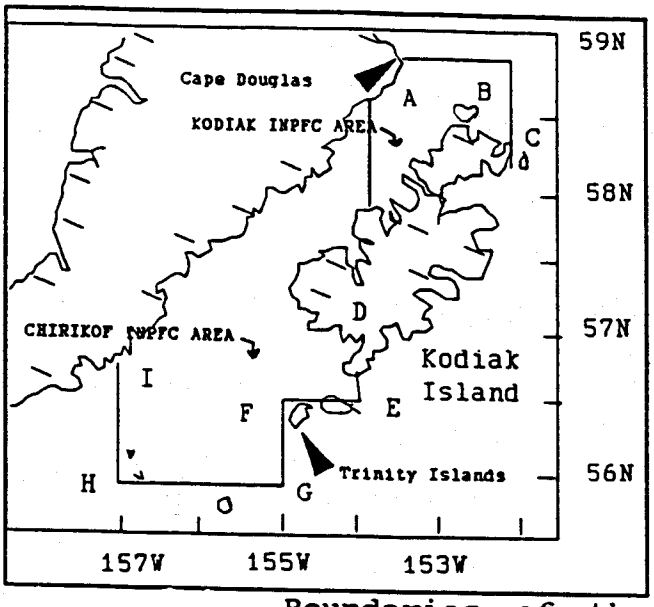
"Information on catching and/or processing activity. The Secretary may require catcher/processor vessels and mothership processor vessels to submit check-in and check-out reports for any Federal statistical area and the Territorial Sea adjacent to the Federal statistical area. Such requirements will be contained in regulations implementing this FMP."

J. In Section 4.3.3.1, "Observers" page 4-23, delete all text and replace it with the following:

"As in the need for reporting requirements, the Council and NOAA Fisheries must have the best available biological and socioeconomic information with which to carry out their responsibilities for conserving and managing groundfish resources. To augment this information, the Secretary, in consultation with the Council, will require each U.S. fishing vessel that catches groundfish from, or receives groundfish from the EEZ, and each shoreside processor that receives fish caught in the EEZ, to accommodate a observer certified by NOAA Fisheries. Such accommodation may be exempt from this requirement under an Observer Plan prepared by the Council according to regulations implementing this FMP. The purpose of the at-sea observer requirement is to verify catches, including those discarded at sea, and collect biological information of types required in the Observer Plan, which will include information on marine mammals and birds.

"Observers associated with the Marine Mammal Protection Act Observer Program will be considered to be observers for purposes of the Observer Plan if they meet requirements of observers for this Program."

Figure 3.2 Shelikof District of the Central Regulatory Area in the Gulf of Alaska.



Boundaries of the Shelikof Strait District in the Gulf of Alaska.

The Shelikof Strait district means all waters of the EEZ enclosed by a line connecting the following points in the order listed:

Reference point	N. Lat.	W. Long.	Description
A	58°51'N.	153°15'W.	Cape Douglas
B	58°51'N.	152°00'W.	then south to the
C			intersection of 152°00'W. with Afognak Island, then counter clockwise around the western shorelines of Afognak, Kodiak, and Raspberry Islands to
D	57°00'N.	154°00'W.	Alitak Bay then south to
E	56°30'N.	154°00'W.	then west through Trinity Islands to
F	56°30'N.	155°00'W.	then south to
G	56°00'N.	155°00'W.	then west to
H	56°00'N.	157°00'W.	then north to
I			Intersection of 157°00'W. with the Alaska Peninsula.

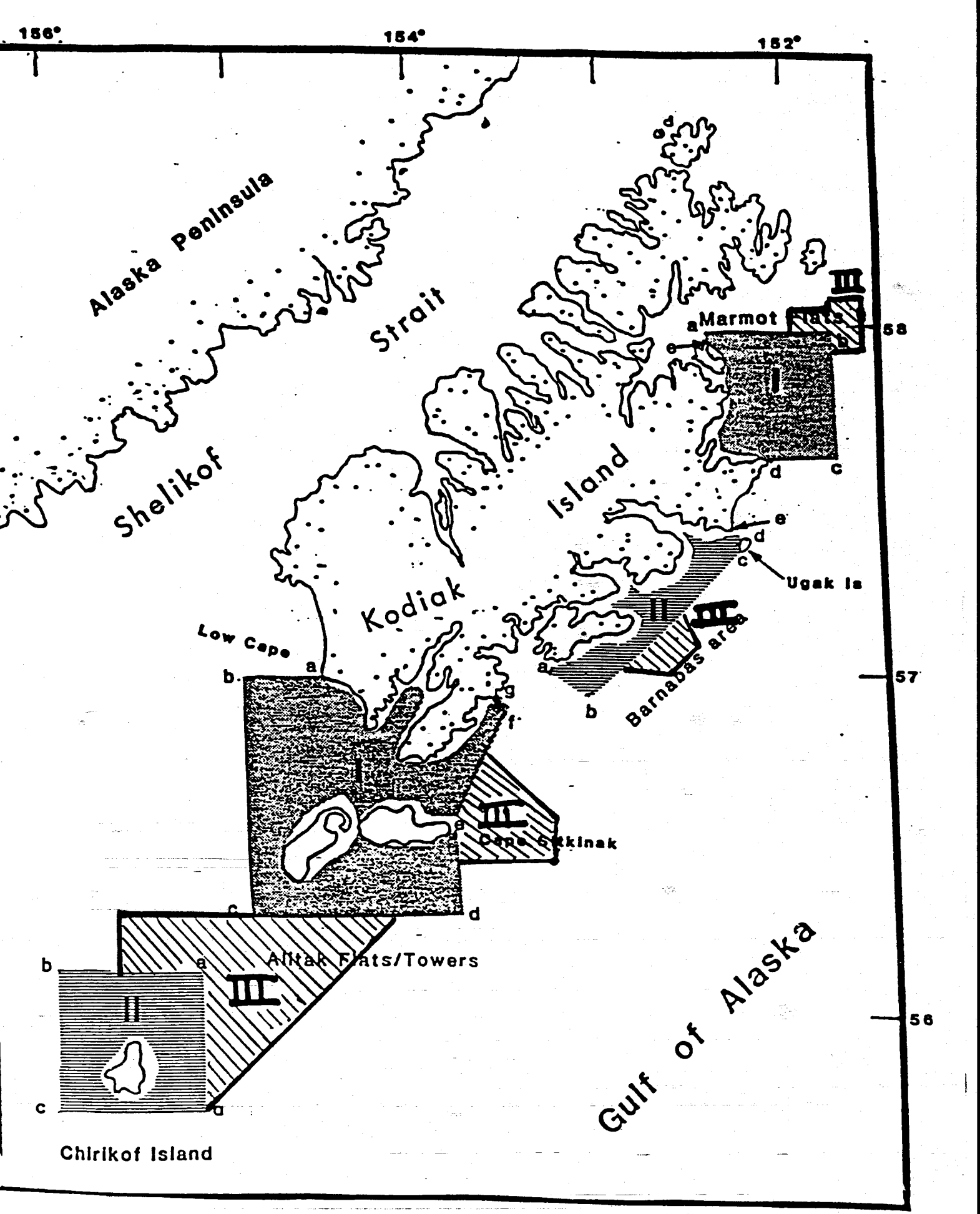


Figure 4.1 Areas around Kodiak Island closed to trawling except with pelagic trawls. TYPE I areas are closed year round. TYPE II areas are closed February 15 to June 15. TYPE III areas close when a significant recruitment event occurs

Table 4.3 Definitions of king crab bycatch areas.

Area Type	Name and Definition
I	Type I areas are those king crab stock rebuilding areas where a high level of protection will be provided to the king crab by closing the area year-round to bottom trawling. Fishing with other gear would be allowed.
II	Type II areas are those areas sensitive for king crab populations and in which bottom trawling will be prohibited during the soft-shell season (February 15 - June 15). Fishing with other gear would be allowed and fishing with bottom trawl gear would be allowed from January 1 - February 14 and June 16 - December 31.
III	Type III areas are those geographic areas adjacent to a Type I or Type II area that have been identified as important juvenile king crab rearing or migratory areas. These areas only become operational following a determination that the "recruitment event criteria" has occurred. The NMFS Regional Director will classify the expanded area as either Type I or II depending on the information available.

Areas designated as Type I, II, or III are shown in Figure 4.1.

For purposes of implementing a Type III area, a "recruitment event" is defined as the appearance of female king crab in substantially increased numbers. A substantially increased number is defined as occurring when the total number of females estimated for a given district equals the number of females established as a threshold criteria for opening that district to commercial crab fishing. In any given year a recruitment event may occur in one or more of the Kodiak management districts as indicated by the standardized Kodiak crab survey conducted by the Alaska Department of Fish and Game. A recruitment event closure will continue until either (1) a commercial crab fishery opens for that district, (2) the number of crab drops below the threshold level established for that district, or (3) the end of 1992 when the closures established by this measure would expire. Implementation of the Type III area closures would be accomplished by regulatory amendment.

See Tables 4.3.1, 4.3.2., and 4.3.3 for geographic coordinates defining Type I,II, and III areas.

Table 4.3.1. TYPE I AREAS

(i) Alitak Flats and Towers Areas: All water of Alitak Flats and the Towers Areas enclosed by a line connecting the following seven points in the order listed:

Reference point	N. lat.	W. long.	Land description
a	56 59 4	154 31 1	Low Cape.
b	57 00 0	155 00 0	
c	56 17 0	155 00 0	
d	56 17 0	153 52 0	
e	56 33 5	153 52 0	Cape Sitkinak
f	56 54 5	153 32 5	East point of Twoheaded Island
g	56 56 0	153 35 5	Kodiak Island, thence, along the coastline of Kodiak Island until intersection of
a	56 59 4	154 31 1	Low Cape.

(ii) Marmot Flats Area: All water enclosed by a line connecting the following five points in the clockwise order listed:

Reference point	N. lat.	W. long.	Land description
a	58 00 0	152 30 0	
b	58 00 0	151 47 0	
c	57 37 0	151 47 0	
d	57 37 0	152 10 1	Cape Chiniak, thence, along the coastline of Kodiak Island to
e	57 54 5	152 30 0	North Cape.
a	58 00 0	152 30 0	

Table 4.3.2. TYPE II AREAS

(i) Chirikof Island Area: All waters surrounding Chirikof Island enclosed by a line connecting the following four points in the counter clockwise order listed:

Reference point	N. lat.	W. long.
a	56 07 0	155 13 0
b	56 07 0	156 00 0
c	55 41 0	156 00 0
d	55 41 0	155 13 0
a	56 07 0	155 13 0

(ii) Barnabas Area: All waters enclosed by a line connecting the following five points in the counter clockwise order listed:

Reference point	N. lat.	W. long.	Land description
a	57 00 0	153 18 0	Black Point.
b	56 56 0	153 09 0	
c	57 22 0	152 18 5	South Tip of Ugak Island.
d	57 23 5	152 17 5	North Tip of Ugak Island.
e	57 25 3	152 20 0	Narrow Cape, thence, along the coastline of Kodiak Island to
f	57 04 2	153 30 0	Cape Kasick to
a	57 00 0	153 18 0	Black Point, incl. inshore waters.

Table 4.3.3. TYPE III AREAS

Outer Marmot Bay

All waters bounded by lines connecting the following coordinates in the order listed: 1) 58 00 00 N lat., 151 55 40 W long. 2) 58 02 30 N Lat., 151 55 40 W Long. 3) 58 02 30 N lat., 151 47 00 W long. 4) 58 04 53 N lat., 151 47 00 W long. 5) 58 04 53 N lat., 151 35 25 W long. 6) 57 57 40 N lat., 151 35 25 W long. 7) 57 57 40 N lat., 151 47 00 W long. 8) 58 00 00 N lat., 151 47 00 W long. 9) 58 00 00 N lat., 151 55 40 W long.

Barnabas

All waters bounded by lines connecting the following coordinates in the order listed: 1) 57 14 30 N lat., 152 37 50 W long. 2) 57 10 00 N lat., 152 25 30 W long. 3) 57 02 32 N lat., 152 35 02 W long. 4) 57 04 25 N lat., 152 54 15 W long. 5) Then following the three mile limit line to 57 13 00 N lat., 152 49 25 W long. 6) Then following the three mile limit line to: 57 14 30 N lat., 152 37 50 W long.

Horse's Head

All waters bounded by lines connecting the following coordinates in the order listed: 1) 56 49 55 N lat., 153 36 30 W long. 2) 56 34 35 N lat., 153 05 37 W long. 3) 56 28 35 N lat., 153 05 37 W long. 4) 56 28 35 N lat., 153 52 05 W long. 5) Then following the three mile limit line to: 56 49 55 N lat., 153 36 30 W long.

Chirikof

All waters bounded by lines connecting the following coordinates in the order listed: 1) 56 16 45 N lat., 155 39 00 W long. 2) 56 16 45 N lat., 155 11 45 W long. 3) 55 41 00 N lat., 155 13 00 W long. 4) 56 07 10 N lat., 155 13 00 W long. 5) 56 07 10 N lat., 155 39 00 W long. 6) 56 16 45 N lat., 155 39 00 W long.