M E M O R A N D U M

TO: Council, SSC and AP Members

FROM: Jim H. Branson
Executive Director

DATE: March 18, 1985

SUBJECT: Gulf of Alaska Fishery Management Plan

ACTION REQUIRED

1. Approve amendment package and decision documents for public review.
2. Clarify Council action in February on DAP trawl fisheries for sablefish.

BACKGROUND

1. Amendment 14 Package

In February the Council reviewed proposals that had been submitted for changes to the Gulf of Alaska Groundfish FMP. The Council's policy provides for initial reviews of all proposals at the February meeting and direction to the plan team to develop the relevant economic and environmental analyses of the viable proposals for Council and public review.

The Council recognized that the large number of proposals and limited time and staff for analysis, required deferring some proposals to next year's amendment cycle. As per the enclosed amendment schedule [item D-3(a)], six proposals were given immediate priority and are in the package presented at this meeting as Amendment 14. Other high priority proposals were postponed to the 1986 amendment cycle. A few were given low priority and dropped but may be resubmitted in the future if still deemed necessary.

Initial Council review of the Amendment 14 package and approval for public review is scheduled for this meeting. Item D-3(b) is the amendment package; it includes an introductory document, a Draft Regulatory Impact Review/Initial Regulatory Flexibility Analysis, and an Environmental Assessment. The amendment contains an analysis of each of the six issues and their management alternatives.

A 30-day public comment period is scheduled to begin on April 4 and end on May 4. The Council will review public comments and take final action on the amendment during its May 22-24 meeting. The amendment should be implemented by November 1985.

2. Clarify Council action on DAP trawl allocation of sablefish.

During the February meeting the Council allocated 5% of the sablefish OY in the Western and Central Regulatory Areas (84 mt and 153 mt, respectively) to domestic trawl operators (DAP) for bycatch purposes. The 5% figure was proposed to the Council by an ad hoc industry workgroup who believed that this amount of sablefish would accommodate DAP trawl bycatch requirements. This ad hoc workgroup included longline, pot and small trawler fishermen but no factory trawler representatives.

Since that decision, there has been confusion as to whether the Council intended to limit the entire trawl harvest of sablefish to 5% of the OY in the Western and Central areas, or whether the Council intended to include trawl gear as a legal method of harvesting sablefish in the directed fishery (i.e., 95% of the OY), with 5% being set aside for trawl bycatch after the directed OY has been attained. Questions the Council needs to address are:

1. What gear is legal in the directed sablefish fishery?

2. If trawl gear is not legal, what is the Council's basis for this decision?

3. Was 5% of the OY for DAP trawl catch intended to eliminate directed trawl fishing on the other 95% of OY?

4. Does the 5% OY limit start after the directed fishery closes?

5. What happens after the 5% limit is reached?

GULF OF ALASKA GROUNDFISH AMENDMENT SCHEDULE*

(based on 1985 GOA Proposal Package)

For 1985 GOA Amendment (implementation in November 1985)

1. Establish a gear and/or area restriction in the sablefish fishery.
2. Establish rockfish areas and quotas.
3. Implement new optimum yields for pollock, POP, rockfish, Atka mackerel, and other species.
4. Implement reporting requirements for catcher/processors.
5. Establish measures to control the halibut bycatch by domestic trawlers.
6. Implement the NMFS habitat policy.

For 1986 GOA Amendment (implementation in November 1986)

1. Comprehensive sablefish amendment
   - a. gear regulation
   - b. limited entry
   - c. OY allocation
   - d. season change
   - e. size limit
   - f. management area

2. Comprehensive rockfish amendment
   - a. gear regulation
   - b. season
   - c. limited entry

3. Domestic observer program

4. OY framework amendment
   - a. streamline annual adjustment process
   - b. single species OY closures
   - c. 1986 OY changes (if any)

5. JVP allocation procedure

6. Prohibited species amendment
   - a. fully utilized species limits for joint venture and foreign operations
   - b. crab bycatch control
   - c. salmon bycatch control
   - d. expanded time/area field order authority

7. FCZ intrusion areas

*Priorities and schedule approved by Council at February 1985 meeting.

Revised

NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
FISHERY MANAGEMENT PLAN FOR GROUNDFISH
OF THE GULF OF ALASKA

AMENDMENT 14 SUMMARY

I. INTRODUCTION

As directed by the Magnuson Fishery Conservation and Management Act of 1976 (MFCMA), the North Pacific Fishery Management Council prepared fishery management plans for those fisheries within its jurisdiction requiring conservation and management. The domestic and foreign groundfish fishery in the 3-200 mile fishery conservation zone of the Gulf of Alaska is managed under the Fishery Management Plan for groundfish of the Gulf of Alaska (FMP) (Figure 1). This FMP was first developed and approved by the Secretary of Commerce in 1978. Since plan implementation, the FMP has been amended twelve times with one amendment withdrawn. Plan amendments are usually prepared in response to changes that occur within a fishery or when an unforeseeable need arises.

At the February 1985 meeting, the Council reviewed management proposals submitted by the public and management agencies for consideration as an amendment to the FMP. Six proposal topics were selected by the Council for inclusion in Amendment 14. The six topics are: (1) sablefish gear regulation; (2) rockfish quotas and management areas; (3) weekly catch reports by catcher/processor vessels; (4) 1985 OY values; (5) halibut prohibited species catch limits (PSC) on domestic trawlers; and (6) implementation of NMFS habitat policy.

An FMP amendment requires preparation of an environmental assessment and a socioeconomic analysis which discuss the potential impacts of management alternatives. A detailed discussion of each alternative and its impacts are provided in those documents. The following is a list of the amendment topics with accompanying alternatives that constitute Amendment 14:

1. Establish a gear and/or area restriction in the sablefish fishery.

a. Alternative 1 - Maintain status quo.

b. Alternative 2 - Prohibit all gear but hook and longline for sablefish east of 140°W longitude.

c. Alternative 3 - Prohibit all gear but hook and longline for sablefish east of 147°W longitude.

d. Alternative 4 - Prohibit all gear but hook and longline for sablefish east of 159°W longitude.

e. Alternative 5 - Prohibit all gear but hook and longline for sablefish east of 170°W longitude.

f. Alternative 6 - Allocate the sablefish OY to specific gear types.

g. Alternative 7 - License limitation.

2. Establish rockfish areas and quotas.

a. Alternative 1 - Maintain a Gulfwide OY for other rockfish.

b. Alternative 2 - Set the Southeast District shelf demersal rockfish OY at 600mt between 56°N. latitude and 57°30'N latitude with the remainder of the 5000 mt OY (4400 mt) to be taken elsewhere in the Gulf.

c. Alternative 3 - Set the Southeast District shelf demersal rockfish OY at 600 mt between 56°N latitude and 57°30'N latitude and set the OY for the pelagic and slope rockfish species within the Southeast-East Yakutat district at 880 mt for a combined other rockfish OY of 1480 mt. The remaining 3520 mt of the other rockfish resource would be harvested from the other areas of the Gulf. (Recommended by the Alaska Board of Fisheries).

1. Change the accounting year to October 1 through September 30 as part of this alternative. (Board recommendation).

2. Retain January 1 - December 31 as the accounting year.

d. Alternative 4 - Set the shelf demersal rockfish OY at 600 mt for the area where the 1984 domestic fishery was concentrated and establish separate OYs for slope, shelf pelagic, and shelf demersal rockfish species groups by Gulf of Alaska management area based on the best available data.

e. Alternative 5 - Set the OY for shelf demersal rockfish at 600 mt between 56°N latitude and 57°30'N latitude. Subtract this amount from the Gulfwide OY of 5000 mt and apportion the remaining 4400 mt by regulatory area as follows: Southeast-East Yakutat, 880 mt, West Yakutat, 880 mt, Central Gulf, 1760 mt, and Western Gulf, 880 mt.

3. Implement new optimum yields for pollock, Pacific ocean perch, rockfish, Atka mackerel, and other species.

Pollock

a. Alternative 1 - Reduce the OY for pollock to 305,000 mt in the Western/Central Area.

b. Alternative 2 - Maintain the OY at 400,000 mt (status quo).

Pacific ocean perch

a. Alternative 1 - Reduce the OY for POP to 1,302 mt and 3,906 mt in the Western and Central Areas, respectively.

b. Alternative 2 - Maintain the OY for POP at 2,700 mt and 7,900 mt in the Western and Central Areas, respectively (status quo).

Rockfish

a. Alternative 1 - Reduce the Gulf of Alaska-wide OY for rockfish to 5,000 mt.

b. Alternative 2 - Reduce the OY to an amount that would provide for a bycatch only.

c. Alternative 3 - Maintain the OY at 7,600 mt (status quo).

Atka mackerel

a. Alternative 1 - Reduce the OY in the Central and Eastern Areas to an amount that would provide for a bycatch only.

b. Alternative 2 - Maintain the OY at 20,800 mt and 3,200 mt in the Central and Eastern Areas, respectively (status quo).

Other species

a. Alternative 1 - Reduce the Gulf of Alaska-wide OY for "other species" to its framework amount of 22,435 mt.

4. Implement Reporting Requirements for Catcher/Processors.

a. Alternative 1 - Maintain the current reporting requirement (status quo).

b. Alternative 2 - Require an FCZ processing permit with check-in/check-out and weekly report.

c. Alternative 3 - Require an FCZ processing permit with a weekly catch report, but without check-in/check-out.

d. Alternative 4 - Place observers aboard a small sample of catcher/processor vessels and mothership/processors and extrapolate the catch from the vessels to the entire fleet.

e. Alternative 5 - Place observers aboard all catcher/processors and mothership/processor vessels.

5. Establish measures to control the Pacific halibut bycatch.

a. Alternative 1 - Maintain the Western and Central Gulf PSC limits of 29 mt and 52 mt, respectively (status quo).

b. Alternative 2 - Raise the Western and Central Gulf PSC limits to 270 mt and 768 mt, respectively.

c. Alternative 3 - Develop a framework procedure for the annual adjustment of PSC limits.

d. Alternative 4 - Establish bycatch fees.

6. Implement the NMFS Habitat Policy.

a. Alternative 1 - Amend the FMP to address habitat considerations.

b. Alternative 2 - Do not amend the FMP to address habitat considerations.

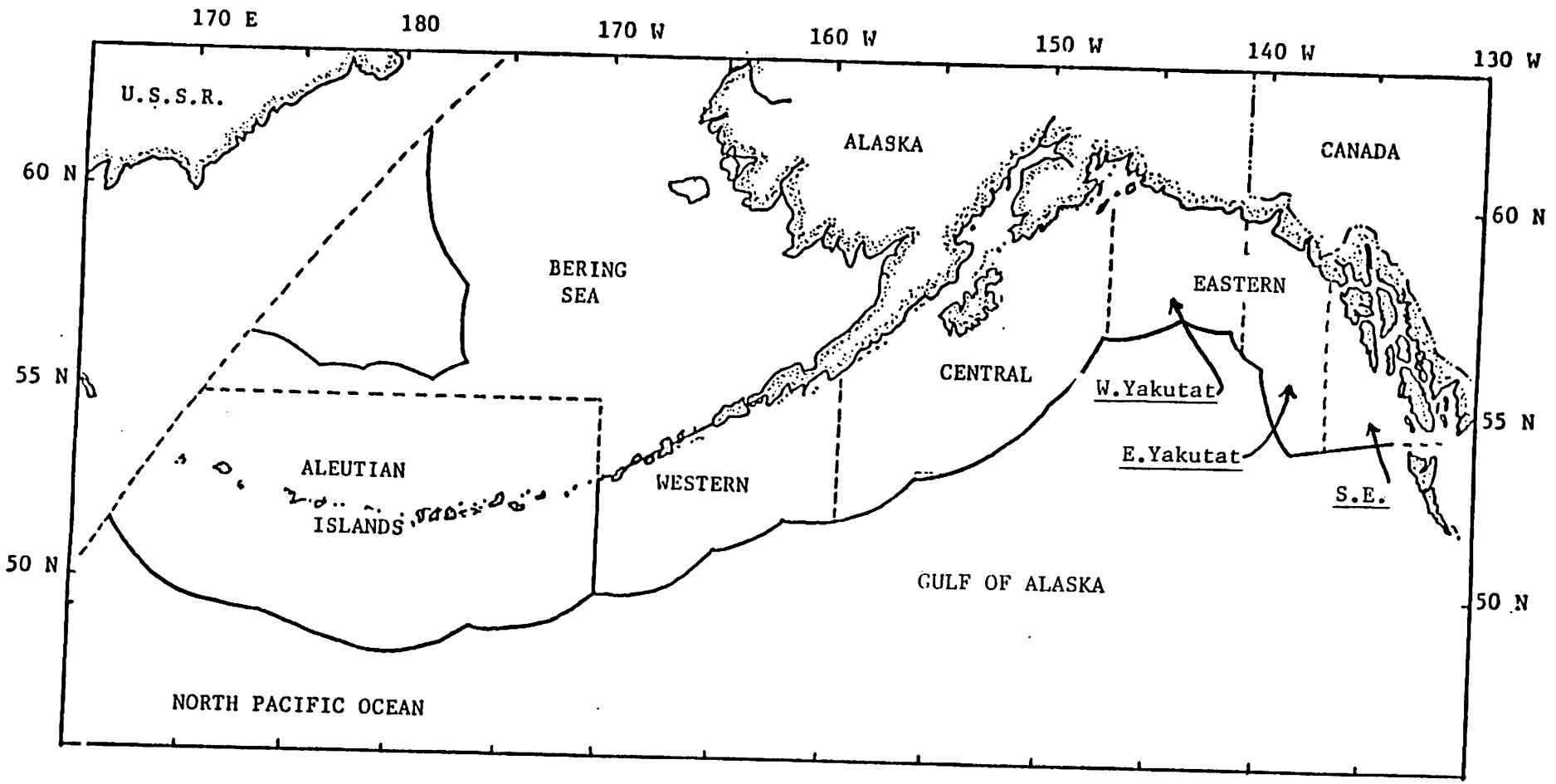
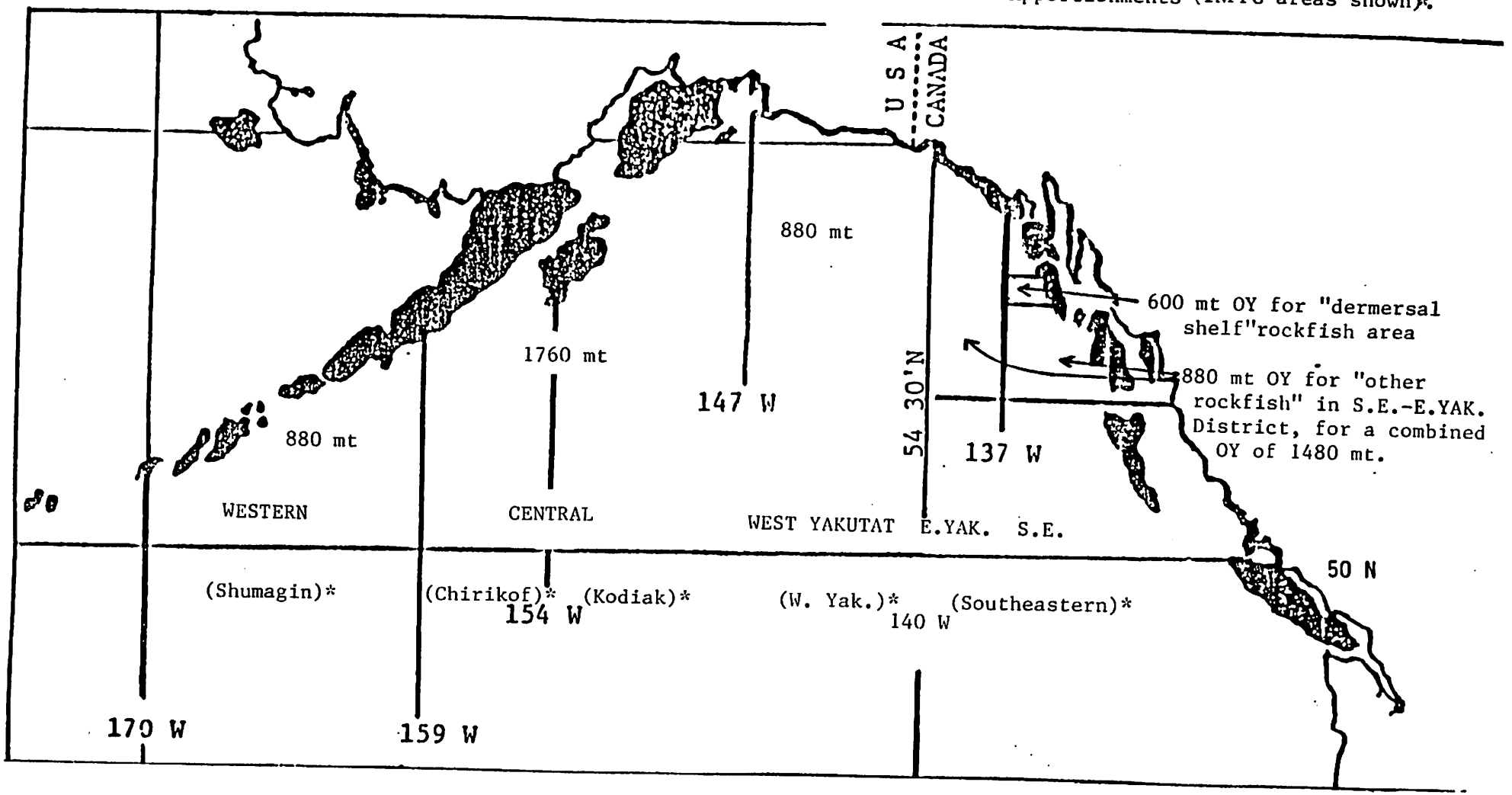


Fig. 1 Major regulatory areas of the Bering Sea and Aleutian Islands Groundfish and Gulf of Alaska Groundfish FMP's.

Figure 2. Proposed FMP Regulatory Areas/Districts for "Other Rockfish" with OY Apportionments (INPFC areas shown)*.



(Retyped from Rapifax copy received March 22, 1985)

TO: NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
ANCHORAGE, ALASKA
ATTN: BRANSON

FROM: F - WILLIAM G. GORDON (SIGNED MARCH 22, 1985 (03/22/85)

PROMULGATION OF A RECENT NOTICE TO CLOSE TWO DISTRICT TO DIRECTED SABLEFISH FISHING UNDER 50 CFR 672.26(B) CONTINUES THE PROBLEM OF INCONSISTENCY WITH CURRENT REGULATIONS WHICH HAS BEEN KNOWN TO THE COUNCIL SINCE EARLY 1984.

NMFS APPROVAL OF THESE ACTIONS WAS PREDICATED ON AN UNDERSTANDING THAT THE COUNCIL WOULD AMEND THE GULF GROUNDFISH FMP AND REGULATIONS TO CONFORM THEM TO THE INTENT REFLECTED IN RECENT CLOSURES. THE FMP IS UNDER CONSIDERATION BY THE COUNCIL IN THE ANNUAL AMENDMENT CYCLE, HOWEVER, I NOTE THIS PARTICULAR ISSUE IS NOT ON THE COUNCIL'S MARCH AGENDA.

I URGE YOU TO TAKE IMMEDIATE ACTION TO AMEND THE FMP AND REGULATIONS. IF THE COUNCIL FAILS TO ACT, WE ARE LEFT WITH TWO ALTERNATIVES; A SECRETARIAL AMENDMENT TO THE FMP, OR CLOSURE OF ALL FISHING IN A DISTRICT WHEN THE OY FOR ANY SPECIES IS REACHED.

FOR: NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
411 WEST 4TH AVENUE
ANCHORAGE, ALASKA 99510

FTS - 271-4064
COMMERCIAL - (907) 274-4563

NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
FISHERY MANAGEMENT PLAN FOR GROUNDFISH
OF THE GULF OF ALASKA

AMENDMENT 14 SUMMARY

I. INTRODUCTION

As directed by the Magnuson Fishery Conservation and Management Act of 1976 (MFCMA), the North Pacific Fishery Management Council prepared fishery management plans for those fisheries within its jurisdiction requiring conservation and management. The domestic and foreign groundfish fishery in the 3-200 mile fishery conservation zone of the Gulf of Alaska is managed under the Fishery Management Plan for groundfish of the Gulf of Alaska (FMP) (Figure 1). This FMP was first developed and approved by the Secretary of Commerce in 1978. Since plan implementation, the FMP has been amended twelve times with one amendment withdrawn. Plan amendments are usually prepared in response to changes that occur within a fishery or when an unforeseeable need arises.

At the February 1985 meeting, the Council reviewed management proposals submitted by the public and management agencies for consideration as an amendment to the FMP. Six proposal topics were selected by the Council for inclusion in Amendment 14. The six topics are: (1) sablefish gear regulation; (2) rockfish quotas and management areas; (3) weekly catch reports by catcher/processor vessels; (4) 1985 OY values; (5) halibut prohibited species catch limits (PSC) on domestic trawlers; and (6) implementation of NMFS habitat policy.

An FMP amendment requires preparation of an environmental assessment and a socioeconomic analysis which discuss the potential impacts of management alternatives. A detailed discussion of each alternative and its impacts are provided in those documents. The following is a list of the amendment topics with accompanying alternatives that constitute Amendment 14:

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b. Alternative 2 - Set the Southeast District shelf demersal rockfish OY at 600 mt between 56°N latitude and 57°30'N latitude and set the OY for the pelagic and slope rockfish species within the district at 800 mt for a combined Southeast-East Yakutat District OY of 1,480 mt. The remaining 3,520 mt OY would be harvested from the other areas/districts of the Gulf. (Recommended by the Alaska Board of Fisheries).

1. Change the accounting year to October 1 through September 30. (Board recommendation).

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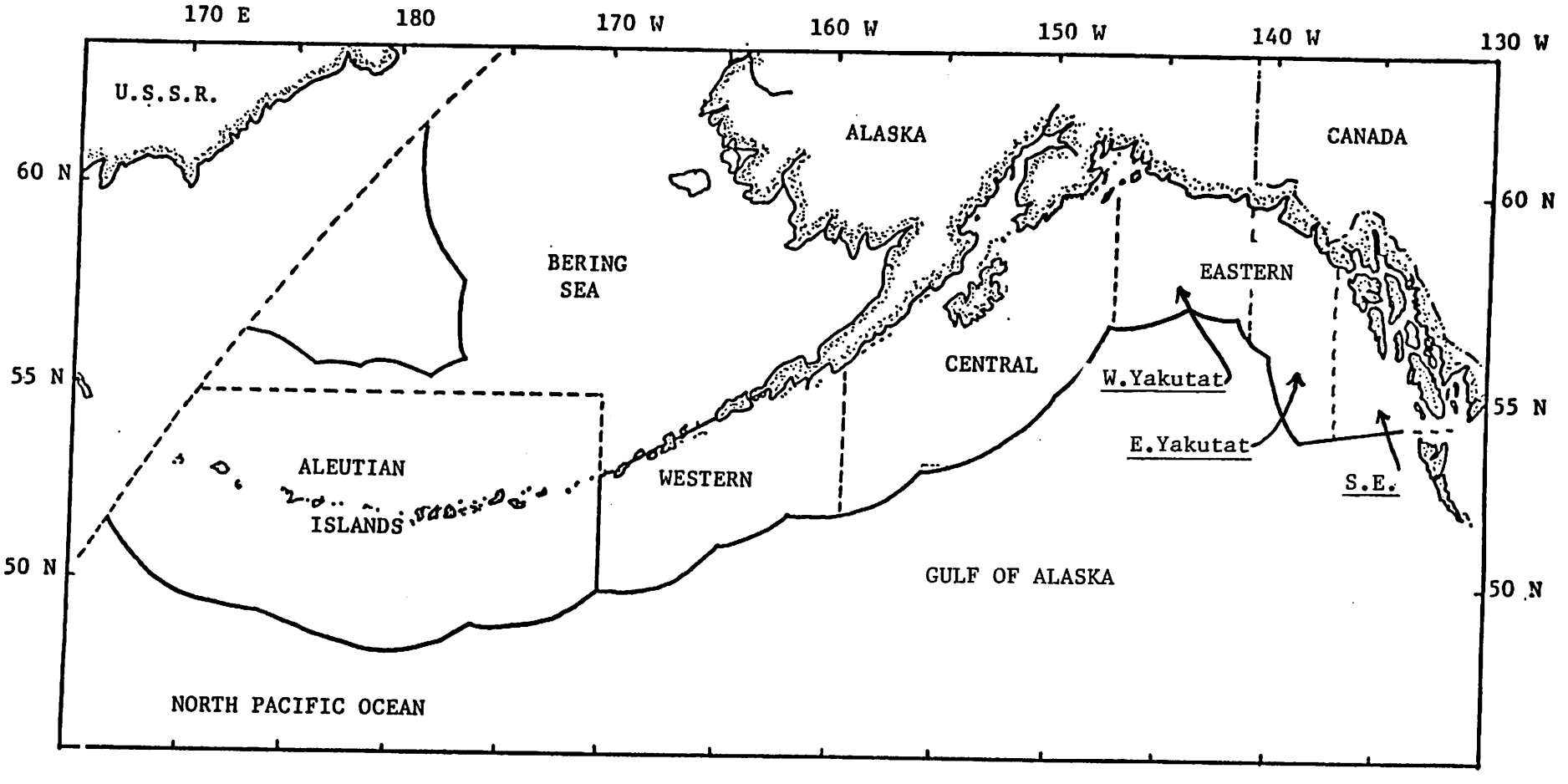

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DRAFT

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ENVIRONMENTAL ASSESSMENT OF AMENDMENT 14 TO THE FISHERY MANAGEMENT PLAN FOR GROUNDFISH OF THE GULF OF ALASKA

ADOPTED BY
THE NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
FOR PUBLIC REVIEW

PREPARED BY THE PLAN TEAM FOR
GROUNDFISH OF THE GULF OF ALASKA

MARCH 1985

CONTENTS

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ENVIRONMENTAL ASSESSMENT OF AMENDMENT 14
TO THE FISHERY MANAGEMENT PLAN FOR
GROUNDFISH OF THE GULF OF ALASKA

I. INTRODUCTION

The domestic and foreign groundfish fishery in the 3-200 mile fishery conservation zone of the Gulf of Alaska is managed under the Fishery Management Plan for Groundfish of the Gulf of Alaska (FMP). This FMP was developed by the North Pacific Fishery Management Council (Council), approved by the Assistant Administrator for Fisheries, NOAA (Assistant Administrator), on February 24, 1978, and implemented by a final rule December 1, 1979 (43 FR 52709, November 14, 1978). A final environmental impact statement was prepared for the FMP and is on file with the Environmental Protection Agency. Since that time, the Council has adopted thirteen amendments to the FMP. Twelve amendments have been implemented by the Secretary of Commerce. The subject of this action is DRAFT Amendment 14. It contains six proposals, which are described below.

Prior to 1984, the Council would receive amendment proposals during any of its scheduled meetings. At its April, 1984 meeting, the Council adopted a policy whereby proposals for amendments would be received only once a year. Proposals contained in Amendment 14 were requested by the Council in September 1984 with a deadline set at December 7, 1984. By the deadline, over thirty proposals were submitted to the Council, who then instructed its Plan Team to review and rank each proposal. At its February 1985 meeting, the Council reviewed the recommendations of the Plan Team, Scientific and Statistical Committee, and Advisory Panel, and selected six proposals for inclusion in Amendment 14. Other proposals were identified for development and consideration in a future amendment.

The six topics to be reviewed in this environmental assessment are: (1) sablefish gear regulation; (2) rockfish quotas and management areas; (3) establish a reporting system for catcher/processor vessels; (4) changes in OY values; (5) halibut prohibited species catch limits (PSC) on domestic trawlers; and (6) implementation of NMFS habitat policy. Each of these topics will be presented as chapters of this document.

This environmental assessment is prepared under Section 102(2)(C) of the National Environmental Policy Act (NEPA) and its implementing regulations.

II. DESCRIPTION OF AND THE NEED FOR EACH AMENDMENT PROPOSAL

A description of, and the need for, each amendment proposal follows:

1. Establish a Gear and/or Area Restriction in the Sablefish Fishery

Current regulations implementing the FMP do not constrain types of gear used in harvesting any of the groundfish categories, with the exception of a temporary emergency rule for sablefish which restricts the gear used in the Eastern Regulatory Area to hook and longline only. All of the proposed

alternatives would entail long-term changes to one or more areas of the Gulf of Alaska and may affect three other potential gear types, besides longlines.

The commercial harvest of sablefish in the Gulf of Alaska began in Southeast Alaska in 1906. Domestic landings grew to a peak in 1946 when about 4,083 mt, dressed weight, was landed. Harvest levels began to decline initially after 1946 in response to a poor market and then in response to foreign competition and poor stock conditions, reaching a minimum in 1968 when 161 mt were landed. During the 1960s foreign harvest of sablefish soon grew to a high of 36,000 mt. Since 1972, the foreign harvests have declined as a result of declining stock conditions and regulation under the FMP.

With the implementation of the MFCMA in 1976, fishery managers have encouraged domestic development of fishery resources. In terms of sablefish, the Alaska fishing industry has responded by expanding quickly, creating jobs for hundreds of fishermen, and providing economic growth to Alaskan and Pacific northwest fishing communities. The challenge to develop the sablefish resource was taken by fishermen using principally longline gear.

Most U.S. fishermen operating in Alaska have chosen longlines as the primary gear when targeting on sablefish, because many of them are experienced in the halibut fishery which is executed strictly with hook and longline and own vessels best suited to fishing that gear type.

Pots have been used periodically since the mid-1970s. In 1973, 42% of the domestic harvest, or 38 mt, was taken by one pot fishing vessel. Since then, no more than six pot vessels have fished in the Gulf during any one season. Since 1973, longline fishermen have dominated this fishery with as many as 200 vessels participating in 1984. Directed fishing for sablefish using trawl and gillnets has been minimal to date.

In 1982, the sablefish optimum yield (OY) was fully achieved by U.S. fishermen in the Southeast Outside District (i.e. westward to the longitude of 137°W.). The OY was again achieved in this district in 1983 and further west to 140°W. (East Yakutat District). In 1984, the OY was reached for the first time throughout the entire Gulf of Alaska. Marking this achievement was a fully capitalized fishing fleet, a large harvesting and processing workforce, increased markets, and the realization that there would be insufficient sablefish resource to accommodate all users at traditional levels.

This fact became apparent in the first two months of 1985 off Southeast Alaska. Historically, the Southeast Alaska sablefish fishery has not begun until spring when weather and fishing conditions improve and the fish have recovered from spawning. In January 1985 three large (catcher/processor) vessels began fishing for sablefish using pot gear. The pots, as with longline gear, are set on a relatively narrow depth range (250-500f). Fishing has been good and it has been projected that the pot vessel catch will exceed 850 mt, or about one-third of the combined Southeast-East Yakutat District OY. As vessels left the area to unload their catch, pots would often be stored on the grounds.

While the pot vessels were fishing there were several gear conflicts between the pot fishermen and those using longline gear. When longline gear, which is relatively lightweight, becomes entangled with the heavier pot gear, the

longline breaks with some or all of it being lost. Gear conflicts are likely between these two gear types since fishing is concentrated along the narrow shelf edge. The presence of just one or two pot vessels can effectively preempt the grounds to longline gear as longline fishermen are forced to move to avoid gear loss. Pots lost or stored on the fishing grounds can contribute to this problem over a long period of time.

2. Rockfish Quotas and Management Areas

"Other rockfish" includes all species of Sebastes other than Pacific ocean perch and four associated slope rockfish species. Other rockfish are currently managed in the FMP with a Gulf-wide OY. The MSY for this complex was based on the incidental catch of slope rockfish in the foreign trawl fishery for Pacific Ocean perch between 1973 and 1976 with OY set at the lower end of the MSY range.

In November 1984 the Alaska Department of Fish and Game (ADF&G) submitted to the Groundfish Team a report on the rapidly expanding domestic fishery for bottom-dwelling (demersal) shelf rockfish in the Southeastern area. That report pointed out that this fishery is targeting on a species complex that has not previously been addressed in the groundfish FMP. This fishery has grown in recent years from less than 45 mt (dressed weight) in 1970 to nearly 400 mt in 1983. The round weight catch for 1984 doubled to approximately 800 mt.

The domestic fishery targets on benthic forms of shelf rockfish in depths of less than 100 fathoms. Over 20 species of rockfish are regularly landed. Predominant species are yelloweye rockfish (S. ruberrimus), canary rockfish (S. pinniger), tiger rockfish (S. nigrocinctus), and rosethorn rockfish (S. helvomaculatus) in the 40-100 fathom depth zone and quillback rockfish (S. maliger), china rockfish (S. nebulosus) and copper rockfish (S. caurinus) in depths of less than 40 fathoms. Yelloweye rockfish and quillback rockfish are the primary target species. Longline gear is the predominant geartype and accounts for well over 90% of the harvest.

Until recently it was assumed that the majority of the landings were from the waters within State jurisdiction. However, approximately 50% of the fishable grounds are within the Fishery Conservation Zone(FCZ). Based on fishermen interviews conducted by ADF&G in 1983 and 1984, approximately 25% of the landings were of catches taken only in the FCZ, 21% only within state waters, and the remaining 54% were taken on trips that fished areas both under state and under federal jurisdiction.

Aging studies conducted in recent years conclude that rockfish are much longer lived and slower growing than early literature suggests. Many of the demersal species live in excess of 50 years and many do not reach maturity until after age 10. Because rockfish are extremely long lived and slow growing, the sustainable yield that can be taken from a stock is much lower than for a comparable biomass of faster growing species such as pollock or cod. As a result, rockfish stocks can be easily and quickly overfished. Lacking information on appropriate harvest levels for the demersal shelf rockfish stocks in Southeastern Alaska, the risk of overharvesting this resource by the expanding target fishery is great.

After reviewing the ADF&G rockfish issue paper the Plan Team recommended in their November 1984 report to the Council that the other rockfish category should be redefined to include three separate assemblages or species groups; slope rockfish, shelf pelagic rockfish and shelf demersal rockfish. Species included in these groups are shown in Table 1. Further, the management of the shelf demersal category should be conducted in cooperation with the State of Alaska. The Team report also noted that, based on the poor showing in the 1984 trawl survey, there was no evidence that the slope complex could sustain a harvest greater than the 1984 harvest of 1500mt.

At the December meeting the Council acted to reduce the Gulf-wide OY of "other rockfish" from 7,600 mt to 5,000 mt due to concern for the risk of overharvesting certain rockfish stocks. The 1984 harvest was approximately 1,500 mt of which approximately 700 mt were taken from the slope rockfish stocks by foreign and joint venture fisheries in the Central and Western Gulf management regions. The remaining 800 mt was taken from shelf rockfish stocks by domestic fishermen in the Southeastern area. In adopting the 5,000 mt OY, the Council considered the testimony of fishermen in the Central Gulf area who expressed a desire to expand the nearshore fisheries in the Central Gulf into the FCZ. At the the joint Alaska Board of Fisheries (Board) and Council meeting in early February 1985, ADF&G staff presented alternative management proposals for establishing a separate management category of shelf rockfish stocks in order to reduce the risk of overharvesting demersal shelf rockfish and to eliminate the possibility of harvesting the entire Gulf-wide OY in any one portion of the Gulf and consistent with the FMP objectives.

At the February joint meeting the Council deferred further discussion on rockfish management pending recommendations by the Board of Fisheries. Following the joint meeting the Board adopted the management alternatives which were developed by ADF&G staff and the Southeast Alaska fishing community and endorsed by the Council Advisory Panel. The recommended action would place a 600 mt OY on demersal shelf rockfish in both State outercoastal and FCZ waters between 56° N. latitude and 57°30' N latitude. In addition, the Board voted to restrict harvest of other rockfish species in the remainder of the Southeast District to no more than 880 mt. That would place a total other rockfish OY of 1,480 mt in the outercoastal state and federal waters within the Southeast District. No more than 600 mt of demersal shelf rockfish could be harvested in the specified portion of the area where the fishery is currently concentrated. No management action was recommended by the Board for the remainder of the Gulf since the February Board meeting was advertised to address Southeastern groundfish issues only. In addition, the Board adopted an October 1 to September 30 accounting year for shelf demersal rockfish in the Southeastern area to assure that fish would be available to the fishermen during the fall and early winter when the market is strongest.

With the increasing effort in directed rockfish fisheries and the vulnerability of these species to overharvest, the risk of overfishing certain stocks is high. Therefore, management action is considered essential for other rockfish. There are several management alternatives that would reduce the risk of overharvest.

Table 1.--Categories of rockfish present in the Gulf of Alaska by habitat area.

Slope Category	Shelf Dermersal Category
POP	Yellowye rockfish
Northern rockfish	Quillback rockfish
Rougheye rockfish	Canary rockfish
Shortraker rockfish	China rockfish
Sharpchin rockfish	Tiger rockfish
Red banded rockfish	Rosethorn rockfish
Rosethorn rockfish	Silvergray rockfish
Darkblotch rockfish	Copper rockfish
Redstripe rockfish	
Splitnose rockfish	
Harlequin rockfish	
Aurora rockfish	
Yelloweye rockfish	

Shelf Pelagic Category

Black rockfish

Dusky rockfish

Yellowtail rockfish

Widow rockfish

Boccacio

Blue rockfish

3. Implement New Optimum Yields for Pollock, Pacific Ocean Perch, Rockfish, Atka Mackerel, and Other Species

At its December 1984 meeting, the Council adopted changes in optimum yields for pollock (Western/Central Regulatory Area), Pacific ocean perch ((Western and Central Regulatory Areas), Atka mackerel (Central and Eastern Regulatory Areas), and rockfish (Gulf-wide). At the same meeting, the Council voted to request the Secretary of Commerce to implement these changes by emergency rule under Section 305(e) of the Magnuson Act. The Secretary did implement these changes on (Insert date of filing with the Office of Federal Register) (__FR, _____). Changes in optimum yields are based on the best available information. A summary of that information concerning the status of pollock, Pacific ocean perch (POP), rockfish, Atka mackerel, and other species follows:

Pollock - On the basis of acoustic surveys conducted in the Shelikof Strait region of the Gulf of Alaska during March and April, 1984, total pollock biomass is estimated to be between 1,574,634 mt and 2,034,857 mt with a mean estimate of 1,789,186 mt. This mean represents the total biomass in the Central and Western Regulatory Areas combined, since few pollock were found elsewhere in these areas while surveys were conducted in Shelikof Strait during the spawning period. Similar surveys have been conducted in Shelikof Strait during 1980, 1981, and 1983. Results of the 1984 survey indicate that total biomass continues to decrease from its peak level in 1982. Length and age composition and hydroacoustic survey data from 1984 joint venture fisheries confirm that the 1980 year class (age 4 fish) is weak. The 1981 year class (age 3 fish) also appears to be weak. The abundance estimate of age 3 fish in 1984 is about the same as age 3 fish (1980 year class) in 1983. It is estimated that the exploitable biomass of pollock has now declined from the 1984 level by some 500,000 mt to fall within a range of 1,200,000 to 1,270,000 mt. An acceptable exploitation rate of 28.5 percent would provide a harvest between 342,000 mt and 358,000 mt, with a mean of 350,000 mt. The Council and the SSC reviewed the Plan Team's concern that the majority of the 1985 harvest will come from the only two dominate year classes, 1978 and 1979, which are 7 and 6 year old fish in the 1985 fishery. The Council chose, therefore, a more conservative exploitation rate of 24 percent times the upper limit of the exploitable biomass to establish an optimum yield of 305,000 mt, to recognize the dependency of the fishery on only two year classes and continuing poor recruitment.

Pacific ocean perch (five species complex) - Results of the triennial Gulf of Alaska biomass survey indicate the current exploitable biomass of the Pacific ocean perch complex are 53,400 mt, 120,150 mt, and 93,450 mt in the Western, Central, and Eastern Regulatory Areas, respectively. Respective EYs are 1,736 mt, 5,208 mt, and 4,530 mt. The Council considered the desirability of establishing optimum yields at levels that would provide only minimal bycatches incidental to other target fisheries in order to promote the quickest rebuilding of Pacific ocean perch stocks. Such minimal levels would prove a burdensome cost to developing domestic fisheries if their operations were terminated by prematurely achieving the bycatch optimal yields. The Council, therefore, established optimum yields at higher than bycatch levels, or 1,302 mt in the Western Area and 3,906 mt in the Central Area. It retained the existing 875 mt optimum yield in the Eastern Area to promote rapid stock rebuilding in this regulatory area.

Other Rockfish - This group contains about eight species of rockfish, excluding the POP complex, that occur along the continental slope and are taken incidental to other target fisheries. Results of the 1984 trawl survey indicate that none of the eight species were present in significant numbers. The average 1982-1984 harvest in the joint venture and foreign fisheries is about 1,500 mt with a 1984 harvest of only 700 mt. The EY for this group needs to be reevaluated. The Council considered the limiting effect that an optimum yield equal to the bycatch would have on the developing domestic fisheries, and established the optimum yield at 5000 mt which is substantially higher than the bycatch level so as not to limit that growth.

Atka mackerel - The 1984 survey indicates that the total biomass for Atka mackerel is 39,000 mt with 38,000 mt being available in the Western Area and 1,000 mt in the Central Area. Length frequency information suggest that the population consists mostly of large fish. Recruitment in the Central Area appears nonexistent. The absence of catches in the Eastern Area indicates stocks are not sufficiently abundant to support a commercial fishery. The low abundance of Atka mackerel may be due to westward shift in the distribution of stocks or to excessive fishing mortality. The Council reviewed the SSC recommendation for the the Western Area to set the exploitation rate between 10 and 15 percent of 38,000 mt, which would provide an OY between 3,800 mt and 5,700 mt. Since the current OY for the Western Area of 4,678 mt falls within this range, the Council opted not to change the OY. The Council also reviewed the SSC recommendation to set the OYs in the Central and Eastern Areas at bycatch levels only and recommended thus to the Secretary of Commerce. After reviewing the recent catch data, OYs were set at 100 mt and 10 mt in the Central and Eastern Areas, respectively.

Other Species - The "other species" category includes those groundfish species not individually addressed in the FMP. The FMP specifies the OY for those species to be equal to 5 percent of the total OY for all of the target groundfish species combined. Consequently, if the recommended OY changes are adopted the OY would be reduced to 22,435 mt.

4. Establish a Reporting System for Catcher/Processors

The objective of this proposal is to ensure that fishery managers receive timely estimates of catch by all domestic vessels so that fishery closure notices can be promptly issued when OYs are achieved. With the rapid recent growth of the domestic fishing fleet, increasing importance is being placed on timely reporting of domestic harvests in order to ensure that OYs are not exceeded. Vessels which deliver their catch to shore-based processors land their catch frequently enough to allow timely estimation of total catch under existing regulations. However, vessels which process their catch at sea can remain on the fishing grounds for extended periods of time. Catch reports submitted by these vessels at the time of landing as required under existing regulations are not timely enough to prevent OYs from being grossly exceeded. The resulting overharvests could seriously damage future production from groundfish stocks.

Current fishing regulations implementing the Gulf of Alaska and Bering Sea Fishery Management Plans require fishing vessels to submit a State of Alaska fish ticket or equivalent document to the Alaska Department of Fish and Game for any commercial groundfish harvest in the Gulf of Alaska or Bering Sea within 7 days of the date of landing the catch. Vessels which preserve their catch by non-freezing refrigeration or icing methods must land their catch within a maximum of 10-12 days from the time of harvest in order to ensure product quality. The catch from these vessels, when delivered to shore-based processors, can be reported on a timely basis under existing regulations. If existing regulations are properly enforced, fishery managers can estimate harvests by these vessels with sufficient precision to ensure that OYs are not exceeded.

However, vessels which freeze or salt their catch aboard frequently remain at sea for trips of up to several months duration and are not currently required to report their catch until the time of landing and offloading. At least twenty two catcher/processor vessels will be operating in the Gulf of Alaska and Bering Sea areas in 1985. Based on past catcher/processor landing records the combined hold capacity of these vessels will be approximately 13,000 mt. Therefore these vessels are capable of harvesting significant portions or even entire OYs in a single trip. Under existing fishing regulations, fishery managers have no knowledge of the catch aboard these vessels until the time of landing. In addition, vessels are not required to notify fishery managers when beginning fishing operations. Since domestic groundfish fishing vessels are also not marked for identification by enforcement overflights, the number of catcher/processor vessels actually fishing in a given management area is not known until the time of landing. Without knowledge of effort levels, fishery managers are not able to make projections of catch aboard based on past performance.

Delayed catch reporting is also a problem for fully domestic mothership operations. In these operations small catcher vessels without processing capability deliver their catch, usually by cod-end transfers, to a mothership/processor vessel. Current regulations require that an ADF&G fish ticket be filled out each time a catcher vessel delivers to the mothership/processor and that these fish tickets be forwarded to ADF&G within 7 days of the date that fish were delivered. Domestic mothership and floating processor operations thus far have all occurred in sheltered waters with at least periodic access to U.S. mail service so that regulations requiring filing of fish tickets with ADF&G within 7 days could have been enforced. However, there is a potential for these mothership operations to occur at sea, with no method of filing the fish tickets with ADF&G within the 7 day period required by law.

With such large processing capacities and increasing numbers of catcher/processor and mothership/processor vessels the risks of overharvesting groundfish resources under the current system are high. Because of the time delays involved in catch reporting under current regulations, groundfish resources could be drastically overharvested before fishery managers had even discovered that OYs had been exceeded. Since many of the groundfish species concerned are slow growing and long-lived, overharvesting can have considerable impacts on future production.

5. Establish Measures to Control the Pacific Halibut Bycatch

The FMP contains restrictions on both foreign and domestic groundfish fishermen in the western and central Areas that are designed to minimize the taking of halibut, an important commercial species to a separate domestic target fishery. Foreign fishermen are restricted to the use of off-bottom gear only when trawling between 147°W and 170°W longitudes from December 1 through May 31, a period when juvenile halibut were subject to high rates of capture. Domestic fishermen may use on-bottom gear during this period, but if the total take of Pacific halibut by domestic trawl operations in the Western or Central Areas reaches 29 or 52 mt, respectively, all further trawling by domestic fishermen is prohibited until June 1.

These PSCs were implemented in 1978 and at that time approximated one percent of the weight of Pacific cod expected to be taken by domestic fishermen in 1979 or soon thereafter. Domestic groundfish catches have increased annually since 1979 as market opportunities developed. Most of the increase is attributed to large quantities of pollock taken in joint venture fisheries operating in the Shelikof Strait region of the Central Area. Relatively few halibut are taken in this fishery, however, because only off-bottom trawl gear has been employed. For example, in 1983 only about 4 mt of Pacific halibut were taken incidental to a pollock catch of 132,000 mt. However, catches of other groundfish species (primarily cod and flounder) that are taken with bottom trawls where a significant bycatch of halibut occurs have also been increasing.

Regulations require that all net-caught halibut be released and some of the halibut may survive. Survival varies with the type of operation. Observer data suggest very low survival in operations which involve the transfer of codends at sea and where the halibut cannot be released immediately. These operations are typically joint ventures or larger freezer/processor vessels. On the other hand, potential survival is relatively high on smaller shore-based operations where the catch is typically sorted on deck and the halibut can be immediately released. Hoag (1975) estimated 50% survival for halibut released from small shore- based trawlers fishing off British Columbia.

Halibut have become more abundant in the Gulf of Alaska, and their greater prevalence has increased their potential catch rates in the trawl fisheries. Recognizing a greater incidental catch in the groundfish fisheries, the Council voted to request the Secretary to implement an emergency rule to increase the PSCs for halibut to 270 mt and 768 mt in the Western and Central Areas, respectively, during December-May. Recognizing that few halibut are taken with off-bottom trawl gear, the Council also voted to request the Secretary to implement an emergency rule to exempt users of off-bottom trawl gear from the restriction.

Recent data also suggest that halibut are vulnerable to trawls during periods other than the December-May period specified in the FMP. An annual PSC would provide protection for halibut during all seasons. Therefore, existing PSC regulations are no longer based on the best available information. Several management alternatives exist which may provide protection for halibut without unduly restricting domestic groundfish fishermen.

6. Implement the NMFS Habitat Policy

The proposed action amends the FMP by modifying and adding certain sections specifically to address the habitat requirements of individual species in the Gulf of Alaska groundfish fishery. The amendment describes the diverse habitat types within the Gulf of Alaska, delineates the life stages of the species, identifies potential sources of habitat degradation and the potential risk to the fishery, and describes existing programs, applicable to the area, that are designed to protect, maintain, or restore the habitat of living marine resources. The amendment responds to the Habitat Conservation Policy of the National Marine Fisheries Service, which advocates emphatic consideration of habitat concerns in the development or amendment of FMPs, and the strengthening of NMFS' partnerships with states and the councils on habitat issues.

III. ALTERNATIVE MANAGEMENT MEASURES INCLUDING THOSE PROPOSED

Certain alternatives to each amendment proposal have been considered by the Council. A summary of each alternative, including those proposed, follows:

1. Establish a Gear and/or Area Restriction in the Sablefish Fishery

For purposes of this plan amendment, there are five alternatives which should be considered. These alternatives encompass a wide range of public proposals calling for a hook and longline only fishery for sablefish for various areas of the Gulf. The Council's alternatives, in terms of gear and area restrictions, were narrowed to limiting areas eastward of a series of longitudinal lines in the Gulf for hook and longline only, while leaving all other areas for multiple gear use. The eligible gear types for multiple gear use are: hook and longline, pot, trawl and gillnet. The five alternative hook and longline areas in the Gulf are:

A. (Alternative 1) Maintain status quo.

Under this alternative, use of all eligible sablefish gear would be allowed throughout the Gulf of Alaska. This alternative would not address any of the problems identified in Section II.

B. (Alternative 2) Prohibit all gear but hook and longline for sablefish east of 140°W. longitude.

This alternative encompasses the Southeast Outside and East Yakutat Districts located within the Eastern Regulatory Area (Figure 1). In 1984, the entire optimum yield (OY) of 2,570 mt for the districts was achieved by June 29. The sablefish fleet is expected to harvest the OY by March 18, 1985 and will then fish in the remainder of the Eastern Regulatory Area. Ground preemptions and gear conflicts between hook and longline fishermen and other gear would be eliminated in the Southeast Outside and East Yakutat Districts if this alternative were approved.

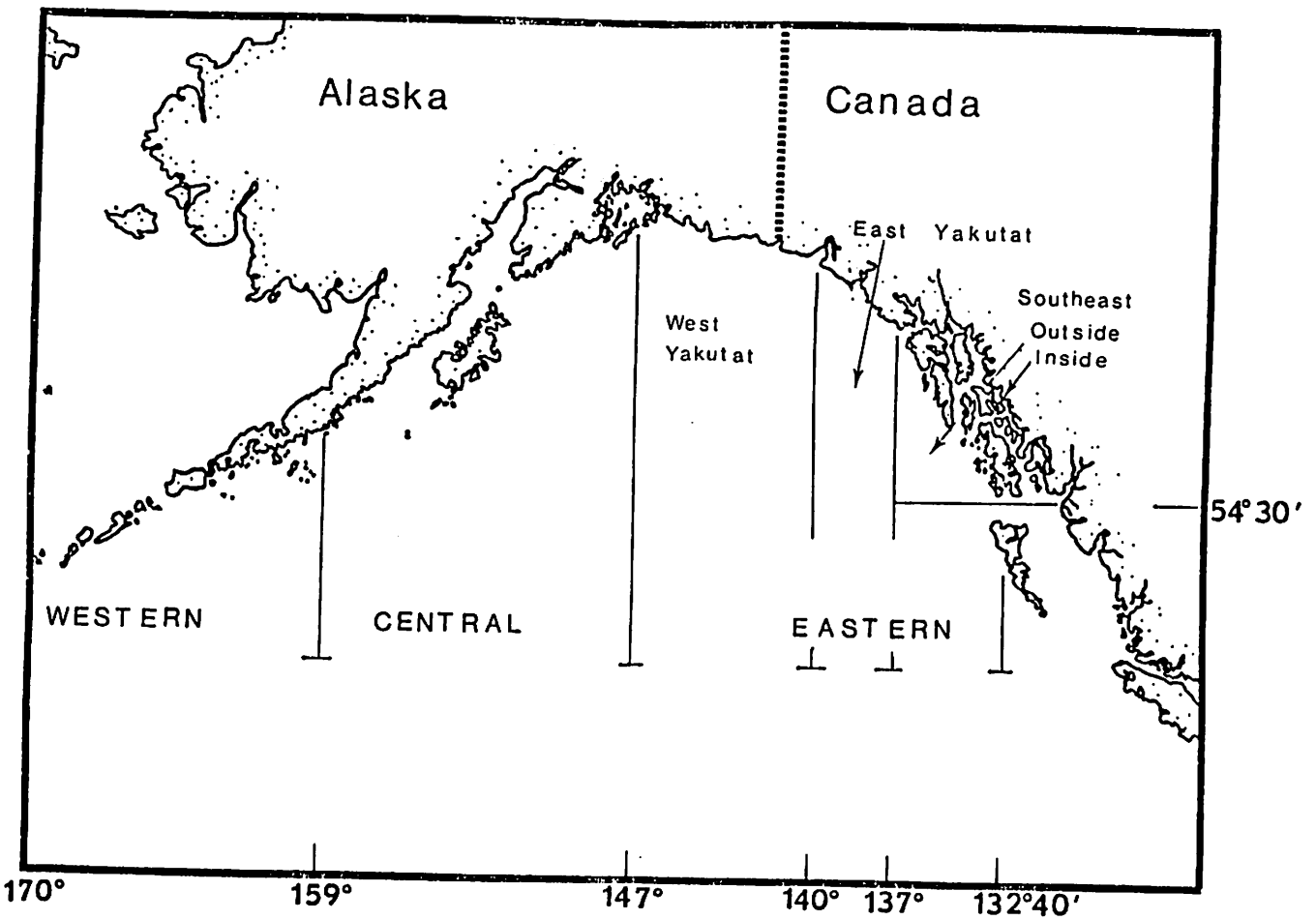


Figure 1. FMP Regulatory Areas and Districts

C. (Alternative 3) Prohibit all gear but hook and longline for sablefish east of 147°W. longitude.

This area includes the existing Southeast Outside, East Yakutat, and West Yakutat Districts which together make the Eastern Regulatory Area. This alternative sets aside a larger area than Alternative 2 where sablefish OYs are fully utilized. A large number of longline boats operate in this area and the Southeast Alaska fish processing industries have come to rely on this resource as a method of maintaining stability in their operations. As with Alternative 2, this option would eliminate grounds preemption and gear conflicts between longline and other gear but in a larger area. Apart from the crab fisheries, there are few fishermen who fish with gear other than hook and line in this area.

D. (Alternative 4) Prohibit all gear but hook and longline for sablefish east of 159°W. longitude.

This alternative would encompass a much larger area than Alternatives 2 or 3, because it would include all of the Eastern and Central Regulatory Areas. If this alternative were approved, a multiple gear sablefish fishery would be limited to waters west of 159°W. longitude, or the Western Regulatory Area. Gear conflict between sablefish fishermen using multiple gear would be eliminated in the two areas. Conflicts between fishermen fishing on a variety of species can still occur, especially in the Central area where an established crab fishery utilizing pots and a developing groundfish trawl fishery is conducted.

E. (Alternative 5) Prohibit all gear but hook and longline for sablefish east of 170°W. longitude.

This alternative would restrict the gear used to harvest sablefish to hook and longline only throughout the Gulf of Alaska. All three regulatory areas, the Eastern, Central and Western, would be included under this proposal. When reviewing the other alternatives, Alternative 5 is the most extreme in comparison to the status quo situation. The alternative if approved, would shift the sablefish fishery from a multiple gear fishery to one of a single gear type. Gear conflicts and grounds preemption between longline fishermen and other gear targeting on sablefish would be eliminated. However, the potential gear conflict between longline sablefish fishermen and fishermen targeting on other groundfish species with a variety of gear will still exist.

2. Establish quotas and areas in the rockfish fishery.

A. (Alternative 1) Maintain a gulfwide OY for other rockfish.

This alternative would maintain status quo in the other rockfish fishery. Other rockfish could be harvested anywhere in the Gulf of Alaska up to a total all-species OY of 5000 mt.

B. (Alternative 2) Set the Southeast District shelf demersal rockfish OY at 600mt between 56°N. latitude and 57°30'N latitude with the remainder of the 5000 mt OY (4400 mt) to be taken elsewhere in the Gulf.

This alternative proposes establishing three districts within the Eastern Regulatory Area for purposes of managing other rockfish. As currently used for managing the sablefish fisheries, Southeast, East Yakutat and West Yakutat districts would be created (Figure 2). This alternative addresses the immediate management concern for the heavily exploited shelf demersal rockfish stocks in the northern southeast outer coastal area by placing a cap on the fishery at approximately the 1984 harvest level.

C. (Alternative 3) Set the Southeast District shelf demersal rockfish OY at 600 mt between 56°N latitude and 57°30'N latitude and set the OY for the pelagic and slope rockfish species within the Southeast-East Yakutat district at 880 mt for a combined other rockfish OY of 1480 mt. The remaining 3520 mt of the other rockfish resource would be harvested from the other areas of the Gulf. (Recommended by the Alaska Board of Fisheries).

1. Change the accounting year to October 1 through September 30 as part of this alternative.(Board recommendation).

2. Retain January 1 - December 31 as the accounting year.

Alternative 3 addresses the immediate management concern for the heavily fished southeastern outercoastal stocks and sets the total OY for other rockfish in the Southeast District at 1480 mt further minimizing the risk of overharvest in that area. In addition option 1 presents the Board recommendation to provide a fall and winter fishery.

D. (Alternative 4) Set the shelf demersal rockfish OY at 600 mt for the area where the 1984 domestic fishery was concentrated and establish separate OYs for slope, shelf pelagic, and shelf demersal rockfish species groups by Gulf of Alaska management area based on the best available data.

This alternative addresses the need for immediate management action in the Southeastern area. It would also provide the lowest risk of overharvesting any one component of the rockfish stock by establishing separate OYs for the various species groups and management areas.

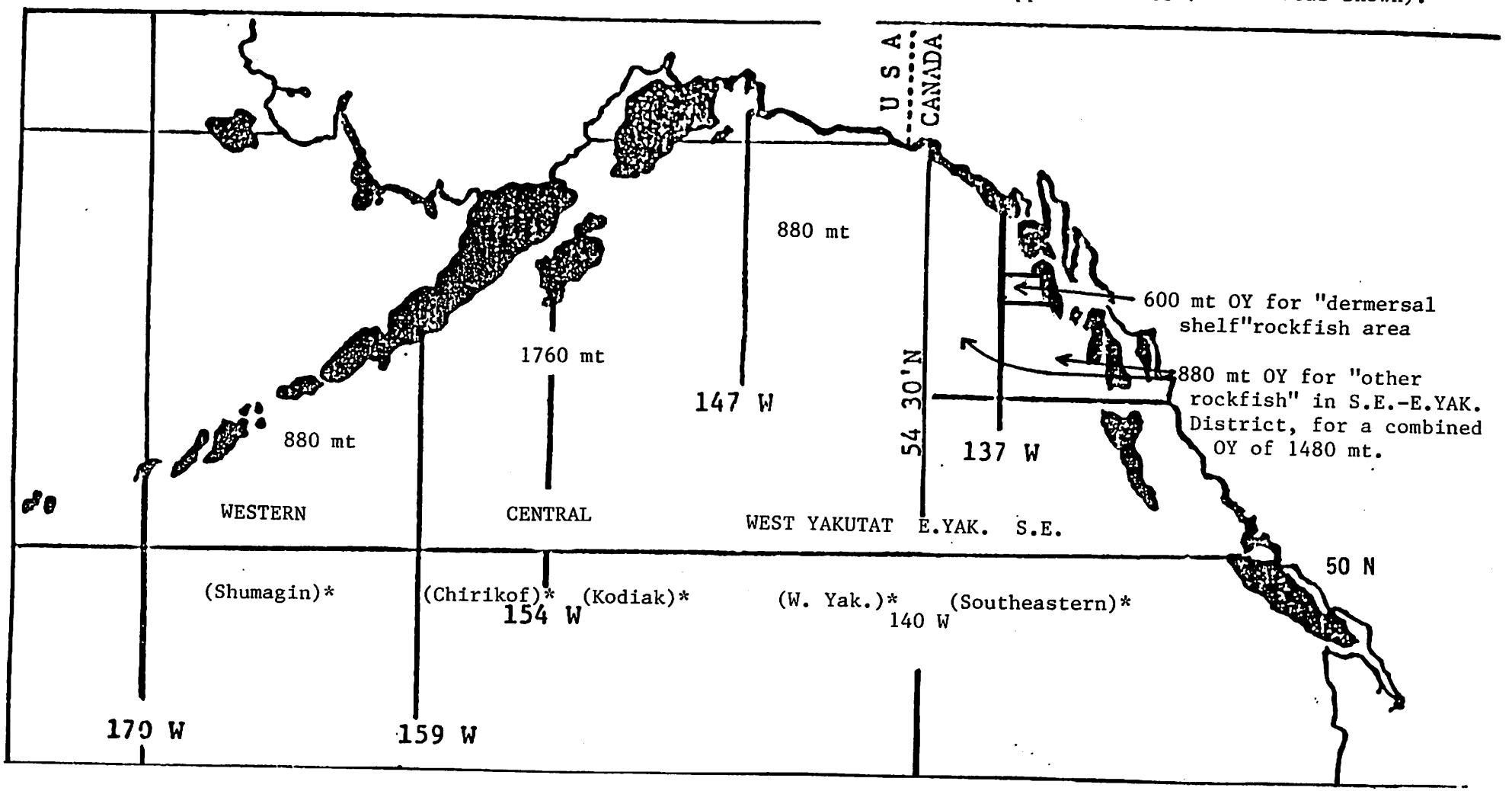
E. (Alternative 5) Set the OY for shelf demersal rockfish at 600 mt between 56°N latitude and 57°30'N latitude. Subtract this amount from the Gulf- wide OY of 5000 mt and apportion the remaining 4400 mt by regulatory area as follows: Southeast-East Yakutat, 880 mt, West Yakutat, 880 mt, Central Gulf, 1760 mt, and Western Gulf, 880 mt.

This alternative sets OY levels for other rockfish by regulatory area throughout the Gulf using a simple division of the established OY of 5000 mt less the 600 mt OY for Southeastern into the five INPFC areas that make up the Gulf of Alaska regulatory districts (Figure 2).

3. Implement new optimum yields for pollock, Pacific ocean perch, rockfish, Atka mackerel, and other species.

Certain alternatives for the OY changes for each species, including the preferred action, have been considered and are hereby addressed as follows:

Figure 2. Proposed FMP Regulatory Areas/Districts for "Other Rockfish" with OY Apportionments (INPFC areas shown)*.



DRAFT

A. Pollock

1. (Alternative 1 = preferred action). Reduce the optimum yield for pollock to 305,000 mt in the Western/Central Area.

This alternative is preferred,because it recognizes the apparent weakness of the 1980 and 1981 year classes and that the 1985 harvest will likely be dependent on the 1978 and 1979 year classes, which are been in the fishery for four and three years, respectively.

2. (Alternative 2) Maintain the optimum yield at 400,000 mt.

This alternative is not acceptable, because over-exploitation of old and weak year classes would likely result.

B. Pacific ocean perch

1. (Alternative 1 = preferred action). Reduce the optimum yield for POP to 1,302 mt and 3,906 mt in the Western and Central Areas, respectively.

This is the preferred action, because it is less constraining to developing domestic fisheries while at the same time does allow for some rebuilding of stocks.

2. (Alternative 2) Maintain the optimum yields for POP at their existing levels.

This alternative would likely result in a continued decline in the condition of POP stocks and therefore is not acceptable.

C. Rockfish

1. (Alternative 1 = preferred action). Reduce the Gulf of Alaska-wide optimum yield for rockfish to 5,000 mt.

This alternative is preferred, because it accommodates some growth in small rockfish fisheries in the Central Regulatory Area, while accounting for the poor condition of stocks generally throughout the Gulf of Alaska.

2. (Alternative 2) Reduce the optimum yield to an amount that would provide for a bycatch only to support other target fisheries.

The total incidental catch of rockfish in 1984 was approximately 700 mt. To set the OY at this level in 1985 as a bycatch amount would severely constrain developing target rockfish fisheries in the Eastern and Central Regulatory Areas. This alternative, therefore, is unacceptable.

3. (Alternative 3) Maintain the optimum yield at 7,600 mt.

This alternative grossly exceeds the 1982-1984 average harvest of 1,500mt which currently represents the best estimate of EY for incidental slope rockfish. There is no evidence that a 7600mt harvest can be sustained even with the developing shelf rockfish fisheries.

D. Atka mackerel

1. (Alternative 1 = preferred action). Reduce the OYs in the Western and Central Areas to bycatch amounts only, or 100 mt and 10 mt, respectively. This alternative is preferred, because it reflects the current availability of stocks that is based on the best available information.

2. (Alternative 2) Maintain the OYs in the Western and Central areas at their current values of 20,836 mt and 3,186 mt, respectively.

This status quo alternative sets OYs equal to amounts that are not available for harvest, according to preliminary results of the 1984 triennial survey.

E. Other species

1. (Alternative 1 = preferred action). The other species OY is set equal to 5 percent of the total OYs for each of the other groundfish categories on the basis of an equation contained in the FMP. This is the only viable alternative under the current FMP.

4. Establish a Reporting System for Catcher/Processors

A. (Alternative 1) Maintain the current reporting requirements.

With the present system catches are reported on ADF&G fish tickets at the time of landing.

B. (Alternative 2) Require an FCZ processing permit with check-in/check-out and weekly catch reporting.

Under this alternative, catcher/processor and mothership/processor vessels would be required to obtain an FCZ processing permit. These catcher/processor and mothership/processor vessels would be required to notify NMFS via U.S. Coast Guard radio each time they entered or left an FMP management area. Catcher/processor and mothership/processor vessel operators or their representatives would also be required to submit a report to NMFS by Coast Guard radio, U.S. mail, or telex for each fishing week documenting the hail weight estimates of catch by FMP species group in each FMP area. These weekly reports would be due within 7 days of the end of the fishing week. ADF&G fish tickets would continue to be required to be submitted within one week of the date of landing to document more precise catch or product weights and specific ADF&G statistical areas. A completed logbook may be submitted with the ADF&G fish ticket showing total catch by species for a trip as a means of documenting catch by specific ADF&G statistical area.

C. (Alternative 3) Require an FCZ processing permit with a weekly catch report, but without check-in/check-out reporting.

Under this alternative, catcher/processor and mothership/processor vessels would be required to obtain an FCZ processing permit. These catcher/processor and mothership/processor vessel operators or their representatives would be required to submit a report to NMFS by Coast Guard radio, U.S. mail, or telex for each fishing week documenting the hail weight estimates of catch by FMP species group in each FMP area. These weekly reports would be due within 7

days of the end of the fishing week. ADF&G fish tickets would continue to be required to be submitted within one week of the date of landing to document more precise catch or product weights and specific ADF&G statistical areas. A completed logbook may be submitted with the ADF&G fish ticket showing total catch by species for a trip as a means of documenting catch by specific ADF&G statistical area.

D. (Alternative 4) Place observers aboard a portion of the catcher/processor and mothership/processor vessels and extrapolate the catch from these vessels to the entire fleet.

Under this alternative, catcher/processor and mothership/processor vessels would be required to obtain an FCZ processing permit which would require that observers be allowed onboard if requested. These catch/processor and mothership/processor vessels would be required to notify NMFS via U.S. Coast Guard radio each time they entered or left an FMP management area. Observers would be placed aboard a portion of the catcher/processor and mothership/processor vessels. Radio reports of catch from the observed sample would be extrapolated to all vessels in each management area. ADF&G fish tickets would continue to be required to be submitted within one week of the date of landing to document more precise catch or product weights and specific ADF&G statistical areas. A completed logbook may be submitted with the ADF&G fish ticket showing total catch by species for a trip as a means of documenting catch by specific ADF&G statistical area.

E. (Alternative 5) Place observers aboard all catcher/processor and mothership/processor vessels.

Require catcher/processor and mothership/processor vessels to obtain an FCZ processing permit which would require that an observer be aboard at all times. Total catch would be computed directly from observer radio reports.

5. Establish Measures to Control the Pacific Halibut Bycatch

A large number of alternative management regimes exist that could be used to control the bycatch of halibut in the Gulf of Alaska groundfish fisheries. These include PSC limits, economic disincentives, gear restriction, time-area closures, and combinations of the above. Terry (1984) has qualitatively evaluated various measures and provided advantages and disadvantages of each measure. Generally, PSC limits or fees combined with exemptions for "clean" gear types provide the greatest benefits with the lease costs as long as observer coverage is adequate. Time/Area closures may be preferable if observer coverage is poor. Three alternatives involving PSC limits and one alternative involving bycatch fees were examined. These include:

A. (Alternative 1) Maintain the Western and Central Gulf PSC Limits of 29 mt and 52 mt, respectively (Status Quo)

These PSC limits are in effect for six months of the year, December 1 - May 31. The PSC limits apply to both domestic and joint venture operations with one limit for each area. All domestic trawling would cease until June 1 in an area when the PSC limit is reached. This alternative would not address the problems identified in section II.

B. (Alternative 2) Raise the Western and Central Gulf PSC Limits to 270 mt and 768 mt, respectively (Currently implemented by emergency rule).

As with Alternative 1, the PSC limits would be in effect for six months of each year, December 1- May 31, and on-bottom trawling would cease until June 1 when a PSC limit is reached. The limit applies to both domestic and joint venture operations, with one PSC limit for each area. With this alternative, the PSC limits would be increased to reflect the growth in the domestic trawl fishery and the higher abundance of halibut in the Gulf of Alaska.

C. (Alternative 3) Develop a Framework Procedure for the Annual Adjustment of PSC Limits.

Such a framework may include PSC limits that are effective for twelve months each year. Off-bottom and on-deck sorting operations could be exempt from the PSC limit. An option for a separate PSC by operation and transferable PSCs could also be designed. This option might allow an operation to continue fishing after its individual PSC limit is reached by requiring the vessel to switch to off-bottom gear. The framework would be specified in the FMP for determination of the PSC. The process and factors would be identified in a general way.

D. (Alternative 4) Establish bycatch fees.

This alternative would set a fee per mt of halibut caught. Such a program might include a framework procedure to periodically determine the fee. Fishing operations with on-deck sorting could be exempt.

6. Implement the NMFS Habitat Policy

A. (Alternative 1 = preferred action) Amend the FMP to address habitat considerations, based on the best available information, to meet standards set forth in the National Marine Fisheries Service's Habitat Conservation Policy.

This alternative is preferred, because it provides a basis for better conservation and management of the Gulf of Alaska groundfish fishery.

B. (Alternative 2) Do not amend the FMP to address habitat considerations.

This alternative is not acceptable, because conservation and management of the fishery resources requires increased understanding of habitat issues. Adoption of this policy is mandated by law.

IV. ENVIRONMENTAL IMPACTS OF THE AMENDMENT PROPOSALS AND THEIR ALTERNATIVES

Environmental impacts on the quality of the human environment are categorized as physical, biological, and socioeconomic. The socioeconomic analysis is presented under the Initial Regulatory Impact Review/Initial Regulatory Flexibility Analysis prepared for Amendment 14. The remaining physical and biological impacts are discussed as follows:

1. Establish a Gear and/or Area Restriction in the Sablefish Fishery

Since pots, longline and gillnets are fixed gear types, only moving generally up and down when set and retrieved, impacts on the physical environment are thought to be insignificant and likely immeasurable above natural physical perturbations. However, pots lost during fishing operations become a part of the bottom substrata and may impact the benthic environment. Trawl gear is a moving gear type and is almost always in contact with the bottom when used to harvest sablefish. A trawl net dragged in this manner will disturb the benthos by mixing sediment and water. However, with trawl fishing on sablefish being nearly non-existent in the Gulf of Alaska at the present time, physical impacts attributed to directed sablefish trawl and fixed gear is considered insignificant.

The biological impacts are categorized as changes in predator-prey relationships among invertebrate and vertebrates, changes in status of marine mammals and birds, and nutrient changes due to processing and dumping of fresh wastes. Biological impacts of a continued harvest will not be measurably different from those of previous years. U.S. fishermen are expected to take an amount of sablefish equal to the optimum yields regardless of the type of gear used. No changes, therefore, in predator- prey relationships or in the status of marine mammals and birds will occur under any of the discussed alternatives with the exception that a hook and longline only restriction would remove from use trawl gear, a gear that is most productive on the continental shelf where larger concentrations of small sablefish are found. An increase in use of this gear type could effect the proportion of juvenile sablefish to the remaining sablefish population. Trawl gear is also associated with high incidental catches of other species including halibut, Pacific cod, and rockfish. While longline and pot gear will also catch a variety of species, the amounts will be small. There currently is insufficient data to assess the full impact of incidental catches of other groundfish species.

Longline, pots and gillnets are usually fished on the edge or slope of the continental shelf where concentrations of larger more marketable fish can be found. Since these three forms of fixed gear can be designed to select for larger fish and are fished on the same grounds where the optimum yield is currently taken, no significant change to predator-prey relationships beyond the status quo is to be expected. No substantial nutrient changes will occur, because all caught sablefish are treated similarly when brought on board the catcher vessels (i.e., they undergo some degree of primary processing before icing or freezing). No differences in amounts of fish wastes entering the marine system will exist. The small number of sablefish pots which are lost during fishing operations, will continue to fish until the biodegradable panel required on each by regulation deteriorates to release those fish that enter them. No data exist to quantify such fishing mortality, but it is not believed to be significant due to the low level of fishing effort with pot gear at this time.

2. Establish Rockfish Quotas and Management Areas

Any decrease in optimum yield is normally expected to result in a reduction of harvest which could have a beneficial impact on the biological and physical environment by resulting in less potential physical disruption of the ecosystem. However, in the case of the five alternatives presented in the

other rockfish category, actual harvest is not expected to decline regardless of the Council action and the selection of a preferred alternative.

In any of the alternatives, the other rockfish harvest could increase from the 1984 level of 1500 mt to a Gulfwide harvest of 5000 mt. The impact of that increase on the biological and physical environment would be largely dependent on the type of gear utilized and the distribution of effort. Currently other rockfish are harvested in the Central and Western Gulf areas by trawl gear incidental to target fisheries for other species and in the Eastern Gulf by a rapidly expanding target longline fishery. Attempts at target rockfish trawl fisheries have so far proven unsuccessful but could be a major consideration in the future.

The biological and physical impacts of the rockfish fishery are not fully understood. Trophic interaction of rockfish with other species and dependence of other species on rockfish for food are just beginning to be explored. Perhaps the greatest potential risk is the impact of overharvest on the rockfish stocks themselves. On-bottom trawl gear may result in some short term damage to the benthic environment. The longterm effect is likely to be a function of the type of gear, the duration of the effort and the area fished. Data is not currently available that would allow potential impact to be quantified. Longline gear is set and retrieved vertically through the water column rather than drug across the bottom and therefore impacts on the environment are thought to be insignificant. Both gear types catch and kill other non-target species to varying degrees, but accurate data is not available. The five alternatives presented would very the degree of potential impact.

Under Alternative 1 all harvest of other rockfish up to a Gulf wide OY of 5000 mt could be taken by any gear type in any area of the Gulf. This could have a negative impact on the rockfish stocks as well as an impact on distribution and abundance of marine mammals, sea birds, and other marine animals that may rely on adult or juvenile rockfish for food. As mentioned above, the extent of dependence if any is not known. Concentrated on bottom trawl effort could have a short term impact on the benthic environment.

Alternative 2 would result in no change to the environment in the area described for the 600 mt OY since the harvest would remain at the 1984 level. However, the potential impacts discussed in alternative A could occur in the remaining areas of the Gulf.

Alternative 3 would minimize potential environmental changes in the Southeastern Gulf, but impacts as a result of concentrated effort could occur in the remaining areas.

Alternative 4 would distribute the effort throughout the Gulf based on abundance of rockfish by species assemblage. Of the five alternatives this one would result in the least potential environmental impact. The distribution of fishing effort would be directly tied to the availability of the resource.

Alternative 5 would also distribute the effort throughout the Gulf, however the extent of fishing effort and the resulting environmental impact would not necessarily be proportional to resource abundance.

More detailed information on the impacts of fisheries on the environment is included in section IV. 3.

3. Implement New Optimum yields for pollock, Pacific ocean perch, rockfish, Atka mackerel, and other species.

A. Implement new optimum yields as described under Alternative 1 for each of the above species.

Any increases or decreases in optimum yields are expected to have certain impacts on the biological and physical environment. These impacts are categorized as changes in predator-prey relations among invertebrate and vertebrates, changes in status of marine mammals and birds, physical changes as a direct result of on-bottom fishing practices, and nutrient changes due to processing and dumping of fish wastes. All such impacts could be cause to varying degrees by taking of any amount of fish, but this analysis is limited primarily to discussion concerning impacts of the reduction of the pollock optimum yield. These impacts are discussed as follows:

Stress to Marine Mammals

In general, changes in optimum yields are calculated to account for amounts consumed by marine mammals, i.e., fisheries are only allowed on surplus production, which should not impact directly marine mammals. On the other hand, certain conflicts occur between marine mammals and fishermen as a result of both "predators" being on the same grounds, sometimes in direct competition with each other. Twenty-six species of marine mammals permanently reside in or seasonally frequent the Gulf of Alaska. Many species occur in large numbers each spring and summer, but are few in number during the winter.

The pinniped species that are found in the Gulf of Alaska are all protected by the Marine Mammal Protection Act of 1972 (MMPA). All species are believed to be at their level of optimum sustainable population as defined under the MMPA so that permits for their taking may be issued under carefully limited circumstances. Because groundfish trawl operations generally do involve conflict with pinnipeds, domestic and foreign fishermen proposing to engage in such operations must obtain certificates of inclusion under a general permit for the taking of marine mammals incidental to commercial trawling operations. Under the general permit not more than 1,000 northern sea lions (Eumetopias jubatus), 10 northern fur seals (Callorhinus ursinus), 10 harbor seals (Phoca vitulina), and 10 small cetaceans may be killed or seriously injured annually by domestic trawl operations off Alaska. The incidental taking of pinnipeds in the groundfish fisheries is a significant problem only with respect to northern sea lions. While these sea lions may avoid areas of conspicuous human activity, they do tend to congregate around commercial groundfish operations and are caught in the moving trawls. They also have been known to damage fishing gear and the catch before it can be taken aboard a fishing vessel. Such activities by sea lions can result in defensive action by the affected fishermen who may harm or harass them in an attempt to keep them away from their gear.

The effect on sea lions as a result of the 1985 joint venture fishery should be similar to that in 1984, because the size of the 1984 joint venture harvest (200,000 mt), is about equal to that part of the new joint venture

allocation(212,500 mt) of the optimum yield. Sea lion mortality from the 1984 pollock joint venture fishery in Shelikof Strait was well within the limits provided by the Certificates of Inclusion. A total of 254 sea lions were reportedly taken during this fishery. A total of 80 sea lions were reportedly taken in the foreign fishery. U.S. fishermen now have three years of experience in this fishery and are mostly familiar with the protection afforded sea lions. Because sea lions are usally highly visible during daytime, fishermen are able to avoid them while trawling, thus minimizing confrontations. Observations by the National Marine Fisheries Service suggest, however, that trawling conducted during periods of darkness is likely to increase encounters with sea lions. Potential methods to reduce such encounters include: 1. scheduling fishing operations to reduce or eliminate the need to trawl during periods of darkness; and 2. adopting certain technical devices, eg. noise emitters, that would repel sea lions in the vicinity of the a trawl. Fishermen should be encouraged continually to consider and adopt such measures to mitigate the effect of their operations on sea lions in order to enjoy fishing activities without additional measures that could be imposed on them under the Marine Mammal Act.

Stress to Marine Birds

Harvesting operations during the groundfish fisheries may cause marine birds, including those protected by the Migratory Bird Treaty Act, to avoid areas that they might otherwise frequent. Such displacement of these birds would not appear to be a prohibited taking for purposes of the Migratory Bird Treaty Act, but its long-term effect on them is largely unknown. Birds protected under this act could theoretically be captured in trawl gear in the course of their feeding activities. Any such capture that is intentional or negligently caused by fishermen would be a violation of this Act.

Food Competition with Marine Mammals and Birds

Many of the marine mammals and birds that occur in the Gulf of Alaska feed on juvenile and adult groundfish and also on the same animals that the groundfish feed on. Because the groundfish stocks themselves are declining, harvesting a reduced amount of groundfish is not anticipated to result in a surplus of fish in the system that marine mammals and birds could then consume. Theoretically, these reductions in allowable levels of harvest should have a zero net effect on the ecosystem; in reality, predator/prey relationships are not well understood and any resulting changes are not possible to measure against natural perturbations in the ecosystem, given the existing technology to measure them.

Physical changes As a Direct Result Of On-bottom Fishing Practices

Depending on the species, changes in OYs could entail certain combinations of trawls (on-bottom and midwater), longlines, pots, and gillnets. Only the bottom trawl has been identified as a gear type that impacts the bottom. It may cause abrasion of the bottom as it is pulled along, killing or injuring any animals and plant life that may have been in its path. Most bottom trawls are also equipped with rollers, or bobbins, that protect the trawl from damage, but which may also kill or injure animals and plant life. The actual severity of such impacts are not known, but are largely believed to be

insignificant over the long term providing that the impact is periodic because of capacity of the ecosystem to repair itself.

Under this alternative, the total available harvest of groundfish will be decreased by more than 100,000 mt. Because most of this amount is attributed to the decrease in the pollock OY, no change in physical impacts are expected, because most of the pollock harvest is currently conducted with off-bottom gear. This fishing method would rarely come into contact with the bottom, and any physical changes would be immeasurable.

Nutrient Changes Due to Processing and Dumping Fish Wastes

Increases and decreases in OYs will change amounts of fish wastes that are discarded at sea. Processes of change in the ocean are dynamic given the biological and physical interactions that occur. An assessment of the true effects caused as a result of changes are not quantifiable given present technology.

B. Maintain the current optimum yields as described under Alternative 2 for each of the above species.

Stress to Marine Mammals and Birds

Under this alternative, more than 100,000mt of groundfish could be made available for harvest than in alternative A. Because the food requirements of marine mammals and birds are factored into the calculations of OYs, the amount being made to the fishery must come partly from the amounts required by marine mammals and birds. If the additional amounts of groundfish were actually harvested, then some adverse impacts must occur on marine mammals and birds through additional harassment or mortality. Whether these impacts would prove deleterious to them is not known. Certain substitutions in prey needed by marine mammals and birds might occur. Likely, however, adverse impacts would accelerate as excess removals of groundfish biomass caused groundfish species to decline in status.

Food Competition with Marine Mammals and Birds

As discussed above for Alternative 1, certain interspecific competition must occur among marine mammals, birds, and fishermen. Harvesting the current specified OYs when the best available information indicates insufficient biomass to support such harvests would cause changes in predator/prey relationships. Fewer large fish would remain in the system to prey on smaller fish etc. Marine mammals may have to forage further than normal. On the other hand, more small organisms may be available to birds and mammals as a result of their not being consumed by larger fish. Again, predator/prey relationships are not well understood and any resulting changes are largely no measurable.

4. Establish a Reporting System for Catcher/Processors

The primary effects imposed upon the biological and physical environment by the catcher/processor reporting alternatives result from the varying potential for overfishing under each alternative. Both targeted groundfish species and

non-targeted incidental or prohibited species could be overfished by catcher/processor and mothership/processor vessels. Since many of the groundfish species concerned are slow growing and long-lived, overharvesting can have considerable impacts on future population levels and production of the targeted groundfish species. Similar effects on population levels and production are possible for incidental and prohibited species catches by these vessels. In addition, considerable socio-economic impacts on catches by other user groups could result from excessive harvests of prohibited species by catcher/processors, particularly for crab, salmon and halibut. Secondary biological impacts of overharvests would result from changes in trophic interactions caused by the altered population levels of the overfished species.

The potential for resource depletion through overfishing results from the large hold capacities of the catcher/processor and mothership/processor vessels and the potential for these vessels to remain at sea for long periods of time. Under Alternative 1, fishery managers have no knowledge of the catch aboard these vessels until the time of landing. By the time these vessels land, OYs and possible PSC levels could have been greatly exceeded by the aggregate catch aboard the catcher/processor vessels and shore-based domestic vessels. Alternative 2 would greatly reduce the risk of overfishing of targeted groundfish species by requiring weekly catch reports from the catcher/processor and mothership/processor vessels. In addition, this alternative requires vessels to check-in and check-out of each management area fished. This requirement increases the compliance and enforceability of this alternative, further reducing the risk of overfishing. Alternative 3 would require only the weekly catch report, with a somewhat larger risk of overfishing of targeted groundfish species, because of reduced compliance and enforceability. The risk of overfishing is also increased under alternative 3 because the precision of catch estimates is reduced. This results from catch projections for the most recent two week reporting period being based on a two week old effort distribution provided by the preceding catch report, rather than basing the effort distribution on current information from the check-in/check-out system. The onboard observer catch reporting of alternatives 4 and 5 provide the least risk of overfishing targeted groundfish species. Observer based catch reporting provides the only reduction of the risk of overfishing prohibited species catches of the alternatives.

5. Establish Measures to Control the Pacific Halibut Bycatch

Each of the alternatives will affect the biological and physical environment to varying degrees. These impacts are related to changes resulting from removing different numbers of halibut and other bottom organisms and from perturbations of the benthos caused by trawls being dragged along the bottom. Halibut are important predators. Larval halibut feed on plankton, whereas halibut one to three years old, that usually are less than 30 cm long, feed on shrimp-like organisms and small fish. As halibut increase in size, fish and crabs become a more important part of the diet. The species of fish frequently observed in stomachs of large halibut include Pacific cod, pollock, sculpins, sandlance and herring. Octopus and clams also contribute to their diet.

The effect of changes in the amounts of halibut that are taken by domestic groundfish fishermen also depends on halibut management measures undertaken by

the International Pacific Halibut Commission (IPHC). If the incidental catch can instead be taken in the directed halibut fishery.

Under Alternative 1, very little bottom trawling would occur during December-May, and the incidental mortality of halibut, crab and other bottom organisms would be low during this period. A much larger catch would be allowed under Alternative 2. Neither Alternative 1 or 2 has any affect on the halibut and crab catch during the remainder of the year (June-November) and thus the total environmental impact of the groundfish fishery cannot be determined. Under Alternative 3, the total environmental impact would be specified according to the framework procedure and environmental factors would be considered in setting the PSC limit. As with Alternatives 1 and 2, the environmental impact of Alternative 4 cannot be determined.

6. Implement the NMFS Habitat Policy

This proposal is descriptive in nature, focusing on the environment within which the product for harvest is generated and nurtured. It's purpose is to alert users of the marine environment to the elemental influence of habitat on the productivity of the fishery and to the potential for alteration by man's actions. The intended effect is to provide the basis for a common awareness among these users and for appropriate expressions of Council concern should the need arise. Because this statement is informational only, there is no immediate environmental impact, although the residual effect of increased knowledge may serve, in the long-term, to protect, maintain, or restore the habitats of the Gulf of Alaska groundfish fishery. In the absence of such an amendment, the benefits of increased public awareness of habitat issues would be lost.

V. EFFECTS ON ENDANGERED SPECIES AND ON THE ALASKA COASTAL ZONE

None of the six amendment proposals or their 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 management proposals, or their alternatives, would be conducted in a manner consistent, to the maximum extent practicable, with the Alaska Coastal Zone Management Program within the meaning of Section 307(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

VI. FINDINGS OF NO SIGNIFICANT IMPACT

For the reasons discussed above, it is hereby determined that neither approval and implementation of any of the reasonable alternatives concerning the six topics presented would significantly affect the quality of the human environment, and that the preparation of an environmental impact statement on these actions is not required by Section 102(2)(C) of the National Environmental Policy Act or its implementing regulations.

Assistant Administrator for Fisheries, NOAA Date

AGENCIES AND PERSONS CONSULTED

The purpose of this draft environmental assessment is to solicit comments from the public and government agencies. After an appropriate review of this draft, a final environmental assessment will be written that incorporates qualified and reasonable comments. Persons and agencies will be listed at that time.

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LIST OF PREPARERS

Steven K. Davis
North Pacific Fishery Management Council
P.O. Box 103136
Anchorage, AK 99510
(907)274-4563

Barry Bracken
Alaska Department of Fish and Game
P.O. Box 667
Petersburg, AK 99833

Fritz Funk
Alaska Department of Fish and Game
P.O. Box 3-2000
Juneau, AK 99802

Ronald J. Berg, Jim Wilson, and Daphnie White
National Marine Fisheries Service
P.O. Box 1668
Juneau, AK 99802
(907)586-7230

Steve Hoag
International Pacific Halibut Commission
P.O. Box 5009, University Station
Seattle, WA 98105

Gary Stauffer and Joe Terry
Northwest & Alaska Fisheries Center
National Marine Fisheries Service
7600 Sand Point Way NE, Bldg 4
BIN C15700
Seattle, Wa. 98155

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REGULATORY FLEXIBILITY ANALYSIS OF AMENDMENT 14 TO THE FISHERY MANAGEMENT PLAN FOR GROUNDFISH OF THE GULF OF ALASKA

PART I

ADOPTED BY THE
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
FOR PUBLIC REVIEW

PREPARED BY THE PLAN TEAM FOR
GULF OF ALASKA GROUNDFISH

March 1985

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REGULATORY FLEXIBILITY ANALYSIS OF AMENDMENT 14 TO THE FISHERY MANAGEMENT PLAN FOR GROUNDFISH OF THE GULF OF ALASKA

PART I

I. INTRODUCTION

In compliance with Executive Order 12291, the National Marine Fisheries Service requires the preparation of a Regulatory Impact Review (RIR) for all regulatory actions or for significant DOC/NOAA policy changes that are of 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 or council 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 Regulatory Flexibility Act (P.L. 96-354). The primary purpose of the Regulatory Flexibility Act 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 recordkeeping 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 of six management proposals under Amendment 14 to the Fishery Management Plan for Groundfish of the Gulf of Alaska. These proposals are: (1) sablefish gear regulation; (2) rockfish quotas and management areas; (3) establish a reporting system for catcher/processor vessels; (4) changes in OY values; (5) halibut prohibited species catch limits (PSC) on domestic trawlers; and (6) implementation of NMFS habitat policy. Each of these topics will be presented as chapters of this document.

II. OBJECTIVES OF AMENDMENT

The proposed amendment was prepared to be consistent with the management objectives of the FMP. The pertinent objectives are:

1. Rationale and optimal use in both the biological and socioeconomic sense of the region's fishery resources as a whole;

2. Protection of the Pacific halibut resource; and

3. Provide for the orderly development of domestic groundfish fisheries consistent with 1 and 2, at the expense of foreign participation.

The proposed management measure also fulfills the goals and objectives of the FMP and the secondary objectives of the FMP. Of these, the most important are:

A. Primary Plan Objectives

1. Promote conservation while providing for optimum yield.

2. Promote the efficient use of fishery resources but not solely for economic purposes.

3. Promote fair resource allocation without allowing for excessive privileges.

4. Use the best scientific information available.

B. Secondary Plan Objectives

4. Promote efficiency while avoiding disruption of existing social and economic structures.

6. Minimize impacts of fishing strategies on other fisheries and environment.

III. PROBLEMS NECESSITATING THE AMENDMENT

A description of, and the need for, each amendment proposal follows:

1. Establish a Gear and/or Area Restriction in the Sablefish Fishery

Current regulations implementing the FMP do not constrain types of gear used in harvesting any of the groundfish categories, with the exception of a temporary emergency rule for sablefish which restricts the gear used in the Eastern Regulatory Area to hook and longline only. All of the proposed alternatives would entail long-term changes to one or more areas of the Gulf of Alaska and may affect three other potential gear types, besides longlines.

The commercial harvest of sablefish in the Gulf of Alaska began in Southeast Alaska in 1906. Domestic landings grew to a peak in 1946 when about 4,083 mt, dressed weight, was landed. Harvest levels began to decline initially after 1946 in response to a poor market and then in response to foreign competition and poor stock conditions, reaching a minimum in 1968 when 161 mt were landed. During the 1960s foreign harvest of sablefish soon grew to a high of 36,000 mt. Since 1972, the foreign harvests have declined as a result of declining stock conditions and regulation under the FMP.

With the implementation of the MFCMA in 1976, fishery managers have encouraged domestic development of fishery resources. In terms of sablefish, the Alaska fishing industry has responded by expanding quickly, creating jobs for hundreds of fishermen, and providing economic growth to Alaskan and Pacific northwest fishing communities. The challenge to develop the sablefish resource was taken by fishermen using principally longline gear.

Most U.S. fishermen operating in Alaska have chosen longlines as the primary gear when targeting on sablefish, because many of them are experienced in the halibut fishery which is executed strictly with hook and longline and own vessels best suited to fishing that gear type.

Pots have been used periodically since the mid-1970s. In 1973, 42% of the domestic harvest, or 38 mt, was taken by one pot fishing vessel. Since then, no more than six pot vessels have fished in the Gulf during any one season. Since 1973, longline fishermen have dominated this fishery with as many as 200 vessels participating in 1984. Directed fishing for sablefish using trawl and gillnets has been minimal to date.

In 1982, the sablefish optimum yield (OY) was fully achieved by U.S. fishermen in the Southeast Outside District (i.e. westward to the longitude of 137°W.). The OY was again achieved in this district in 1983 and further west to 140°W. (East Yakutat District). In 1984, the OY was reached for the first time throughout the entire Gulf of Alaska. Marking this achievement was a fully capitalized fishing fleet, a large harvesting and processing workforce, increased markets, and the realization that there would be insufficient sablefish resource to accommodate all users at traditional levels.

This fact became apparent in the first two months of 1985 off Southeast Alaska. Historically, the Southeast Alaska sablefish fishery has not begun until spring when weather and fishing conditions improve and the fish have recovered from spawning. In January 1985 three large (catcher/processor) vessels began fishing for sablefish using pot gear. The pots, as with longline gear, are set on a relatively narrow depth range (250-500f). Fishing has been good and it's projected that the pot vessel catch will exceed 850 mt, or about one-third of the combined Southeast-East Yakutat District OY. When vessels left the area to unload their catch, pots would often be stored on the grounds.

While the pot vessels were fishing there were several gear conflicts between the pot fishermen and those using longline gear. When longline gear, which is relatively lightweight, becomes entangled with the heavier pot gear, the longline breaks with some or all of it being lost. Gear conflicts are likely between these two gear types since fishing is concentrated along the narrow shelf edge. The presence of just one or two pot vessels can effectively preempt the grounds to longline gear as longline fishermen are forced to move to avoid gear loss. Pots lost or stored on the fishing grounds can contribute to this problem over a long period of time.

2. Rockfish Quotas and Management Areas

"Other rockfish" includes all species of Sebastes other than Pacific ocean perch and four associated slope rockfish species. Other rockfish are currently managed in the FMP with a Gulf-wide OY. The MSY for this complex was based on the incidental catch of slope rockfish in the foreign trawl fishery for Pacific Ocean perch between 1973 and 1976 with OY set at the lower end of the MSY range.

In November 1984 the Alaska Department of Fish and Game (ADF&G) submitted to the Groundfish Team a report on the rapidly expanding domestic fishery for bottom-dwelling (demersal) shelf rockfish in the southeastern area. The

report pointed out that this fishery is targeting on a species complex that has not previously been addressed in the groundfish FMP. This fishery has grown in recent years from less than 45 mt (dressed weight) in 1970 to nearly 400 mt in 1983, doubling further in 1984 to approximately 800 mt.

The domestic fishery targets on benthic forms of shelf rockfish in depths of less than 100 fathoms. Over 20 species of rockfish are regularly landed. Predominant species are yelloweye rockfish (S. ruberrimus), canary rockfish (S. pinniger), tiger rockfish (S. nigrocinctus), and rosethorn rockfish (S. helvomaculatus) in the 40-100 fathom depth zone and quillback rockfish (S. maliger), china rockfish (S. nebulosus) and copper rockfish (S. caurinus) in depths of less than 40 fathoms. Yelloweye rockfish and quillback rockfish are the primary target species. Longline gear is the predominant gear type and accounts for well over 90% of the harvest.

Until recently it was assumed that the majority of the landings were from the waters within state jurisdiction. However, approximately 50% of the fishable grounds are within the Fishery Conservation Zone(FCZ). Based on fishermen interviews conducted by ADF&G in 1983 and 1984, approximately 25% of the landings were of catches taken only in the FCZ, 21% only within state waters, and the remaining 54% were taken on trips that fished areas both under state and under federal jurisdiction.

Aging studies conducted in recent years conclude that rockfish are much longer lived and slower growing than early literature suggests. Many of the demersal species live in excess of 50 years and many do not reach maturity until after age 10. Because rockfish are extremely long lived and slow growing, the sustainable yield that can be taken from a stock is much lower than for a comparable biomass of faster growing species such as pollock or cod. As a result, rockfish stocks can be easily and quickly overfished. Lacking information on appropriate harvest levels for the demersal shelf rockfish stocks in southeastern Alaska, the risk of overharvesting this resource by the expanding target fishery is great.

After reviewing the ADF&G rockfish issue paper the Plan Team recommended in their November 1984 report to the Council that the other rockfish category should be redefined to include three separate assemblages or species groups; slope rockfish, shelf pelagic rockfish and shelf demersal rockfish. Species included in these groups are shown in Table 1. Further, the management of the shelf demersal category should be conducted in cooperation with the State of Alaska. The Team report also noted that, based on the poor showing in the 1984 trawl survey, there was no evidence that the slope complex could sustain a harvest greater than the 1984 harvest of 1,500 mt.

At the December meeting the Council acted to reduce the Gulf-wide OY of "other rockfish" from 7,600 mt to 5,000 mt due to concern for the risk of overharvesting certain rockfish stocks. The 1984 harvest was approximately 1,500 mt of which approximately 700 mt were taken from the slope rockfish stocks by foreign and joint venture fisheries in the Central and Western Gulf management regions. The remaining 800 mt was taken from shelf rockfish stocks by domestic fishermen in the southeastern area. In adopting the 5,000 mt OY, the Council considered the testimony of fishermen in the Central Gulf area who expressed a desire to expand the nearshore fisheries in the Central Gulf into the FCZ. At the the joint Alaska Board of Fisheries (Board) and Council

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Table 1.--Categories of rockfish present in the Gulf of Alaska by habitat area.

Slope Category	Shelf Dermersal Category
POP	Yellowye rockfish
Northern rockfish	Quillback rockfish
Rougheye rockfish	Canary rockfish
Shortraker rockfish	China rockfish
Sharpchin rockfish	Tiger rockfish
Red banded rockfish	Rosethorn rockfish
Rosethorn rockfish	Silvergray rockfish
Darkblotch rockfish	Copper rockfish
Redstripe rockfish	
Splitnose rockfish	
Harlequin rockfish	
Aurora rockfish	
Yelloweye rockfish	

Shelf Pelagic Category
Black rockfish
Dusky rockfish
Yellowtail rockfish
Widow rockfish
Boccacio
Blue rockfish

meeting in early February 1985, ADF&G staff presented alternative management proposals for establishing a separate management category of shelf rockfish stocks in order to reduce the risk of overharvesting demersal shelf rockfish and to eliminate the possibility of harvesting the entire Gulf-wide OY in any one portion of the Gulf and consistent with the FMP objectives.

At the February joint meeting the Council deferred further discussion on rockfish management pending recommendations by the Board of Fisheries. Following the joint meeting the Board adopted the management alternatives which were developed by ADF&G staff and the Southeast Alaska fishing community and endorsed by the Council Advisory Panel. The recommended action would place a 600 mt OY on demersal shelf rockfish in both state outercoastal and FCZ waters between 56°N latitude and 57°30'N latitude. In addition, the Board voted to restrict harvest of other rockfish species in the remainder of the Southeast-East Yakutat District to no more than 880 mt. That would place a total other rockfish OY of 1,480 mt in the outer coastal state and federal waters within the Southeast District. No more than 600 mt of demersal shelf rockfish could be harvested in the specified portion of the area where the fishery is currently concentrated. No management action was recommended by the Board for the remainder of the Gulf since the February Board meeting was advertised to address southeastern groundfish issues only. In addition, the Board adopted an October 1 to September 30 accounting year for shelf demersal rockfish in the southeastern area to assure that fish would be available to the fishermen during the fall and early winter when the market is strongest.

With the increasing effort in directed rockfish fisheries and the vulnerability of these species to overharvest, the risk of overfishing certain stocks is high. Therefore, management action is considered essential for other rockfish. There are several management alternatives that would reduce the risk of overharvest.

3. Implement New Optimum Yields for Pollock, Pacific Ocean Perch, Rockfish, Atka Mackerel, and Other Species

At its December 1984 meeting, the Council adopted changes in optimum yields for pollock (Western/Central Regulatory Area), Pacific ocean perch ((Western and Central Regulatory Areas), Atka mackerel (Central and Eastern Regulatory Areas), and rockfish (Gulf-wide). At the same meeting, the Council voted to request the Secretary of Commerce to implement these changes by emergency rule under Section 305(e) of the Magnuson Act. The Secretary did implement these changes on (Insert date of filing with the Office of Federal Register) (__FR, _____). Changes in optimum yields are based on the best available information. A summary of that information concerning the status of pollock, Pacific ocean perch (POP), rockfish, and Atka mackerel follows:

Pollock - On the basis of acoustic surveys conducted in the Shelikof Strait region of the Gulf of Alaska during March and April, 1984, total pollock biomass is estimated to be between 1,574,634 mt and 2,034,857 mt with a mean estimate of 1,789,186 mt. This mean represents the total biomass in the Central and Western Regulatory Areas combined, since few pollock were found elsewhere in these areas while surveys were conducted in Shelikof Strait

during the spawning period. Similar surveys have been conducted in Shelikof Strait during 1980, 1981, and 1983. Results of the 1984 survey indicate that total biomass continues to decrease from its peak level in 1982. Length and age composition and hydroacoustic survey data from 1984 joint venture fisheries confirm that the 1980 year class (age 4 fish) is weak. The 1981 year class (age 3 fish) also appears to be weak. The abundance estimate of age 3 fish in 1984 is about the same as age 3 fish (1980 year class) in 1983. It is estimated that the exploitable biomass of pollock has now declined from the 1984 level by some 500,000 mt to fall within a range of 1,200,000 to 1,270,000 mt. An acceptable exploitation rate of 28.5 percent would provide a harvest between 342,000 mt and 358,000 mt, with a mean of 350,000 mt. The Council and the SSC reviewed the Plan Team's concern that the majority of the 1985 harvest will come from the only two dominate year classes, 1978 and 1979, which are 7 and 6 year old fish in the 1985 fishery. The Council chose, therefore, a more conservative exploitation rate of 24 percent times the upper limit of the exploitable biomass to establish an optimum yield of 305,000 mt, to recognize the dependency of the fishery on only two year classes and continuing poor recruitment.

Pacific ocean perch (five species complex) - Results of the triennial Gulf of Alaska biomass survey indicate the current exploitable biomass of the Pacific ocean perch complex are 53,400 mt, 120,150 mt, and 93,450 mt in the Western, Central, and Eastern Regulatory Areas, respectively. Respective EYs are 1,736 mt, 5,208 mt, and 4,530 mt. The Council considered the desirability of establishing optimum yields at levels that would provide only minimal bycatches incidental to other target fisheries in order to promote fastest rebuilding of Pacific ocean perch stocks. Such minimal levels would prove a burdensome cost to developing domestic fisheries if their operations were terminated by prematurely achieving the bycatch optimal yields. The Council, therefore, established optimum yields at higher than bycatch levels, or 1,302 mt in the Western Area and 3,906 mt in the Central Area. It retained the existing 875 mt optimum yield in the Eastern Area to promote rapid stock rebuilding in this regulatory area.

Other Rockfish - This group contains about eight species of rockfish, excluding the POP complex, that occur along the continental slope and are taken incidental to other target fisheries. Results of the 1984 trawl survey indicate that none of the eight species were present in significant numbers. The average 1982-1984 harvest in the joint venture and foreign fisheries is about 1,500 mt with a 1984 harvest of only 700 mt. The EY for this group needs to be reevaluated. The Council considered the limiting effect that an optimum yield equal to the bycatch would have on the developing domestic fisheries, and established the optimum yield at 5,000 mt which is substantially higher than the bycatch level so as not to limit that growth.

Atka mackerel - The 1984 survey indicates that the total biomass for Atka mackerel is 39,000 mt with 38,000 mt being available in the Western Area and 1,000 mt in the Central Area. Length frequency information suggest that the population consists mostly of large fish. Recruitment in the Central Area appears nonexistent. The absence of catches in the Eastern Area indicates stocks are not sufficiently abundant to support a commercial fishery. The low abundance of Atka mackerel may be due to westward shift in the distribution of stocks or to excessive fishing mortality. The Council reviewed the SSC recommendation for the the Western Area to set the exploitation rate between

10 and 15 percent of 38,000 mt, which would provide an OY between 3,800 mt and 5,700 mt. Since the current OY for the Western Area of 4,678 mt falls within this range, the Council opted not to change the OY. The Council also reviewed the SSC recommendation to set the OYs in the Central and Eastern Areas at bycatch levels only and recommended this to the Secretary of Commerce. After reviewing the recent catch data, OYs were set at 100 mt and 10 mt in the Central and Eastern Areas, respectively.

Other Species - The "other species" category includes those groundfish species not individually addressed in the FMP. The FMP specifies the OY for those species to be equal to 5 percent of the total OY for all of the target groundfish species combined. Consequently, if the recommended OY changes are adopted the OY would be reduced to 22,435 mt.

4. Establish a Reporting System for Catcher/Processors

The objective of this proposal is to ensure that fishery managers receive timely estimates of catch by all domestic vessels so that fishery closure notices can be promptly issued when OYs are achieved. With the rapid recent growth of the domestic fishing fleet, increasing importance is being placed on timely reporting of domestic harvests in order to ensure that OYs are not exceeded. Vessels which deliver their catch to shore-based processors land their catch frequently enough to allow timely estimation of total catch under existing regulations. However, vessels which process their catch at sea can remain on the fishing grounds for extended periods of time. Catch reports submitted by these vessels at the time of landing as required under existing regulations are not timely enough to prevent OYs from being grossly exceeded. The resulting overharvests could seriously damage future production from groundfish stocks.

Current fishing regulations implementing the Gulf of Alaska and Bering Sea Fishery Management Plans require fishing vessels to submit a State of Alaska fish ticket or equivalent document to the Alaska Department of Fish and Game for any commercial groundfish harvest in the Gulf of Alaska or Bering Sea within 7 days of the date of landing the catch. Vessels which preserve their catch by non-freezing refrigeration or icing methods must land their catch within a maximum of 10-12 days from the time of harvest in order to ensure product quality. The catch from these vessels, when delivered to shore-based processors, can be reported on a timely basis under existing regulations. If existing regulations are properly enforced, fishery managers can estimate harvests by these vessels with sufficient precision to ensure that OYs are not exceeded.

However, vessels which freeze or salt their catch aboard frequently remain at sea for trips of up to several months duration and are not currently required to report their catch until the time of landing and offloading. At least twenty two catcher/processor vessels will be operating in the Gulf of Alaska and Bering Sea areas in 1985. Based on past catcher/processor landing records the combined hold capacity of these vessels will be approximately 13,000 mt. Therefore these vessels are capable of harvesting significant portions or even entire OYs in a single trip. Under existing fishing regulations, fishery managers have no knowledge of the catch aboard these vessels until the time of landing. In addition, vessels are not required to notify fishery managers when

beginning fishing operations. Since domestic groundfish fishing vessels are also not marked for identification by enforcement overflights, the number of catcher/processor vessels actually fishing in a given management area is not known until the time of landing. Without knowledge of effort levels, fishery managers are not able to make projections of catch aboard based on past performance.

Delayed catch reporting is also a problem for fully domestic mothership operations. In these operations small catcher vessels without processing capability deliver their catch, usually by cod-end transfers, to a mothership/processor vessel. Current regulations require that an ADF&G fish ticket be filled out each time a catcher vessel delivers to the mothership/processor and that these fish tickets be forwarded to ADF&G within 7 days of the date that fish were delivered. Domestic mothership and floating processor operations thus far have all occurred in sheltered waters with at least periodic access to U.S. mail service so that regulations requiring filing of fish tickets with ADF&G within 7 days could have been enforced. However, there is a potential for these mothership operations to occur at sea, with no method of filing the fish tickets with ADF&G within the 7 day period required by law.

With such large processing capacities and increasing numbers of catcher/processor and mothership/processor vessels, the risks of overharvesting groundfish resources under the current system are high. Because of the time delays involved in catch reporting under current regulations, groundfish resources could be drastically overharvested before fishery managers had even discovered that OYs had been exceeded. Since many of the groundfish species concerned are slow growing and long-lived, overharvesting can have considerable impacts on future production.

5. Establish Measures to Control the Pacific Halibut Bycatch

The FMP contains restrictions on both foreign and domestic groundfish fishermen in the western and central Areas that are designed to minimize the taking of halibut, an important commercial species to a separate domestic target fishery. Foreign fishermen are restricted to the use of off-bottom gear only when trawling between 147°W and 170°W longitudes from December 1 through May 31, a period when juvenile halibut were subject to high rates of capture. Domestic fishermen may use on-bottom gear during this period, but if the total take of Pacific halibut by domestic trawl operations in the Western or Central Areas reaches 29 or 52 mt, respectively, all further trawling by domestic fishermen is prohibited until June 1.

These PSCs were implemented in 1978 and at that time approximated one percent of the weight of Pacific cod expected to be taken by domestic fishermen in 1979 or soon thereafter. Domestic groundfish catches have increased annually since 1979 as market opportunities developed. Most of the increase is attributed to large quantities of pollock taken in joint venture fisheries operating in the Shelikof Strait region of the Central Area. Relatively few halibut are taken in this fishery, however, because only off-bottom trawl gear has been employed. For example, in 1983 only about 4 mt of Pacific halibut were taken incidental to a pollock catch of 132,000 mt. However, catches of other groundfish species (primarily cod and flounder) that are taken with bottom trawls where a significant bycatch of halibut occurs have also been increasing.

Regulations require that all net-caught halibut be released and some of the halibut may survive. Survival varies with the type of operation. Observer data suggest very low survival in operations which involve the transfer of codends at sea and where the halibut cannot be released immediately. These operations are typically joint ventures or larger freezer/processor vessels. On the other hand, potential survival is relatively high on smaller shore-based operations where the catch is typically sorted on deck and the halibut can be immediately released. Hoag (1975) estimated 50% survival for halibut released from small shore-based trawlers fishing off British Columbia.

Halibut have become more abundant in the Gulf of Alaska, and their greater prevalence has increased their potential catch rates in the trawl fisheries. Recognizing a greater incidental catch in the groundfish fisheries, the Council voted to request the Secretary to implement an emergency rule to increase the PSCs for halibut to 270 mt and 768 mt in the Western and Central Areas, respectively, during December-May. Recognizing that few halibut are taken with off-bottom trawl gear, the Council also voted to request the Secretary to implement an emergency rule to exempt users of off-bottom trawl gear from the restriction.

Recent data also suggest that halibut are vulnerable to trawls during periods other than the December-May period specified in the FMP. An annual PSC would provide protection for halibut during all seasons. Therefore, existing PSC regulations are no longer based on the best available information. Several management alternatives exist which may provide protection for halibut without unduly restricting domestic groundfish fishermen.

6. Implement the NMFS Habitat Policy

The proposed action amends the FMP by modifying and adding certain sections specifically to address the habitat requirements of individual species in the Gulf of Alaska groundfish fishery. The amendment describes the diverse habitat types within the Gulf of Alaska, delineates the life stages of the species, identifies potential sources of habitat degradation and the potential risk to the fishery, and describes existing programs, applicable to the area, that are designed to protect, maintain, or restore the habitat of living marine resources. The amendment responds to the Habitat Conservation Policy of the National Marine Fisheries Service, which advocates emphatic consideration of habitat concerns in the development or amendment of FMPs, and the strengthening of NMFS' partnerships with states and the councils on habitat issues. It also provides the necessary authorization for institution of marine debris restrictions and other regulations to protect the marine habitat.

IV. ALTERNATIVE MANAGEMENT MEASURES INCLUDING THOSE PROPOSED

Certain alternatives to each amendment proposal have been considered by the Council. A summary of each alternative, including those proposed, follows:

1. Establish a Gear and/or Area Restriction in the Sablefish Fishery.

(See RIR, Part II)

2. Establish quotas and areas in the rockfish fishery.

A. (Alternative 1) Maintain a gulfwide OY for other rockfish. This alternative would maintain status quo in the other rockfish fishery. Other rockfish could be harvested anywhere in the Gulf of Alaska up to a total all-species OY of 5000 mt. This alternative does not address the risk of overharvesting shelf demersal rockfish in the rapidly expanding southeastern fishery. Also, it does not address the potential problem of all of the other rockfish OY being harvested in one area of the Gulf and the negative impact that a Gulf-wide closure would have on target fisheries for rockfish and on other fisheries where other rockfish are landed as an incidental species.

B. (Alternative 2) Set the Southeast District shelf demersal rockfish OY at 600 mt between 56°N latitude and 57°30'N latitude with the remainder of the 5000 mt OY (4400 mt) to be taken elsewhere in the Gulf.

This alternative addresses the immediate management concern for the heavily exploited shelf demersal rockfish stocks in the northern southeast outercoastal area by placing a cap on the fishery at approximately the 1984 harvest level. However, the problems of the remainder of the quota being taken in a single management area and the need for separate management of the different species groups are not addressed. Included in this alternative would be the designation of two management districts (Southeast-East Yakutat and West Yakutat) within the Eastern Regulatory Area (Figure 1). The new rockfish district boundaries would be the same as those currently used to manage the sablefish fishery.

C. (Alternative 3) Set the Southeast District shelf demersal rockfish OY at 600 mt between 56°N latitude and 57°30'N latitude and set the OY for the pelagic and slope rockfish species within the district at 880 mt for a combined Southeast District OY of 1,480 mt. The remaining 3,520 mt could be harvested from the other areas of the Gulf. (Recommended by the Alaska Board of Fisheries).

1. Change the accounting year to October 1 through September 30 as part of this alternative. (Board recommendation).

2. Retain January 1 - December 31 as the accounting year.

This alternative addresses the immediate management concern for the heavily fished southeastern outercoastal stocks and sets the total OY for other rockfish in the new Southeast-East Yakutat District at 1,480 mt thus minimizing the potential for large rockfish harvests in other portions of the

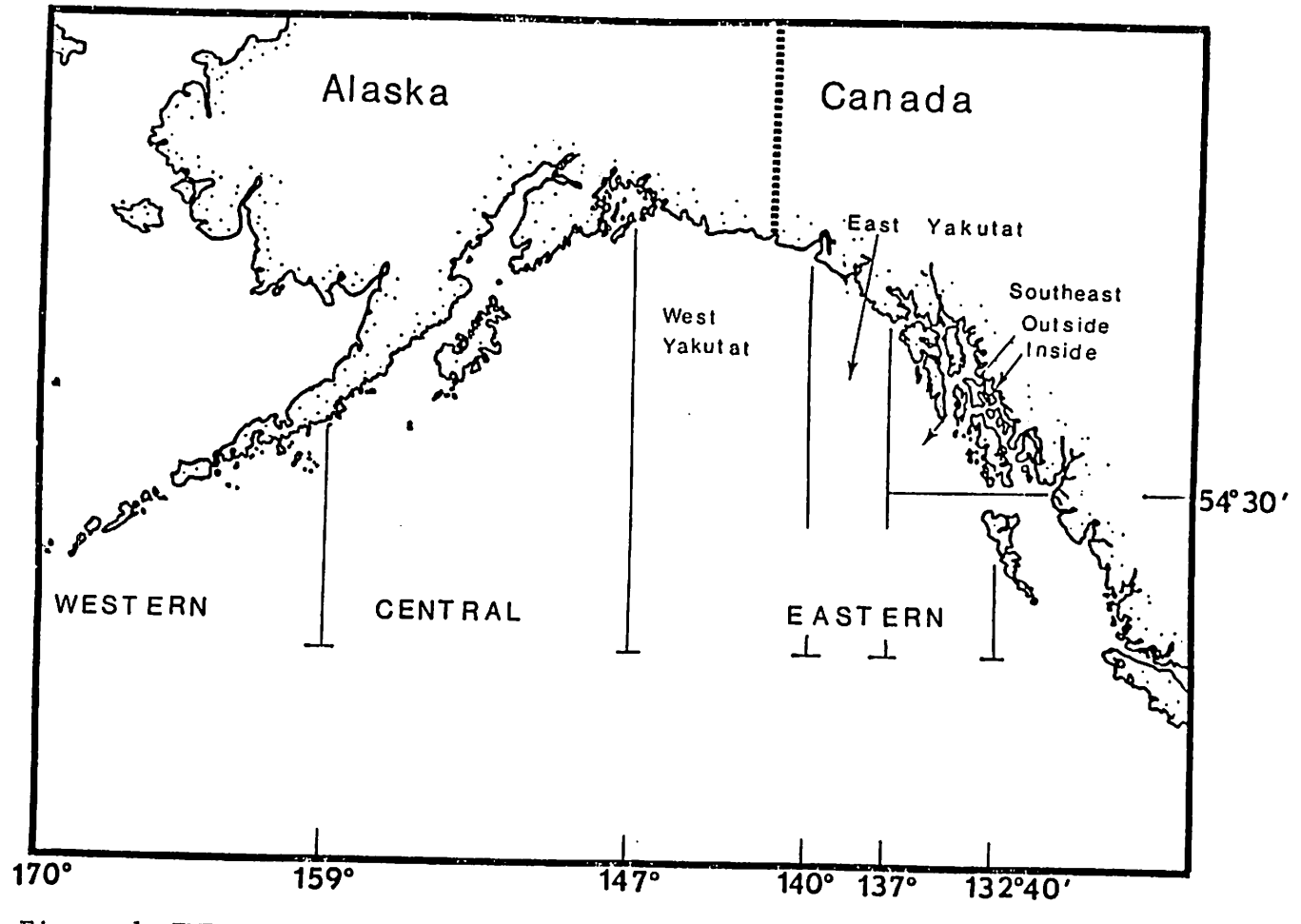


Figure 1. FMP Regulatory Areas and Districts

Gulf impacting the developing domestic fishery in the southeastern area. Conversely, it minimizes the potential for a rapidly harvested OY in the southeastern fisheries impacting fisheries for rockfish and other species where rockfish are landed in the remainder of the Gulf. Alternative 3 does not address the need to establish separate OYs for the three rockfish species groups and does not establish OYs for management area other than for the Southeast-East Yakutat District. Also, the 880 mt OY for the remainder of the Southeast District was derived by subtracting the recommended 600 mt quota for the northern southeast area from the 5,000 mt Gulfwide OY and dividing the remaining 4,400 mt into the five INPFC areas of the Gulf. This may not be an appropriate division of OY as rockfish abundance is not uniform Gulfwide. In addition option 1 presents the Board recommendation to provide a fall and winter fishery.

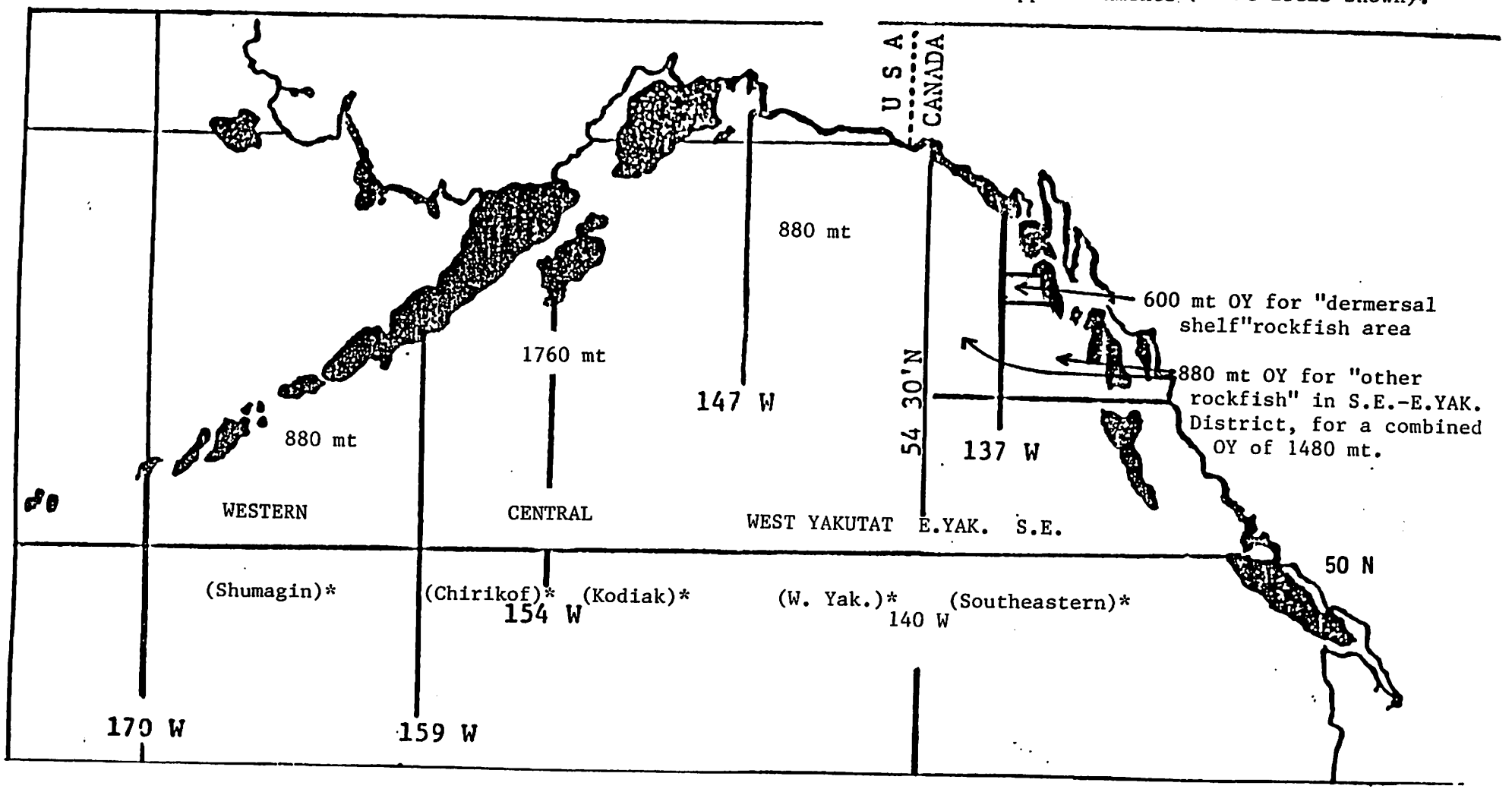
D. (Alternative 4) Set the shelf demersal rockfish OY at 600 mt for the area where the 1984 domestic fishery was concentrated and establish separate OYs for slope, shelf pelagic, and shelf demersal rockfish species groups by Gulf of Alaska management area based on the best available data.

Alternative 4 addresses the need for immediate management action in the southeastern area by establishing a 600 mt OY for demersal shelf rockfish. It would also provide the lowest risk of overharvesting OYs for the various species groups and management areas. Separation of OYs by species assemblage and management area based on catch history and survey data would be scientifically defensible and would provide for a more orderly fishery as target effort on certain stocks increases. However, a cursory review of the 1984 triennial survey data and the joint Japan/U.S. survey data for 1981-1983 was inconclusive beyond the fact that concentrations of shelf demersal species appear to be substantially higher in the Eastern Gulf and that very few shelf rockfish of either species group were caught in the Central or Western Gulf. It may be difficult to establish appropriate OYs for shelf pelagic and shelf demersal rockfish by management area with the existing data base.

E. (Alternative 5) Set the OY for shelf demersal rockfish at 600 mt between 56°N latitude and 57°30'N latitude. Subtract this amount from the Gulfwide OY of 5,000 mt and apportion the remaining 4,400 mt by regulatory area as follows: Southeast-East Yakutat 880 mt, West Yakutat 880 mt, Central Gulf 1,760 mt, and Western Gulf 880 mt.

Alternative 5 is similar to Alternative 3 by establishing a 600 mt OY for demersal shelf rockfish stocks located in the southeastern outercoastal waters between 56°N latitude and 57°30'N latitude and an 880 mt OY for other rockfish harvested from the remaining portion of the proposed Southeast-East Yakutat District. As mentioned previously, the 880 mt figure was calculated by subtracting 600 mt from the current Gulfwide OY of 5,000 mt and dividing the remainder by the five INPFC areas. This alternative goes beyond Alternative 3 by apportioning OY to each of the remaining management areas. The overlaying of INPFC areas on to the FMP management areas will produce a Western Area OY of 880 mt; a Central Area OY of 1,660 mt; and an 880 mt OY for the proposed West Yakutat District (Figure 2).

Figure 2. Proposed FMP Regulatory Areas/Districts for "Other Rockfish" with OY Apportionments (INPFC areas shown)*.



3. Implement new optimum yields for pollock, Pacific ocean perch, rockfish, Atka mackerel, and other species.

Certain alternatives for the OY changes for each species, including the preferred action, have been considered and are addressed as follows:

A. Pollock

1. (Alternative 1 = preferred action). Reduce the optimum yield for pollock to 305,000 mt in the Western/Central Area.

This alternative is preferred,because it recognizes the apparent weakness of the 1980 and 1981 year classes and that the 1985 harvest will likely be dependent on the 1978 and 1979 year classes, which are been in the fishery for four and three years, respectively.

2. (Alternative 2) Maintain the optimum yield at 400,000 mt.

This alternative is not acceptable, because over-exploitation of old and weak year classes would likely result.

B. Pacific ocean perch

1. (Alternative 1 = preferred action). Reduce the optimum yield for POP to 1,302 mt and 3,906 mt in the Western and Central Areas, respectively.

This is the preferred action, because it does allow for some rebuilding of stocks. Any lesser amounts would prove constraining to developing domestic fisheries while.

2. (Alternative 2) Maintain the optimum yields for POP at their existing levels.

This alternative would likely result in a continued decline in the condition of POP stocks and therefore is not acceptable.

C. Rockfish

1. (Alternative 1 = preferred action). Reduce the Gulf of Alaska-wide optimum yield for rockfish to 5,000 mt.

This alternative is preferred, because it accommodates some growth in small rockfish fisheries in the Central Regulatory Area, while accounting for the poor condition of stocks generally throughout the Gulf of Alaska.

2.(Alternative 2) Reduce the optimum yield to an amount that would provide for a bycatch only to support other target fisheries.

The total incidental catch of rockfish in 1984 was approximately 700 mt. To set the OY at this level in 1985 as a bycatch amount would severely constrain developing target rockfish fisheries in the Eastern and Central Regulatory Areas. This alternative, therefore, is unacceptable.

3. (Alternative 3) Maintain the optimum yield at 7,600 mt.

This alternative grossly exceeds the 1982-1984 average harvest of 1,500mt which currently represents the best estimate of EY for incidental slope rockfish. There is no evidence that a 7600mt harvest can be sustained even with the developing shelf rockfish fisheries.

D. Atka mackerel

1. (Alternative 1 = preferred action). Reduce the OYs in the Western and Central Areas to bycatch amounts only, or 100 mt and 10 mt, respectively. This alternative is preferred, because it reflects the current availability of stocks that is based on the best available information.

2. (Alternative 2) Maintain the OYs in the Western and Central areas at their current values of 20,836 mt and 3,186 mt, respectively.

This status quo alternative sets OYs equal to amounts that are not available for harvest, according to preliminary results of the 1984 triennial survey.

E. Other species

1. (Alternative 1 = preferred action). The other species OY is set equal to 5 percent of the total OYs for each of the other groundfish categories on the basis of an equation contained in the FMP. This is the only viable alternative under the current FMP.

4. Establish a Reporting System for Catcher/Processors

A. (Alternative 1) Maintain the current reporting requirements.

With the present system catches are reported on ADF&G fish tickets at the time of landing.

B. (Alternative 2) Require an FCZ processing permit with check-in/check-out and weekly catch reporting.

Under this alternative, catcher/processor and mothership/processor vessels would be required to obtain an FCZ processing permit. These catcher/processor and mothership/processor vessels would be required to notify NMFS via U.S. Coast Guard radio each time they entered or left an FMP management area. Catcher/processor and mothership/processor vessel operators or their representatives would also be required to submit a report to NMFS by Coast Guard radio, U.S. mail, or telex for each fishing week documenting the hail weight estimates of catch by FMP species group in each FMP area. These weekly reports would be due within 7 days of the end of the fishing week. ADF&G fish tickets would continue to be required to be submitted within one week of the date of landing to document more precise catch or product weights and specific ADF&G statistical areas. A completed logbook may be submitted with the ADF&G fish ticket showing total catch by species for a trip as a means of documenting catch by specific ADF&G statistical area.

C. (Alternative 3) Require an FCZ processing permit with a weekly catch report, but without check-in/check-out reporting.

Under this alternative, catcher/processor and mothership/processor vessels would be required to obtain an FCZ processing permit. These catcher/processor and mothership/processor vessel operators or their representatives would be required to submit a report to NMFS by Coast Guard radio, U.S. mail, or telex for each fishing week documenting the hail weight estimates of catch by FMP species group in each FMP area. These weekly reports would be due within 7 days of the end of the fishing week. ADF&G fish tickets would continue to be required to be submitted within one week of the date of landing to document more precise catch or product weights and specific ADF&G statistical areas. A completed logbook may be submitted with the ADF&G fish ticket showing total catch by species for a trip as a means of documenting catch by specific ADF&G statistical area.

D. (Alternative 4) Place observers aboard a portion of the catcher/processor and mothership/processor vessels and extrapolate the catch from these vessels to the entire fleet.

Under this alternative, catcher/processor and mothership/processor vessels would be required to obtain an FCZ processing permit which would require that observers be allowed onboard if requested. These catcher/processor and mothership/processor vessels would be required to notify NMFS via U.S. Coast Guard radio each time they entered or left an FMP management area. Observers would be placed aboard a portion of the catcher/processor and mothership/processor vessels. Radio reports of catch from the observed sample would be extrapolated to all vessels in each management area. ADF&G fish tickets would continue to be required to be submitted within one week of the date of landing to document more precise catch or product weights and specific ADF&G statistical areas. A completed logbook may be submitted with the ADF&G fish ticket showing total catch by species for a trip as a means of documenting catch by specific ADF&G statistical area.

E. (Alternative 5) Place observers aboard all catcher/processor and mothership/processor vessels.

Require catcher/processor and mothership/processor vessels to obtain an FCZ processing permit which would require that an observer be aboard at all times. Total catch would be computed directly from observer radio reports.

5. Establish Measures to Control the Pacific Halibut Bycatch

A large number of alternative management regimes exist that could be used to control the bycatch of halibut in the Gulf of Alaska groundfish fisheries. These include PSC limits, economic disincentives, gear restriction, time-area closures, and combinations of the above. Terry (1984) has qualitatively evaluated various measures and provided advantages and disadvantages of each measure. Generally, PSC limits or fees combined with exemptions for "clean" gear types provide the greatest benefits with the lease costs as long as observer coverage is adequate. Time/Area closures may be preferable if

observer coverage is poor. Three alternatives involving PSC limits and one alternative involving bycatch fees were examined. These include:

A. (Alternative 1) Maintain the Western and Central Gulf PSC Limits of 29 mt and 52 mt, respectively (Status Quo)

These PSC limits are in effect for six months of the year, December 1 - May 31. The PSC limits apply to both domestic and joint venture operations with one limit for each area. All domestic trawling would cease until June 1 in an area when the PSC limit is reached. This alternative would not address the problems identified in section II.

B. (Alternative 2) Raise the Western and Central Gulf PSC Limits to 270 mt and 768 mt, respectively (Currently implemented by emergency rule)

As with Alternative 1, the PSC limits would be in effect for six months of each year, December 1- May 31, and on-bottom trawling would cease until June 1 when a PSC limit is reached. The limit applies to both domestic and joint venture operations, with one PSC limit for each area. With this alternative, the PSC limits would be increased to reflect the growth in the domestic trawl fishery and the higher abundance of halibut in the Gulf of Alaska.

C. (Alternative 3) Develop a Framework Procedure for the Annual Adjustment of PSC Limits.

Such a framework may include PSC limits that are effective for twelve months each year. Off-bottom and on-deck sorting operations could be exempt from the PSC limit. An option for a separate PSC by operation and transferable PSCs could also be designed. This option might allow an operation to continue fishing after its individual PSC limit is reached by requiring the vessel to switch to off-bottom gear. The framework would be specified in the FMP for determination of the PSC. The process and factors would be identified in a general way.

D. (Alternative 4) Establish bycatch fees

This alternative would set a fee per metric ton of halibut caught. Such a program might include a framework procedure to periodically determine the fee. Fishing operations with on-deck sorting could be exempt.

6. Implement the NMFS Habitat Policy

A. (Alternative 1 = preferred action) Amend the FMP to address habitat considerations, based on the best available information, to meet standards set forth in the National Marine Fisheries Service's Habitat Conservation Policy.

This alternative is preferred, because it provides a basis for better conservation and management of the Gulf of Alaska groundfish fishery.

B. (Alternative 2) Do not amend the FMP to address habitat considerations.

This alternative is not acceptable, because conservation and management of the fishery resources requires increased understanding of habitat issues. Adoption of this policy is mandated by law.

V. REGULATORY IMPACTS OF THE AMENDMENT PROPOSALS AND THEIR ALTERNATIVES

1. Establish a Gear and/or Area Restriction in the Sablefish Fishery.

(See RIR - Part II)

2. Rockfish Quotas and Management Areas

There is a real need for management action in this fishery. The risk of overharvest in the domestic shelf demersal rockfish fishery is great. Because of that risk the OY in the area where the 1984 fishery was concentrated should not exceed the 1984 harvest level of approximately 600 mt round weight.

Little is known about the abundance of shelf demersal rockfish in other areas of the Gulf or of shelf pelagic rockfish anywhere in the Gulf. The original OY for other rockfish was based on incidental catch of slope rockfish only. As pointed out in the November Team report, the predominant species in the incidental slope rockfish landings have since been incorporated into the POP complex or assigned to another separate species group (Sebastolobus sp.). There is no evidence that a 5000 mt OY can be maintained for other rockfish.

Trawl surveys and the cooperative Japan/U.S. longline surveys have not been designed to sample the abundance of shelf rockfish. The average depth of the shallowest end of the longline rockfish and the joint Japan/U.S. longline survey set at average is greater than the depth that many of the shelf species inhabit. Therefore, there is little hope of determining appropriate harvest levels based on the existing survey data. Also, until recently there was no fisheries data on the shelf species and what little does exist is limited to only demersal species in a portion of their range.

The three species groups that make up the current other rockfish category have been defined. A list of species by category was presented in Table 1. If separate OYs are established, it will bring the total number of rockfish species categories in the Groundfish FMP to five including the POP complex and the thornyhead complex that are already in the FMP. Because of some species overlap and the lack of data mentioned previously, it will be difficult to assign scientifically defensible ABC levels for most species groups.

Alternatives 2, 3, and 4 place a limit on the catch of shelf demersal rockfish at approximately the 1984 harvest level for the fishery operating along the outer coast of the Baranof and Chichagof Islands. With continued expansion of fishing effort, the 600 mt OY would likely be achieved prior to the end of the accounting year. If this occurs, the fishery can continue by expanding north of 57°30'N latitude and south of 56°N latitude. This will increase travel time to the new grounds by fishing vessels operating out of Sitka, thereby increasing the costs and hazards of fishing, but it will not prevent additional growth in the fishery operating along the outer coast. The 600 mt

limit in this proposed management area will provide the time to assess the impact of a 600 mt harvest on the rockfish stocks which are highly susceptible to overfishing. Due to the complexity of the problem, the lack of data for many of the species involved, and the biology of these fish that makes them so vulnerable to overexploitation, it would to be in the best interest of this valuable resource and the developing domestic fishery to assign OY values at very low levels until the needed stock status data can be obtained.

If either amendment 3 or 4 are adopted for Groundfish FMP for 1985, all of the existing data should be carefully analyzed to determine if ABC levels for the various species groups can be calculated by area. Where gaps exist data needs should be determined and studies designed to furnish the needed data. The rockfish fisheries are expected to expand rapidly and stock status data are essential for orderly development of a sustained domestic multispecies fishery.

3. Implement New Optimum Yields for Pollock, Pacific Ocean Perch, Rockfish, Atka mackerel, and Other Species.

A. Reduce the optimum yield for pollock from 400,000 mt to 305,000 mt in the Western/Central Regulatory Area.

Costs

Risk of overfishing - Under this alternative, the OY is reduced 24 percent from its present level. If it were fully harvested, however, the OY would represent a 1 percent increase over the actual 1984 harvest, which equaled the sum of U.S. and foreign harvests of 202,700 mt and 99,200 mt, respectively, or 301,900 mt. The OY is based on the best available scientific information. This information was mostly derived from the hydroacoustic surveys conducted in an area (Shelikof Strait) where pollock were concentrated, making biomass estimates more reliable. Although some risk of overfishing exists because biological information always includes a degree of uncertainty as to its accuracy, this OY is based on a very conservative exploitation rate that reflects that this fishery is now dependant on only two year classes and continuing poor recruitment. The risk of overfishing is believed, therefore, to be small.

Impact on prices - Assuming the entire 305,000 mt of the pollock OY were caught, the 95,000 mt decrease from the present OY of 400,000 mt represents only 6.4 percent of the 1984 U.S. and foreign 1,474,000 mt pollock catch from the FCZ off Alaska and only 2.1 percent of the 1982 worldwide total pollock catch , which was about 4.5 million mt. The amount of the pollock decrease, therefore, is likely too small to influence price at any level.

Foreign fees - Of the 305,000 mt OY, only 25,000 mt will be apportioned initially to TALFF; an additional 23,129 mt is apportioned to the reserve, which could be reapportioned to TALFF during the fishing year if not needed by U.S. fishermen. Foreign nations must pay a poundage fee (in $ per mt) for amounts of groundfish they actually harvest. Assuming foreign nations harvest all of the 25,000 mt, the Federal government would receive $800,000 in foreign fees based on the 1985 foreign fee schedule for pollock of $32/mt. Depending on how much of the 23,129 mt reserve is allocated to and caught by foreign nations, the Federal government could receive an additional $740,000. This

alternative OY, however, results in a 95,000 mt decrease in a potential foreign harvest that could have generated an additional $3 million in foreign fees if it all were allocated to and harvested by foreign nations. This amount, then, represents an upper bound cost of this alternative.

Benefits

Species conservation - This alternative is a management and conservation measure that will promote the economic well-being of the commercial fisheries that are being , or have, developed to profit from pollock. The best available information indicates that the lowest exploitable biomass that can be tolerated without inducing drastic effects on the pollock stocks, as well on other animal populations that depend on pollock, is about 600-700 thousand mt. A catch level in 1985 equal to about 305,000 mt will likely reduce the exploitable biomass to about 800,000-900,000 mt in 1986, i.e., an amount higher than the 600,000-700,000 mt threshold that would harm the resource. Higher catch levels, then, could jeopardize the health of the resource to a point where allowable catches should be reduced to zero. The entire OY, if harvested by U.S. fishermen, is worth about $40 million, ex-vessel value. This amount is an estimate of the minimum benefit conveyed to the Nation as a result of successful protection of the pollock resource as a result of this alternative.

Conservation of prohibited species - Any catches of prohibited species, i.e., Pacific halibut, salmon, king crab, and Tanner crab, which are not allowed to be retained in the groundfish fisheries, must be discarded. Because U.S. fishermen trawling for pollock typically use off-bottom or pelagic trawls, few prohibited species are caught as compared to foreign nations that have been major harvesters of pollock in past years. If a biological conservation need had not dictated the 95,000 mt decrease in the pollock OY, and this amount were declared available to TALFF for harvest by traditional bottom trawl harvest methods, then amounts of prohibited species can be estimated from amounts of these species taken incidentally while trawling for pollock in 1984 (Table 2). On the basis of weighted averages calculated from 1984 data, 475 mt of halibut, 38 mt of salmon, 4 mt of king crab, and 2 mt of Tanner crab could have been taken. To the extent that this scenario will not happen is a benefit under this alternative.

Table 2. Foreign trawl catches (mt) of prohibited species and pollock in the Western/Central Regulatory Area in 1984.

	Pollock	Halibut	Salmon	King crab	Tanner crab
Japan	57,363.3	298.9	14.2	4.3	2.3
ROK	38,553.5	205.0	3.6	0.0	0.2
Poland	2,793.9	3.6	18.8	0.0	0.0
TOTAL	98,710.7	507.5	36.6	4.3	2.5

B. Maintain the optimum yield at 400,000 mt.

Costs

Risks of overfishing - The effects of maintaining the optimum yield at its status quo level of 400,000 mt are uncertain. The exploitable biomass could decline to unacceptable levels it this amount were actually harvested in 1985, but other factors, eg. predation by Pacific halibut and Pacific cod, make reliable predictions difficult. The increased availability of pollock during the years 1977-82 could have caused an significant, albeit lagged, increase in predator populations. Predators will now be taking a relatively greater percentage of pollock as numbers of pollock decline until numbers of predators also decline. Suffice it to say that any harvest amount above 305,000 mt will cause the exploitable biomass to approach the minimum threshold level of 600-700 thousand mt at a faster rate, which will increase the level of overfishing.

Impact on prices - If the resulting 1985 harvest actually equaled this alternative, it would represent an increase above the 1984 total harvest of about 100,000 mt. This amount would only represent about 2 percent of the total worldwide production of 4.5 million mt. Although more pollock would be available under this alternative , the additional amount is likely too small to significantly influence price.

Species conservation - This alternative would not be consistent with the best available information concerning the status of the pollock resource, which indicates that the harvest should be curtailed in response to few supporting year classes and poor recruitment. The upper end of the maximum sustainable yield for pollock is 344,000 mt, which at an ex-vessel value of $0.06/pound, should be worth $45 million. To the extent that a harvest of 400,000 mt is in excess of MSY and jeopardizes a maximum sustainable return to the fishing industry is a cost under this alternative.

Conservation of prohibited species - The benefits identified for the alternative of setting the OY at 305,000 mt would now be costs under this

alternative. If an additional 95,000 mt of pollock were made available to foreign fisheries - a reasonable expectation at present, because this amount appears excess to the needs of U.S. fishermen - additional amounts of prohibited species would be caught, estimated at: 475 mt of halibut, 38 mt of salmon, 4 mt of king crab, and 2 mt of Tanner crab. These species bring a high return to U.S. fishermen, which must be foregone under this alternative.

Benefits

Foreign fees - Under this alternative, an additional 95,000 mt could be allocated to foreign nations if it were not needed by U.S. fishermen. If all this additional amount were actually harvested, the Federal government could receive in $3 million.

C. Changes in optimum yields for POP, rockfish, and Atka mackerel.

1. Reduce the optimum yields for POP, Other Rockfish, and Atka Mackerel as stated under the preferred alternative.

Costs

Risks of over fishing - 1. POP. The OYs adopted by the Council in the Western and Central Regulatory Areas are substantially higher than those amounts that would have been sufficient for bycatches to support other domestic target fisheries. POP catches in a pollock fishery can be quite small; conversely, POP catches in a flounder fishery can be quite large. For instance, in 1984 joint venture catches of POP in the pollock fishery ranged from a trace to 0.2% of the pollock catch; monthly catches of POP in the flounder fishery ranged from 1% to 33% of the flounder catch.

Impact on prices - 1. The total reductions of the POP, rockfish, and Atka mackerel OYs are equal to 5,392, 2,600 mt, and 23,912 mt, respectively. World-wide data are not available to compare the amounts of these reductions with world-wide harvests to estimate the impact of these reductions on prices. On the other hand, actual 1984 harvests of these species were only 4,358 mt, 1,332 mt, and 1,143 mt (Table 3).

Table 3. 1984 catches (mt) of POP, rockfish, and Atka mackerel in the Gulf of Alaska by domestic, joint venture, and foreign fishermen.

	POP	Rockfish	Atka mackerel
Domestic	120	632	31
Foreign	2,580	414	536
Joint venture	1,658	286	576
Total	4,358	1,332	1,143

The new OYs are not large changes in terms of magnitude from 1984 catches, especially compared to the total 2.4 million mt of groundfish available for harvest off Alaska, and likely represent amounts too small to affect prices.

Foreign fees - The respective poundage fees that foreign fishermen must pay to the Federal government for POP, rockfish, and Atka mackerel are $100 /mt, $94/mt, and $52/mt. If the OYs were not reduced and if surplus amounts, i.e., amounts not needed by U.S. fishermen (currently set at 6,181 mt, 4,733 mt, and 3,808 mt, respectively) were allocated to, and actually caught by foreign fishermen, then the Federal government could have collected fees equal to $540,000, $244,000, and $1.2 million, respectively.

Benefits

The reductions in OYs for POP, rockfish, and Atka mackerel are conservation and management measures calculated to prevent potential harm to the resource that could otherwise occur if fishing effort were actually applied to harvest the current OYs. These measures are calculated to protect commercially important species; such measures employed over the long-term could theoretically result in stock recovery to maximum sustainable yields (MSYs). These amounts represent upper bound benefits that could be achieved under this alternative.

2. Reduce the optimum yields for POP, rockfish, and Atka mackerel to levels that would provide for bycatches in other target fisheries.

Costs

Catches of POP, rockfish, and Atka mackerel are caught incidental to a flounder fishery in significant amounts. Data from the 1983 Japanese trawl fisheries show that bycatch rates in a flounder fishery can range from 0.63 to 0.92 for POP; 0.10 to 0.23 for rockfish; and 0.20 to 0.56 for Atka mackerel. On the other hand, catches of these species in a pollock fishery are small. Data from the 1983 Japanese trawl and joint venture (all nation) fisheries show by-catch rates ranging from 0.002 to 0.01 for POP; 0.001 to 0.002 for rockfish; and 0.006 to 0.008 for Atka mackerel (Table 4). If bycatch amount were set to be as "clean" as possible, eg. employing those rates experienced in the pollock fishery, then premature closures of the flounder fishery could result. Also, the Council recommended that sufficient bycatches be provided so as not to overly restrict the newer fisheries in which fishermen may not have the necessary experience to avoid POP, rockfish, and Atka mackerel. Assuming U.S. fishermen inadvertently harvested small bycatches prematurely, and thus were forced to terminate a flounder fishery, some amount of the flounder harvest up to an amount short of the OY itself, could be foregone by U.S. fishermen. At an ex-vessel price of about $0.30/lb. for flounder, U.S. fishermen could forego an amount equal to about $27 million.

Table 4. 1983 groundfish catches (mt) by Japanese and joint venture trawlers in the Gulf of Alaska. (Numbers in parentheses are percentages.)

	Japan Trawl Vessel Class			
	Small	Surimi	Lg. Freezer	Joint Venture
Pollock	10,582	31,507	5,280	134,131
Flounder	2,297	204	3,751	2,691
POP	1,442 (63)	38 (.2)	3,448 (92)	1,974 (1)
Rockfish	229 (10)	32 (.1)	845 (23)	289 (.2)
Atka mackerel	445 (20)	239 (.8)	2,109 (56)	789 (.6)
	(*)	(**)	(*)	(**)

Note: (*) percent of flounder
(**) percent of pollock

Foreign fees - Bycatch rates in Table 4 are reasonable estimates to calculate bycatch amounts that would be needed to support a flounder fishery hence only a total of 7,150 mt (OY-DAH) of flounder are currently available for apportionment to TALFF, at least 4,500 mt of POP, 700 mt of rockfish, and 1,430 mt of Atka mackerel might be needed to support a flounder harvest of 7,150 mt. The differences between these amounts and the amounts of OY reductions are 693 mt of POP, 1900 mt of rockfish, and 22,482 mt of Atka mackerel, respectively. If the OYs were not reduced and U.S. fishermen did not require the surplus then these amounts might have been available for a directed fishery by foreign nations. If these amounts were actually available to, and were harvested by, foreign fisheries, the Federal government would receive about $87,200, $178,000, and $3.4 million in foreign fees.

Benefits

As in the above Alternative, reduced OYs for POP, rockfish, and Atka mackerel are conservation and management measures calculated to protect these species. To the extent that this alternative will allow faster rebuilding of these stocks to former, more productive, levels is a benefit of this alternative.

4. Establish a reporting system for catcher/processors.

A. (Alternative 1) Maintain the status quo system with catches reported on ADF&G fish tickets at the time of landing.

Because catch reports are not required until the time of landing under the current regulatory regime, OYs will almost always be exceeded before a fishery closure order can be issued. Given the large hold capacity of the current catcher/processor and mothership/processor fleets and the rapid expansion of these fleets, the risks of overfishing and reducing stock production in future years is high. Under the current regulations, fishery managers have no

knowledge of fishing effort by area prior to the time of landing by each vessel and are therefore not able to project catches based on past performance.

Under this alternative, as well as under all alternatives which do not require onboard observers, discarded prohibited species catches will remain largely unaccounted for. Prohibited species caught and discarded at sea usually have high mortality rates, especially for trawl gear catches. Prohibited species catches as well as discard mortality of unwanted species is largely unaccounted for under the present system. In certain few cases, prohibited species catches can be extrapolated from data provided from the limited observer program of ADF&G or from the NMFS foreign and joint venture observer program. Prohibited species catches can easily be illegally retained, landed and sold by catcher/processors under the current regulatory and enforcement system.

Enforcement of regulations prohibiting catches of species after fishery closure orders have been issued is extremely difficult under the present system. Because there is no existing method of tracking or even identifying catcher/processor vessels on the fishing grounds, it is difficult to locate, board and inspect the holds of these vessels on the fishing grounds or in port during the infrequent landings of these vessels. Because of the duration of fishing trips by catcher/processor vessels, these vessels retain large quantities of legally caught catches in their holds long after fisheries for certain species have been closed but prior to their subsequent landing and offloading. Enforcement of fishery closure regulations by hold inspections is extremely difficult under these conditions.

The reporting burdens placed on fishing vessels under the current regulations are minimal. Vessels are required to fill out an ADF&G fish ticket or provide equivalent information within 7 days of the date of landing or delivering their catch. ADF&G fish tickets require vessels to identify the vessel, operator, processor, gear(s) used, and catch by species in each ADF&G statistical area fished for the duration of the trip. Catches are not required to be subdivided into time units smaller than the duration of the trip. Vessels which are leaving Alaskan waters to deliver to ports outside the state of Alaska are required to notify ADF&G or NMFS of their departure prior to leaving the FCZ. Very few vessels have abided by this regulation in the past. The regulation is very difficult to enforce without prior knowledge of which vessels are capable of delivering catches outside of the state of Alaska.

b. (Alternative 2) Require FCZ processing permit with check-in/check-out and weekly catch report.

Under this alternative vessels would be required to obtain a permit to process their catch in the FCZ. The permit would serve to identify those vessels which would be required to participate in the additional reporting programs. Each time one of these vessels enters or leaves an FMP management area (an area for which a quota is defined), they would be required to notify NMFS via U.S. Coast Guard radio. These vessels would also be required to submit a report to NMFS by Coast Guard radio, U.S. mail, or telex for each fishing week documenting the hail weight estimates of catch by FMP species group in each FMP area. These weekly reports would be due within 7 days of the end of the fishing week. The medium by which the catch reports are submitted is up to

the discretion of the vessel operator. Large catcher/processor and mothership/processor operations usually maintain home port offices which are in at least weekly contact with their vessels. Catch reports could be submitted by these offices via telex, telephone, or U.S. mail. Smaller operations without frequent home office contact would have to contact NMFS via U.S. Coast Guard radio.

Under this alternative, as well as under all alternatives which do not require onboard observers, discarded prohibited species catches will remain largely unaccounted. Prohibited species caught and discarded at sea usually have high mortality rates, especially for trawl gear catches. Prohibited species catches as well as discard mortality of unwanted species is largely unaccounted for under the present system. In certain few cases, prohibited species catches can be extrapolated from data provided from the limited observer program of ADF&G or from the NMFS foreign and joint venture observer program. Prohibited species catches can easily be illegally retained, landed and sold by catcher/processors under the current regulatory and enforcement system.

Under this alternative, fishery managers would be provided with estimates of catch aboard from FCZ domestic processing vessels that were no more than two weeks old. With the check-in/check-out reporting requirement, projections of catch within the most recent two week period could be made based on past performance. This method would allow fishery managers to estimate the date when OYs would be achieved with a moderate level of precision.

With the check-in/check-out reporting requirement, catch reporting by area fished can be enforced. The locations of vessels boarded at sea or sighted from enforcement overflights could be checked against the check- in/check-out list for verification. Without the check-in/check-out requirement, vessels could easily alter the reported area of fishing on the weekly catch report in the rare event of an enforcement boarding or overflight observation. The check-in/check-out requirement would also enable enforcement officials to be notified of upcoming landings so that hold inspections could be performed at the port of landing. Hold inspections performed at the port of landing impose far less burden on fishing vessels than at-sea boardings and are much less expensive to implement. Weekly catch reports would be verified against ADF&G fish tickets which would be submitted at the time of landing. Spot checking of catches from hold inspections performed at the port of landing could be used to verify the fish ticket information.

The catch data in the weekly catch reports would be based on skipper's estimates of catch weights or "hail weights" by species group and management area. Fishing vessels do not weigh their catch at sea and can only estimate "hail weights" from experience. At the time vessels offload their catch, more accurate weights are obtained and these are recorded on the fish ticket, presently required under state and federal regulations, which is forwarded to ADF&G. It is always desirable to update the "soft" data obtained from "hail weights" with the more accurate weights and specific statistical areas obtained from fish tickets.

C. (Alternative 3) Require an FCZ processing permit with a weekly catch report, but without check-in/out.

Under this alternative vessels would be required to obtain a permit to process their catch in the FCZ. The permit would serve to identify those vessels which would be required to participate in the weekly catch reporting programs. These vessels would then be required to submit a report to NMFS by Coast Guard radio, U.S. mail, or telex for each fishing week documenting the hail weight estimates of catch by FMP species group in each FMP area. These weekly reports would be due within 7 days of the end of the fishing week. The medium by which the catch reports are submitted is up to the discretion of the vessel operator. Large catcher/processor and mothership/processor operations usually maintain home port offices which are in at least weekly contact with their vessels. Catch reports could be submitted by these offices via telex, telephone, or U.S. mail. Smaller operations without frequent home office contact would have to contact NMFS via U.S. Coast Guard radio.

Under Alternative 3, as well as under all alternatives which do not require onboard observers, discarded prohibited species catches will remain largely unaccounted for. Prohibited species caught and discarded at sea usually have high mortality rates, especially for trawl gear catches. Prohibited species catches as well as discard mortality of unwanted species is largely unaccounted for under the present system. In certain few cases, prohibited species catches can be extrapolated from data provided from the limited observer program of ADF&G or from the NMFS foreign and joint venture observer program. Prohibited species catches can easily be illegally retained, landed and sold by catcher/processors under the current regulatory and enforcement system.

Under this alternative, fishery managers would be provided with estimates of catch aboard from FCZ domestic processing vessels that were no more than two weeks old. Fishery managers would make projections of current catch based on past performance and the two week old effort distribution provided in the weekly catch reports.

Without the check-in/check-out reporting requirement, catch reporting by area is more difficult to enforce. The locations of vessels boarded at sea or sighted from enforcement overflights could only be checked against areas fished that are reported at the end of each week. Vessels could easily alter the reported area of fishing on the weekly catch report in the rare event of an enforcement boarding or overflight observation. The current FCZ checkout regulation could enable enforcement officials to be notified of upcoming out-of-state landings so that hold inspections could be performed at the port of landing. However, lacking knowledge of the vessels which are actually operating in an area, the current check-out regulation has been difficult to enforce. Hold inspections performed at the port of landing impose far less burden on fishing vessels than at-sea boardings and are much less expensive to implement. Weekly catch reports would be verified against ADF&G fish tickets which would be submitted at the time of landing. Spot checking of catches from hold inspections performed at the port of landing could be used to verify the fish ticket information.

The catch data in the weekly catch reports would be based on skipper's estimates of catch weights or "hail weights" by species group and management

area. Fishing vessels do not weigh their catch at sea and can only estimate "hail weights" from experience. At the time vessels offload their catch, more accurate weights are obtained and these are recorded on the fish ticket, presently required under state and federal regulations, which is forwarded to ADF&G. It is always desirable to update the "soft" data obtained from "hail weights" with the more accurate weights and specific statistical areas obtained from fish tickets.

D. (Alternative 4) Place observers aboard a small sample of catcher/processor vessels and mothership/processors and extrapolate the catch from these vessels to the entire fleet.

Under this alternative vessels would be required to obtain a permit to process their catch in the FCZ. The conditions of the permit would require observers to be allowed onboard, if requested. All processing vessels would be required to notify NMFS via U.S. Coast Guard radio each time they entered or left an FMP management area. Observers would be placed aboard a sample of catcher/processors and mothership/processors. Observers would radio catch reports to fishery managers on a weekly basis. The observed catch sample would be extrapolated to the total catch in an FMP management area based on the ratio of sampled effort to total effort as determined from the vessel check-in/check-out system.

Observer derived samples provide the most accurate estimates of total catch of the alternatives. Observer samples estimate catch of all species, including prohibited species and unwanted legal species or sizes that are discarded. Observer samples would also provide the least time delay in catch reporting of the alternatives, at a maximum lag of one week. However, observer derived catch sampling is by far the most expensive of the alternatives. Based on the performance of the foreign and joint venture observer programs, observers would have to be placed aboard at least 30% of the vessels in the fleet in order to provide catch estimates with sufficient precision. Reporting burdens place on vessel operators are reduced under this alternative since no in-season catch reporting is required of the vessel operator. Vessel operators would still have to notify NMFS each time they entered or left an FMP area. Because of cramped living conditions aboard most domestic fishing vessels, vessel operators would be burdened to some extent by the presence of the observer aboard, even if reimbursed for the living expenses of the observer.

E. (Alternative 5) Place observers aboard all catcher/processor and mothership/processor vessels.

Under this alternative vessels would be required to obtain a permit to process their catch in the FCZ. The conditions of the permit would require an observer to be taken aboard at all times. Observers would radio catch reports to fishery managers on a weekly basis. Catches within areas could be computed by fishery managers as total counts.

Observer derived samples provide the most accurate estimates of total catch of the alternatives. Observer samples estimate catch of all species, including prohibited species and unwanted legal species or sizes that are discarded. Observer samples also provide the least delay in catch reporting of the alternatives, at a maximum lag of one week. Placing observers aboard all catcher/processor and mothership vessels could be prohibitively expensive.

Reporting burdens placed on vessel operators are minimal under this alternative since no in-season reporting is required of the vessel operator. Vessels would not be required to check in or out of FMP areas since the observer reports would contain this information for all vessels. Because of cramped living conditions aboard most domestic fishing vessels, vessel operators would be burdened to some extent by the presence of the observer aboard, even if reimbursed for the living expenses of the observer.

5. Establish Measures to Control the Pacific Halibut Bycatch

The following discussion of potential elements of halibut bycatch management regimes is in the order in which these elements are listed in Section IV, Part 5.

A. PSC Units of Measure

Although a rate may be used to determine a numerical PSC, a PSC in terms of a rate may be difficult to implement. For example, if sanctions are to be imposed when a specific rate is exceeded, there is the problem of determining how frequently the actual bycatch rate would be calculated and compared to the specified rate. The comparison could be made each tow, day, week, month, 1,000mt, etc.. and when the comparison is made and the actual rate is found to exceed the specified rate there is the additional problem of deciding if the groundfish fleets should be given another chance to reduce the actual rate or if the fleets can start over again with a clean slate in a later period or different area. Another disadvantage is that a PSC rate does not put a direct limit on bycatch. This is because with a PSC rate limit, bycatch can increase proportionally with the groundfish catch. However, if the rate is adjustable and partly based on expected groundfish catch, this problem may be minimal. An advantage of having the limits defined in terms of a rate is that, if the limit is not frameworked and if it is desirable to allow bycatch to increase proportionally with groundfish catch, the use of a rate provides flexibility that would not otherwise be available.

The advantage of stating a PSC in terms of metric tons as opposed to stating it in terms of numbers of halibut is that the estimated potential loss in target halibut catch resulting from bycatch mortality is much more stable by weight than by number as the age at bycatch changes. Specifically, based on an annual natural mortality rate of 0.2, average weight-at-age data, and a terminal fishery age of 11, it is estimated that the potential loss per metric ton ranges from 3.3 mt for age 4 halibut to 1 mt for age 11 halibut while the potential loss per 1,000 fish of bycatch ranges from 4.6 mt to 21.7 mt, respectively, for bycatch ages of 4 and 11 (see Table 5). This difference in potential loss per unit of bycatch as bycatch age changes may be at least partially offset by lower discard mortality rates for older fish. Conclusive evidence concerning discard mortality and its dependence on age is not available. It has been suggested that bycatch numbers are more readily available than weights; however, The NMFS Observer Program has indicated that either measure is readily available for a vessel with an observer. It should be noted that the IPHC estimates of annual surplus production and bycatch and the resulting halibut quotas are in terms of weight. If the objective is to control the impact of bycatch on the halibut fishery, it may be appropriate to eliminate the instability problem further by defining PSC limits in terms of estimated impacts.

TABLE 5-- ESTIMATED REDUCTION IN RESOURCE AVAILABILITY RESULTING FROM BYCATCH MORTALITY MEASURED IN METRIC TONS AND NUMBERS OF HALIBUT FOR VARIOUS BYCATCH AND TERMINAL FISHERY AGES.

LOSS IN METRIC TONS PER METRIC TON OF BYCATCH

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
4	1.00	1.58	2.17	2.69	3.07	3.29	3.36	3.30	3.13	2.89	2.61	2.32	2.03	1.75	1.49	1.26	1.06	0.88	0.73
5		1.00	1.37	1.70	1.94	2.08	2.12	2.08	1.98	1.83	1.65	1.47	1.28	1.10	0.94	0.80	0.67	0.56	0.46
6			1.00	1.24	1.41	1.51	1.55	1.52	1.44	1.33	1.20	1.07	0.93	0.80	0.69	0.58	0.49	0.40	0.34
7				1.00	1.14	1.22	1.25	1.23	1.16	1.08	0.97	0.86	0.75	0.65	0.55	0.47	0.39	0.33	0.27
8					1.00	1.07	1.10	1.07	1.02	0.94	0.85	0.76	0.66	0.57	0.49	0.41	0.34	0.29	0.24
9						1.00	1.02	1.00	0.95	0.88	0.79	0.70	0.62	0.53	0.45	0.38	0.32	0.27	0.22
10							1.00	0.98	0.93	0.86	0.78	0.69	0.60	0.52	0.44	0.37	0.31	0.26	0.22
11								1.00	0.95	0.88	0.79	0.70	0.61	0.53	0.45	0.38	0.32	0.27	0.22
12									1.00	0.92	0.84	0.74	0.65	0.56	0.48	0.40	0.34	0.28	0.23
13										1.00	0.90	0.80	0.70	0.60	0.52	0.44	0.37	0.30	0.25
14											1.00	0.89	0.78	0.67	0.57	0.48	0.40	0.34	0.28
15												1.00	0.87	0.75	0.64	0.54	0.46	0.38	0.31
16													1.00	0.86	0.74	0.62	0.52	0.43	0.36
17														1.00	0.85	0.72	0.60	0.50	0.42
18															1.00	0.84	0.71	0.59	0.49
19																1.00	0.84	0.70	0.58
20																	1.00	0.83	0.69
21																		1.00	0.83
22																			1.00

LOSS IN METRIC TONS PER 1,000 HALIBUT OF BYCATCH

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
4	1.38	2.18	3.00	3.71	4.24	4.55	4.64	4.55	4.32	3.99	3.61	3.20	2.80	2.41	2.06	1.74	1.46	1.21	1.01
5		2.73	3.75	4.64	5.30	5.68	5.80	5.69	5.40	4.99	4.51	4.00	3.50	3.02	2.57	2.17	1.82	1.52	1.26
6			4.69	5.80	6.62	7.10	7.25	7.11	6.75	6.24	5.64	5.00	4.37	3.77	3.22	2.72	2.28	1.90	1.57
7				7.25	8.28	8.88	9.07	8.89	8.44	7.80	7.05	6.26	5.47	4.71	4.02	3.40	2.85	2.37	1.96
8					10.35	11.10	11.33	11.11	10.55	9.75	8.81	7.82	6.83	5.89	5.03	4.25	3.56	2.97	2.46
9						13.87	14.16	13.89	13.19	12.19	11.02	9.78	8.54	7.37	6.28	5.31	4.45	3.71	3.07
10							17.71	17.36	16.48	15.23	13.77	12.22	10.68	9.21	7.85	6.64	5.56	4.63	3.84
11								21.71	20.60	19.04	17.21	15.27	13.34	11.51	9.82	8.30	6.96	5.79	4.80
12									25.76	23.80	21.52	19.09	16.68	14.39	12.27	10.37	8.69	7.24	6.00
13										29.75	26.90	23.87	20.85	17.98	15.34	12.96	10.87	9.05	7.50
14											33.62	29.83	26.06	22.48	19.18	16.20	13.58	11.31	9.37
15												37.29	32.58	28.10	23.97	20.25	16.98	14.14	11.71
16													40.72	35.12	29.96	25.32	21.23	17.68	14.64
17														43.91	37.45	31.65	26.53	22.10	18.30
18															46.82	39.56	33.17	27.62	22.87
19																49.45	41.46	34.53	28.59
20																	51.82	43.16	35.74
21																		53.95	44.68
22																			55.85

B. Under the current FMP the halibut PSC limits are in effect for domestic groundfish vessels from December 1 through May 31.

The purpose of this regulation was to allow domestic vessels to fish with on-bottom gear during a period in which foreign on-bottom trawling was prohibited if the domestic vessels could maintain low levels of bycatch. Therefore, at the time it was implemented there was a rationale for limiting the PSC to a six month period. This rationale has been eliminated because beginning in 1985 foreign vessels will not be permitted to use on-bottom trawls anytime during the year. Although limiting the PSC to six months benefits domestic trawlers in that they can fish from June 1 to November 30 regardless of their bycatch, it is not clear why it is more important to control bycatch in any one part of the year. That is, unless either the PSC limits set for an entire year might result in higher bycatches or the limits are defined in a manner that does not reflect the fact that the impact of bycatch is age dependent and there are seasonal differences in bycatch age composition.

C. Allocation of PSC Limits

The advantage of a Gulf-wide PSC area is that the information necessary to define the appropriate allocation of PSC limits into subarea limits will probably not be available and operations of fleets would be more constrained and, therefore, more costly if inappropriate subarea allocations are made. The advantages of defining smaller PSC areas are that if a limit is met in a subarea, sanctions are not invoked in the entire Gulf and there may be biological reasons for providing some control on the spacial distribution of halibut bycatch. Whichever approach is taken, it is probably desirable to include all areas in the regulations so that the the regulations are flexible enough to address bycatch problems that may occur anywhere in the Gulf.

The advantage of an aggregate PSC for both domestic and joint-venture fisheries is that no decision has to be made concerning how to explicitly split a PSC among these two types of fisheries or subsets of these fisheries. The disadvantages of not having separate limits for joint-venture and wholly domestic operations are that one either type of operation can cause sanctions to be imposed on the other and the incentive to control bycatch is diminished.

The disadvantages of further dividing the PSC limits to limits for individual operations are that it may be difficult to determine how to allocate the overall limits to individual operations and this is a new concept. The disadvantages of not having limits by operation include the following:

1. The entire fishery can be closed due to the actions of a few vessels.
2. A vessel or fleet is not directly rewarded for its efforts to control bycatch.
3. Therefore, each vessel or fleet has less incentive to control bycatch.
4. The desire to meet its target species catch objective before the PSC limit is reached may cause vessels to use more costly and/or less productive fishing strategies. If individual PSC limits are allocated by fleet, operation, or vessel, the advantage of nontransferability is that some will receive larger allocations than

they need and actual bycatch will tend to be less than the PSC limit. The advantages of transferability include the following:

1. Those who have the greatest need for bycatch allocations will be able to obtain them.
2. Each allocation unit (e.g., fleet, operation, etc.) would have an incentive to reduce bycatch regardless of its initial allocation because each could increase its net earnings by increasing the amount of its initial allocation it sells to others or by decreasing the amount it buys from others.
3. Therefore, the inability of fishery managers to determine the "correct" initial allocation is less important.

This discussion of transferability is based on the assumption that the initial PSC limits are given to fishing units. The advantages of transferability are significantly diminished if a market-oriented mechanism is used to make the initial allocation. The sale of bycatch allocations either at a predetermined price per unit or by auction are two such mechanisms. The advantage of these alternatives is that fishery managers do not have to determine the "correct" initial allocation. The disadvantage is that fishermen would have to pay for all of their bycatch allocation rather than being given the allocations as a group.

The allocation of transferable PSC limits to halibut fishermen is another example of a market oriented allocation mechanism. With such a system groundfish fishermen would obtain PSC limits from halibut fishermen. One possibility would be to have the IPHC or NMFS act as the agent for the transfer of these limits at a predetermined price. In addition to the advantages listed above, this approach would directly compensate halibut fishermen for loss imposed by bycatch and it may face fewer legal problems than other market oriented allocation mechanisms.

Regardless of what decision is made concerning the use of aggregate or individual limits, the regulations should include all groundfish fleets. This will provide the flexibility that may be needed as bycatch conditions change for different domestic, joint-venture, and foreign fleets.

D. Sanctions Imposed When PSC Limit Reached

The advantage of prohibiting fishing once the PSC limit is reached is that it is a relatively harsh penalty and fishing units would have a strong incentive to avoid taking the limit either if the PSC limits are allocated to individual fishing units or if through some other mechanism individual units were held accountable. The disadvantage is that there tend to be less costly methods of keeping bycatch at "acceptable levels". For example, it may be possible to prevent bycatch from significantly exceeding the limit by imposing a gear restriction once the limit is reached. It should be noted that the objective is to allow for the "correct level" of bycatch and that level is determined by both the benefits and costs of controlling bycatch. Prohibiting all fishing once the PSC limit is reached may impose very high costs and provide very low benefits if because of a low PSC it prohibits the continuation of a profitable fishery that has a low bycatch rate.

The advantage of having the sanction be that additional PSC allocations must be obtained at a predetermined price is that those operations which have low catch rates can continue to fish. Only those operations that are not profitable when they bear the cost of bycatch would discontinue fishing. This approach is, therefore, one method of controlling bycatch that explicitly reflects the tradeoffs between the continuation of a groundfish fishery operation and the cost imposed by additional bycatch.

E. Determination of PSC limits

The advantage of having a PSC limit specified in the FMP is that the limit is then more difficult to change. This is also the main disadvantage of specific limits being in the FMP. As biological and socioeconomic conditions change, the Council's opinion as to the "correct level" of bycatch is expected to change. It is to the advantage of those who would lose as the result of a change in the limits to have the limits specified in the FMP and require the lengthy and cumbersome amendment process to change the limits. Conversely, it appears to be in the Council's interest to be able to rapidly adjust the PSC limits to reflect changing conditions and attitudes. The safeguard of having PSC limits specified in the FMP and thereby requiring a more rigorous review process before the limits are changed may be very costly in terms of the Council's ability to respond to changing conditions. This ability is particularly important for relatively young and rapidly developing fisheries such as the domestic groundfish fisheries in the Gulf of Alaska.

The alternative to specifying PSC limits in the FMP is to specify the framework to be used in periodically setting the limits. There are two basic types of frameworks. One is a procedure which lists how often the procedure will be used, who will be involved, the timing of individual steps, and the factors to be considered in setting PSC limits. The other is a procedure that includes an explicit formula (i.e., a mathematical equation) for setting the PSC limits. With the latter type of framework, the procedure is much more precisely defined. This is an advantage in that it may simplify the determination of the limits; however, it may be very difficult to develop a formula that is acceptable and is sufficiently flexible to remain acceptable over time. The use of a less specific procedure would allow for the fact that an allocation decision, such as that of setting PSC limits, requires compromises among competing user groups. The Council process may provide the best forum for negotiations among such groups.

F. Exemptions From PSC Limits

It may be appropriate to exclude specific types of fishing operations from the PSC limits for reasons including those listed below.

1. The bycatch rate of some operations may be thought to be sufficiently low relative to the benefits from the continuation of the operation; for example, the halibut bycatch rates for off-bottom gear are very low.
2. The discard mortality may be thought to be sufficiently low; for example, with the on deck sorting that occurs on longline vessels and some trawlers discard mortality may be relatively low.
3. It may not be cost effective to monitor the bycatch of some vessels. Accurate bycatch data are not available in the absence of onboard

observers and for vessels with low target catch and bycatch rates the cost of observer coverage could exceed its benefits.

The disadvantage of excluding such fishing operations is that it may provide an incentive to convert to a type of operation that would otherwise be less profitable and over time the bycatch of such operations may result in bycatch exceeding the "acceptable levels".

G. Non PSC Alternatives

The use of time/area closures, gear restrictions, and bycatch fees are three alternatives to PSC limits. A major disadvantage of these alternatives is perceived to be that they are not as effective as PSC limits in assuring that observed bycatch does not exceed a given predetermined level. For example, it would be very difficult to determine the time/area closures, gear restrictions, or bycatch fees that would result in a bycatch of approximately 250 mt in the Western Gulf. However, if 250 mt is not the "correct limit" and one of the alternatives results in an actual bycatch that is approximately equal to the "correct limit", the perceived disadvantage is eliminated. In this context the term "correct limit" refers to a limit that reflects the tradeoffs between the benefits and cost of controlling bycatch.

The advantage of time/area closures is that it may be possible to enforce them without onboard observers. The disadvantages include the following:

1. The factors that determine bycatch rates often change seasonally and annually; therefore, it is very difficult to predict the magnitude or direction of change in bycatch that will result from a given closure.
2. It is also very difficult to predict the costs associated with a specific closure.
3. By stipulating that bycatch will be controlled with closures, little incentive is provided for the development or use of more cost effective methods of control.
4. Fishing operations that may be able to fish with very low bycatch rates in an area are prevented from doing so.

An advantage of gear restrictions is that trawl gear can be identified that will result in very low halibut bycatch rates. With few exceptions the disadvantages are similar to those of closures:

1. It is very difficult to predict the costs associated with a specific gear restriction..
2. By stipulating how bycatch will be controlled, very little incentive is provided for the development or use of more cost effective methods of control.
4. Fishing operations that may be able to fish with very low bycatch rates with a prohibited gear are prevented from doing so.
5. Although the use of off-bottom trawls will decrease the bycatch of halibut and crab, it may result in increased salmon bycatch.

The advantages of bycatch fees include the following:

1. Complete information concerning the tradeoffs of costs and benefits is not required to have actual bycatch approximately equal to the "correct

level". Knowledge of the approximate benefits of controlling bycatch is sufficient.
2. Each vessel would be free to and provided an incentive to develop and use the most effective methods to control bycatch.
3. Vessels that have very low bycatch rates would not be significantly affected.
4. The difficult problems of determining the PSC limits and how to allocate them would be replaced by the potentially much less difficult problem of determining the appropriate bycatch fee.

In addition to the above mentioned perceived problem of not being able to set a bycatch fee that will result in a predetermined level of bycatch, the disadvantages of bycatch fees are that: 1) fishery managers and the members of the competing user groups are not used to the concept of fees as management tools and find it difficult either to understand how they can be used or to negotiate in terms of alternative fees; and 2) the MFCMA may limit the the use of such fees. It should be noted that if such fees are prohibited by the MFCMA there are other market oriented approaches that share many of the advantages of bycatch fees while avoiding this potentially overriding disadvantage. Element C.3 discussed above is one example of such an approach.

PROBLEMS COMMON TO MOST MANAGEMENT REGIMES TO CONTROL HALIBUT BYCATCH

With the possible exception of time/area closures, none of the management measures discussed above are enforceable without an adequate observer program. There are two potential problems with requiring such a program for enforcement: 1) such a program may not be cost effective for some fleets or subfleets and 2) as the enforcement role of the existing observer program increases, fishermen have an increased incentive to not cooperate with observers or perhaps to actually interfere with the ability of an observer to collect data. The cost per observer month, excluding training and data management costs, is approximately $4,600 for the NMFS Observer Program. Therefore, if discard mortality is 50%, if the loss to the halibut fishery is 1mt for each t of bycatch, and if the ex-vessel price and recovery rate to dressed weight are $0.75 and 75%, respectively, the cost of an observer would be greater than the cost of the bycatch unless the bycatch per vessel month were at least equal to 7.4mt of halibut. If the sole purpose of the observer coverage were to monitor halibut bycatch, the program would not be cost effective unless, in this example, it resulted in at least a 7.4 mt reduction in halibut bycatch per vessel month.

The problem of an enforcement role for an observer occurs whenever what the observer reports can result in sanctions being imposed. The severity of the sanctions and the probability of their being imposed determine the extent of the problem.

FOUR MANAGEMENT REGIMES DEFINED

Each combination of the elements outlined and discussed above defines a distinct management regime. The four alternative management regimes defined in this section are:

1. Status Quo

2. 1984 Emergency Rules

3. Frameworked PSC Limits

4. Bycatch Fees

The details of each alternative are outlined below.

1. Status Quo
   a. Western and Central Gulf PSC limits of 29 mt and 52 mt, respectively
   b. PSC limit in effect 6 months each year, December 1 - May 31
   c. All domestic trawling would cease until June 1 in an area when PSC reached
   d. There is one limit per area
   e. The PSC limit applies to both wholly domestic and joint-venture operations

2. 1984 Emergency Rules
   a. Western and Central Gulf PSC limits of 270 mt and 768 mt, respectively
   b. PSC limit in effect 6 months each year, December 1 - May 31
   c. On-bottom domestic trawling would cease until June 1 when a PSC is reached
   d. There is one limit per area
   e. The PSC limit applies to both wholly domestic and joint-venture operations

3. PSC Framework
   a. a PSC in metric tons for each area (e.g., Western, Central, and Eastern) and a procedure is specified for changing the areas as the fisheries change or as new information becomes available
   b. PSC limit in effect 12 months each year
   c. In each area there are separate PSC limits for wholly domestic, joint-venture, and foreign fisheries and a procedure is specified for changing the number of PSC limits per area as the fisheries change or as new information becomes available.
   d. Once a fishery's PSC limit is reached, on-bottom trawling is prohibited during the remainder of the year for nonexempt operations
   e. Off-bottom and on-deck sorting operations would be exempt from the PSC regulations
   f. A PSC framework specified in the FMP is used for periodic determination of PSC limits. The framework identifies a process to be used including factors to be considered. The process is not defined in terms of a mathematical equation.
   g. A framework for changing the exemptions and imposing alternative regulations for exempt fishing operations.

Possible modifications to this alternative are outlined below. These modifications are for a subset of the elements of Alternative 3 and are presented using the reference letters used above.

c. Each operation would be allocated individual PSC limits for each area, individual PSC limits are transferable and additional PSC allocations are available from the Council (regional Director) at a predetermined price per unit

4. Bycatch Fees
   a. Bycatch fees per metric ton of halibut
   b. Framework specified to periodically determine fee
   c. Fishing operations with ondeck sorting are exempt
   d. A framework for changing the exemptions and imposing alternative regulations for exempt fishing operations.

EVALUATION OF FOUR ALTERNATIVE MANAGEMENT REGIMES

The following evaluation of the four alternative halibut bycatch management regimes defined above is brief because: 1) the Council has not yet selected a preferred alternative and there is no assurance that the preferred alternative will be among those considered here; 2) the preceding evaluation of potential elements of a management regime provided a basis for evaluating alternative regimes; and 3) the information required for a detailed benefit cost analysis of the alternatives is not available.

1. Status Quo.

Although it appears that the 1985 Shelikof Strait fishery will not be jeopardized by the existing PSC limits, the 1984 fishery would not have occurred if these limits had not been temporarily removed by emergency rules and the 1986 fishery could be jeopardized by these limits if the joint venture and domestic on-bottom trawl fisheries are active in December through March. The current limits restrict the timing of the on-bottom fisheries for cod and flounders without assuring that the annual halibut bycatch is reduced in these fisheries. The existing regulations do not reflect the best scientific information concerning the period of the year halibut are vulnerable to trawl gear, they do not reflect the tradeoffs between the benefits and costs of controlling bycatch, they do not provide the flexibility required to successfully manage rapidly developing and changing fisheries, and they do not reflect the changes that have occurred in the fisheries since they were established.

2. 1984 Emergency Rules.

The 1984 emergency rules prevent halibut bycatch from restricting the Shelikof Strait pollock fishery by allowing off-bottom trawling to continue regardless of the halibut bycatch. The PSC limits imposed by these rules were sufficiently high that they did not appear to restrict the on-bottom trawl fisheries in 1984, and, depending in part on whether bycatch data become available for wholly domestic operations, these limits may be sufficiently high that they will provide little incentive for the on-bottom trawl fisheries to control halibut bycatch. As rapidly as the groundfish fisheries are changing, the PSC limits of the 1984 emergency rules could be completely

inappropriate in 1985, or 1986 and beyond. The 1984 emergency regulations do not reflect the best scientific information concerning the period of the year halibut are vulnerable to trawl gear, they do not reflect the tradeoffs between the benefits and costs of controlling bycatch, and they do not provide the flexibility required to successfully manage rapidly developing and changing fisheries.

3. Frameworked PSC Limits.

Frameworked PSC limits would allow the Council to use the best scientific information available to adjust PSC limits, areas, exemptions, species, and sanctions. This would tend to assure that, within a system of setting PSC limits, the most appropriate set of limits will be in effect for each fishing year. Annual PSC limits would provide assurance that bycatch is not just shifted from one period to another. The tradeoff between the benefits and costs of controlling bycatch is partially reflected by the exemptions for Off-bottom and on-deck sorting operations. These elements would prevent the bycatch of on-bottom trawl fisheries from jeopardizing the Shelikof Strait pollock fishery or other fisheries with low bycatch mortality.

The modifications to Alternative 3 that are discussed would provide a greater incentive for on-bottom trawl fleets to develop and use improved methods to control bycatch and assure that the cost imposed on fleets to control bycatch does not exceed a predetermined level per unit of reduction in bycatch.

4. Bycatch Fees.

If the bycatch fee is set approximately equal to the benefit of reducing bycatch by one unit, if that benefit is constant with respect to the level of bycatch, and if the costs of efforts to control bycatch are borne by the fleets making them, the use of bycatch fees will tend to result in the level of bycatch that best reflects the benefits and costs of controlling bycatch. A more complete discussion of the advantages and disadvantages of this alternative was presented in Section G.

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VII. LIST OF PREPARERS

Steve Davis and Doug Larson
North Pacific Fishery Mgmt Council
P.O. Box 103136
Anchorage, AK 99510
(907) 274-4563

Barry Bracken
Alaska Dept. of Fish & Game
P.O. Box 667
Petersburg, AK 99833

Fritz Funk
Alaska Dept. of Fish & Game
P.O. Box 3-2000
Juneau, AK 99802

Gary Stauffer and Joe Terry
Northwest & Alaska Fisheries Center
National Marine Fisheries Service
7600 Sand Point Way NE, BIN C15700
Seattle, WA 98115

Ron Berg and Jim Wilson
National Marine Fisheries Service
P.O. Box 1668
Juneau, AK 99802

DRAFT

REGULATORY IMPACT REVIEW/INITIAL REGULATORY FLEXIBILITY ANALYSIS OF AMENDMENT 14 TO THE FISHERY MANAGEMENT PLAN FOR GROUNDFISH OF THE GULF OF ALASKA

PART II

ADOPTED BY THE
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
FOR PUBLIC REVIEW

PREPARED BY:

NATIONAL MARINE FISHERIES SERVICE, ALASKA REGION

AND

NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

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Background

Current regulations implementing the FMP do not constrain types of gear used in harvesting any of the groundfish categories, with the exception of a temporary emergency rule for sablefish which intends to restrict the gear used in the Eastern Regulatory Area to hook and longline-only. All of the proposed amendments would entail long-term changes in the Gulf of Alaska Groundfish plan, and may affect as many as three other potential gear types, besides longlines.

The commercial harvest of sablefish in the Gulf of Alaska began in Southeast Alaska in 1906. Domestic landings grew to a peak in 1946 when about 4,083 metric tons (mt), dressed weight, were landed. Harvest levels began to decline initially after 1946 in response to a poor market and then in response to foreign competition and poor stock conditions, reaching a minimum in 1968 when 161 mt were landed. During the 1960s foreign harvest of sablefish soon grew to a high of 36,000 mt, most being taken in the western and central Gulf of Alaska. Since 1972, the foreign harvests have declined as a result of declining stock conditions.

With the implementation of the Magnuson Fishery Conservation and Management Act (Magnuson Act) in 1976, fishery managers encouraged domestic development of fishery resources. In terms of sablefish, the Alaska fishing industry has responded by expanding quickly, providing more stable employment for hundreds of fishermen, and providing economic growth to Alaskan and Pacific Northwest fishing communities. The challenge to develop the sablefish resource was taken by fishermen using principally longline gear.

In recent years, between 1977 and 1985, the trend of events in the groundfish in the fishery conservation zone off Alaska has been the removal of the foreign fishing effort and the encouragement of domestic effort. This domestic effort consists of a wide variety of different vessel sizes and types, including trollers, longliners, vessels converted from crabbers to trawlers or sablefish pot vessels, and large trawler-processors. Major

sectors of this fleet are dispersed, spatially, throughout the Pacific Northwest but some ports have very high concentrations of particular gear types or vessels. Often, the predilection towards the use of a gear-type might be caused by:

1. Historical fisheries in the area,

2. Type of vessel and available gear on the vessel,

3. Perceptions about the effectiveness of gear at catching fish and minimizing damage to the environment or the resource,

4. Strength of exvessel markets for certain species, or other market phenomena,

5. The perceived need to diversify activities in the face of uncertainty.

Because of the relatively open access condition of most federally-managed resources, the possibility exists for a rapid expansion of effort (labor and capital) which is then focused on a relatively small resource base. In the completely unregulated fishery, temporary or permanent economic harm to the resource can rapidly ensue, and prior to that occurrence substantial conflicts between producers can take place. These conflicts are external to market-related competition and therefore have nothing to do with economic efficiency. Such conflict is, in fact, characteristic of extra-market phenomenon. The results of these conflicts are usually grounds preemption, where one gear "wins," in terms of productive efficiency, and also by imposing external (or nonmarket) effects on other gear types. These types of resource conflicts would not be of great concern if there were easy or costless alternative employment opportunities for displaced capital and labor, or if the costs of negotiating and enforcing agreements between gear types were low enough that such external effects could be arbitrated. However, this is usually not the case. Stability of economies in remote communities needs to be considered precisely because there are structural inefficiencies in the

whole economy. Attempts to gain efficiencies in one sector without consideration of these realities are of questionable social value.

Recent developments of the sablefish fishery provide excellent examples of the open access phenomenon at work. In this section, recent events in the sablefish fishery will be examined. These events caused the pattern of landings between foreign and domestic fishermen to change, and within the American industry, caused changes in the pattern of catch by gear type. This documentation of current trends in the sablefish fishery should provide a better understanding of why it is necessary to contemplate regulation of the domestic sablefish fishery.

Table 1 describes the historical catch of sablefish by management area by all the fisheries off Alaska. The two areas which clearly have the most fishing pressure, from a historical standpoint, are the Southeast Area (Southeast, East Yakutat, and West Yakutat) and international waters. The central Gulf follows, in terms of both magnitude and history of catches, followed by the Bering Sea, Aleutians, and the western Gulf. The westernmost areas of the Gulf appear to have had the least amount of fishing pressure up until 1983.

Table 2 outlines the dramatic change in pattern of harvests of sablefish in the Gulf of Alaska which occurred during the 1984 season. In the 1983 season, there were substantial foreign longline fisheries for sablefish in each of the Eastern, Central, and Western Gulf regulatory areas. In the Eastern area, domestic fishermen took the bulk of the OY, some 2,491 mt compared with a total foreign catch of 1,046 mt, all taken by longliners. In the Central and Western Gulf, however, domestic fishermen took a small fraction of the total catch, some 393 mt of total (foreign and domestic) catch of 2,759 mt, and in the Western Gulf a total of 144 mt compared to a total catch of 1,483 mt.

In 1984, the domestic sablefish fishery accelerated rapidly, largely due to an agreement by the foreign longline fleets to abstain from fishing in the Gulf until after October 7, to allow American fishermen the opportunity to prove the claim that they could take the entire Gulf-wide resource. New

Table 1. Historical sablefish catch by management area

Year	Southeast/ East Yakutat Tons	West Yakutat Tons	Central Gulf Tons	Western Gulf Tons	Bering Sea Tons	Aleutians Tons	International Waters Tons	Unknown Waters Tons	TOTAL Tons
1975	391		0				1,165		1,555
1976	282						858		1,140
1977	750		0	0	2		421		1,173
1978	1,018		1				650	6	1,675
1979	2,143	5	48				1,100		3,297
1980	1,621	0	19	1	2		506		2,350
1981	1,316	5	6		2		705		1,834
1982	1,756	253	19		148	29	772		2,977
1983	2,269	368	251	10	26	25	847		3,796

Source: Alaska Department of Fish and Game

Table 2. Foreign and Domestic Catches of Sablefish in Gulf of Alaska Regulatory Areas, 1983 and 1984.

	1984			1983		
Domestic	Eastern	Central	Western	Eastern	Central	Western
Pots	53 mt	74 mt	80 mt	0 mt	0 mt	0 mt
Gillnets	1	42	0	0	0	0
Longlines	4,165	2,628	96	2,483	251	0
DAP Trawl	0	12	30	8	1	10
JVP Trawl	0	207	256	0	141	134
TOTAL DOMESTIC	4,219 mt	2,963 mt	462 mt	2,491 mt	393 mt	144 mt
Foreign						
Trawl	0 mt	249 mt	50 mt	tr	326 mt	187 mt
Longline	0	113	702	1,046	2,040	1,152
TOTAL FOREIGN	0 mt	362 mt	752 mt	1,046 mt	2,366 mt	1,339 mt
TOTAL CATCH	4,219 mt	3,325 mt	1,214 mt	3,537 mt	2,759 mt	1,483 mt
OPTIMUM YIELD	3,000-4,250 mt	3,060 mt	1,670 mt	3,000-4,250 mt	3,060 mt	1,670 mt

tr = trace

Source: Domestic directed fisheries and DAP trawl - ADF&G
JV trawl and foreign trawl - PacFIN
Foreign Longline - PacFIN and NMFS

market opportunities fueled the domestic fishery, and the American fishermen did take the bulk of the optimum yield in both the Eastern and Central regulatory areas and made a substantial increase in their catch in the Western Gulf of Alaska. In the Eastern Gulf there was no foreign fishing, while American fishermen took a total 2,419 mt; in the Central Gulf, domestic fishermen took 2,963 mt of a total catch of 3,325 mt, and in the Western Gulf domestic fishermen took nearly 40% of the total catch, compared with less than 10% a year prior.

The bulk of the catch by domestic fishermen was taken by longline gear, though two new gear types that had not been seen in the domestic sablefish fishery in recent history also were used to take small amounts of the total catch. Pots were used to land some 53 mt in the Eastern Gulf, 74 mt in the Central Gulf, and 80 mt in Western Gulf, compared to zero the year before. Sunken gillnets were used to take 1 mt in the Eastern Gulf and 42 mt in the Central Gulf, compared with zero the year before. Trawlers, particularly fishing for joint ventures, took somewhat increased catches of sablefish incidentally to target operations for other groundfish species. In the Central and Western Gulf, JVP trawlers took roughly 463 mt, compared with some 275 mt the year before, and DAP trawlers took some 42 mt, compared to 19 mt the year before.

One consequence of the improved market opportunities for American fishermen, then, was a dramatic increase in the amount of domestic effort expended, which enabled the fleet to take virtually the entire optimum yield in 1984. This increase, while very beneficial to American fishermen because foreign fisheries were displaced, cannot continue indefinitely without adverse effects on current fishermen who pioneered the fully domestic fishery in 1984. Since the Gulf-wide OY for sablefish is very close to being fully taken by American fishermen now, increases in number of vessels and participants in the fishery will begin to decrease harvests of current participants, seasons will grow shorter, and capacity will be idled in the fishery.

A second consequence of the fisheries expansion in 1984 is that experimenting with new gear occurred. However, many people in the industry are concerned that with the longline fishery showing adequate capacity to take

the entire sablefish OY, permitting continued introduction of new gear into the fishery will tend not only to diminish the harvest shares of current participants, but will also result in adverse effects on current operations because of gear conflicts.

The domestic sablefish fishery, particularly in the Eastern Gulf of Alaska, has traditionally been the province of longliners, many of whom reside in Southeast Alaska. Sablefish fishing constitutes an important groundfish fishery to residents of this region, and is one of the major non-salmon finfish fisheries from which local residents, both in the harvesting and processing sector, derive a substantial share of their income. Thus, fishing in general and sablefish in particular, concern has arisen over the use of new gear by new entrants to the fishery out of fear for adverse effects on small communities.

Another trend that appeared in 1984, and has been greatly exaggerated by events so far in 1985, is an acceleration of harvests in the fishery. Table 3 compares the 1984 and 1983 catches by month in the domestic sablefish fishery, and the cumulative percentage of the catch and the OY that was taken by month in each year. Notice that in 1984, the domestic fishery had reached 99% of the OY by the end of September, while in 1983 at that point, only 56% of the OY had been reached, and only 87% of the eventual total domestic catch had been reached. Table 3 shows an increase in the rate of prosecution which occurred in 1984 compared to 1983, and the trend is even more pronounced in 1985.

Preliminary results from the ongoing 1985 fishery indicate that as of mid-March, 55% of the OY for the entire Eastern Regulatory Area had been caught, compared with 8% of the OY caught through the end of March of 1984. The entire quota for the Southeast and East Yakutat subareas of the Eastern Gulf had been taken, with 874 mt (34% of the OY) taken by pot gear, with three vessels fishing, and 1,696 mt, or 66% of the OY, taken by 33 longline vessels. The only other reported catches of any significance from the Gulf were 43 mt taken in the West Yakutat subarea of the Eastern Gulf, by two longline vessels. The catch by pot gear is approximately a fifteen-fold increase over

Table 3. Catches of sablefish by month in the domestic sablefish fishery in the Eastern Regulatory Area, and cumulative percentage of optimum yield and of total domestic catch taken by month; 1983-1984.

Month	Catches by Month[a/]		Cumulative Percent of Catch taken by Month		Cumulative Percent of OY taken by Month	
	1984	1983	1984	1983	1984	1983
January	101.3 mt	2.9 mt	2	tr	2	1
February	107.7	27.8	4	1	4	4
March	198.0	103.3	8	6	8	12
April	677.9	244.3	21	17	21	24
May	1,141.7	427.5	43	36	43	35
June	1,445.8	390.8	71	53	71	41
July	247.0	210.6	76	62	76	47
August	74.7	251.5	77	73	77	56
September	1,041.1	312.9	99	87	99	64
October	tr	304.1	99	100	99	64
November	0	0	99	100	99	64
December	42.6	0	100	100	100	64
TOTAL CATCH[a/]	5,077.8 mt	2,275.7 mt				
Optimum Yield[b/]	5,077.8 mt	3,537.0 mt				

Source: PacFin

a/PacFin reports of catch for the Southeastern area include state internal waters, so totals do not match these in other tables (e.g., Table 1).

b/Optimum Yield for the Eastern Regulatory Area is managed as a range (3,000-4,750 mt); we have used the resulting total (foreign and domestic) catch as a point estimate.

the entire 1984 pot catch. Preliminary estimates of the southeast communities' loss as a result of this influx of new effort is $1.637 million. This is an overestimate of actual loss, since some employment alternatives likely exist. This loss is based on $.85/lb., and the knowledge that pot boats are delivering their catches to Seattle, while longliners (resident and non-resident) deliver to Southeast Alaska ports.

In summary, marking the achievement of a fully utilized resource was a fully capitalized fishing fleet, a large harvesting and processing work force, increased markets, and the realization that there would be insufficient sablefish resource to accommodate all users at traditional levels.

This fact became apparent in the first 2 months of 1985 off southeast Alaska. Historically, the southeast Alaska sablefish fishery has not begun until spring, when weather and fishing conditions improve and the fish have recovered from spawning. In January 1985, three large (catcher/processor) vessels began fishing for sablefish using pot gear. One of these vessels, a catcher/processor new to this fishery, fished with 600 pots along an area ranging from 15-45 miles.

While the pot vessels were fishing there were several gear conflicts between the pot fishermen and those using longline gear. When longline gear, which is relatively lightweight, becomes entangled with the heavier pot gear, the longline breaks with some, or all of it, being lost. Gear conflicts are likely between these two gear types since fishing is concentrated along the narrow shelf edge. The presence of just one or two pot vessels can effectively preempt the grounds to longline gear, as longline fishermen are forced to move to avoid gear loss. Pots lost or stored on the fishing grounds can contribute to this problem.

The Council, in their February meeting in Sitka, heard testimony which suggested that an important secondary impact of the multiple gear open access condition is the potential for widespread destabilization of community economies in Alaska. This problem can come as a result of large and efficient vessels fishing adjacent to small communities which rely on the resource.

It should be pointed out that nearly all longline fishermen, whether from Alaska or from outside, land their fish in Alaska ports. Many of the pot boats which have fished in 1984 and early 1985 are large freezer vessels which deliver to ports outside the state. To the extent that location of delivery is correlated with type of gear used, it appears to be the case at present, then regulation of gear type can well affect where the fish caught are landed, and a restriction on the use of gear could mean that fewer sablefish are landed outside the state and more are landed (by longliners) within the state. It has not been possible to break out the catch of sablefish by gear type and port of landing, so it is not possible at this time to tell how strongly port of landing and gear type used are correlated.

However, the central issue, or problem, is that more effort can potentially target on sablefish than there are sablefish to go around, and can keep all participants fully employed. This is especially the case in the eastern part of the Gulf of Alaska where there is a substantial traditional longline fishery having home ports in Southeastern and South Central Alaskan towns.

These facts explain the basis for concern over the management of the sablefish resource. If current trends continue, substantial gear conflicts from the application of two incompatible types of gear could result; an erosion of an income base for local communities dependent on sablefish fishing will occur, and an acceleration of the fishery will a build up of excess capital will occur in very short order. This is the same problem seen in other common property fisheries.

Statement of the Problem

The Alaska sablefish fishery has undergone a very rapid transformation, within little over a year's time, from a foreign-dominated fishery to a fishery fully utilized by domestic fishermen, and which will in the near future, if left unregulated, experience serious problems with gear conflict and excess effort. This draft Regulatory Impact Review was written to: (1) provide the North Pacific Fishery Management Council with background information on recent development of the fishery and its importance to fishermen and communities; (2) to propose and discuss possible objectives for

regulation of the fishery; and (3) to analyze several possible regulatory strategies for the fishery.

Current Fishery Situation in Relation to Amendment 12

The creation of a hook and longline-only area is similar in concept to that proposed under Amendment 12 to the Gulf of Alaska FMP, originally passed by the Council in July of 1982 and reaffirmed in September of 1982. Amendment 12 was never successfully implemented, because the factual basis upon which the Council acted appeared insufficient to show that there was a need for the action. At the time of the initial passage, there was no pot fishing in Southeast Alaska waters, and the primary concern voiced by those testifying was over pot gear which had been lost some seasons prior. This gear constituted a continuing problem for operation of longline gear because it snagged the gear, and because of concern of ghost fishing by the pots.

The difficulty which existed with Amendment 12 was that the requirements for the analysis of regulations introduced during the Reagan Administration are strict in terms of documenting the need for regulation and the potential cost of not regulating (or the gain from regulating). Without an active pot fishery, other solutions likely existed for the removal of pot gear from the grounds. Another difficulty is that often managers are forced to wait until a problem exists, rather than preventing its occurrence in the first place. By the time regulation can be undertaken, the problem becomes much more difficult to deal with. The experience with Amendment 12 points out the fact that even though long range planning is recognized as essential, the regulatory environment sometimes forces federal fisheries management to be myopic.

Such is the setting for the current sablefish management problem. Because no pot ban was successfully implemented earlier, the reintroduction of pot gear to the grounds now poses, among other things, an active gear conflict with the longline fishery, and concurrent rightful claims by pot and longline fishermen to harvest the sablefish resource. At this point, and the longer the situation delays, the more difficult, and the more harmful, will be the effects on pot fishermen of a pot prohibition, or other regulations which may face them to alter their fishing patterns.

In summary, the potential problem with the use of pot gear which was cited by industry two years ago and was deemed insufficient in terms of documenting an actual problem, has now become an actual problem. That it has become an actual problem simultaneously makes it easier to justify the need for action, but more difficult to find equitable solutions, because pot fishermen as well as longline fishermen can now point to their record of participation in the fishery as a justification for their right to continue that participation.

II. DEFINING OBJECTIVES FOR REGULATION

Before strategies for managing a fishery can be adequately evaluated, objectives should be well defined for the purpose of management. Events in the sablefish fishery would appear to warrant concern on several grounds, and therefore there are several objectives for Council regulation of the sablefish fishery at this time. The Gulf of Alaska Plan Team has identified four possible objectives, which the Council should weigh before selecting strategies for regulating the fishery.

These objectives are:

1. maintain economic viability in small Alaskan communities, by stabilizing the proportion of the fishery which is taken by residents of these communities;

2. limit concentration of incompatible effort in small areas, thereby mitigating gear conflicts;

3. Prevent or slow the development of excess capacity in the sablefish fishery;

4. minimize hardship on current participants using different gear types by establishing a regulation which takes into consideration home port of vessels using different gear types.

The following analysis of possible regulatory impacts will evaluate each of three regulatory strategies against these four objectives, in an effort to assist the Council in selecting the strategy which is most appropriate to its objectives for the sablefish fishery. The three regulatory approaches evaluated, in addition to no action (the status quo), are limited access, making specific allocations to each gear type by area, and definition of hook and longline-only areas.

III. REGULATORY ALTERNATIVES

In response to its call for proposals ending in December, the Council received several proposals to manage effort in the sablefish fishery. These proposals ranged from conventional methods which are already used, such as gear and area restrictions, to fairly new methods which involve quota allocations to gear types or a government-industry approach to management of effort through a combination of a moratorium, conventional restrictions and a privately funded buy-back program. Among these alternatives, the ones selected for consideration and analysis were allocating specific amounts to each gear types and license limitations.

The majority of the gear/area restrictions called for a hook and longline-only fishery for sablefish for various areas of the Gulf of Alaska. The Council's alternatives, in terms of gear and area restrictions, were narrowed to limiting areas eastward of various longitudinal lines in the Gulf to hook and longline-only for the directed sablefish fishery, while leaving all other areas for multiple gear use. The gear types currently used in the directed sablefish fishery are: hook and longlines, pots, and gillnets. The large number of possible alternative hook and longline areas in the eastern Gulf were narrowed to the Eastern Gulf, the Eastern and Central Gulf, and the entire Gulf.

In summary, the Regulatory alternatives presented and analyzed in this document are:

1. Status Quo (No Action);

2. Allocating the sablefish quota to specific gear types;
3. License limitation; and
4. Hook and longline-only areas

   (a) Eastern Gulf of Alaska
   (b) Eastern and Central Gulf of Alaska
   (c) the Gulf of Alaska.

The status quo, or no area restriction, is also among the alternatives considered.

IV. EMPLOYMENT, EARNINGS, AND PARTICIPATION IN THE ALASKA SABLEFISH FISHERY

Recent Patterns of Employment and Earnings in Southeast Alaska Fisheries

Since one of the potential objectives for regulation of the sablefish fishery is to attempt to maintain the economic viability of small communities who are heavily dependent on fishing as a source of income, it is important that we know what current (or relatively recent) levels of earnings and employment are supported by the sablefish fishery and other fishery activities in those communities. Since the question to be evaluated here is whether, and how, to regulate the sablefish fishery, a predominantly longline fishery, in an attempt to maintain the stability of community income and employment, the focus of our discussion will be on Southeast Alaska. This particular Alaska region has a well documented history of participation in, and dependence upon, the sablefish fishery.

Estimates of how the sablefish fishery contributes to each of the principal southeast Alaska communities in terms of income and employment generated, and how this income and employment might change if no action is taken, would be very useful. However, such data are not systematically collected. Also, it should be remembered that in a quota constrained fishery, where the total harvest is not increasing over time, any regulatory action which has beneficial consequences on income and employment in one region is likely to have adverse consequences in another region. Thus, the objective of

maintaining community stability is multi-faceted, and involves consideration of trade-offs in other areas as well as the area in which stability is being maintained.

Recent work conducted by the Alaska Commercial Fisheries Entry Commission (CFEC) and the Alaska Department of Labor (ADOL) has focused on providing at least rough estimates of the employment that is generated through a commercial harvesting activity, and this information is useful for understanding the economic impact associated with commercial fisheries. However, it is not a complete assessment of that impact.

Table 4 provides estimates, for 1977-82, of the gross exvessel earnings and two measures of employment associated with each of the major longline, trawl, and pot fisheries in Southeast Alaska. While, unfortunately, these latest estimates do not capture the recent increase in domestic activity in the sablefish fishery, they nonetheless provide a useful perspective on the relation between sablefish fishery and employment in the harvesting sector, particularly in relation to other fishery opportunities. Sablefish is one of the major longline fisheries, and is particularly important in terms of providing a longer season of employment. This fishery has been quite useful, considering the halibut seasons have been literally just a few fishing days in recent years. In Southeast Alaska, sablefish has been the third most important fishery to the region in terms of employment behind halibut and salmon (which is not shown). With the recent developments not captured by Table 4, namely the rapid expansion of the sablefish fishery and the decline of the crab fisheries, sablefish has become even more important as a source of employment to the region, and as a source of income to the region.

The "people employed" measure is the number of different individuals who were at some time during the year employed in harvesting the resource. These estimates are generated by identifying the number of different permit holders who made landings in each fishery during the year, and multiplying by an assumed "crew factor" representing the typical crew size in the fishery. The number of people employed is not additive across the fisheries because some individuals participated in more than one fishery, but the total for Southeast Alaska presented at the bottom of the table represents the number of unique

TABLE 4. All fishermen: estimated total gross exvessel earnings, number of people employed in the harvesting sector, and average annual harvesting employment in the Southeast Alaska sablefish fishery, 1977-82.

	1977			1978			1979		
	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment
LONGLINE FISHERIES									
Halibut									
vessels 5 nt	176.7	508	73.1	514.5	665	106.9	1,683.7	1,413	213.5
vessels _ 5 nt	4,167.2	1,496	279.3	6,573.4	1,152	243.3	11,079.9	1,828	282.3
Sablefish									
vessels 5 nt							33.8	26	3.2
vessels _ 5 nt	1,098.2	283	49.2	1,591.8	283	57.4	3,311.1	570	120.9
Other Groundfish									
vessels 5 nt	0.6	10	1.5	11.5	30	3.2	17.0	70	9.3
vessels _ 5 nt	20.3	28	4.7	79.0	52	7.0	122.9	64	11.5
TRAWL FISHERIES									
Groundfish	179.5	18	4.8	335.3	21	6.0	251.8	21	5.8
POT FISHERIES									
Sablefish									
vessels 5 nt							101.7	10	1.7
King Crab									
vessels _ 50 ft.	364.6	48	11.5	519.2	70	17.1	575.2	93	23.8
vessels 50 ft.				280.7	25	6.0	238.7	28	6.0
Tanner Crab									
vessels _ 50 ft.	434.8	56	13.3	603.2	68	*	703.3	82	22.3
vessels 50 ft.	748.4	36	7.8	512.1	30	*	1,099.9	44	11.8
Dungeness Crab									
vessels _ 50 ft.	70.9	18	4.8	664.1	50	*	631.3	61	15.0
vessels 50 ft.				961.6	14	2.8	1,016.5	34	6.1
S.E. ALASKA TOTAL	61,802.3	6,823	1,807.4	77,342.3	7,917	2,123.4	94,800.7	8,309	2,134.5

*Data not reported because of confidentiality constraints.

Source: Commercial Fisheries Entry Commission (1984).

TABLE 4. (Continued) All fishermen: estimated total gross exvessel earnings, number of people employed in the harvesting sector, and average annual harvesting employment in the Southeast Alaska sablefish fishery, 1977-82.

	1980			1981			1982		
	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment
LONGLINE FISHERIES									
Halibut									
vessels 5 nt	533.7	1,298	116.0	887.4	1,483	125.0	790.4	1,303	*
vessels _ 5 nt	4,179.9	2,312	*	5,045.9	2,256	189.7	4,868.1	2,196	*
Sablefish									
vessels 5 nt	38.4	40	9.0				15.9	20	3.3
vessels _ 5 nt	1,375.1	406	88.1	1,050.8	292	*	2,965.3	351	71.5
Other Groundfish									
vessels 5 nt	7.8	90	11.3	25.8	90	13.8	47.3	66	11.0
vessels _ 5 nt	25.0	114	13.5	83.7	132	24.3	126.2	156	*
TRAWL FISHERIES									
Groundfish	225.0	15	1.8	98.2	18	2.5	88.7	21	2.8
POT FISHERIES									
Sablefish									
vessels 5 nt									
King Crab									
vessels _ 50 ft.	343.5	66	16.0	798.5	88	20.2	1,867.2	157	*
vessels ¯ 50 ft.	440.2	47	14.0	784.1	61	*	1,867.4	85	20.6
Tanner Crab									
vessels _ 50 ft.	457.8	80	21.3	1,143.3	107	*	2,807.5	215	43.3
vessels ¯ 50 ft.	1,752.7	110	27.0	1,064.5	88	*	2,216.8	113	21.1
Dungeness Crab									
vessels _ 50 ft.	165.2	36	9.2	2,274.5	149	39.9	4,045.5	275	*
vessels ¯ 50 ft.	530.5	34	6.8	1,657.8	47	7.1	2,338.0	63	13.5
S.E. ALASKA TOTAL	71,863.6	8,343	2,026.9	89,524.4	8,031	1,896.8	95,648.0	8,131	2,124.1

*Data not reported because of confidentiality constraints.

Source: Commercial Fisheries Entry Commission (1984).

individuals involved in any of Southeast Alaska's fisheries; there is no double counting of individuals across fisheries. The "average annual employment" is the simply the sum of the employment in a fishery in each month, divided by 12. This takes into account the number of months over which employment in the fishery is generated, and in a rough sense measures the average number of harvesting jobs each month during the year. The crew factors employed were developed by ADOL from a statewide survey and in consultation with fishing associations, government agencies, and knowledgeable individuals. They include crews and skippers on board vessels harvesting the resource, but do not include tender and packer crews or onshore fish processing employment generated from those harvests.

Tables 5 and 6, respectively, represent estimates of earnings and employment in Southeast Alaska fisheries, by residence of participants. These again must be considered rough estimates because it was necessary to assume that crew hired by a particular gear operator also resided in the same area as the skipper, and (implicitly) that the number of resident crew members hired by nonresident skippers and the number of nonresident crew members hired by resident skippers would tend to cancel out.

When the earnings and employment data are broken out on a residency basis, it can be seen that Alaska residents took roughly two-thirds to three-quarters of the gross earnings generated, and had a roughly similar portion of people employed. Sablefish fishing was a significant source of revenue to longline fishermen, and a significant source of employment.

The ADOL survey which was the basis for the crew factors used in this exercise reported slightly higher employment aboard longline vessels (2.4 people vs. 2.0 in Southeast Alaska and 4.0 vs. 3.5 people in Kodiak, for example) than aboard pot vessels. However, discussions with ADOL reveal that these difference are probably not significant statistically, so based upon this evidence alone it should not be concluded that longline vessels employ more people than pot vessels, or even that longline vessels have larger crews than pot vessels.

TABLE 5. Alaska residents: estimated total gross exvessel earnings, number of people employed in the harvesting sector, and average annual harvesting employment in the Southeast Alaska sablefish fishery, 1977-82.

	1977			1978			1979		
	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment
LONGLINE FISHERIES									
Halibut									
vessels 5 nt	152.0	493	70.4	411.3	630	101.0	1,518.9	1,340	202.9
vessels _ 5 nt	3,460.4	1,252	237.0	5,637.5	960	209.7	9,236.1	1,524	*
Sablefish									
vessels 5 nt							33.8	26	3.2
vessels _ 5 nt	850.4	238	39.6	1,184.8	225	*	2,219.9	426	88.5
Other Groundfish									
vessels 5 nt	0.6	10	1.5	11.4	26	2.8	15.2	62	8.5
vessels _ 5 nt	16.9	26	4.2	78.4	48	6.3	93.3	58	10.7
TRAWL FISHERIES									
Groundfish	144.5	12	3.8				200.3	15	3.5
POT FISHERIES									
King Crab									
vessels _ 50 ft.	364.6	48	11.5	497.7	65	16.3	550.9	85	22.3
vessels ¯ 50 ft.				280.4	23	5.8	227.6	25	5.8
Tanner Crab									
vessels _ 50 ft.	434.8	56	13.3	591.3	64	*	638.2	74	20.7
vessels ¯ 50 ft.	601.6	32	7.3	512.1	30	*	760.7	36	10.2
Dungeness Crab									
vessels _ 50 ft.	70.9	18	4.8	286.2	38	9.6	227.9	47	10.8
vessels ¯ 50 ft.							128.0	11	1.9
S.E. ALASKA TOTAL	40,933.0	5,175	1,434.0	47,980.1	5,741	1,610.7	65,583.4	6,232	1,653.5

*Data not reported because of confidentiality constraints.

Source: Commercial Fisheries Entry Commission (1984).

TABLE 5. (Continued) Alaska residents: estimated total gross exvessel earnings, number of people employed in the harvesting sector, and average annual harvesting employment in the Southeast Alaska sablefish fishery, 1977-82.

	1980			1981			1982		
	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment
LONGLINE FISHERIES									
Halibut									
vessels 5 nt	439.1	1,190	105.6	802.5	1,398	117.9	701.2	1,235	*
vessels _ 5 nt	3,307.0	1,900	198.7	4,209.6	1,924	*	3,967.0	1,836	*
Sablefish									
vessels 5 nt	33.4	36	8.7						
vessels _ 5 nt	969.2	273	*	797.9	226	46.8	1,950.3	253	54.6
Other Groundfish									
vessels 5 nt	7.6	81	9.8	25.6	78	12.8	41.8	57	9.5
vessels _ 5 nt	20.7	93	11.5	69.7	105	20.3	108.7	147	22.0
TRAWL FISHERIES									
Groundfish	171.8	12	1.5						
POT FISHERIES									
King Crab									
vessels _ 50 ft.	335.7	61	15.4	794.2	85	19.9	1,813.0	143	*
vessels ~ 50 ft.	431.9	44	13.5	695.0	58	*	1,837.1	66	19.0
Tanner Crab									
vessels _ 50 ft.	420.4	72	19.7	938.5	102	22.5	2,617.3	201	41.3
vessels ~ 50 ft.	789.7	91	23.4	758.7	72	*	1,830.2	80	18.1
Dungeness Crab									
vessels _ 50 ft.	165.2	36	9.2	1,151.8	117	30.9	1,758.3	191	*
vessels ~ 50 ft.	213.9	18	3.9	380.0	20	2.8	406.9	32	6.9
S.E. ALASKA TOTAL	42,930.4	6,130	1,513.2	54,629.1	5,920	1,436.3	58,827.0	5,771	1,567.7

*Data not reported because of confidentiality constraints.

Source: Commercial Fisheries Entry Commission (1984).

TABLE 6. Out-of-state residents: estimated total gross exvessel earnings, number of people employed in the harvesting sector, and average annual harvesting employment in the Southeast Alaska sablefish fishery, 1977-82.

	1977			1978			1979		
	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment
LONGLINE FISHERIES									
Halibut									
vessels 5 nt	24.7	15	2.7	103.2	35	5.9	164.8	73	10.6
vessels _ 5 nt	706.8	244	42.3	935.9	192	33.6	1,843.8	304	*
Sablefish									
vessels 5 nt							0	0	0
vessels _ 5 nt	247.8	45	9.6	407.0	58	*	1,091.2	144	32.4
Other Groundfish									
vessels 5 nt	0	0	0	0.1	4	0.4	1.8	8	0.8
vessels _ 5 nt	3.4	2	0.5	0.6	4	0.7	29.6	6	0.8
TRAWL FISHERIES									
Groundfish	3.5	6	1.0				51.5	6	2.3
POT FISHERIES									
King Crab									
vessels _ 50 ft.	0	0	0	21.5	5	0.8	24.3	8	1.5
vessels ~ 50 ft.				0.3	2	0.2	11.1	3	0.2
Tanner Crab									
vessels _ 50 ft.	0	0	0	11.9	4	*	65.1	8	1.6
vessels ~ 50 ft.	146.8	4	0.5	0	0	0	339.2	8	1.6
Dungeness Crab									
vessels _ 50 ft.	0	0	0	377.9	12	*	403.4	14	4.2
vessels ~ 50 ft.							888.5	23	4.2
S.E. ALASKA TOTAL	20,869.3	1,648	373.4	29,362.2	2,176	512.7	29,217.3	2,077	481.0

*Data not reported because of confidentiality constraints.

Source: Commercial Fisheries Entry Commission (1984).

TABLE 6. (Continued) Out-of-state residents: estimated total gross exvessel earnings, number of people employed in the harvesting sector, and average annual harvesting employment in the Southeast Alaska sablefish fishery, 1977-82.

	1980			1981			1982		
	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment	Gross Exvessel Earnings ($000)	People Employed	Average Annual Employment
LONGLINE FISHERIES									
Halibut									
vessels 5 nt	94.6	108	10.4	84.9	85	7.1	89.2	68	*
vessels _ 5 nt	872.9	412	*	836.3	332	*	901.1	360	*
Sablefish									
vessels 5 nt	5.0	4	0.3						
vessels _ 5 nt	405.9	133	*	253.1	66	*	1,015.0	98	16.9
Other Groundfish									
vessels 5 nt	0.2	9	1.5	0.2	12	1.0	5.5	9	1.5
vessels _ 5 nt	4.3	21	2.0	14.0	27	4.0	17.5	9	*
TRAWL FISHERIES									
Groundfish	53.2	3	0.3						
POT FISHERIES									
King Crab									
vessels _ 50 ft.	7.8	5	0.6	4.3	3	0.3	54.2	14	*
vessels ¯ 50 ft.	8.3	3	0.5	89.1	3	*	30.3	19	1.6
Tanner Crab									
vessels _ 50 ft.	37.4	8	1.6	204.8	5	*	190.2	14	2.0
vessels ¯ 50 ft.	963.0	19	4.4	305.8	16	*	386.6	33	3.0
Dungeness Crab									
vessels _ 50 ft.	0	0	0	1,122.7	32	9.0	2,287.2	84	*
vessels ¯ 50 ft.	316.6	16	2.9	1,277.8	27	4.3	1,931.1	31	6.6
S.E. ALASKA TOTAL	28,933.2	2,213	513.7	34,895.3	2,111	460.5	36,821.0	2,360	556.4

*Data not reported because of confidentiality constraints.

Source: Commercial Fisheries Entry Commission (1984).

When considering the employment generated by different kinds of vessels, it should be kept in mind that increases in employment may also be decreases in efficiency. That is, a fishing operation may be more efficient with two people, in terms of profits that can be generated, but if it employs four people, more employment will be generated though increased costs associated with additional two crew may not be justified in terms of the additional profits they helped to provide.

These tables are presented in the hopes that they will provide a better understanding of the importance of the sablefish fishery, both in relation to other fisheries and in relation to the employment and earnings it generates for both Alaska residents and out-of-state residents. It is not possible at this point to identify the changes in employment that would result from change (say, a decrease) in the harvest of a particular group. If, for example, no action were taken on the sablefish issue, it may well be that earnings by Southeast Alaska residents will decline, but whether this will translate to lost jobs or to smaller incomes per job cannot be predicted at this point. Thus, it is important to keep in mind that these Tables 4-6 provide a better understanding of where we are with respect to earnings and employment, but may be of limited value in terms of predicting changes that will occur through various regulations.

Growth in Permits Issued and Vessels Fishing in the Alaska Sablefish Fishery

Turning to an analysis of the numbers of potential entrants in the sablefish fishery, Table 7 shows the number of Gulf of Alaska groundfish permits issued by residency of applicant and gear category, for 1984 and 1985. The city/state designations are presented in a footnote. The gear groups are divided generally into two groups--the "specialists" and the "generalists"--or those who listed only one gear type which they might fish in the upcoming season versus those who listed multiple gear types. Those who listed multiple gear types have been divided into those who included longlines as a possible gear type to use, and those who listed pot gear as a possible gear type to use. These statistics, then, reflect numbers of permits by residency which show a high degree of involvement in a single gear-type fishery, and others who may be listing extra gear types in order to have the option to switch gear

Table 7. Number of Gulf of Alaska Permits by Residency of Applicant and Gear category, 1984-1985

	CITY GROUPS/STATE GROUPS[1/]															
	1	2	3	4	5	6	7	8	9	10	11	12	OR	CA	OTH	U
1984																
Longline only	26	18	10	6	29	12	21	37	36	12	54	3	3	5		1
Pot only					1			1	2		3			1		
Other gear only	10	1	3		4	4	1	4	26	2	53	5	21	5		3
Multi-gear, longlines incl.	55	18	25	11	52	24	27	84	43	16	37	3	8	2		1
Multi-gear, pots incl.	25	13	13	4	23	12	22	58	30	13	26	1	3	2		
Total number of permits[2/]	91	38	38	17	86	40	51	127	108	31	157	11	33	14		5
1985 (Preliminary)																
Longline only	26	14	8	3	20	5	13	36	29	7	42	4	1	3		
Pot only									1		3			2		
Other gear only	10	1	4		8	3		3	15	1	56	5	21	4		
Multi-gear, longlines incl.	56	26	26	13	57	27	33	79	40	20	37	5	9	4	1	1
Multi-gear, pots incl.	25	19	15	5	29	10	26	55	37	16	22	2	6	3	1	
Total number of permits[2/]	92	41	38	16	86	35	47	119	89	28	146	14	32	13	1	1

1/ 1 = Sitka; 2 = Petersburg/Wrangell; 3 = Ketchikan; 4 = Pelican; S = Juneau/Douglas; 6 = Other Southeast Towns; 7 = Prince William Sound; 8 = Kenai Peninsula; 9 = Kodiak/Aleutian Islands; 10 = Alaska Interior; 11 = Seattle/Puget Sound; 12 = Other Washington; OR = Oregon; CA = California; OTH = Other Cities or States; U = Unknown locale or unable to locate residence.

2/ This row is not a column-wise addition of the top five rows. This row represents the total number of individual permits, regardless of gear categories listed. A column addition would double-count permits, and is therefore not a relevant indicator of permit numbers.

Source: National Marine Fisheries Service; V. Vaughn, Analyst

types in the future. There may be a number of motivations for such diverse behavior, ranging from genuine ability to switch to other gear, to speculative motives. However, the interpretation of the multiple gear figures is that these may be the reserve or potential numbers of participants in longline and pot fishing who might switch over, depending on markets, regulatory environment changes, or stock conditions. The second important observation regarding Table 7 is that the 1985 permit numbers, although preliminary, are very nearly that of the 1984 permits in terms of the magnitude of the numbers. The other notable observation is that both longline-only and pot-only permit numbers have not yet reached the 1984 levels, even though one fishery for which most of these licenses are obtained--the sablefish fishery--is already underway. One possible explanation is that many of the longline vessels anticipate fishing halibut only, the fishery for which will occur later in the season.

However, the most interesting aspect of Table 7 is the area of residency of the permit holders for 1984 and 1985, and the composition of the gear types which were listed on the permits. For example, the largest fleet is based in Seattle and is composed mainly of longline and "other gear" (mostly trawls).

The number of vessels fishing pots exclusively and which were licensed in 1984 were relatively small compared to those vessels which listed multiple gear plus pots. The same pattern is almost duplicated in 1985. The five major cities in terms of number of Gulf of Alaska groundfish permit holders were Seattle/Puget Sound, Kenai Peninsula, Kodiak/Aleutian, Sitka, and Juneau/Douglas in 1984 and 1985.

Table 8 presents the number of vessels which actually fished sablefish in the respective management areas by year and gear type used. It cannot be inferred from this table where these vessels come from. The only inference which can be made is that a mixed group of vessels fished in the area. The subheading "Southeast totals" gives the total numbers of vessels operating in the Eastern Gulf, by gear type, in a given year. It is interesting to note that since 1981, there has been a general increase in the number of vessels fishing in the southeast area. As other tables indicate, there is reason to believe that the share of the catch by Southeast Alaska longliners have

gradually declined, and the beneficiaries of this decline have been vessels from southern states. Although this phenomenon cannot be easily seen in this table, catch tonnages reveal the pattern and suggest that the vessels which are contributing to the increased effort may be coming from outside the southeast area. There has been little trawl activity for sablefish, although there have been limited attempts in 1981 and 1983. The presence of pot fishermen in southeast Alaska has fluctuated from 4 in 1980 to 2 in 1984. The general trend over all gear classes, then, is a gradual accumulation of effort, which appears to be accelerating through time. Practically speaking, encouragement to fully develop the sablefish fishery has now added to a rapid trend towards overdevelopment. This phenomenon is also reflected in many of the other indicators of effort shown. For example, the management area called "State waters" is that fishing area within 3 miles of the States coast line, plus internal areas beyond 3 miles recently ceded over to the State. There are a number of vessels which fish exclusively in this area throughout Alaska, and their numbers have been steadily increasing since 1982. The largest group of vessels in this category are the longliners, and they appear to have contributed substantially to the overall increase in small vessels fishing in the State. It should be mentioned that these vessels which fish exclusively in State waters are likely to be smaller and less mobile than other vessels engaged in fishing operations. They are not, however, subject to Federal regulation.

In contrast, those vessels which visit from outside of the State to fish are likely to be more seaworthy, since they are in the position of having to make longer trips from the south. Also, 1984 is the first time there has been longline activity for sablefish in the Bering Sea or Aleutian Islands management area. There is, however, a noticeable increase in these areas by pot, trawl and longline vessels recently.

Overall, the image that is presented is one of a rapidly growing fishery, with little or no constraints placed on it, and a rather large involvement in the fishery by those outside the State in several different gear types. Pots and gillnets are, for the present, in the minority as far as numbers are concerned, although pot vessels appear to have taken large proportions of the OY in areas where they have fished.

Table 9 presents two important pieces of information in a time series; the numbers of groundfish permits by gear type and also by city group or state in which the permit holder is resident. Although data are not readily available by area of residence and gear type earlier than 1984 (see Table 8), this table does show overall trends by each category. The figures should be interpreted as a listing not only of those presently engaged in the fishery, but also those who may not be fishing sablefish at this time, but who might have the capability or the motivation to enter the fishery. The top part of the table is a tabulation of gear categories and groupings which were listed on the permit application for the fishery in the EEZ (Exclusive Economic Zone).

The permits were divided into several categories according to the gear type or groups of gear types the applicant expected to use in the fishery. As in Table 8, this type of information may reflect speculative motives, actual capability, or desires for planning flexibility in the face of uncertainty. None of these motives can be completely discounted as mere wishful thinking on the part of the fishermen. This is especially true for longline vessels, which are well adapted to rapid conversion to other rigs of longlines. Pot fishing would likely require more capital investment, and therefore conversion to sablefish pots may be slower; however, the manager is dealing with a potentially volatile fishery which, at present, would be very hard to manage on a long-term basis.

As could be expected, those fishermen who specified gear type tended to try to diversify their permits by making themselves eligible to fish multiple gear types. The growth in pot-only permits has been somewhat sporadic, but the instances where pots are specified as an alternative has grown steadily to an impressive number. By the same token, longline-only permits first declined and then went on the increase, and now stands at 203 permits as of March 1985. Overall, however, the incidence of longlines as a possible gear type has reached very large proportions. In 1985, there were twice as many fishermen specifying longlines as a possible gear type as there were pot specifications in permits. From 1981, the total number of permits distributed by NMFS has been practically on an exponential increase.

TABLE 8. Number of vessels which fished sablefish, by year, gear, and management are, 1980-1984[1/]

	LL	TRWL	POT	GLNT	OHL	OTHR	TOT	LL	TRWL	POT	GLNT	OHL	OTHR	TOT
					1980							1981		
Southeast/East Yakutat	96	0	4	0	0	0	100	62	0	1	0	3	0	66
West Yakutat	1	0	0	0	0	0	1	0	1	0	0	0	0	1
Central Gulf	3	4	0	0	0	0	7	0	4	0	0	0	0	4
Western Gulf	1	1	0	0	0	0	2	0	0	0	0	0	0	0
Gulf of Alaska Total	100	5	4	0	0	0	109	62	5	1	0	3	0	71
Bering Sea/Aleutians Total	0	1	0	0	0	0	1	0	1	0	0	0	0	1
State Waters Total	76	0	1	0	1	1	79	56	0	3	1	2	1	63
					1982							1983		
Southeast/East Yakutat	95	0	0	0	2	0	97	95	0	0	0	3	0	98
West Yakutat	21	0	1	0	0	0	22	23	1	0	0	0	0	124
Central Gulf	4	8	0	0	0	0	12	23	3	0	0	1	0	27
Western Gulf	0	0	0	0	0	0	0	0	2	0	0	0	0	2
Gulf of Alaska Total	105	8	1	0	2	0	116	113	6	0	0	4	0	123
Bering Sea/Aleutians Total	0	22	0	0	0	2	24	0	5	0	0	0	0	5
State Waters Total	64	0	1	1	0	0	66	80	0	1	0	1	0	82
					1984									
Southeast/East Yakutat	126	0	2	0	5	2	135							
West Yakutat	64	0	0	1	0	0	65							
Central Gulf	46	9	3	5	0	0	63							
Western Gulf	8	7	1	0	0	1	17							
Gulf of Alaska Total	173	16	5	5	5	3	200							
Bering Sea/Aleutians Total	3	26	1	0	0	1	28							
State Waters Total	108	0	4	0	7	0	119							

1/
LL = Longlines
TRWL = Trawl
POT = Pot
GLNT = Gillnet
OHL = Other Hook-and-line
OTHR = Other gear
TOT = Total

Source: Alaska Department of Fish and Game

The lower half of Table 9 investigates the residence of the permit holders. In practically every city group and state of residence, there has been an explosive growth in permits, overall, in 1983 and 1984, and especially 1984. Those areas experiencing the most rapid growth in permit holdings since 1982 have been, in order, the Kenai Peninsula, Kodiak/Aleutians, Seattle/Puget Sound, Juneau/Douglas, Sitka, and Prince William Sound.

This information suggests, again, that growth in the sablefish fishery has the potential of being broad-based and rapid, with a high likelihood of this growth outstripping the ability of the managers to monitor resource use or to manage effort. This is not uncommon in open access fisheries, where large amounts of effort are chasing resources.

V. ANALYSIS OF ALTERNATIVES

Overview

Gains in social welfare can occur with more efficient production of goods, efficient transformation of production from one good to some other good, and efficiencies in trade. However, the realities of the socioeconomic environment are that productive efficiencies are sometimes confused with overall social efficiency, and the effect of structural inefficiencies, such as imperfect knowledge and transactions costs, on the practical outcome of a decision are sometimes ignored. Social efficiency, of which productive efficiency is only a part, is highly desirable, from the standpoint of maintaining social stability. Given these realities, the achievement of, say, productive efficiencies in the face of other structural inefficiencies may greatly destabilize an economy, and can end up being actually less efficient, in the long run, than a more basic attack on the structural inefficiencies. An analysis of the alternatives must address this issue of gains in overall social welfare by satisfaction of the objectives. Various arguments have been advanced in testimony to the Council which have attempted to present a strong case for action based on social efficiency. One argument has been that longline prices and markets, in comparison to pot prices for sablefish, are stronger. Subsequent draft work by Wilson (1984) has shown that, although

Table 9. Number of Gulf of Alaska groundfish permits by gear type and residence of permit holder, by year.

	1979	1980	1981	1982	1983	1984	1985[3/]
Permits where longline is specified:	180	188	149	172	272	680	625
Longline only	163	140	82	93	133	273	203
Longline and pots	3	9	17	13	19	59	61
Longline, pots, and other	0	8	16	29	45	169	185
Longline and other (no pots)	14	31	34	37	75	179	176
Permits where pots are specified:	12	27	40	49	79	253	267
Pots only	3	6	2	0	3	8	6
Longline and pots[1/]	3	9	17	13	19	59	61
Longline, pots, and other[1/]	0	8	16	29	45	169	185
Pots and other (no longlines)	6	4	5	7	12	17	15
Other gear only	33	59	43	71	106	142	130
Total Gulf of Alaska Permits[2/]	222	257	199	250	393	847	776
City Group or State of Residence							
1. Sitka	22	34	25	37	58	91	
2. Petersburg/Wrangell	33	31	21	19	22	38	
3. Ketchikan	17	12	9	10	11	38	
4. Pelican	4	3	2	5	12	17	
5. Juneau/Douglas	34	41	30	31	55	86	
6. Other Southeast	4	6	6	6	6	40	
7. Prince William Sound	1	7	6	6	4	51	
8. Kenai Peninsula	23	22	16	9	21	127	
9. Kodiak/Aleutians	12	23	16	16	36	111	
10. Alaska Interior	0	0	1	1	4	28	
11. Seattle/Puget Sound	57	55	50	79	111	157	
12. Other Washington	1	1	0	1	3	19	
13. Other:							
Oregon	5	11	10	17	36	23	
California	3	9	7	13	14	14	
Other	0	1	0	0	0	0	
Unknown	1	1	0	0	0	5	

1/ These categories were duplicated in the major heading "Permits where longline is specified".
2/ Totals represent individual permits, regardless of the number of gear types specified.
3/ Preliminary estimates.

Source: National Marine Fisheries Service

this argument might be made with regard to directed longline versus directed trawl fisheries, it is not so much the case in the pot/longline controversy. In fact, it is ultimately possible for all vessel gear types to create high quality products. This observation, however, leads to a second argument for some form of effort management. In the Eastern Regulatory Area, there were 190 longline vessels which fished sablefish in 1984. In this area, the sablefish OY was competely taken. This happened prior to the influx of pot vessels into the fishery by Washington and Alaskan residents. This new pot fishery, which consists of a number of large (90-160 foot) vessels with 500 to 1,000 pots per vessel, may have the potential for introducing yet even more effort than the resource is capable of supporting at this time. The result of the completely open access condition of this fishery again has produced the familiar result of excessive amounts of effort, focused on a fairly limited resource. Pot and longline fishing is expected to expand at a rapid rate, leading to a fishery which is very difficult to monitor. Although ability to monitor a fishery may not be a sufficient argument for suggesting a management measure, other issues in addition to this one do provide a strong argument for serious consideration of some measure to assuage the basic management problem, which is a rapidly expanding amount of effort.

Given the potential overabundance of different types of effort in the fishery, one might ask whether there are any advantages of one gear type over another in terms of productive efficiency, and if there is, what relevance does productive efficiency have on the discussion. A basic issue is the relative "employability" of the different components of effort, and specifically, the human and nonhuman capital which goes to make up effort. The pot fishery, although they may not be necessarily less labor intensive per vessel than longlines, does appear to employ relatively more non-human capital than other directed sablefish operations, and also appears to be relatively more efficient, which means that the tonnage caught per worker is high. In a word, they are efficient. However, the open access fishery with this gear would tend to overuse nonhuman capital in much the same way as the longline gear types will tend to overuse human capital. An important question which might be answered by a decision maker is whether, given the open access problem (which will cause all factors of production to be overused), is it more desirable to employ relatively more people or relatively larger amounts

of nonhuman capital? In addition, relative employability of human capital from different regions becomes an important issue, since the social costs of reemployment of displaced workers may vary depending on where they live. For these reasons, relative efficiency of different gear types has seldom been a reason for promoting a fishery or gear type in an open access situation. Instead there has been an emphasis on balancing productive efficiency arguments with:

1. minimization of gear conflicts and ground preemptions;

2. consideration of traditional dependence of community economies on traditional fishing methods, and employment impacts on human capital;

3. development of fishing regulations which do not unduly favor larger scale operations over those of smaller scale; and

4. maintenance of a healthy fishery resource, primarily by efficiency restrictions on effort.

As shown in the introduction, an open access fishery has no lack of incentives for gains in the amount of effort used or in the development of efficiencies in production, and this is a source of a number of fisheries management problems to date. For this reason, arguments for explicitly allowing even more effort of a greater productive efficiency in an open access situation with scarce resources is counter-intuitive from a fisheries management standpoint. Therefore, productive efficiency-based arguments are rendered moot when overall economic efficiency must be addressed. These considerations fall under a general heading of avoiding adverse impacts on competition and promotion of overall economic efficiency, through maintaining stable community economies.

The conflict between pot and longline vessels may substantially inhibit competition of both gear types beyond what one could normally attribute to economic activity. That is, the definition of competition in the economic sense does not include direct external effects on other producers. Yet, current practice in the pot and longline fishery would have the effect of

subjecting the fleets not only to market competition, which is acceptable, but also to physical competition as well. This physical competition would inhibit the effectiveness of the fleets in the market place, as discussed above.

Alternative 1 - Status Quo (No Regulation)

The status quo would leave the fishery as it is, which means that all vessels would be fishing on a common pool or stock of fish, with free entry and exit. When an area OY is reached, then the fishery would close down.

Traditional dependence on a fishery and economic stability of small communities are both at issue in this discussion. The area under consideration has 190 vessels which were actively engaged in longlining, and a number of shore-based processing plants, either privately or cooperatively owned. In the Eastern Gulf, the catch of sablefish in 1984 was 4,330 mt, which provided a long seasonal fishery for the residents. Assuming a conservative average price, dressed weight, of $0.65/pound, the maximum value of this fishery to local communities was $4,343,394. This figure represents the maximum amounts of primary producer loss that could occur to the region if all longline fishing had to cease. The current weighted average price, as of March 1985, is now even higher for this region at $0.85/pound. More realistically, longline fishing probably would not cease altogether, but would lose considerable ground and resource to the pot fishermen.

One example of how the status quo might affect a local community could be seen by examining the economy of Sitka, a representative town, which has readily available cost and earnings data, and which has one of the more diversified (and therefore relatively healthy) economies in southeast Alaska. Sitka also is one of the active fishing ports in the Southeast District. Five main sectors of Sitka's economy are, in order: forest products, fisheries, health care, education, and government. Fishing represents 28.6% of the economy in terms of employment, based on a 1982 survey by a local consulting firm. With the diminishing position of the wood products industry, the contribution of fisheries to the community may have increased since 1982. In 1984, approximately 1,815 mt of sablefish was landed in Sitka for gross sales

of $2,600,00, assuming an average price of $0.65/pound. The disposition of these sales were roughly as follows: Boat payments; 30%: Variable costs, less labor; 30%: Labor, in the form of crew shares; 40% (includes skipper). If one thinks of the notions of economic rents, or profit, as applied to this problem, some portion of the figure $1,040,000 (40% times gross sales) represents gains to society from sablefish fishing. However, the separation of profit from the normal return on labor is extremely difficult, since an opportunity cost of labor would have to be established for those living in Sitka. This figure, however, represents an upper bound on primary producer rents which accrue to Sitka in a year, if all other factor markets are considered perfectly competitive, and the fishery is unchanged. Additionally, the true benefits probably tend toward the upper bound for the following reasons:

1. labor in Sitka probably has a low opportunity cost;

2. labor mobility, for whatever reasons, is relatively low in a community like Sitka.

Other benefits may accrue to Sitka if the assumption of perfect competition is violated. Turning to the processor side, or the buyers of sablefish, the net operating profit of the processing sector for sablefish is between $100,000 and $150,000 per year, not including payments to labor (approximately $700,000). This net operating profit is one other representation of societal benefits accruing not only to Sitka but to society as a whole. Therefore, based on 1984 figures, a rough estimate of the total net benefits to society of maintenance of a hook and longline-only fishery in Sitka alone for sablefish alone might have been as high as $1,055,000--assuming that processing labor is more mobile than labor in the fishery.

However, some of the parameters of this issue have changed rapidly since 1984. Pot fishing activity in this region in 1985 is estimated to take 20.6% of the Eastern Regulatory Area OY by end of March 1985, and nearly 34% of the Southeast/East Yakutat District OY, by the time the fishery closes down. Assuming the landings made by Sitka were to decline by equal proportions, the

impact of this activity on the economy of Sitka in 1985 would be some measure of loss in operating profits for processors and primary product rent for fishermen. An estimate of these losses to the Eastern regulatory area via the losses to fishermen as a result of the new pot effort would be $458,583. Although it is difficult to make precise estimates on social losses based on processing and harvesting cost structures for the Eastern Regulatory Area fishery, it is possible to show general magnitudes of loss and gain as a result of the open access phenomenon. If profits as a percentage of the total cost of the raw product can be extrapolated from Sitka to the processing sector for the Eastern Regulatory Area, then a rough estimate of producer losses would be $34,393. A similar inference has been used to obtain fishermen losses for the Eastern Regulatory Area, above. An estimate of the total losses for the Eastern Regulatory Area, based on Sitka cost and production figures, is $492,976.

A complete benefit-cost analysis would include a discussion of the net benefits which accrue to the buyer and seller of the pot-caught product. However, meaningful comparisons require that the cost structure of the other sector be available; it makes little sense to apply the same heuristics to both sectors. At this time, the best price data which exist are some reported exvessel prices of Alaska pot-caught sablefish delivered in Washington in 1984, at $1.10/pound, dressed and frozen at sea. This appears to be a fairly liberal estimate of price. However, since cost data for the vessel and the receiving company is unavailable to public agencies, the price and the attendant gross value estimate is not comparable with those estimates of losses for firms in the Eastern Gulf. Cost data for the receiving company in Seattle is not available. If the reasonable assumption is made that those vessels delivering sablefish from Alaska have onboard freezing capacity, then this would mean that the product which was delivered, semi-processed, to Seattle was closer in product form to the processed fish in Sitka. It is impossible to discuss implications of cost structures and productive efficiencies beyond this, without a better appreciation of the relative cost structures of the different market channels.

Alternative 2 - Allocate the Sablefish Quota to Specific Gear Types

The Council has long been aware that many of the questions it faces involve the allocation of scarce fishery resources between competing groups of users. Any regulatory measure which affects the pattern of catch in the industry technically can be thought of as having allocational effects. Where a fishery is resource constrained, or fully harvested by all the gear groups, actions which increase the share of harvests to one group of fishermen will necessarily decrease the share to other groups.

The most common approaches to the regulation or management of fishing effort have involved the institution of time and area closures, restrictions on the amount of gear or on the types and size of vessels that can be used, or (as in the case of prohibited species) the amounts of incidental catch that may be taken by different groups of vessels. Only the latter can be considered a direct form of allocation, since it involves telling one group what the limit on the catch of a particular species may be. This is typically done for species taken incidentally to target operations for some other species and then as a further disincentive to capture, all of the species are prohibited; they must be returned to the sea.

The other types of regulation just mentioned have definite allocational effects, but they are indirect in the sense that the Council (or, for state-managed fisheries, the Board of Fisheries) does not tell members of each gear group how much of a species they can take. Rather, through the institution of various types of restrictions, the amounts which each group will ultimately take is affected. However, the managing body often has not established exactly what the allocational outcome might be, and is sometimes surprised by unexpected outcomes of some types of regulations.

It is for this reason that the alternative of allocating specific amounts to different gear groups in the directed sablefish fishery is proposed. The Council may wish, after weighing all of the pertinent testimony and analysis, to make a decision regarding the amounts of the resource which each gear group can take, rather than selecting a strategy which will generally favor one group, but to an unknown extent.

This point can be examined by referring to Table 10. This table lists the current optimum yields for sablefish in each of the three Gulf of Alaska regulatory areas, and the possible allocation outcomes between pot and longline fishermen which could occur should the Council decide to make the Eastern area a hook and longline-only area, the Eastern and Central areas hook and longline-only, and the whole Gulf of Alaska hook and longline-only. Since 50% of the Gulf OY is located in the Eastern area, if that area alone were made hook and longline-only, and the whole Gulf sablefish OY were taken by domestic fishermen, longline fishermen could catch a minimum of 50% of the OY, and a maximum of 100%. Conversely, pot fishermen could catch the entire remaining 50% of the OY in the common Central and Western regulatory areas (though this is quite unlikely), or (though this is equally unlikely) they could catch as little as 0%. Since 82% of the total Gulf sablefish OY are found in the Eastern and Central areas, making both these areas hook and longline-only would result in an allocational outcome to longliners of 82%-100% of the OY, and an allocational outcome to pot fishermen of 0%-18% of the OY. Of these three possible definitions of a hook and longline-only area, only the third (making the whole Gulf a hook and longline-only area) is determinate with respect to the allocation to each gear group; in this case of course pot fishermen would be allocated 0% of the optimum yield, and longline fishermen would be allocated 100%. The Council may wish for a more determinate outcome as regards allocation than is possible using the hook and longline-only strategy for Eastern and Central areas of the Gulf.

It should be pointed out that the gear allocation alternative is the same as the hook and longline-only alternative for a particular area, if the Council chooses to allocate 100% of the OY to longline fishermen and to allocate 0% of the OY to fishermen using other forms of directed gear. The gear allocation alternative does not, in itself, do anything to satisfy a gear conflict objective, short of allocating 100% of an OY to a given gear type. If the Council were to allocate portions of the OY in each area to different gear groups, if these groups were to fish in the same area at the same time gear conflicts would be expected to occur. Thus, it might be necessary to separate the gear groups in time by staggering seasons or in space by offering different fishing areas; given the amount of effort already extant in the 1985 sablefish fishery, the Council could probably specify seasons for the use of

Table 10. An illustration of the possible allocation outcomes associated with selected longline-only areas for the directed sablefish fishery.

	Type of Longline-only area		
Gear Types	Eastern Area	Eastern and Central	Whole Gulf
Longlines	4,750-9,480 mt	7,810-9,480 mt	9,480 mt
	(50-100%)	(82-100%)	(100%)
Pots/Gillnets	0-4,730 mt	0-1,670 mt	0 mt
	(0-50%)	(0-18%)	(0%)

pot gear, and different seasons for the use of longline gear, and perhaps seasons for the use of other gear, so that the same grounds could be used, but at different times, subject to some provisions for lost gear. Alternatively, the Council could define grounds that would be used for longline fishing and grounds that would be used for other fishing.

Gear allocation strategy might be no better than the other proposed strategies in dealing with the maintenance of employment and incomes in Alaska communities. At the same time, depending on how it is implemented, it would be no worse, since one form of the gear allocation strategy would be in effect the same as creation of hook and longline-only areas.

The problem with satisfaction of this objective is that the share of longline catch which is taken by residents of Alaska has declined from 1983 to 1984, and if this were symptomatic of a trend, no manner of regulation of other gear types would prevent the erosion of an income base and an employment base to those local Alaska communities. In fact, any regulation short of effort management aimed at entry limitation will at best slow the open access phenomenon.

The gear allocation alternative, like the hook and longline-only strategy, does not address the longer term issue of too much effort in the domestic sablefish fishery. It is generally recognized that no conventional management methods (those which restrict the use of inputs to fishing, such as gear or vessel restrictions, or those which establish time and area regimes) is satisfactory to address the problem of too many fishermen and too few fish. On the other hand, it is not clear that there are any good examples of limited access systems from American fishery management experience that adequately address this problem either.

Perhaps the objective which allocating by gear type best satisfies is the one of avoiding undue hardship on current industry participants on the introduction of a regulation. Through the use of this alternative, the Council could essentially "freeze" the pattern of catch of gear groups in whatever way it wished, including the current pattern of catches. This

alternative could well impose less cost on non-longline fishermen, because it would not necessarily require such fishermen to relocate to new grounds.

The question has arisen whether it is legal for the Council to make such allocations according to the type of gear used in the fishery, and in effect create the situation where one group of domestic fishermen is closed out of the fishery (because the quota for their gear type had been taken), while other domestic fishermen (whose quota had not yet been taken) are allowed to continue to fish. Legal advice received is that this strategy is feasible, provided that in the allocation chosen the Council feels that there is a "niche" for each type of gear, and that ensuring that fishermen with each type of gear have an opportunity to take part of the harvest enhances the economic benefits derived from the resource. One issue of particular concern here is National Standard 4 which provides that conservation and management measures shall promote economic efficiency, but that economic allocation not be the sole purpose for the measure. Economic allocation would not be the sole purpose if a particular allocation scheme resulted in a greater overall level of net national benefits than continuing the status quo or choice of some other regulatory strategy. In the present case, if the Council finds that stipulating a specific allocation to each gear group avoids unnecessary hardship on fishermen who currently have claim to the resource and (perhaps through the simultaneous specification of seasons for each gear type) that the pattern of catch can be maintained, without undue gear conflict, then these might be grounds for successful implementation of an allocation scheme and satisfaction of National Standard 4.

From discussions with enforcement and management personnel, it would appear that this regulatory alternative poses substantially the same issues and concerns pertaining to enforcement of the regulation and monitoring of the catch in season.

Monitoring Allocations by Gear Type

Much of the responsibility for inseason monitoring of groundfish harvests rests with the Alaska Department of Fish and Game. The Department has developed a soft data monitoring system which has proven highly responsive to

management needs with respect to monitoring total catch from a fishery. One area of concern with this system, however, is the frequency of reporting by vessels making harvests. For vessels which make landings ashore, this has proven to be no problem, even though some of these vessels make trips of up to ten days in length. For catcher-processors, factory trawlers, and motherships, the situation is somewhat different. These vessels are often based outside the State of Alaska, and they often will not make any landings until they return to their home base at the end of the season. Thus, it is very difficult to know in season how much of a particular species (say, sablefish) each of these vessels may have on board; however, the Council is taking steps to require these vessels to report their catches on a weekly basis, and much of the concern about these vessels will be obviated once this regulation is in place.

The issue of reporting by catcher-processors has been of concern generally for the sablefish fishery, and this concern applies equally to all of the regulatory approaches discussed in this section. However, there is a second monitoring issue which is of particular concern for the alternative to allocate the sablefish quota in each area by gear type.

According to the Department, a situation could arise where a vessel obtained a federal permit for fishing for groundfish, but not a state permit. Because of Alaska's landing laws, vessels must in effect possess a State of Alaska license in order to enter state waters and because the need might arise to enter state waters to lay over in a blow, it is unlikely that vessels would obtain just a federal permit. In fact, in 1984 there were no vessels that had just a federal permit. In 1985, however, there are 24 catcher-processors or motherships with federal licenses, and six of those do not yet have State of Alaska licenses. Informed opinion is that a number of these vessels are new of construction, and for a variety of reasons these vessels have not yet picked up State of Alaska licenses although they are expected to do so.

The problem which arises if a vessel has just a federal permit, and not a state permit, is that the federal permit has several fields for gear type to be used and the individual applying checks all of the fields that he feels may be appropriate for the upcoming year. As a result, some of the federal

permits issued (228 in 1984; 246 to date in 1985) have both the longline and the pot field checked. Thus, theoretically, under the gear allocation alternative, if the pot fishery were to be closed because its allocation had been taken by pot vessels, and a vessel which had only a federal vessel which authorized both pot and longline gear on the grounds, it might not be immediately obvious on overflight what kind of gear the vessel was actually fishing. This might raise an enforcement issue, which will be discussed more fully in a following section. With regard to monitoring, with weekly reporting by catcher-processors (and normal fish ticket procedures for other vessels), such a vessel would have to file a fish ticket reporting the catch made and the gear used to take the harvest. Past experience indicates that the gear used field is not well completed, though the Department of Fish and Game has instituted requirements that the fish ticket be fully completed and they have the power to enforce this provision. Thus, a circumstance could arise where a vessel that had just a federal permit, with both pot and longline authorizations, and which turned in a fish ticket without the gear used field completed, could temporarily be difficult to monitor.

The occurrence of this type of situation is acknowledged to be remote because there were no vessels in 1984 that had just a federal permit and not a state permit, and while there are six currently in this condition in 1985, they are expected to obtain state permits during the year. Also, the Department's ability to enforce the completion of fish tickets and obtain the gear type used would further prevent any significant monitoring problem from arising. Nonetheless, it is useful for the Council to be aware of this theoretically possible difficult with monitoring allocations by gear type. Both NMFS and the Department of Fish and Game have advised that they are working on procedures to eliminate completely the possibility of such a circumstance happening.

Alternative 3 - License Limitation

The are a number of effort limitation methods. However, the one which will be discussed in this review is the proposal presented to the Council in December 1984 to institute a system in which effort would be controlled by general moratorium, followed by the institution of a privately-funded effort

management program by gear type. This general type of limited access is not new; it has been practiced by the Australian government and other countries for 15 years, with some measure of success. However, what is unique in the proposal which was presented to the Council was the notion of using a system of checks and balances, or a market adversarial relationship between the public and private sector for the management of sablefish. This method of introducing checks and balances to provide stable management in a changing environment is similar in many ways to Jeffersonian types of government models, upon which the United States system of democracy is based. This idea was an extension of a proposal for a cooperative government and industry effort management program developed by an industry member from Kodiak, Alaska. The intent of the original proposal was to find a solution to the problems encountered in the management of effort in the halibut fishery.

There are a number of theoretical underpinnings which the proposal explicitly or implicitly addresses which make it highly attractive. A few of these observations from theory are listed below:

1. Fishermen in the aggregate are affected, to some extent, by whatever misallocation of resources may occur as a result of the open access condition. The so called "dissipation of rents" imposes a cost to fishermen and to all of society.

Although society as a whole could bear this cost, and has done so under most forms of fisheries management, it is often to the advantage of individual fishermen in an open access fishery to attempt negotiations which would lead to a stronger definition of property rights. The problem which usually arises is that the costs of coalition and negotiation may be very great; prejudices and biases could preclude meaningful discussions altogether. Fisheries management at the Federal level is often not equipped to manage effort using analytical approaches and is often constrained by a formidable set of criteria apparently designed to limit agency access to information. Rational management methods must therefore require little or no appeals for additional information, must be flexible and timely, and must conform, at least conceptually, to the national standards, some of which are based on neoclassical and welfare economics. Fisheries management agencies can

sometimes do little more than help set reasonable initial conditions; where "reasonable" implies a condition where the probability of widespread litigation is greatly reduced.

2. If costs of coalition and transaction (or negotiation) are reduced sufficiently, a system of property rights in the fishery will arise, and these property rights will likely be a "socially superior" move, even if these rights continue to be constrained by other rules and regulations such as gear restrictions or fishing seasons. The role of a fisheries management agency might then be to facilitate the formation of negotiations which could yield a stronger system of property rights.

3. An "optimal" number and distribution of permits in any licencing scheme is practically impossible to determine a priori. In fact, optimality depends upon the perceptions of the observer, through time. Social perceptions of the optimal number and distributions of permits as articulated by a regulatory agency may vary substantially from private notions of what is optimal. Since the long-term stability of the resource is ultimately a public responsibility, some exertion of regulatory agency influence is needed. Since long-term stability of effort entry and exit is of concern to those in the fishery, some exertion of the private notions of optimality in numbers and distribution of permits is also needed.

4. Overcapacity in a fishery which arises from attempts to diversify may be a rational response to uncertainty in the fishery. However, this further obscures the idea of analytically deriving an "optimal" number of vessels which collectively possess the correct capacity. However, one could use theoretical results which are accepted by most economists to guide the development of an effort management system which would address the problem of overcapacity, without having to attempt a measurement of optimal capacity in all cases where this information would be needed.

These underpinnings which appeal to the theory of property rights formation and the rise of markets, as well as the inherent role of risk and uncertainty in decision-making, suggest a framework for effort management which is relatively simple to administer, once in place.

First, representatives of different gear types which target on sablefish could be solicited for participation in preliminary planning meetings where a basic framework of self-managed effort would be discussed. This basic framework would include:

1. The setting of a moratorium. This moratorium would be the result of all negotiation between the private and public sector representatives, and would cover, in detail, the criterion and conditions under which the moratorium would take place. However, no moratorium proposal would be advanced until a complete negotiation of the effort management model had taken place. The objective would be to develop a moratorium which would minimize the possibility of lengthy litigation.

2. The setting of a yearly fee for permit holders according to some aspect of scale of production (say, size of vessel). A yearly licence fee would serve the twofold purpose of generating funds for effort management, as well as discouraging the speculative motive in the permitting system.

3. Deciding upon the terms of use and transferability of a permit. For example, to further discourage speculative motives, all permits might be initially nontransferable, (or transferrable, but not at a free market value) for some period of time, which would be agreed to in negotiation. After this time of limited trading rights, permits would then become freely transferable. This is but one example of terms which might be applied to permits in order to assure an orderly fishery. Other types of terms might include:

(a) Maximum number of licences one can hold,

(b) Rules governing the licencing of those having fished more than one scale size or class of vessel,

(c) Rules governing the use of licences by absentee owners

(d) Rules governing special cases which are likely to occur, such as eligible fishermen who do not have a vessel,

(e) Other features designed to make the fishery more rational, such as provisions for inactive permits which would decrease fishing pressure which is based on speculative motive.

4. Development of a nominal fish tax, also used to fund effort management. The reason for this provision would be to tax those fishermen who benefit the most from the fishery. The tax would also have the dual purpose of slowing down "capital stuffing" while at the same time contributing to a buy-back fund.

5. Developing of the fishermen's association and trust fund for that gear type and fishery, and outlining the rules under which funds could be used. Some of the more important issues which would have to be resolved would be those associated with the organization of the association, and the legal basis for the collection of fees for management. More specifically, a plan would probably have to address:

(a) composition, tenure and bylaws of the Board of Trustees;

(b) development of the specific uses for monies collected (i.e., to fund meetings of fishermen representatives, mailings, commissioned studies on status of stocks or fishery, and buy-back schemes);

(c) bylaws regulating the trading rules for the exchange of permits by all participants.

6. Appointment of an effort management board composed of public managers for the purpose of engaging in open market bids for permits, either for retirement or for resale. The basis for these dichotomous bodies involved in the management of effort would ultimately be to provide a free market checks and balances approach to fisheries management between public and private interests. For example, if public managers are more concerned about effort reduction than their counterpart board, it would be incumbent upon them to engage in open market operations to buy and retire permits. Obviously, the checks and balances system could just as easily work in a number of other

ways, all of which would provide market solutions to specific cases of effort oversupply or undersupply.

There are a number of very strong recommendations for such an effort management system, the most important of which is that fishermen collectively bear some of the costs and responsibilities of fisheries management directly, and they do so in areas like effort management, where public managers in this country have been neither too eager nor very successful at suggesting different approaches to the management of effort. Costs of litigation under this alternative are intentionally avoided by having a high degree of participation by fishermen from the beginning, and a fairly liberal set of entry criterion. However, annual fees for permits, poundage taxes for deliveries or "no-trade" periods could be structured in such a way as to discourage speculators, but not be burdensome to low income fishermen.

There is a theoretical basis both for the entry fee and the poundage tax, since the entry of more vessels in a fishery than needed imposes a cost to society in the form of dissipated rents, which might be partially corrected through time by removal of effort. A poundage tax, especially if divided between the fishermen and management boards for purposes of effort management, and used for fisheries management related activity only, conforms closely to the notion of fishermen remitting some captured rents resulting from effort management directly to the public sector, through taxes, which has been a frequent recommendation coming from fisheries economic theory. A market adversarial relationship between effort management boards, one for public managers and one for private managers, maintains a set of checks and balances which are inherent in fisheries management anyway, but in this system the adversarial relationship is market related. Such a system might be more in conformance with the dynamics of the fishery itself, and does not necessarily require large amounts of data to bring about a change (in fact, information associated with licence trading could generate considerable data on vital indicators of the fishery). The proposal is general in approach to effort management; and the implementation need not necessarily disturb the present fisheries management structure.

Most other limited entry plans assume that the primary focus should always be effort reduction through the permanent retirement of permits. These plans, however, suffer from the inability to allow growth in a fleet when or if it is needed, or to provide for a system of permit redistribution in accordance with the desires of public or private managers. A system where permits are temporarily retired and then recirculated at later dates have several positive features, and are therefore attractive from a cybernetic standpoint:

1. It provides for the possibility for a growth in fleet size if stocks rebuild.

2. It allows for the possibility of resales to occur over time; the practical effect of such an arrangement is that effort is redistributed over time in a way that might better reflect a social optimum. Permit sales could be used to recoup losses which occur in previous time periods.

3. It allows for the possibility of subsidized permit redistribution to occur to disadvantaged groups or younger fishermen in order to partially offset whatever biases a market approach may have against those activities which generally might be considered to be socially desirable.

It should be added that the general notion of effort management with checks and balances is applicable to all fisheries and gear types, although it has been discussed here primarily in connection with sablefish. The features of this alternative are its basis in economic theory, a reliance on a Jeffersonian system of checks and balances to represent public and private views, a management alternative which encourages negotiation between gear types and coalition among similar gear types, and flexible effort management response to exogenous changes, especially those occurring as a result of stock rebuilding.

There are, however, a number of drawbacks to this system of managing the sablefish fishery and there are immediate problems which are apparent. First, the negotiation of bylaws for any fishermen's association and board of trustees would likely be long and somewhat expensive to accomplish. Even if a

guideline plan which would serve as the basis for further development were well developed by Council and NMFS staff, a substantial amount of time would have to be devoted to refining this plan and exploring the "what if's" which would arise. This formative part of the plan would have to be worked out far in advance of any proposed moratorium. From the standpoint of timing and costs of development, such a plan would not provide effective short-term solutions to the problems which were identified by the Council.

A second major problem with this alternative is the legalities of the proposed boards of trustees and the source of their funding. This is especially true since there have been no changes in fee collecting provisions in the Magnuson Act. These provisions, as they are now stated, do not permit the collection of fees, the amounts of which exceed the administrative costs of issuing licenses. Although it is clear that management costs can far exceed the costs of issuing licenses, this continues to be a substantial roadblock to the more rational management of the fishery.

This alternative, because of its long-term nature, would do little to correct or curtail gear conflict problems in the southeast part of the Gulf of Alaska, nor would it be an immediate solution to the other, more general consequences of the open access condition. The benefits that would accrue would be longer-term, and substantial. However, time would be required, both to set up the system and to realize these benefits. Even over the medium-term, the problem of "capital stuffing" might persist, and would therefore not necessarily result in an immediate reduction of effort, unless conventional gear restrictions are imposed or retained.

There is also a problem with the ease in which a moratorium might be imposed. Inherent in any successful moratorium is a distillation of very simple criteria which, for one reason or another, are not seriously contested. Difficulties arise, however, when a moratorium and plan for effort management has not been worked out well in advance and then the proposal is stymied or killed during review. The public attention given to the moratorium then affects the speculative motives of fishermen, which then descend on the resource en masse; and, as can be seen historically, this economically rational, individual act by all fishermen nevertheless poses formidable

fisheries management problems by greatly exacerbating the open access phenomenon.

These issues pose problems in the timely implementation of this alternative, and in the realization of positive benefits. Depending on future changes which could take place in the Magnuson Act, some variant of this proposal might be more politically or legally acceptable.

However, even with the possibility of setting up such an effort management program, three problems still remain, which are somewhat related to each other. The first problem is that agencies will, as a matter of practicality, need to make decisions on the appropriate gear type which will be used in a given fishery, unless all gear types are simultaneously treated. If all gear types are simultaneously treated, the manageability of the resource could be severely taxed. If certain gear types are excluded, the likelihood of legal conflict becomes greater. The second problem is related to the first, and has to do with the applicability of license limitation by gear type and fishery. If the fishing environment is unstable to the point where diversification of operations is a way for fishermen to maximize returns in the face of uncertainty, how reasonable is it to propose effort management programs which are piecemeal, by gear type, and by directed fishery? Also, if there are participants who are less able to exclusively target on one resource than on others, but who are able to retain their rights to sell incidental catch, would an effort management model based on single species and gear type be useful?

Finally, the difficulties in defining the eligible gear types for a specific fishery extend to problems in defining the appropriate region within which such effort management would take place. Ultimately, both of these definitions must be somewhat arbitrary, but must at the same time conform to national standards. Most of these problems might be overcome by incorporation of existing management infrastructure, such as development of effort management for the participants in the Alaska Region, regardless of the state of origin. Many problems could be resolved by judiciously selecting representatives of a negotiating team which would include as many of the affected parties as possible. However, it could well be that negotiations

aimed at comprehensively dealing with the effort management issue could lead to recommendations which transcend any one fishery, and which would be general enough to be applicable to different gear types. Such thinking, while badly needed for the long-range welfare of the fisheries, would do little in the way of clearing up the short term problems which the Council has identified.

Alternative 4 - Hook and Longline-Only Areas

A general class of management tools considered by the Council was gear restrictions for selected areas in the Gulf of Alaska. These types of restrictions have been used in the past in order to protect the resource of the directed fishery as well as to disperse effort and reduce the magnitude of incidental catch. There are several major advantages to this general class of effort management.

1. It is timely. The effects of a gear restriction area would be immediate. The time necessary for setting gear area restrictions could be comparatively shorter than for other measures.

2. Gear restriction can reduce gear conflicts by physically separating gear types in many cases. Note, however, that it is conceivable for a management area to become so small, relative to the number of potential participants in the area, as to bring on the very gear conflict which was to be solved by a gear/area designation.

3. Gear restrictions, if they are not challenged, may be less costly to enact than other effort management approaches.

4. A variant of this alternative will likely mitigate the short-term impacts on southeastern and south-central community economies. However, note that since this management tool does not explicitly address the problem of overuse of effort, these benefits are likely to be short-lived.

Catch By Gear Type and Residence

In Table 2, it was shown that the pattern of catch in the sablefish fishery shifted from a substantially foreign fishery to a wholly domestic fishery between 1983 and 1984. Since two of the Council's objectives may include maintenance of community stability and minimization of hardship on current participants, it is useful to know not only what type of gear is being used to harvest the resource, but where the fisherman doing the harvesting call home, and where they have fished in the past. Because creation of hook and longline-only areas could disadvantage other gear types by making them forego grounds they previously fished, it is helpful to know where fishermen live in relation to where they fished in 1984.

Tables 11-13 present a more detailed breakdown of catch in the domestic sablefish fishery by gear type and residence of the permit holder making landings, for each of the three Gulf of Alaska regulatory areas. Taking Table 11 first, of those reporting catches from the Eastern Gulf, residents of Southeast Alaska reported longline catches of 1,685 mt in 1983, and 2,298 mt in 1984. The five major communities of residence were Sitka, Petersburg-Wrangell area, the Ketchikan area, Pelican, and the Juneau area. Longliners residing in other Alaskan communities took a total of 57 mt in 1983 from the Eastern area, and 120 mt in 1984. Residents of other states took 730 mt from the Eastern area in 1983, and 1,721 mt in 1984, using longline gear.

Two important trends from these brief data series should be pointed out. First, since the fishery was expanding dramatically between 1983 and 1984, the increases in catches by other gear types did not significantly affect the share of harvest taken by longline gear; it changed from 99.7% in 1983 to 98.7% in 1984. However, events in 1985 have substantially altered the share of harvest taken by longline gear: pot gear has taken 34% of the Eastern area catch to date, and longline gear has taken 66%.

The second interesting trend is that among longliners, the share of longline harvests taken by Southeast Alaska residents declined from between 1983 and 1984. In 1983, Southeast Alaska residents took 68% (1,685 mt divided by 2,483 mt) of longline harvests, while in 1984 they took some 55% (2,298 mt

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Table 11. Eastern Gulf Regulatory Area: Domestic Catches of Sablefish by Gear Type and Residence of Permit Holder Making Landings, 1983 and 1984.

Residence	1984 Longline	1984 Pot	1984 Gillnet	1983 Longline	1983 Trawl
Sitka	603 mt	0 mt	0 mt	422 mt	0 mt
Petersburg/Wrangell	467	0	0	343	0
Ketchikan	200	1	0	84	0
Pelican	368	0	0	402	0
Juneau/Douglas	622	0	0	396	0
Other SE	38	0	0	38	0
SE ALASKA TOTAL	2,298 mt	1 mt	0 mt	1,685 mt	0 mt
Cordova/Prince William Sound	10 mt	0 mt	0 mt	0 mt	0 mt
Homer/Kenai Peninsula	58	0	1	53	0
Kodiak/Aleutians	45	0	0	4	8
Other Alaska	7	0	0	0	0
ALASKA TOTAL	2,418 mt	1 mt	1 mt	1,742 mt	8 mt
Seattle/Puget Sound	1,473 mt	0 mt	0 mt	659 mt	0 mt
Other Washington	9	51	0	0	0
Other Outside	239	0	0	71	0
OUT OF STATE TOTAL	1,721 mt	51 mt	0 mt	730 mt	0 mt
Unknown	26	0	0	0	0
TOTAL HARVEST	4,165 mt	53 mt	1 mt	2,483 mt	8 mt

Source: Alaska Dept. of Fish and Game

Table 12. Central Gulf Regulatory Area: Domestic Catches of Sablefish by Gear Type and Residence of Permit Holder Making Landings, 1983 and 1984.

	1984				1983	
Residence	Longline	Pot	Gillnet	Trawl	Long-line	Trawl
Sitka	142 mt	0 mt	0 mt	0 mt	74 mt	0 mt
Petersburg/Wrangell	19	0	0	0	0	0
Ketchikan	20	0	0	0	0	0
Pelican	72	0	0	0	3	0
Juneau/Douglas	53	0	0	0	7	0
SE ALASKA TOTAL	306 mt	0 mt	0 mt	0 mt	84 mt	0 mt
Cordova/Prince William Sound	5 mt	0 mt	0 mt	0 mt	3 mt	0 mt
Homer/Kenai Peninsula	452	0	3	0	51	0
Kodiak/Aleutians	492	12	0	11	3	1
Other Alaska	32	0	0	0	0	0
ALASKA TOTAL	1,287 mt	12 mt	3 mt	11 mt	141 mt	1 mt
Seattle/Puget Sound	1,017 mt	62 mt	39 mt	0 mt	38 mt	0 mt
Other Outside	324	0	0	1	72	0
OUT OF STATE TOTAL	1,341 mt	62 mt	39 mt	1 mt	110 mt	0 mt
TOTAL HARVEST	2,628 mt	74 mt	42 mt	12 mt	251 mt	1 mt

Source: Alaska Dept. of Fish and Game

Table 13. Western Gulf Regulatory Area: Domestic Catches of Sablefish by Gear Type and Residence of Permit Holder Making Landings, 1983 and 1984.

	1984			1983
Residence	Longline	Pot	Trawl	Trawl
Ketchikan	66 mt	0 mt	0 mt	0 mt
Pelican	tr	0	0	0
SE ALASKA TOTAL	66 mt	0 mt	0 mt	0 mt
Kodiak/Aleutians	3 mt	80 mt	3 mt	0 mt
ALASKA TOTAL	69 mt	80 mt	3 mt	0 mt
Seattle/Puget Sound	24 mt	0 mt	1 mt	10 mt
Other Washington	0 mt	0	1	0
Other Outside		0	22	10
OUT OF STATE TOTAL	24 mt	0 mt	24 mt	10 mt
Unknown	3 mt	0 mt	3 mt	10 mt
TOTAL HARVEST	96 mt	80 mt	30 mt	10 mt

tr = trace

Source: Alaska Dept. of Fish and Game

divided by 4,165 mt). What this suggests is that even though a hook and line only area might be formed, the basic open access problem still remains, and such regulation may only provide short term relief.

The bulk of the pot catch taken in 1984 and 1985 has been by nonresidents. In 1984 only a single metric ton of sablefish was taken by gillnet gear in the Eastern area. In 1983, neither of these gears were reported as taking any sablefish catches, although 8 mt of DAP trawl catch was reported.

Table 12 presents similar information for the Central Gulf of Alaska. Most of the longline catch in 1984 was taken by nonresident boats, while residents of Central Alaska communities, primarily Homer and Kodiak, landed nearly 1,000 mt, compared to 141 mt the year before. Southeast Alaska residents accounted for only 306 mt, a substantial increase from 84 mt the year prior.

Pot and gillnet gear accounted for slightly more than 4% of the Central Gulf domestic sablefish catch in 1984 compared with 0% the year prior. The bulk of the pot and gillnet catch was taken by nonresidents of the state. In the Central Gulf, sablefish fishing became a major source of earnings to residents of Kodiak and Homer in particular. As in the Eastern Gulf, the share of longline harvests taken by Alaska residents declined somewhat between 1983 and 1984 from 56% to 49%, though in absolute volume the catches increased by a factor of eight-fold.

In the Western Regulatory Area, domestic fishermen did not take the entire optimum yield for sablefish. Here, the catch was much more evenly split between longlines and pots, with pot gear accounting for 80 mt of catch and longline gear accounting for 96 mt of catch. Neither gear had registered any harvest in 1983. There was also a small trawl catch of 30 mt in 1984 and 10 mt in 1983.

Relative Importance of Sablefish Management Objectives by Regulatory Area

The following discussion will focus on which objectives for regulation of the sablefish fishery might appear to be most important in each of the regulatory areas, based on evidence on the pattern of catch from 1983 to 1985.

In looking at the Eastern Gulf (Table 11), it appears that a strong case can be made that maintaining the stability of Southeast Alaska communities which rely on the sablefish fishery can be made. In 1983, as in prior years (see Table 5), residents of Southeast Alaska derived substantial income and employment from the longline sablefish fishery. While the fishery is important to residents of other states, the catches of non-residents were at a level of one-quarter to one-third of the total harvest in 1984; most of these non-resident (longline) fishermen land their catches in Southeast Alaska, and for 1983 and 1984, most of the non-resident catch was taken by fishermen who lived in the Seattle/Puget Sound region, a metropolitan area with substantially greater employment opportunities than exist for most Southeast Alaska communities. Mitigation of the gear conflict issue did not arise until the 1985 fishery, but it is a very real and substantial problem now, according to testimony the Council has received.

With respect to avoiding hardship on current participants in the fishery, it is interesting to note that nearly all of the pot catch in 1984 taken in the Eastern Gulf was by residents of communities outside the state, and indications are that the same is true for 1985. This suggests that a hook and longline-only area in the Eastern Gulf would require vessels from out of state to travel farther to fish in the Central or Western Gulf than they would if the Eastern Gulf were available to them; there may also be differences in catch rates between the two areas, which could affect the cost of operation of pot boats either positively or negatively. The Council may wish to evaluate how much greater cost is involved for pot vessels in traveling from the Seattle area to the Central or Western Gulf, relative to traveling from Seattle to the Eastern Gulf, in considering the costs imposed on pot fishermen.

With respect to the prevention of excess capitalization, it does not appear to be reasonable to argue that creation of a hook and longline-only area addresses the issues this issue satisfactorily. It also appears, from

the evidence of the 1985 fishery, that this is a major problem in the Eastern Regulatory Area; it was noted earlier that by mid-March 1985, 55% of the entire Eastern area quota had been taken, compared with 8% through all of March in 1984. While 34% of this catch was taken by pot fishermen, the other 66% was taken by longline fishermen, so longline fishermen alone accounted for the taking of 36% of the Eastern area OY through mid-March 1985. While it is possible that the longline fishery would not have accelerated so rapidly had there not been pot boats actively fishing, it is nevertheless true that the increasing number of longline vessels participating in the fishery would tend to accelerate the fishery anyway, and this fishery would only become more grave in the years to come unless it is addressed soon.

Taking the Central Area (Table 12), it is interesting to see that this area has not been historically depended upon by local communities, since the 1983 catches were only something like 8% of the total available optimum yield. Even in 1984, catches by Southeast Alaska residents increased only moderately in relation to increases by fishermen in other areas. A substantial portion of the optimum yield was taken by residents of small communities in the Central Gulf of Alaska in 1984, mainly from Homer and Kodiak, though catches by people from these areas was relatively small in 1983. While the longline fishery is currently a source of significant income to residents of Central Alaska and of communities outside the state, there does not appear to be as strong a case to be made in this area that regulation of the sablefish fishery significantly affects the maintenance of incomes in local communities historically dependent upon the sablefish fishery.

Gear conflict would appear to be an important issue in this area as well as in the Eastern Gulf. While it has not yet reached crisis proportions, the Council undoubtedly would not wish to wait until it did reach those proportions before acting, because once the fishery reached that point it might be very difficult to establish appropriate restrictions. Most of the pot and gillnet catch (101 mt out of 116 mt) was taken by residents of the Seattle/Puget Sound area. If this area were made hook and longline-only, most of the costs of conforming to the regulation would be placed on fishermen from outside the state, who would have to travel further to find fishable grounds. However, the additional costs in terms of running time and running expenses in

going to the Western Gulf from Seattle, relative to going to the Central Gulf from Seattle, may be fairly small. The Council will wish to consider this factor in its determination about a possible hook and longline-only area in the Central Gulf. For this reason, it may be that the objective of avoiding hardship on current participants is not quite so important in the Central Gulf, since there have been no landings of any consequence made yet from the Central Gulf, and the pot and gillnet landings in 1984 were relatively small in magnitude, made by a relatively small number of vessels for whom the additional running costs of relocating to the Western Gulf may not be an extreme burden.

In this regulatory area, the problem of excess of effort is clearly not so major, as it is in the Eastern Gulf, but should well be considered because of the long lead time in attempting to put effective regulations in place to deal with this problem. As the Eastern Gulf becomes rapidly over capitalized, and seasons shorten, the effort will surely move west, so the Council should be thinking ahead toward possible strategies of dealing with this problem in the fairly near future.

Turning to the Western Gulf (Table 13), this fishery remains considerably more wide open, and there is still a significant foreign presence in this fishery. Pot and longline landings in 1984 were nearly equal, so on the basis of catch, both gear groups would appear to have roughly equal claims to the rights to harvest the resource. Similarly, the first landings of sablefish to speak of with these gear types were made in 1984, the objective of maintaining local community stability dependent upon fishing in this area should not be considered a major one. Gear conflict can still be a very real issue since both gear groups (pot and longline) have made landings, avoidance of hardship to either group is a concern; excess effort is not at this point a major concern in this fishery.

To provide a summary of some possible effects of a hook and longline-only area on different groups of fishermen, Table 14 was prepared. Here, much the same information presented in Tables 4-6 is condensed and organized by gear type, management area, and residence of permit holder for 1984 and 1983. Total harvest information is presented for 1985, though it cannot be broken

Table 14. A summary of domestic catches in the Gulf of Alaska sablefish fishery by gear used, management area, and residency of permit holder; 1983 and 1984.

Year/ Residency of Holder	Longline			Pot			Gillnet		
1984	Eastern	Central	Western	Eastern	Central	Western	Eastern	Central	Western
Southeast Alaska	2,298 mt	306 mt	66 mt	1 mt	0 mt	0 mt	0 mt	0 mt	0 mt
Central Alaska	113	949	3	0	12	80	1	3	0
Other Alaska	7	32	0	0	0	0	0	0	0
Out of State	1,721	1,341	24	51	62	0	0	39	0
TOTAL HARVEST	4,165 mt	2,628 mt	96 mt	53 mt	74 mt	80 mt	1 mt	42 mt	0 mt
1983									
Southeast Alaska	1,685 mt	84 mt	0 mt	0 mt	0 mt	0 mt	0 mt	0 mt	0 mt
Central Alaska	57	57	0	0	0	0	0	0	0
Other Alaska	0	0	0	0	0	0	0	0	0
Out of State	730	110	0	0	0	0	0	0	0
TOTAL HARVEST	2,483 mt	251 mt	0 mt	0 mt	0 mt	0 mt	0 mt	0 mt	0 mt

Source: ADF&G

out by residence of permit holder. If the Eastern regulatory area is made hook and longline-only, vessels landing 53 mt in 1984 and 874 mt in 1985 would be required to conduct their fishing operations westward. Data for 1984, and available evidence for 1985, suggest that these are primarily out-of-state fishermen on whom the burden of this requirement would fall. Similarly, if the Central Gulf were made a hook and longline-only area, it would be out-of-state fishermen who have made the bulk of landings, who would be affected, in both the gillnet and pot fisheries. If the Western Gulf were made hook and longline-only, it would be residents of Central Alaska, who fished pots in 1984, who would be required to move. Looked at another way, residents of other states accounted for the bulk of the pot and gillnet catch in the Eastern and Central regulatory areas, while residents of Central Alaska accounted for the bulk of the catch in the Western area.

It is not possible to provide very definitive assessments of the impacts involved with creation of alternative hook and longline-only areas; however, it is thought that the burdens will mainly accrue at the harvesting level, and take the form of increased costs of operation due to the increased running time required to move to new grounds. To the extent that catches per unit effort are different on the new grounds, which would be a transitory phenomenon, some differences in cost of operation of harvesting vessels could result. The number of vessels potentially impacted is small, ranging from three to six vessels which operated pot and gillnet gear in 1984 and 1985; however, the catch accounted for by pot boats in 1985 is substantial. If it were possible to make up catches lost in the Eastern area in areas farther west, there might not be significant adverse impacts on these pot boats, aside from the costs of running mentioned earlier. However, as pot boats compete in the remaining unrestricted areas, with longline vessels, the gear conflicts between vessels could increase. The Council may wish to consult Table 14, to better understand the magnitude of catches, and who made them, which would be relocated under different forms of the hook and longline-only area.

For purposes of evaluating which of several different hook and longline-only areas is preferable, one important criterion will be the amount of displacement of other participants. To assist in the evaluation of this question, Table 14 was prepared. It summarizes, by major residence category,

catches by longline, pot, and gillnet gear in each of the three Gulf of Alaska regulatory areas. According to the figures for 1984, nearly all of the pot catch in both the Eastern and Central regulatory areas was registered by residents of other states; in contrast, all of the Western area pot catch was taken by Central Alaska residents, and a small amount of the Central area catch was taken by Central Alaska residents. Nearly all of the gillnet catches came from the Central area, and most of those were recorded by nonresidents.

For purposes of comparison between these catch statistics and the numbers of permits which have been recorded by NMFS and ADF&G, the reader should refer to Tables 7, 8, and 9, as well as the discussions developed there.

There are three proposed sub-alternatives within the broad alternative of implementing a hook and line only area. All involve the question of where the most appropriate longitudinal line should be drawn in the Gulf of Alaska which will delineate the hook and longline-only sablefish fishery from the mixed gear areas. The mixed-gear areas would allow pot, longline, trawl and experimental bottom gillnet fisheries. The longline-only area would allow only a hook and longline fishery.

It is difficult to determine what the most socially efficient placement of the boundary between these two management areas might be. Inherent in the decision process is the need to determine the additional costs of travel to new ground, the impacts on local, small communities due to redistribution of effort, search costs associated with prospecting for new grounds, and the success at avoiding the crowding effects which may result in gear conflicts. None of these considerations can be completely analyzed due to lack of data sufficient for analysis. However, some limited data may be brought to bear on this problem; and with an appeal to economic theory, a discussion of likely sources of costs and benefits can be presented. Although this approach will not result in a specific numerical presentation of the alternative yielding the maximum net benefits, it should be helpful to those who are trying to make a choice of an appropriate sub-alternative within the general scope of a hook and line only area.

Alternative 4a - Designate the Area East of 147°W. Longitude as a Hook and Longline-Only Area for Directed Sablefish Fishing

This alternative would force those vessels which are not longline fishing to move west of 147°. This restriction would apply to those vessels from Washington, Oregon, California, and Alaska. The number of vessels which would be directly affected by having to move is estimated to be a minimum of three vessels, based on 1984 estimates of the number of sablefish vessels by gear and management area (Table 8). Based on 1985 estimates, a total of six pot vessels would be affected. By placing the line at 147°, at least 190 longline vessels presently fishing would not have to move their operations from where they fished in 1984. At least 57 longline vessels would be fishing in the mixed gear zone west of 147°. It is unknown at this time whether or not a portion of these 57 vessels will be affected enough by the competition in the westerly district to attempt fishing in the longline area. The practical effect of this regulation is to allocate the eastern Gulf OY of sablefish to longlines, and the western Gulf OY to a mixed gear fishery. Providing for management districts with restricted gear will implicitly allocate the resource, but such measures may not yield definitive allocations. For example, the decision maker does not normally know exactly how much fish each gear type will actually be able to take, on the whole, as a result of this type of action. However, these types of alternatives do attempt to provide a simultaneous reduction of gear conflict in the eastern Gulf, while at the same time providing for some guidance in terms of general directions of allocation, thus satisfying the objectives set out in the RIR.

There are two likely sources of costs arising from this alternative. One source is the extra costs of running to and from legal grounds. The other is the logistical constraints of going to another area and discovering the new grounds. The data required to present the costs explicitly are not available, since fuel consumption by general vessel class is unavailable at this time. In addition, lost time due to prospecting has never, to the authors' knowledge, been collected. However, forcing some fishermen to search for new grounds is at issue.

Assume that a fisherman will attempt to move from the illegal area to the closest known legal area, in order to minimize running time. Of course, vessel characteristics, such as whether or not it relies on ice for refrigeration, will affect the decisions on where to run. However, the basic assumption is reasonable. In this case, the closest known fishing ground west of 147° lies roughly on the 500 fathom mark at between 147° and 148°, at about 59°20'N. The minimum distance between a known fishing ground in the illegal area (based on ADF&G contacts as well as NMFS documents on historical foreign longline activity) and the closest known legal fishing ground is approximately 140 nautical miles. The maximum direct distance between a known illegal fishing ground and this same closest known legal ground would be about 520 nautical miles. Based on this information, and the knowledge that 6 vessels would be affected, the total one way mileage which would likely be travelled in order to avoid the illegal areas would be between 840 and 3,120 nautical miles.

The extent to which prospecting for new fishing grounds adds to costs is not known, but the components of that cost would certainly include increased time fishing at lower overall catches, for some period of time. These gross notions of costs and benefits cannot be any better defined without a substantial increase in the amount of information collected, which would be costly to accumulate.

Finally, the effects of this alternative on the motivations to switch gear types is not completely known. However, the longline fleet in general is thought to be more effective at making changes in target species (by relatively modest changes in gear type) like any other gear, with the possible exception of trawls. As a result, it is not clear that, for the long term, a hook and longline-only area will actually address the problems of open access; and if it does, the solution will most likely be a short-term one.

Alternative 4b - <u>Designate the Area East of 159°W. Longitude as a Hook and Longline-Only Area for Directed Sablefish Fishing.</u>

This alternative is a simple variation on Alternative 3b, in which the demarcation line between the longline area and the mixed gear areas is set at 159°. The longline area would include all of Kodiak island, practically to

the Shumagin islands. Under this alternative, at least 236 longline vessels which fish in Federal waters would be included in the sanctuary area, assuming that the fishing patterns remain the same as in 1984. Eight vessels in the western Gulf and three vessels in the Bering sea would still be in the mixed gear area. However, 9 out of 53 trawl vessels, 5 out of 11 pot vessels, and all 6 gillnet vessels would be forced to fish westward of 159°. In this case, the closest known fishing ground west of 159° lies roughly on the 160°longitude at 54°00'. The minimum distance between a known fishing ground in the illegal area and this fishing ground is about 188 nautical miles. The maximum direct distance between a known illegal fishing ground and this closest known fishing ground would be about 960 miles. Based on this information, and the knowledge that 20 vessels would be affected, the total one-way mileage which would likely be travelled in order to avoid the illegal areas would be between 3,760 and 19,200 miles. Again, the actual costs associated with this type of activity are difficult to come by. It would include items such as fuel and food, and could include lost income as a result of learning new grounds. The extent of these costs is not known, because there have been no cost studies by gear type in the groundfish fishery. Weighed against this expected cost is the likely benefits of the proposal. These benefits would, in the short term, be reduction of gear conflicts by making vessels and certain gear types somewhat immobile, which should stabilize deliveries to local communities in the short run. However, the problems of open access, which is manifested as large amounts of effort converging on a relatively limited resource, are not completely solved by this or any of the other actions which do not propose to regulate entry and exit.

Alternative 4c - <u>Designate the Area East of 170°W. Longitude as a Hook and Longline-Only Area for Directed Sablefish Fishing</u>

This is the most restrictive alternative for all other gear types besides hook and longline. One-hundred percent of the longline vessels which fished in the Gulf of Alaska (all areas westward to and including the western Gulf) in 1984 would be included in the hook and longline-only area. Sixteen trawl vessels, six pot vessels, and six gillnet operations would have to move to the Aleutian Islands and the Bering Sea. There are three possible results, among others, of such an action:

1. All vessels who have targeted on sablefish, but who are not set up for hook and longline, would have to move west, or shut down.

2. The delineation of such an area might, for a period immediately after the regulation, reduce density of vessels in hook and line only Area and increase the density of other gear types in the Bering sea and Aleutian islands area. This could possibly recreate the gear conflicts which the measure itself was designed to avoid.

3. Such a measure could impose the same type of hardship on towns such as Kodiak as the opposite measure (status quo) would likely impose on southeast Alaska. This alternative might be even more severe, since not even a mixed gear type fishery would be allowed east of 170°, where most of the sablefish activity by non-longline gear types has occurred.

The most severe impacts would likely occur if all of the displaced vessels were forced completely out of business as a result of a rule such as this. The loss, however, would not necessarily be in the form of foregone catch to society. The open access condition would assure that a substantial portion of the resource would be taken by someone else. However, as in the southeastern part of the Gulf, achieving productive efficiencies in the short-term by fiat, at the expense of the stability of local communities to the west might arguably leave the manager and society no better than a choice of the status quo would for the Eastern part of the Gulf of Alaska.

VI. ENFORCEMENT ISSUES

Discussions with NMFS enforcement personnel indicate that the enforcement issues concerning possible Council regulation of the sablefish fishery are substantially the same for the hook and longline-only alternative and the gear allocation alternative. The primary issues concern how the fishery is closed once the quota (either in the aggregate, for the hook and longline-only alternatives, or for each gear type, in the gear allocation alternative) is reached. If the regulation providing for closure of the fishery stipulated that once the quota was reached, fishing for groundfish with that gear type in

the area would be prohibited, enforcement would be relatively easy and could be done on an overflight basis. If, on the other hand, the regulation stipulated that once the quota for sablefish for a gear type were reached, fishing for sablefish with that gear type would be prohibited, enforcement would be more difficult, and could not be done simply on the basis of overflight. The reason enforcement in this case is made more difficult is that there are other groundfish fisheries which are currently taken by longline gear, and after a longline closure for sablefish occurred under either alternative a vessel observed fishing with longline gear in the area could not automatically be assumed to be in violation of the regulation. A combination of overflight and dockside monitoring would be necessary to determine that a vessel had been observed fishing with longline gear actually had sablefish on board. Even in this instance, it would be necessary for the Council to recommend a second regulation prohibiting the possession of sablefish while fishing with longline gear for other groundfish species, to prevent skippers from arguing that sablefish found on board at dockside were actually caught in another regulatory area.

As noted earlier, these enforcement issues apply both to the hook and longline-only alternative and to the gear allocation alternative. Under the hook and longline-only alternative, since there currently are longline fisheries for rockfish, the Council may wish to provide that once the sablefish quota had been reached, fishing for sablefish with longline gear is prohibited to avoid unnecessary closure of longline fisheries for other groundfish species. This, as indicated, would be relatively more difficult to enforce, and would require a second provision that possession of sablefish while fishing with longline gear for other groundfish would be prohibited. The easy-to-enforce alternative, of prohibiting fishing for groundfish for longline gear once the sablefish quota was reached, could well have an adverse impact on longline operations for other groundfish.

To put this concern in perspective, currently the same enforcement issue is raised by the recent (March 13, 1985) closure of the sablefish fishery in the Southeast Outside district of the Gulf. Since the aggregate quota in that fishery has been taken, longline (and pot) fishing for sablefish is

prohibited. However, there are ongoing longline rockfish fisheries, and under the status quo, this enforcement issue still exists.

With the gear allocation alternative, the same sort of enforcement difficulty would exist in closing the longline fishery for sablefish. However, because there are not currently any pot fisheries for other groundfish, the Council could, as part of its rulemaking under this alternative, easily prohibit the fishing for groundfish with pot gear once the pot quota had been reached. Thus, it doesn't appear likely that any additional enforcement burdens would be incurred as a result of this alternative.

One other issue already addressed concerns the ability of enforcement officials to determine whether or not a vessel having only a federal fishing permit which authorized both pot and longline fishing was fishing illegally if the quota for one or the other of the fisheries had been taken. In this situation, overflight of the vessel would not enable enforcement officials to tell whether or not a violation was occurring. However, the risk of this becoming a major enforcement problem remains small, both because of NMFS enforcement plans to make their permitting more gear-specific, and because there are few, if any, vessels which have only a federal permit.

VII. LIST OF PERSONS CONSULTED

Fritz Funk, Barry Bracken, Pete Jackson
Alaska Department of Fish and Game

Steve Davis
North Pacific Fishery Management Council

Ron Berg
National Marine Fisheries Service, Alaska Region

Joe Terry, Gary Stauffer
Northwest and Alaska Fisheries Center

Steve Hoag
International Pacific Halibut Commission

VIII. LIST OF PREPARERS

J.R. Wilson
National Marine Fisheries Service, Alaska Region
P.O. Box 1668
Juneau, AK 99802
(907) 586-7229

D.M. Larson
North Pacific Fishery Management Council
P.O. Box 103136
Anchorage, AK 99510
(907) 274-4563

North Pacific Fishery Management Council
Fishery Management Plan for the
Gulf of Alaska Groundfish Fishery

Outline for Habitat Sections of
Amendment #14

[2.0 Introduction]

2.1 Goals for management plans.
1. [Replace with habitat goal.]

* * * * * *

[3.0 Description of fishery.
3.5 Socio-economic characteristics.]

3.5.7 Other activities directly related to fishing: offshore petroleum production.
3.5.7.1 History.
3.5.7.2 Procedures.
3.5.7.3 Schedule and location.
3.5.7.4 Potential effects on fisheries.

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[4.0 Biological descriptors.]

4.10 Description of Gulf of Alaska Groundfish Stocks: Introduction.
4.10.1 Description of habitat types in the Gulf of Alaska.
4.10.2 Habitat requirements.
4.10.2.1 Walleye pollock.
4.10.2.2 Pacific cod.
4.10.2.3 Flounder.
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4.10.2.5 Sablefish.
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4.10.2.10 Pacific halibut.
4.10.3 Habitat areas of particular concern.
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4.10.4.2 Coastal development and filling.
4.10.4.3 Marine mining.
4.10.4.4 Derelict fragments of gear and general litter.

4.10.4.5 Organic enrichment.
4.10.4.6 Ocean discharge and dumping.
4.10.4.7 Benthic habitat damage by fishing gear.
4.10.4.8 Contamination by heavy metals.
4.10.4.9 Environmental stress indication.
4.10.5 Habitat protection: existing programs.
4.10.5.1 Federal legislative programs and responsibilities related to habitat.
4.10.5.2 Specific actions for the GOA groundfish fishery.
4.10.6 Habitat recommendations.
4.10.6.1 General techniques to address identified problems.
4.10.6.2 Specific recommendations.

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[8.0 Management regime.]

8.1 Management objectives.
(5) [Add habitat objective.]

* * * * * *

[10.0 References.]
Section 3.5.7
Section 4.10

2.0 Introduction.

2.1 Goals for management plans.

1. Conserve and manage the groundfish fishery resources of the Gulf of Alaska to assure long-term productivity, mantenance of habitat quality and quantity, and consideration for interactions with other elements of the ecosystem. [This corresponds with Goal #1 as approved by the Council in December. It would replace Goal #1 as now written in the FMP.]

8.0 Management regime.

8.1 Management objectives.

(5) Seek to maintain the productive capacity of the habitat required to support the Gulf of Alaska groundfish fishery.

3.0 **Description of fishery.**

3.5 **Socio-economic characteristics.**

3.5.7 **Other Activities Related to Fishing: Offshore Petroleum Production.** Material here and at 4.10.4.1 is drawn from Berg (1977); Deis et al (1983); Thorsteinson and Thorsteinson (1982); and Weise (1984).

3.5.7.1 **History.** The first Federal lease sale on the Alaska offshore area was held in April 1976 in the northern Gulf of Alaska. Since then, there have been five other lease sales in the Gulf. No development or production activities have taken place. The Alaska offshore area comprises 74 percent of the total area of the U.S. continental shelf. Because of its size, the Alaska OCS is divided into 3 subregions: Arctic, Bering Sea, and Gulf of Alaska. The Gulf of Alaska Subregion presently contains four planning areas where lease sales have been held or are currently scheduled: Gulf of Alaska, Cook Inlet/Shelikof Strait, Kodiak, and Shumagin.

The final 5-year OCS oil and gas leasing schedule was approved by the Secretary of the Interior on July 21, 1982. Six lease sales have been held in the Gulf of Alaska (see section 3.5.7.3). Three other lease offerings are scheduled in this region through 1987; however, Gulf of Alaska/Cook Inlet Sale 100 has recently been postponed indefinitely. Kodiak Sale 99 and Shumagin Sale 86 are scheduled pending response to the Request for Information on oil industry interest in these areas.

The Secretary of the Interior is required to maintain an oil and gas leasing program that "consists of a schedule of proposed lease sales indicating, as precisely as possible, the size, timing, and location of leasing activity" that will best meet national energy needs for a 5-year period following its approval or reapproval. In developing the schedule, the Secretary is required to take into account the potential impacts of oil and gas exploration on other offshore resources, including the marine, coastal, and human environments.

3.5.7.2 **Procedures.** Once a lease is awarded, before exploratory drilling can begin in any location, the lessee must submit an exploration plan to the Minerals Management Service for approval. An oilspill contingency plan must be contained within the exploration plan. If approved by MMS and having obtained other necessary permits, the lessee may conduct exploratory drilling and testing in keeping with lease sale stipulations and MMS Operating Orders.

If discoveries are made, before development and production can begin in a frontier lease area, a development plan must be submitted and a second EIS process begun. At this time, a somewhat better understanding of the location, magnitude, and nature of activity can be expected, and resource concerns may once again be addressed before development can be permitted to proceed.

If discoveries are not made within the five year terms of the leases, the lease expires. Companies can also relinquish their leases at any time. Almost all of the leases in the Gulf of Alaska from earlier sales have been relinquished or expired because of the lack of any commercial finds. The only active exploration is currently underway in the Shelikof Strait.

If an oilfield is discovered, the decision to produce it depends on a number of factors, including the oilfield's size, depth, and formation conditions; drilling water depth; environmental constraints; distance to onshore facilities; regulatory constraints; and the projected price of oil. If a commercial quantity of petroleum is found in the Gulf of Alaska, the effort would require construction of a production facility and all the necessary infrastructure for either pipelines to onshore storage and shipment terminals or to build offshore loading facilities.

3.5.7.3 **Schedule and location.**

Area		Date	Status
Gulf of Alaska	(#39)	4/13/76	11 dry holes All leases expired
	(#55)	10/21/80	No discoveries Most leases relinquished
	(RS-1)	6/30/81	One lease issued
	(#100)	12/84	Sale postponed
Cook Inlet	(CI)	10/27/77	No discoveries All leases expired
	(#60)	9/29/81	Included Shelikof Str. One active lease
	(RS-2)	8/5/82	No bids received
Kodiak	(#99)	2/87	1st offering
Shumagin	(#86)	6/87	1st offering

3.5.7.4 **Potential effects on fisheries.**

(a) **Oil and gas development.** See section 4.10.4.1 (Habitat Threats) which describes pollution risks and interference by seismic vessel operations.

(b) **Commercial Fishing--Oil Industry Conflicts.** Although the fishing industry is presently the major user of the Gulf of Alaska, with any growth in petroleum industry activities in this area it is likely that conflicts will arise between the two industries.

There are several points of potential conflict that could affect the fishing industry without affecting the resource itself. These potential sources of conflict include preemption of fishing space, gear damage, contamination of catch, and competition for port facilities and supplies.

Loss of Fishing Grounds: Siting of offshore facilities, pipelines, safety zones and transportation corridors, and, at least temporarily, a major oil spill could preempt fishing grounds. The extent of loss will depend on the number and locations of structures and the sizes of the safety zones required. These losses could persist throughout the life of the field (up to 25 years). In the North Sea, a loss of 0.79 sq. km is associated with each platform (University of Aberdeen, 1978).

Damage to Fishing Gear: Seabed installations, unburied pipelines, mooring chains and anchors, or discarded debris could snag lines and trawls and cause damage or gear losses. Vessel traffic could entangle crab pots and line sets or their marker buoys. Avoidance of fishing gear sets will be hampered by frequent low visibility conditions of the area. An oil spill could contaminate gear.

Contamination of Catch: Oil-fouled gear could contaminate the catch and render it unmarketable. Oil-contaminated water could affect at-sea processors or live-holds of crabbers. Perceived tainting as the result of publicity about a major oil spill could reduce product demand, price, or market for the fisherman.

Competition for Facilities and Supplies: Kodiak is a major fishing port in Alaska. Oil and gas leasing in the Kodiak area could result in oil industry demands for use of the port as well. Limited availability of space and supplies will increase competition for them, and could inflate the prices for space, services, and goods between the fishing and petroleum industries.

4.0 Biological Descriptors.

4.10 Description of Gulf of Alaska Groundfish Stocks: Introduction.

A fishery has been defined as a system made up of three interacting components - the aquatic habitat, the aquatic biota, and the human users of these resources (Lackey and Nielsen, 1980). However, since a fishery is most often described in terms of the product harvested (Rounsefell, 1975), productivity is likewise often exclusively described in quantitative harvest terms. The purpose of this section is to focus on the source of that productivity - that is, the environment (habitat) within which the product for harvest is generated and nurtured, the effect of man's actions on this environment, and thereby, the total productivity of the fishery.

The abundance and composition of fishery resources of a region are greatly influenced by the characteristics and quality of available habitat. The relationship between the components of a marine ecosystem can be altered by variabilities in physical and chemical processes,fluctuations in population dynamics, human activities, or the interactions of these forces combined. Such alteration can affect living marine resources through changes in physical habitat, water and sediment chemistry, or the structure and function of biological communities. Among the environmental factors that limit or augment stocks are temperature, salinity, oxygen, light, depth, turbulence, currents, bottom topography, ice cover, dissolved and suspended materials, nutrients, and prey abundance, density and distribution. Temporal and spatial distribution of these factors influence their impact on stocks and some factors are subject to change by man. Each fish species has its own range of limiting factors; these interact and affect survival in complex ways, usually one being more critical than others. Water pressure, light, temperature, oxygen, and nutrient elements all vary with depth, and each is vital to life in the water. Generally, other features of the water column, such as nitrogen, carbon dioxide, pH, density, and salinity, vary so little with depth that living things are not affected directly, although slight variations are important for physical reasons. Currents and upwelling carry heat, nutrients, food, eggs and larvae, and the plants and animals themselves (Royce, 1972). Species thus seek the depths, currents, and substrates most favorable to their survival. Physical conditions of sediments affect species composition of the benthos. The complexity of its physical structure, as well as environmental factors, combine to make the Gulf of Alaska a highly productive ocean habitat.

4.10.1 Description of Habitat Types in the Gulf of Alaska.

In terms of both the variety and diversity of habitats and species of marine life, the Gulf of Alaska is incomparable within Alaska. Marine habitats within this region include estuaries, tideland marshes, bays, fjords, sandy beaches, unprotected rocky shores, river deltas, and a variety of continental shelf, slope, seamounts, and deep ocean habitats. No other coastal or shelf waters of Alaska provide the variety of seafood produced from the Gulf of Alaska. Only the Bering Sea shelf outranks this area as the major seafood producer in the western hemisphere.

The Gulf of Alaska is a large body of water bordered by the Alaska coast from Dixon Entrance to Unimak Pass. This coast is unusually rugged and mountainous and deeply indented by many fjords and inlets. Tidewater glaciers flow down into the heads of many bays. Many streams and rivers flow into these waters, including many that are glacier-fed and silt-laden.

The continental shelf parallels the southeastern Alaska coast and extends around the Gulf of Alaska. Although its width is less than 10 miles at some points, it is generally 30 to 60 miles wide. Off the Kenai Peninsula and Kodiak Island it is more than 100 miles broad.

The continental shelf reflects the rugged coastline; it is irregular and frequently interrupted by submarine valleys. These deepwater valleys or troughs separate broad bank areas such as Albatross and Portlock Banks near Kodiak Island and Davidson Bank south of Unimak Island. In the western Gulf of Alaska, these submarine banks are generally covered with sand and gravel, indicating a vigorous current flow in the overlying water. In contrast, the sea valleys adjacent to these banks are usually sediment-laden. Rock outcroppings occasionally occur along the edge of these banks and where the continental shelf meets the deeper water of the slope. A pronounced feature of the western portion of the Gulf is a greater frequency and expansiveness of plateau-like banks and offshore islands than in the eastern part.

The continental shelf extends from the coast seaward to depths of approximately 200 m. At its edge, bottom depths increase rapidly toward the ocean basin or abyssal plain of the Gulf of Alaska. This region of rapidly increasing depth is known as the continental slope, which can be subdivided into an upper slope from 200 to 500 m in depth and a lower slope greater than 500 m. The 2000-m depth line can be considered the boundary between the continental slope and the abyssal plain. In general, bottom sediment becomes finer with increasing depth so that in the lower slope and abyssal plain the sediment consists mainly of a mixture of clay and silt. The abyssal plain of the Gulf of Alaska contains submarine mountains that rise thousands of meters from the ocean floor. These seamounts, or guyots, are remnants of extinct volcanoes whose peaks have been eroded away to form flat-topped features.

Coastal waters overlying the continental shelf are subject to considerable seasonal influences. Winter cooling accompanied by turbulence and mixing due to major storms results in a uniform cold temperature in the upper 100 m. During the winter, surface water piles up in coastal areas in the path of prevailing storms and low pressure systems, and produces a compensating flow seaward along the seabottom. With the shift in wind direction and decrease in wind intensity during the summer, there is surface flow seaward and a compensating transport and upwelling of nutrient-rich subsurface water shoreward across the continental shelf. Summer heating and river runoff results in a stable temperature in the upper water layers and the establishment of a seasonal thermocline. Temperatures

in shelf waters may be as high as 8 to 12 degrees C during the summer but less than 4 degrees C in the winter.

Seaward of the continental shelf, there is a surface flow of water called the Alaska Current which moves in a northwesterly direction in the eastern Gulf of Alaska and swings to the west and southwest off Kodiak Island and westward toward Unimak Pass. Its rate of flow varies by season and is highest during the winter where, off Kodiak Island, its speed may exceed one knot. There is also evidence of an interannual eddy off the coast of southeast Alaska named the Sitka Eddy. This is a large (300 km in diameter) clockwise-rotating vortex that is observed in some years centered near 57 degrees North, 138 degrees West. Currents in the eddy can exceed one knot and could affect distribution of fish and larvae (Hamilton and Mysak, 1985, and Tabata, 1982).

Seasonal changes in temperature and salinity diminish with increasing depth and distance from shore. Along the outer shelf and upper slope, bottom water temperatures of 4 to 5 degrees C persist year-round throughout the periphery of the Gulf of Alaska (Figure 4.3). With further increase in depth, water temperature shows no significant seasonal change but gradually decreases with depth, reaching 2 degrees C or less at greater depths.

Most of the commercial fisheries on pelagic and demersal fishes take place in the habitats of the shelf and upper slope. Longline fisheries for sablefish and rattails extend deeper into the lower slope habitat to about 1200 m. No fisheries take place in the abyssal plain where commercial quantities of fishery resources are believed to be lacking. Fisheries of limited duration have taken place on selected seamounts.

Associated with seasonal temperature changes in the bottom water of the shelf habitat are bathymetric shifts in the distribution of many demersal fish and shellfish populations from shallow to deeper water during the winter cooling period and the reverse movement to shallower water during the summer warming period.

Habitat can also be partitioned by fish species according to its life history stage and depth of occurrence in the water column. Many of the commercial species of groundfish lay eggs which are either pelagic themselves or hatch out as pelagic larvae. These weakly swimming larval stages are distributed according to their own buoyancy, vertical swimming abilities, and the water currents, turbulence, mixing, or stratification on their nursery grounds. Generally, the egg and larval stages occupy the upper mixed layer of the water column, often at or near the sea surface, until they grow and develop into more actively swimming juveniles that are able to seek a preferred depth. Adults of these species are typically demersal or benthic, but some of the roundfish may form schools over a wide depth-range in the water column.

4.10.2 **Habitat requirements.** This section describes the particular habitat requirements of the different species and their

life stages in the Gulf of Alaska. This information is extracted from Carlson and Haight (1976), Carlson and Straty (1981), Gunderson (1971), Lisovenko (1964), Major and Shippen (1970), and Morris et al (1983). See sections 4.1 and 4.2 for brief general descriptions of life history features and stock units.

4.10.2.1 **Walleye pollock** are found throughout the water column from shallow to deep water, frequently forming large schools at depths of 100 to 400 m along the outer continental shelf and slope, as well as in the deepwater straits and embayments that are found in southeastern Alaska and around Kodiak Island. Seasonal movements between inshore-offshore habitats have been observed, with adult fish moving in the spring from deep water to shallower depths where they remain throughout the summer. In the fall, they return to deep water. In addition to seasonal movements, there may be vertical movements in the water column associated with time of day and feeding patterns.

Spawning is seasonal and occurs during the winter-spring period. Important spawning habitats include the Kilfuda and Chirikof-Shelikof Troughs. Eggs, larvae, and young pollock are found in near-surface waters in great numbers in straits and nearshore areas. The young develop separately from the adults and enter the adult population in bottom waters at or near maturity (age 3 to 4).

Feeding is opportunistic; walleye pollock feed on free-swimming pelagic animals. They feed predominantly on small to medium size planktonic and nektonic prey such as copepods, euphausiids, amphipods, and shrimps, smelt, and other small fish. At times they are cannibalistic. They are preyed upon by marine mammals and other large pelagic fish.

4.10.2.2 **Pacific cod** is a widespread demersal species found along the continental shelf of the Gulf of Alaska from inshore waters to the upper slope. Maximum abundance of adult cod is generally in depths less than 100 m. In the Gulf of Alaska, Pacific cod is most abundant in the western Gulf, where large schools may be encountered at varying depths depending upon the season of the year. During the winter and spring, cod appear to concentrate in the canyons that cut across the shelf and along the shelf edge and upper slope between depths of 100-400 m where they overwinter and spawn. In summer, they shift to shallower depths (30-75 m).

Pacific cod spawn in winter. They are very fecund and can produce from 200,000 to 5,700,000 eggs, which are benthic and initially slightly adhesive. Larvae are pelagic. Nursery areas are principally in coastal habitats with rocky bottoms. As the juveniles grow older they move offshore into deeper waters.

Pacific cod are an apex predator within the demersal animal community and feed on a variety of prey and prey sizes. Their principal prey are fish such as herring and sand lance as well as invertebrates such as crabs, shrimp, polychaetes, clams, and snails.

4.10.2.3 **Flounder.** This group includes arrowtooth flounder, flathead sole, rock sole, Dover sole, yellowfin sole, and rex sole. All are demersal, but have varying depth ranges.

Distribution. Arrowtooth flounder are abundant over a depth range of 100-500 m. During the winter months, they aggregate in the deeper portion of their range. High densities of arrowtooth flounder, as indicated from trawl surveys, have also been found in waters off southeastern Alaska at depths of 200-400 m. Flathead sole are most abundant at depths less than 350 m. Rock sole are most abundant in the Kodiak and Shumagin area. They are a shallow-water species, preferring depths less than 100 m. Dover sole and rex sole are closely associated with the soft bottom community of benthic animals that occurs in the deepwater portions of submarine canyons. They are found throughout the northwestern Pacific and in the Bering Sea at depths usually less than 275 m. There is a population of yellowfin sole in outer Cook Inlet. Although yellowfin sole are only an incidentally caught species in the Gulf of Alaska, they are the second most abundant demersal fish (after pollock) in Cook Inlet, and are also found in Prince William Sound.

Spawning. Spawning seasons of these flatfish vary by species. Rock sole spawn in the winter, flathead sole in the spring, and starry flounder (a nearshore species) spawns in February in southeast Alaska. Female flatfishes release pelagic eggs which are simultaneously fertilized by the male. The buoyant eggs develop in the water column. After a period of one or two weeks, the eggs hatch and planktonic larvae emerge. Aberrant among flatfishes, the rock sole is a demersal spawner. The duration of larval development varies among species - a few weeks in some species and almost a year in others such as the Dover sole. Juvenile flatfishes are found in the bottom habitat of bays, inlets, and other nearshore areas where they grow and develop. As they approach maturity, they move into deeper water to join the adults.

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

4.10.2.4 **Pacific ocean perch.** Concentrations of the rockfish (Sebastes) group are located at the shelf edge, and particularly along the upper slope of the shelf (300-500 m). This rockfish complex, although varying in species composition, is typical of the demersal fish community at these depths from California waters to the Bering Sea.

Pacific ocean perch is the major component of this group. Before intensified fishing by foreign fleets in the 1960's, Pacific ocean perch, together with other rockfish species, dominated the demersal fish community of the outer shelf and slope in the Gulf of Alaska. In any region of the Gulf of Alaska there may, however, be 20 or more rockfish species (most of the genus Sebastes) occurring at the shelf edge and upper slope.

Among the rockfishes, members of the genus Sebastes are confined to the near-bottom waters of the upper slope and outer shelf. Pacific ocean perch is an abundant demersal species in the Gulf of Alaska, with maximum abundance between 200-300 m. Productive habitats for Pacific ocean perch are off southeastern Alaska, Yakutat, the Kenai Peninsula, and Kodiak Island.

Pacific ocean perch occur in schools and make diel migrations off the sea bottom. They feed on small to medium size prey which they capture off the bottom or at mid-depths, such as planktonic crustaceans, primarily euphausiids, and copepods. Seasonal migrations onto the shelf and shelf edge habitats from May to September for feeding are believed to occur. After feeding throughout the summer, the fish descend off the shelf to the upper slope waters for mating and fertilization of eggs that will be retained in females and later released as larvae. Feeding ceases during mating after which the fish segregate by sex. The rocky areas, exposed to open sea conditions are important nursery grounds for young rockfish. The juvenile Pacific ocean perch inhabit these areas where cover and protection are afforded by cracks and crevices in and under rocks and ledges and among sessile invertebrates. Because Pacific ocean perch inhabit such deep waters, tag and recapture studies are virtually impossible. Any statements about their migration patterns are therefore speculation. Portlock and Albatross Bank are important feeding areas for these fish.

4.10.2.5 **Sablefish** is an important offshore/demersal species of the bathyal or slope region (400-1200 m). Adult sablefish occur over a wide range of depths that includes the outer shelf, slope, and abyssal habitats. The center of abundance by depth of adult sablefish appears to lie at 400-1000 m along the continental slope, especially within or near submarine canyons and gullies. Adult fish also inhabit the cold deep waters of bays, straits, fjords, and the seamount habitats that dot the abyssal plain of the Gulf of Alaska. During seamount studies by the NMFS in 1979, these species were found to be the dominant component of deepwater trap catches.

Tagging studies to determine sablefish migrations have been conducted. The results of these studies have yet to determine whether sablefish perform significant migrations. There have been cases where individual fish, tagged and released in west coast waters, have been recovered later in the Bering Sea, but other evidence suggests that most sablefish remain in the same general bottom area where they settled after their pelagic existence as juveniles. As sablefish age, there is apparently a tendency for them

to move into deeper water, as the proportion of young fish caught decreases with increasing depth trawled, and the proportion of older fish increases. There may also be some seasonal bathymetric movement of sablefish to somewhat shallower waters in the spring.

Adults spawn during the fall to spring months at depths of 250-750 m. The eggs are bouyant and rise toward the surface as they develop and hatch. The later-stage larvae are found near the surface waters of the shelf and in shallow bays and inlets during the late spring and early summer. As juveniles, they return to deeper waters on the outer shelf and upper slope.

Sablefish is an omnivorous bottomfish, roaming from near the bottom to mid-depths of the slope region to feed on semipelagic animals such as squid and lantern fish, as well as on bottom-dwelling fish and invertebrates. Common food items are polychaetes, crustaceans, sand lance, and herring. It is also a scavenger and will consume refuse and remains of animals.

4.10.2.6 **Atka mackerel** is a widespread species throughout the Gulf of Alaska, forming large schools in the upper water layer of the outer continental shelf. During the winter, Atka mackerel are predominantly found aggregated near the shelf edge off Kodiak Island, the Alaska Peninsula, and the Aleutian Islands. The species is pelagic during much of the year, but annually migrates inshore to moderately shallow waters and becomes demersal during their spawning season (May through October). During this time they are patchily distributed in dense schools near the bottom. Preferred spawning habitat is in straits between islands that have tidal currents. The locations of many spawning areas are not yet known. Although Atka mackerel is not strictly a bottom-dwelling animal, it lays demersal eggs on the sea bottom. The adhesive egg mass attach to rocks and other surfaces on the sea bottom. Development and hatching of the eggs takes place on the seafloor; then the larvae are planktonic. Adults feed largely on euphausiids.

4.10.2.7 **Squid.** At least ten species of squid are known from Alaska waters, but two species comprise most of the commercial catch. Although some squid species inhabit the continental shelf, the pelagic species that live farther to sea seem to be the most abundant in Alaska waters. They are probably most abundant in areas with abrupt change in depth, and areas of upwelling on the continental slope. Little else is known of their distribution, migrations, or biology. Most squid are short-lived; few live beyond two years.

4.10.2.8 **Grenadiers.** Grenadiers, or rattails, are composed of a number of species, of which Albatrossia pectoralis and Coryphaenoides acrolepis may be the most abundant. Grenadiers are an important component in the Japanese longline fishery for sablefish in the slope region, and may at times be a greater proportion of the total catch than sablefish. They are generalized feeders, consuming a variety of benthic and semipelagic prey.

4.10.2.~~10~~ 9 **Thornyhead rockfish.** Information on the distribution patterns of the various rockfish species in the Gulf of Alaska is generally inadequate. In any region of the Gulf of Alaska there may be, however, 20 or more rockfish species (most of the genus Sebastes) occurring at the shelf edge and upper slope. Thornyhead rockfish (Sebastolobus) have a depth range extending from the outer shelf into the lower slope region. Thornyheads are benthic, and unlike rockfishes of the genus Sebastes, do not live in schools, and seldom swim far off the bottom. They feed on small to medium-sized nectonic prey which they capture near the bottom. Female thornyheads release a mass of eggs that are held together by a gelatinous material. The gelatinous mass then rises to surface waters where it becomes free-floating. Whether fertilization takes place within the female or at the moment when the eggs are extruded is not known.

4.10.2.~~11~~ 10 **Pacific halibut** inhabit bottom depths of the continental shelf and slope of the Gulf of Alaska. They are a relatively abundant offshore/demersal species, having a wide bathymetric range depending on season and age of fish. They are intensively fished in the Gulf of Alaska at depths of 25 to 300 m. Highest abundances are often in submarine canyons at depths less than 150 m.

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

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

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

4.10.3 **Habitat areas of particular concern.** As outlined in the previous section, the groundfish resources of the Gulf of Alaska are abundant and widely distributed. The waters of the continental shelf and upper slope are the sites of the major commercial groundfish fisheries, with little effort on offshore deep basin fisheries.

Although there is good general knowledge of the fishery resources of the Gulf of Alaska, and locations of major concentrations of many finfish and shellfish can be broadly mapped, knowledge of this region is by no means complete. Spatial and temporal changes in distribution and abundance of these resources occur and and are poorly known, both offshore and in the nearshore areas. Adjacent bays may be very dissimilar from each other and very few coastal inlets have been even superficially studied. For example, four bays on the east side of Kodiak Island that were recently studied showed significant differences in their fish and shellfish communities from bay to bay, and by depth of habitat. Important seasonal changes were also observed.

Few fisheries investigations have been conducted in the offshore areas of the Gulf of Alaska. Much of what is known is derived from periodic NMFS exploratory surveys and from catch statistics gathered by NMFS observers aboard foreign fishing vessels, and is primarily focused on the shelf and upper slope. The biota of the lower slope, seamounts, and the ocean basins is poorly known.

It is difficult, therefore, to designate particular habitats that can be spatially and temporally defined as holding substantially more important resource values than other areas. Adults of many of the commercially important groundfish species are known to form dense aggregations on feeding or spawning grounds at certain seasons. Most often these concentrations are found on the shelf or shelf edge in spring and early summer when and where suitable environmental conditions have formed. However, these areas can shift in size and location from year to year, presumably due to a combination of environmental and population variables that are not yet well understood.

Eggs and larvae of the groundfish species are usually more widely distributed spatially than the adults, but may be confined to a specific range of water depths. Walleye pollock lay buoyant eggs that float to the sea surface; other species such as Pacific cod, Atka mackerel, and rock sole lay demersal eggs that sink or adhere to the bottom.

In a general way, the following habitats of the Gulf of Alaska and Aleutians can be described as particularly rich in groundfish:

- The shelf edge in the western Gulf from Kodiak southwest along the Alaska Peninsula contains abundant schools of walleye pollock, Pacific cod, and rockfish.

- The shelf edge and upper slope in the eastern Gulf contains the densest spawning and feeding aggregations of sablefish.

- Submarine canyons along the continental slope from southeast Alaska to Kodiak harbor contains the densest concentrations of Pacific ocean perch and other rockfish species.

- The nearshore, extremely uneven rocky areas off southeastern Alaska appear to be a major nursery for juvenile rockfish (ages one to three years old).

- Atka mackerel spawning occurs on certain restricted shelf areas with suitable bottom characteristics, and may be particularly concentrated in the western Gulf, such as the straits nearby Kodiak Island.

- An isolated population of yellowfin sole inhabits lower Cook Inlet.

Significant increases in knowledge of the habitat requirements of the groundfish species in the Gulf of Alaska are yet to be made. With this additional understanding, it may be possible to provide a finer definition of habitat areas of particular concern and a better ability to manage both single and multispecies fishery resources.

4.10.4 **Habitat threats.** This section discusses the potential sources of pollution and habitat degradation that could affect groundfish populations in the Gulf of Alaska fishery management area. At present, there are no indications that any of these potential threats to the habitat have had any measurable effect on the existing habitats or stocks of groundfish though there have been localized effects. The purpose of this discussion is to create awareness of potential problems or cumulative impacts that may occur in the future and could be avoided.

The present major human use of the Gulf of Alaska is commercial fishing, and, to a lesser degree, shipping. While the establishment of other activities could create user conflicts, pollution, and habitat deterioration, it is the collective opinion of NMFS and the Council that the status of the habitat in this management area is generally unimpacted by other human activities at this time. If there should be a big oil or gas discovery or surge in other development activities it may be appropriate to make a subsequent review of the habitat's status.

4.10.4.1 **Oil and Gas Development.** Oil and gas related activities in the Gulf of Alaska could cause pollution of habitats, loss of resources, and use conflicts. Preemption of fishing grounds because of the siting of offshore drilling rigs and platforms, loading platforms, pipelines, or oil spills may result in the dislocation of fishing ground, possibly a reduction in habitat quality or quantity. Some structures, could in turn, increase hard substrate habitat and may result in an increase in populations of some species of rockfish. Schooling fish may also concentrate near some structures. Habitat decreases would result only from physical alteration of the habitat by construction activities, losses of productivity or resident biota, or chemical degradation from pollutants.

Pollution Risks. Oil spills are the most serious source of pollution. Offshore oil and gas development will inevitably result in some oil entering the environment. At some level, this oil can affect habitats and fish populations and has the potential to be damaging. Although many factors determine the degree and duration of the damage from a spill, the most important variables are the size of the spill, the duration of the spill, and the time and geographic location of the spill. Oil is toxic to all marine organisms at some concentration. Certain species are more sensitive than others. In general, the early life stages (eggs and larvae) are most sensitive; juveniles less sensitive, and adults least so (Rice et al, 1984).

Habitats most sensitive to oil pollution are those with the lowest physical energy because once oiled, these areas are the slowest to repurify. Examples of low energy environments include tidal marshes, protected embayments, and seafloor sediments. Rocky coasts and ocean surface waters are higher energy environments where physical processes will more rapidly remove or actively weather spilled oil.

A major oil spill (i.e., 50,000 bbls) would produce a surface slick covering up to several hundred square kilometers of surface area. Oil would generally be at toxic levels within this slick. Beneath and surrounding the surface slick, there would be oil-contaminated waters with lethal to sub-lethal concentrations depending on the time and distance from the surface slick. Mixing and current dispersal would act to reduce the oil concentrations with depth and distance. If the oil spill trajectory moves toward land, habitats and species could be severely affected by the loading of toxic quantities of oil into a bounded area of the nearshore environment. In the nearshore waters that are not vertically stratified, oil could be mixed throughout the water column and contaminate the seabed sediments. Suspended sediment will also act to carry oil to the seabed. During recovery, a year class of a commercially important species of fish or shellfish could be reduced in numbers, and any fishery dependent on it would be reduced.

Toxic fractions of oil mixed to depth and under the surface slick would cause mortalities and sublethal effects to populations. However, the area contaminated would appear negligible in relation to the overall size of the area inhabited by commercial groundfish in the Gulf of Alaska. As a result, oil spills at sea are believed to be transitory and minor in effect on fish populations overall. But even though concentrations of oil may be sufficiently diluted not to be phsyically damaging to marine organisms or their consumers, it still may be detected by them, and alter certain of their behavior patterns. For instance, some animals may alter their migration routes as an avoidance response. Other exceptions are where the spill reaches nearshore areas with productive nursery grounds or areas containing high densities of fish larvae in surface waters. An oil spill at an especially important habitat could result in disproportionately high losses of the resource compared to other areas.

The shipment of up to 1.5 million barrels a day of oil out of Valdez presently presents the greatest risk of a major oil spill in the Gulf of Alaska. A major tanker accident could release over 100,000 barrels of crude oil into these waters. Since these oil tanker routes transit important commercial fishing grounds enroute from Valdez, the potential for damage to groundfish resources exists.

Other sources of potential habitat degradation and pollution from oil and gas activities include the disposal of drilling muds and cuttings to the water and seabed, disposal of drilling fluids and produced waters in the water column, and dredging materials from pipeline laying or facilities construction. These materials may contain heavy metals or other chemical compounds that will be released to the environment, but in general the quantities are such that only local impacts can be expected to occur. Again, these activities may be of concern if they occurred in habitats of special biological importance to a resource.

Interference by Seismic Vessel Operations. Seismic vessels operate in the Gulf of Alaska fishery management area for oil and gas

exploration purposes. The potential exists for interference between commercial fishing vessels and seismic vessels if both are operating in an area at the same time. The effect of seismic noises on groundfish is being studied off the coast of California, since concern has been expressed by fishermen that the seismic pulse has the effect of dispersing schools of fish and making them difficult to catch. Results of these studies are not yet available. There have not been many complaints by fishermen about seismic activities interfering with harvest in the Gulf of Alaska area. If a significant problem were to develop, it might be necessary to regulate seismic operations around fishery areas.

4.10.4.2 **Coastal development and filling.** Developmental pressure to the coastal habitat of the Gulf of Alaska has been largely due to residential and industrial support activities generated by the fishing, mining, timber, and oil industries.

Coastal fills are regulated by permits issued under Section 10 of the River and Harbor Act and Section 404 of the Clean Water Act. In 1983, for example, the Department of the Army issued 91 permits in southeast Alaska and 25 from Prince William Sound over to the Aleutians, which involved fill to be placed in coastal or intertidal areas. Effects of fill in these wetland and intertidal areas are felt by the marine resources through loss of the nutrients that would have been produced intertidally and transported to surface and deep waters. Development of marinas and small boat harbors can also affect resources by increased hydrocarbon discharge and heavy metal accumulation in the biota and sediments (Karinen, 1983).

Another affect of coastal development is the timber harvest on the Tongass National Forest mandated in the Alaska National Interest Lands Act. This Act has been interpreted by the USDA Forest Service to require that 450 million board feet of timber be made available for harvest each year. Additional harvest is occuring from private lands in southeast Alaska. Effects of this harvest on groundfish are thought to be minimal. One exception might be that accumulation of woody debris on estuarine habitat in the vicinity of log transfer sites may be affecting marine aquatic organisms present.

Hard rock mining in the coastal areas, such as the proposed U.S. Borax Molybdenum mine at Quartz Hill will have an impact on marine organisms by the discharge of approximately 16 million tons of finely ground quartz into a marine fjord (either Boca de Quadra or Smeaton Bay). These mine tailings will effectively cover the benthic habitat in the fjord for as long as it takes recolonization to occur on top of them. Habitat burial by tailings will affect benthic fish populations in the fjord quite extensively.

4.10.4.3 **Marine mining.** The advisability of developing a program for leasing of nonenergy minerals on the outer continental shelf is being considered by the Minerals Management Service. They have indicated that the most promising sand and gravel deposits are associated with glacial moraines and drift, outwash plains, and glaciofluvial deltas - dominant characteristics of the Gulf of Alaska

coastline. Areas where onshore lode deposits of gold are near enough to the continental shelf to merit investigation include lower Cook Inlet in Kamishak Bay extending around the lower end of Kenai Peninsula, and possibly Resurrection Bay near Seward. Offshore areas possessing potential for placer mining include Shelikof Straits, offshore of the Copper River Delta, and most of the inside waters in southeast Alaska. Currently there are some placer mining claims on the beach in the Yakataga area, and some storage and transfer activities associated with native allotments of mineral deposits in the Copper River area.

4.10.4.4 **Derelict fragments of fishing gear and general litter.** The types of fishing gear used in the Gulf of Alaska groundfish fishery are midwater and bottom trawls, longlines, gillnets, and sablefish pots. Longlining is the principal method used in the eastern Gulf, whereas all four types of gear are used in the central and western areas. Deliberate discards and accidental losses of gear can impact the groundfish and other species such as salmon, marine mammals, marine birds, and crab. Heavy polyethylene and polypropylene netting from trawl gear comprised about 80 percent of the observed litter at Amchitka Island in surveys by Merrell (1984). Derelict trawl web probably has its main impact in terms of entanglement of marine mammals such as seals, seal lions, and fur seals. While drifting at sea, the trawl webbing floats at the surface and is probably not a threat to groundfish. The survey data collected by Merrell has shown that most of the observed litter is in small and damaged pieces of trawl webbing which were probably discarded deliberately at the time repairs were made to the trawls. A significant decline (37%) in the amount of debris was observed between 1974 and 1982 which may be an indication of reduced fishing effort or greater control on the part of fishermen in discarding debris. There are no specific estimates of the amounts of gear being lost in the Gulf of Alaska fishery management area.

4.10.4.5 **Organic enrichment.** Organic enrichment may result from natural input of carbon (very high rates of primary production) or from man-induced changes such as oils or discharge from fishing vessels and processing plants. Fishing vessels and processing plants have three principal reasons for discharging organic material:

(a) dumping of prohibited species (salmon, crab, herring, and halibut) which are inadvertently caught;
(b) dumping of undesirable or untargeted catches due to lack of market, size of the fish, damaged fish, limitations in individual vessel quotas (trip limits), or individual vessel limitations such as no fish meal plant onboard;
(c) discharge of waste product and viscera from onshore and offshore processing plants. (also varies depending on presence of fish meal plant).

Low temperatures reduce metabolic rates of microorganisms and the oxidation of carbon. Depressions containing very cold Arctic water, therefore are conducive to development of anoxic conditions if

excessive organic enrichment occurs over a short time period and circulation is poor. In the case of poor bottom circulation and absence of scavengers to consume the material, organic material may take a long time to decompose and could become a source of contamination for the spread of bacterial and viral diseases. Development of a layer of anoxic bottom water could also adversely affect benthic organisms (Karinen, ABL, personal communication).

No real measure of the amount of discard from (b) and (c) can be made. There are statistics kept of (a), but even if they were summarized, it would be difficult to evaluate what impact the discard is having on the environment. Marine mammals and birds are frequently seen flocking to an area at times of discard and consuming considerable quantities of the fish or viscera; however, some portion of the discard is probably settling to the bottom. In the case of poor bottom circulation and absence of scavengers to consume it, it may take a long time to decompose and could become a source of contamination for the spread of bacterial and viral diseases. Requiring full utilization of allowable catch would reduce the occurrence of discarded catches, but would create additional economic and management concerns. The location of any new shoreside processors should be examined for ability to assimilate organic waste.

Shelikof Straits may be a possible problem area because it is a fairly confined area with an intensive fishery during a short season. Pollock roe is the product harvested, and the rest of the fish are often discarded. Pollock carcasses without roe have been taken in trawls made by NMFS research vessels in the spring of 1983 (Eric Brown, NMFS, personal communication.) The deep fjords of southeast Alaska which have shallow sills may also be at risk from organic enrichment and development of anoxic conditions.

4.10.4.6 **Ocean discharge and dumping.** The largest point source discharge of hydrocarbon pollution entering the Gulf of Alaska may be the discharge from the ballast water treatment facility at the terminal of the Transalaska Pipeline System at Valdez. Federal law requires ballast water to be treated to recover residual crude oil prior to returning it to port. This effluent criteria is set at five parts per million oil and grease; the treatment plant processes 10 to 20 million barrels of bilge water per day. During the first 74 months of operation, a total of 350 metric tons of oil and grease were discharged, which corresponds to about 170 kilograms per day (Shaw, 1984).

Other sources of possible contaminants would be ocean dumping of sewage sludge, industrial waste, dredged material, or radioactive waste. The city of Acutan, for example, has a permit to dump waste at sea from the city's incinerator.

4.10.4.7 **Benthic habitat damage by fishing gear.** Trawling, potfishing, gillnets, and longlines are the methods of fishing for groundfish in the Gulf of Alaska management area (see

section 4.10.4.4). Bottom type varies from the rocky complex to the flatter sand and mud.

Bottom trawls can affect the ocean floor. Even though there are no direct observations of trawl door effects in the Gulf, there have been observations in other areas with other gear. At one time the NMFS NWAFC looked at the result of a clam dredge passing over the ocean floor with a TV video camera. The biggest disruption on the bottom came from the impact of the dredge which created a two to three foot wide ditch or trench; the effect of the foot rope of the trawl was minor. In the video it was observed that crabs and starfish had converged on the dredge track within fifteen minutes. The sediment disturbed by the dredge had settled within thirty minutes, with the only visible trace being the ditches dug by the dredge, and crab and starfish concentrations along the ditches.

4.10.4.8 **Contamination by heavy metals.** Accumulation of heavy metals in fish tissue is an indicator of habitat deterioration, which would, in turn, affect marketability of the fish. The FDA's safety limit for mercury is presently 1.0 ppm of methyl mercury or about 1.1 ppm of Hg. In Hall, et al (1976) a sample of sablefish caught in the Bering Sea and in the vicinity of Kodiak Island contained very low levels of mercury (0.02 - 0.11, $\bar{x}$ 0.04 ppm).

4.10.4.9 **Environmental stress indication.** (To be completed, pending literature summary.)

4.10.5 **Habitat protection: existing programs.** This section describes (a) general legislative programs, portions of which are particularly directed or related to the protection, maintenance, or restoration of the habitat of living marine resources; and (b) specific actions taken within the Gulf of Alaska area for the same purpose.

4.10.5.1 **Federal legislative programs and responsibilities related to habitat.** The Department of Commerce, through NOAA, is responsible for, or involved in, protecting living marine resources and their habitats under a number of Congressional authorities that call for varying degrees of interagency participation, consultation, or review. Those having direct effect on Council responsibilities are identified with an asterisk. A potential for further Council participation exists wherever Federal-level review is required or encouraged. In some cases, State agencies may share the Federal responsibility. (See Sections 4.10.3 and 4.10.5.2 for specific application to groundfish.)

* (a) Magnuson Fishery Conservation and Management Act (Magnuson Act). This Act provides for the conservation and management of U.S. fishery resources within the 200-mile fishery conservation zone, and is the primary authority for Council action. Conservation and management is defined as referring to "all of the rules, regulations, conditions, methods, and other measures which are required to rebuild, restore, or maintain, and which are useful in rebuilding, restoring, or maintaining, any fishery resource and the marine environment, and which are designed to assure that... irreversible or long-term adverse effects on fishery resources and the marine environment are avoided." Fishery resource is defined to include habitat of fish. The North Pacific Council is charged with developing FMPs, FMP amendments, and regulations for the fisheries needing conservation and management within its geographical area of authority. FMPs are developed in consideration of habitat-related problems and other factors relating to resource productivity. After approval of FMPs or FMP amendments, NMFS is charged with their implementation.

(b) Fish and Wildlife Coordination Act of 1958 (FWCA). The FWCA provides the primary expression of Federal policy for fish and wildlife habitat. It requires interagency consultation to assure that fish and wildlife are given equal consideration when a Federal or Federally-authorized project is proposed which controls, modifies, or develops the Nation's waters. For example, NMFS is a consulting resource agency in processing Department of the Army permits for dredge and fill and construction projects in navigable waters, Environmental Protection Agency (EPA) ocean dumping permits, Federal Energy Regulatory Commission hydroelectric power project proposals, and Department of the Interior Outer Continental Shelf (OCS) mineral leasing activities, among others.

* (c) National Environmental Policy Act of 1969 (NEPA). NEPA requires that the effects of Federal activities on the environment be assessed. Its purpose is to insure that Federal

officials weigh and give appropriate consideration to environmental values in policy formulation, decisionmaking and administrative actions, and that the public is provided adequate opportunity to review and comment on the major Federal actions. NEPA requires preparation of an Environmental Impact Statement (EIS) for major Federal actions that significantly affect the quality of the human environment, and consultation with the agencies having legal jurisdiction or expertise for the affected resources. NMFS reviews EISs and provides recommendations to mitigate any expected impacts to living marine resources and habitats. An EIS or environmental assessment for a finding of no significant impact is prepared for FMPs and their amendments.

(d) Clean Water Act (CWA). The purpose of the CWA, which amends the Federal Water Pollution Control Act, is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters; to eliminate the discharge of pollutants into navigable waters; and to prohibit the discharge of toxic pollutants in toxic amounts. Discharge of oil or hazardous substances into or upon navigable waters, contiguous zone and ocean is prohibited. NMFS reviews and comments on Section 404 permits for deposition of fill or dredged materials into U.S. waters, and on EPA National Pollutant Discharge Elimination System permits for point source discharges.

(e) River and Harbor Act of 1899. Section 10 of this Act prohibits the unauthorized obstruction or alteration of any navigable water of the United States, the excavation from or deposition of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such water. Authority was later extended to artificial islands and fixed structures located on the Outer Continental Shelf. The Act authorizes the Department of the Army to regulate all construction and dredge and fill activities in navigable waters to mean high water shoreline. NMFS reviews and comments on Public Notices the Corps of Engineers circulates for proposed projects.

* (f) Endangered Species Act of 1973 (ESA). The ESA provides for the conservation of endangered and threatened species of fish, wildlife, and plants. The program is administered jointly by DOI (terrestrial, freshwater, and some marine species such as walrus) and DOC (marine fish, and some marine mammals including the great whales). Federal actions that may affect an endangered or threatened species are resolved by a consultation process between the project agency and DOC or DOI, as appropriate. For actions related to FMPs, NMFS provides biological assessments and Section 7 consultations if the Federal action may affect endangered or threatened species or cause destruction or adverse modification of any designated critical habitat.

* (g) Coastal Zone Management Act of 1972 (CZMA). The principal objective of the CZMA is to encourage and assist States in developing coastal zone management programs, to coordinate State activities, and to safeguard the regional and national interests in the coastal zone. Section 307(c) requires that any Federal activity

directly affecting the coastal zone of a State be consistent with that State's approved coastal zone management program to the maximum extent practicable. Under present policy, FMPs undergo consistency review. Alaska's coastal zone program contains a section on Resources and Habitats. Following a January 1984 U.S. Supreme Court ruling, the sale of OCS oil and gas leases no longer requires a consistency review; such a review is triggered at the exploratory drilling stage. (See section 3.5.7)

* (h) Marine Protection, Research and Sanctuaries Act (MPRSA). Title I of the MPRSA establishes a system to regulate dumping of all types of materials into ocean waters and to prevent or strictly limit the dumping into ocean waters of any material which would adversely affect "human health, welfare or amenities or the marine environment, ecological systems, or economic potentialities." NMFS may provide comments to EPA on proposed sites of ocean dumping if the marine environment or ecological systems may be adversely affected. Title III of the MPRSA authorizes the Secretary of Commerce (NOAA) to designate as marine sanctuaries areas of the marine environment that have been identified as having special national significance due to their resource or human-use values. The Marine Sanctuaries Amendments of 1984 amend this Title to include, as consultative agencies in determining whether the proposal meets the sanctuary designation standards, the Councils affected by the proposed designation. The Amendments also provide the Council affected with the opportunity to prepare draft regulations, consistent with the Magnuson Act national standards, for fishing within the FCZ as it may deem necessary to implement a proposed designation.

(i) Outer Continental Shelf Lands Act of 1953, as amended (OCSLA). The OCSLA authorizes the Department of Interior's Minerals Management Service (MMS) to lease lands seaward of state marine boundaries, design and oversee environmental studies, prepare environmental impact statements, enforce special lease stipulations, and issue pipeline rights-of-way. It specifies that no exploratory drilling permit can be issued unless MMS determines that "such exploration will not be unduly harmful to aquatic life in the area, result in pollution, create hazardous or unsafe conditions, unreasonably interfere with other uses of the area, or disturb any site, structure or object of historical or archaeological significance." Drilling and production discharges related to OCS exploration and development are subject to EPA NPDES permit regulations under the CWA. Sharing responsibility for the protection of fish and wildlife resources and their habitats, NOAA/NMFS, FWS, EPA and the States act in an advisory capacity in the formulation of OCS leasing stipulations that MMS develops for conditions or resources that are believed to warrant special regulation or protection. Some of these stipulations address protection of biological resources and their habitats. Interagency Regional Biological Task Forces and Technical Working Groups have been established by MMS to offer advice on various aspects of leasing, transport, and environmental studies. NMFS is represented on both groups in Alaska.

* (j) National Fishing Enhancement Act of 1984. Title II of this Act authorizes the Secretary of Commerce (NOAA) to develop and publish a National Artificial Reef Plan in consultation with specified public agencies, including the Councils, for the purpose of enhancing fishery resources. Permits for the siting, construction, and monitoring of such reefs are to be issued by the Department of the Army under Section 10 of the River and Harbor Act, Section 404 of the Clean Water Act, or Section 4(e) of the Outer Continental Shelf Lands Act, in consultation with appropriate Federal agencies, States, local governments and other interested parties. NMFS will be included in this consultation process.

(k) The Northwest Power Act of 1980 (NPA). The NPA includes extensive and unprecedented fish and wildlife provisions designed to assure equitable treatment of fish and wildlife, particularly anadromous fish, in making decisions about hydroelectric projects. Under the NPA, a detailed Fish and Wildlife Program has been established to protect, mitigate, and enhance fish and wildlife in the Columbia River Basin. In addition, general fish and wildlife criteria for hydroelectric development throughout the region have been established in the Regional Energy Plan developed under the Act. NMFS has a statutory role in the development of the Program and the Plan and encourages their implementation by Federal agencies such as the Federal Energy Regulatory Commission, the Corps of Engineers, the Bureau of Reclamation, and the Bonneville Power Administration.

(l) Alaska National Interest Lands Conservation Act of 1980. The purpose of this Act is to provide for the designation and conservation of certain public lands in Alaska. The Department of Agriculture Forest Service has authority to manage surface resources on National Forest Lands in Alaska. Under Title V of this Act, any regulations for this purpose must take into consideration existing laws and regulations to maintain the habitats, to the maximum extent feasible, of anadromous fish and other foodfish, and to maintain the present and continued productivity of such habitat when they are affected by mining activities. For example, mining operations in the vicinity of the Quartz Hill area in the Tongass National Forest must be conducted in accordance with an approved operations plan developed in consultation with NMFS; consultation continues through the monitoring and altering of operations through an annual review of the operations plan. Title XII of the Act establishes an Alaska Land Use Council to advise Federal agencies, the State, local governments and Native Corporations with respect to land and resource uses in Alaska. NOAA is named as a member of this Council.

4.10.5.2 Specific actions for the Gulf of Alaska Groundfish fishery.

(a) Gear limitations that act to protect habitat or critical life stages. Section 611.16 of the foreign fishing regulations prohibit discard of fishing gear and other debris by foreign fishing vessels. Section 672.24 requires biodegradable escape panels for all sablefish pots in order that lost pots do not continue fishing.

(b) Seasonal restrictions that act to protect habitat or critical life stages. Section 611.92 of the foreign fishing regulations prohibits foreign trawling during specified periods in the West Yakutat area to provide protection against a possible directed fishery on spawning halibut and prevent disturbance of the spawning grounds. It also restricts foreign trawling from December 1 through May 31 in the Western and Central Gulf to protect winter concentrations of juvenile halibut.

(c) Recommendations to permitting agencies regarding lease sales. Recommendations have been made to permitting agencies on all past proposed lease sales on the Alaska OCS, in the interests of protecting or maintaining the marine environment. These recommendations have ranged from calling for delay or postponement of certain scheduled sales such as in Bristol Bay and Kodiak, requesting deletions from sales of certain areas such as in Shelikof Strait, identifying the need for additional environmental studies and for protective measures such as burial of pipelines, seasonal drilling limitations, and oilspill countermeasure planning. These recommendations are made in response to the "Call for Information", the Environmental Impact Statements, and the Proposed Notice of Sale for each lease sale. Exploration plans submitted by each oil company are also reviewed for their environmental protection provisions. In the future, assuming commercial discoveries of oil or gas, development EIS's and plans will receive similar review and comment.

4.10.6 **Habitat recommendations.**

4.10.6.1 **General techniques to address identified problems.** The following is a list of "real time" possible actions or strategies the Council may wish to take in the future, based on concerns expressed and data presented or referenced in this FMP. Actions taken must also be consistent with the goals and objectives of the FMP. Authorities for Council participation are described in section 4.10.5.1.

(a) Non-regulatory.

- Hold hearings to gather information or opinions about specific proposed projects having a potentially adverse affect on the Gulf of Alaska groundfish fishery.

- Write comments to regulatory agencies during project review periods to express concerns or make recommendations about issuance or denial of particular permits.

- Respond to "Calls for Information" from MMS regarding upcoming oil and gas lease areas affecting the Gulf of Alaska/Cook Inlet areas.

- Identify research needs and recommend funding for studies related to habitat issues of new or continuing concern and for which the data base is limited. Examples would include research to identify critical habitats or to determine the long-term effect of

various levels and types of toxicity on marine fish and their food webs in the Gulf of Alaska region. Other examples: underwater TV observations of trawl impacts, and investigations as to how to modify gear to reduce these impacts.

- Establish review panels or an ad hoc task force to coordinate or screen habitat issues.

- Propose to other regulatory agencies additional restrictions on industries operating in the fisheries management area, for purposes of protecting the fisheries or habitat against loss or degradation. Examples are waste discharge restrictions for floating processors, or drilling restrictions for oil and gas exploration.

- Join as amicus in litigation brought in furtherance of critical habitat conservation, consistent with FMP goals and objectives.

(b) Regulatory. An FMP may contain only those conservation and management measures which pertain to fishing or to fishing vessels.

- Propose regulations establishing gear, timing, or area restrictions for purposes of protecting particular habitats or life stages of species in the Gulf of Alaska groundfish fishery. An example would be the winter halibut savings area designed to protect juvenile Pacific halibut concentrations during the winter months.

- Propose regulations establishing area or timing restrictions to prevent the harvest of low-quality fish in contaminated areas, in the interests of public health and safety. An example would be that if fish taken at or near dumpsites or areas of concentrated discharge were shown to be harmful to human health or to be less valuable commercially or nutritionally, an area closure could be established.

- Propose regulations restricting disposal of fishing gear.

4.10.6.2 **Specific recommendations.** The following section summarizes Council policy regarding the habitat issues contained in the Gulf of Alaska fishery management plan.

- Recommendation re further research.
- Recommendation re oil activity.

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AGENDA D-3 SUPPLE.
MARCH 1985

RECEIVED MAR 2 2 1985

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF FISH AND GAME

P.O.BOX 3-2000
JUNEAU, ALASKA 99802
PHONE: (907) 465-4100

OFFICE OF THE COMMISSIONER

ACTION	ROUTE TO	INITIAL
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March 19, 1985

Mr. Jim Branson
Executive Director
North Pacific Fisheries
Management Council
Box 103136
Anchorage, AK 99510

Dear Mr. Branson:

It has recently come to my attention that the issue of the sablefish season opening dates is not on the Council's agenda for consideration during our scheduled gulf groundfish plan amendment review for this year. I am not really sure how we failed to get this particular issue on the agenda for this year's amendment cycle. I am assuming it was simply an oversight rather than an explicit decision. This is an important issue and one which deserves attention this year, versus holding off until the next amendment cycle in 1986, delaying any season adjustments until the 1987 fishery. Again, I believe it is an issue that should be considered this amendment cycle and I believe there are other Council members who will agree with me and my inquiry of you then is how do we make that happen. I would appreciate any suggestion or procedural recommendations which you may have.

Sincerely,

Don W. Collinsworth
Commissioner

11-K12LH

ROBERT C. BUNDY
BRIAN W. DURRELL
DAVID R. MILLEN
STEVEN E. MULDER
DOUGLAS S. PARKER
JAMES N. REEVES

BOGLE & GATES
A PARTNERSHIP INCLUDING PROFESSIONAL CORPORATIONS
SUITE 600
510 L STREET
ANCHORAGE, ALASKA 99501
(907) 276-4557 TELEX: 090-26-695
TELECOPIER: 907-276-4152

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BELLEVUE, WASHINGTON
SEATTLE, WASHINGTON
WASHINGTON, D.C.

FILE: 16216/30160

March 25, 1985

Mr. Jim H. Branson
Executive Director
North Pacific Fishery Management Council
P. O. Box 103136
Anchorage, AK 99510

HAND-DELIVERED

Re: Apportionment of the Sablefish OY to DAP Trawl Fisheries in the Gulf of Alaska

Dear Mr. Branson:

We are writing on behalf of the Fishing Company of Alaska. The draft agenda for the 65th plenary session schedules the Council to clarify its February 1985 apportionment of sablefish OY to DAP trawl fisheries in the Gulf of Alaska. We request that the Council not preclude domestic trawling for the sablefish OY in the Central and Western Gulf. The Fishing Company of Alaska ("FCA") plans to commence fishing its trawler/processor, the ALASKA I, in the Gulf of Alaska later this spring. Sablefish is one of the species for which FCA has a market. FCA's revenue projections are based in part on the harvest of sablefish in the Gulf of Alaska. Precluding FCA from harvesting sablefish in the Gulf will create a financial hardship for the company at the inception of its operations.

We understand the Council has allocated 10% of the Western and Central area sablefish OY to joint venture trawlers (790 mt) as bycatch. This joint venture bycatch will not count toward OY which has been set below equilibrium yield to enhance stock rebuilding. U.S. factory trawlers and domestic trawlers (DAP) were allocated 5% of OY (approximately 247 mt) of sablefish as bycatch from the Western and Central Gulf. This 5% bycatch would be counted toward OY.

The purpose of establishing a bycatch allocation is to minimize disruption of the developing U.S. groundfish fisheries. Limiting domestic trawl harvest of sablefish to 5% bycatch fails to achieve this purpose. The ability to produce both under-utilized and fully-utilized species is critical to satisfying foreign markets. The ability to supply the more desired fully-utilized species along with the under-utilized species is a market-bargaining "chip." Solving the bycatch problem is of course necessary to allow continued harvest of the under-utilized species. Domestic trawlers are the mainstay harvestors of these developing fisheries which the Magnuson Act and the Council seek to encourage. Precluding harvest of the more lucrative fully-utilized fisheries, now that foreign markets are becoming accessible, reduces the economic viablity of larger domestic trawler/processors. Access to these species by domestic trawlers is an important factor in achieving the development of U.S. groundfish fisheries.

The bycatch issue should be addressed without allocating the OY between gear types. There is no basis for allocating 95% of the sablefish OY to the U.S. pot and longline gear types at the expense of the trawl fleet. There is not a sufficient historical use record to justify precluding the trawl fleet from harvesting the sablefish OY. This is the first year that foreign allocation (TALFF) for sablefish has been eliminated. Thus, there is no historical dependency to justify restricting gear types.

Likewise there is not a resource management justification to restrict trawl fishing for the sablefish OY. No evidence was presented at the Sitka meeting to justify restricting gear type on a biological basis.

FCA requests the Council to allocate 90% of sablefish OY to all U.S. gear types and reserve 10% of OY for domestic bycatch. Upon harvesting the 90% of OY, all gear types would have to cease targeting on sablefish. The 10% bycatch reserve should provide ample bycatch allocation to prevent disruption of the developing U.S. groundfish fisheries.

In conclusion, there is no justification to preclude domestic trawlers from harvesting the sablefish OY in the the Western and Central Gulf. Such a preclusion reduces the economic viability of domestic trawler/processors in their efforts to achieve the goal of developing U.S. groundfish fisheries.

We plan to attend the Council meeting in Anchorage and would like the opportunity to discuss this issue with you.

Very truly yours,

BOGLE & GATES

Steven E. Mulder

Steven E. Mulder

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Prepared by Captain Barry Fisher

Sole Bottom Trawling in the Bering Sea; Some Practical Do's and Dont's

Summary

A rich fishery for various soles and flounders exists in the Bering Sea. Some fishery biologists feel a sustained yield of 400,000 to 500,000 metric tons can be achieved. The Bering Sea areas where these soles are concentrated also have high concentrations of king crab, tanner crab, and halibut which move in time and area over the region and these species are often taken as a minor catch component along with the target sole species.

The unit values of these crab and halibut fisheries are quite high. The crab and halibut fisheries represent fully utilized fisheries which are important components of the overall fisheries. Uncontrolled removals of these species by bottom trawlers targeting on soles or flounders could well impact the biological mass of crab and halibut. Five years of intensive sole trawling has not yielded any but a rare incidental by-catch of salmon and there is little need to address a salmon by-catch.

This paper addresses some tactics and techniques of trawling which have been proven to work in reducing unwanted incidental catches of these species of crab and halibut which are prohibited to trawlers.

The Sole and Flounder Fisheries

The sole and flounder fisheries in the Bering Sea are well known and have been historically dominated by the U.S.S.R. and Japan with some later Korean exploration. The stocks of soles and flounders were

heavily overfished by these foreigners in the late 1950's and early 1960's (catches of yellow-fin sole alone averaged 400,000 metric tons from 1959 through 1962). The status of these stocks is once again plentiful and growing thanks to tightened American management controls occasioned by bilateral fisheries agreements preceding the FCMA of 1976 and by active and concerned fisheries management by the North Pacific Fishery Management Council since 1976.

Yellow-fin sole is the predominate sole species in the Eastern Bering Sea. This fish is primarily concentrated in shallow water, 20-45 fathoms, and in an area bounded roughly by latitudes 55° 50' to 58° 50' North and in longitudes 169° West to 159° West.

There are also lesser, but good, concentrations of such flounder species as Alaska plaice, lemon soles, flathead soles, rock soles, turbot and starry flounders in this same huge general area.

American trawlers were quick to realize opportunities to catch these soles as a result of the provision of markets by joint ventures. The yellow-fin sole fishery has grown steadily since the first joint venture in 1980.

Soles and flounders are caught by bottom trawls fishing "hard on bottom" and utilizing long mud lines or ground cables and bridles between the trawl doors and trawl which "herd" the fish into the path of the trawl.

The sole and flounder resources co-exist at certain times of the year and in certain areas in the Eastern Bering Sea with other bottom creatures such as halibut, king crab and tanner crab. These species are fully utilized by domestic American fleets and have a high unit value. Crab and halibut are important components of the American

fisheries. Uncontrolled removals of crab and halibut by trawlers targeting on soles could well impact the allowed quotas in the halibut and crab fisheries. Crab and halibut by-catches in the yellow-fin sole fishery, for example, have been relatively small as a percentage of the total catches of targeted species (yellow-fin sole, rock sole, plaice and lemon soles) but even by-catches of as little as 2-3% of crab and halibut are felt to be intolerably high by most fishermen from all the concerned fisheries: trawl, crab and halibut.

These feelings coalesced into a Work Study Group being appointed by the North Pacific Fishery Management Council in the fall of 1983. The purpose of this group (composed of trawlers in the sole fishery, crab fishermen and halibut longliners with some agency observers) was, simply put, to determine what "allowable" by-catches of prohibited species, crab and halibut, should be in the trawl fisheries for soles and secondly to devise fishing techniques and tactics which could and would lower the incidental catches of crab and halibut.

The Work Study Group is to be congratulated for their perseverence, objectivity and dogged determination to achieve agreements between the concerned fishery representatives.

The group and the N.P.F.M.C. can also point to real results in seeing the incidental catch of prohibited species lowered substantially by sole fleets practicing certain trawling tactics and techniques.

However, this performance of lowered by-catches is not yet universal in the trawl fleet and as the fishery grows, concern must be exercised to keep by-catches of crab and halibut to a minimum. Accordingly, this paper on trawling techniques and tactics is offered to the fishing industry as an example of the trawler's desires to

minimize by-catches.

It is fully recognized that much of what follows in the rigging of trawl gear, avoidance of concentrations of prohibited species and/or employment of trawling tactics will be adjudged as "basic, well known and just plain common sense" by experienced sole trawlermen. Their indulgence is asked by the author. But it is also felt that every effort possible (including the writing of this paper) should be expended to minimize by-catches. Further, that utilization of all of the tactics and techniques described below in a trawling strategy can and will significantly lower incidental by-catches of prohibited species.

Sole Gear in the Bering Sea

A sole trawl is a conically shaped otter trawl that is fished "hard on bottom" (where the full footrope of the trawl makes a constant contact from one wing tip to the other on the sea bed). Soles and flounders are true demersal or bottom-dwelling species and sole trawls are generally designed to permit little or no escapement possibilities under the trawl's footrope or through gaps between the trawl footrope and the fishing line at the bottom of the mouth of the trawl.

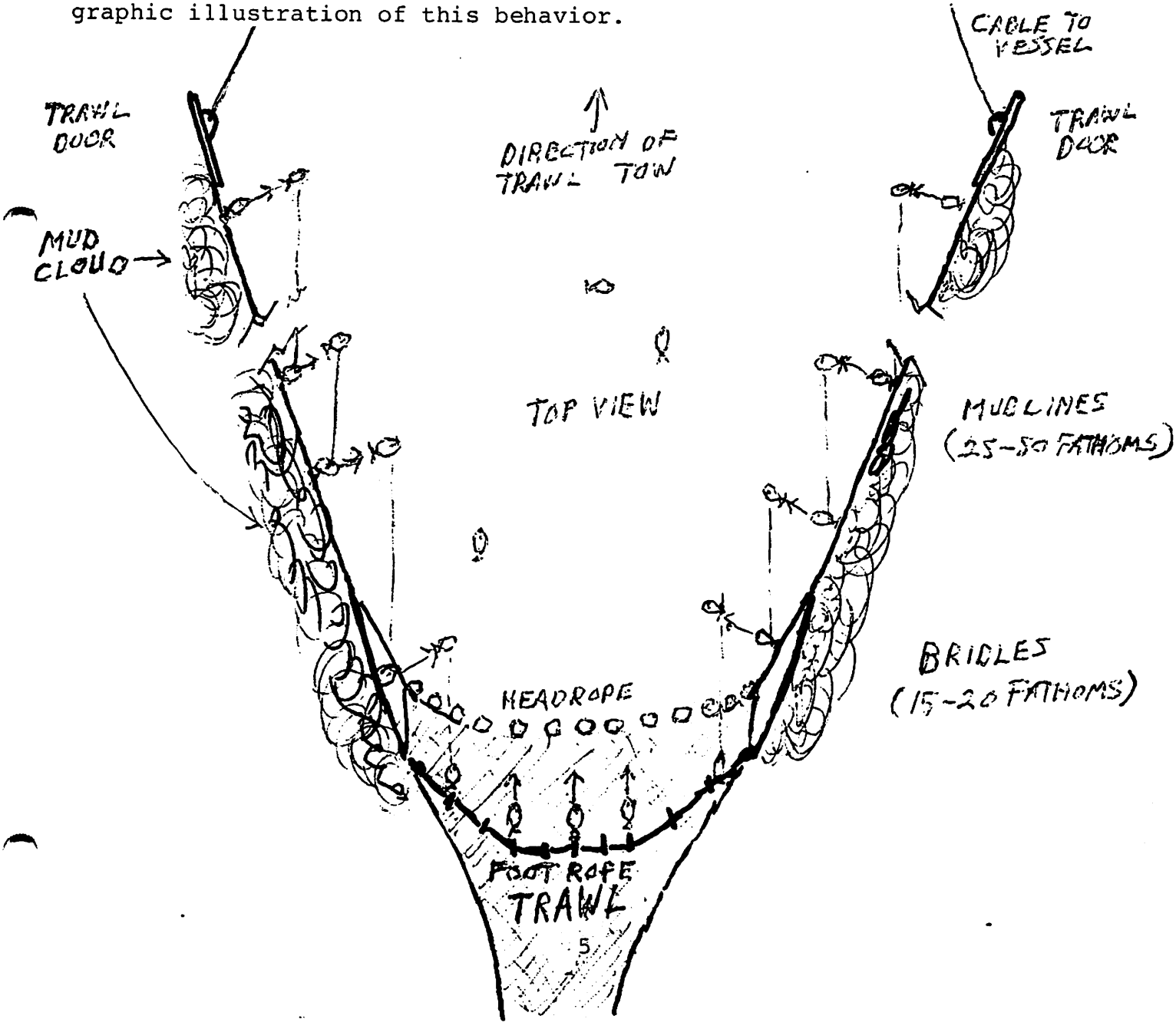
Usually the soles are also herded by long rubber disc-covered ground cables (or mud lines) and trawl bridles which run from the trawl doors back to the mouth of the trawl.

An initial "mud cloud" is stirred up by the trawl doors (which serve to keep the mouth of the trawl spread open and to maintain the bottom contact of mud lines, bridles and trawl by their weight).

This "mud cloud" or trails of sand and mud in the water column is

carried back and is added to by the action of the mud lines and bridles which also produce a mud cloud along the entire span back to the mouth of the trawl.

The soles on bottom respond to this approaching gear and the attendant mud clouds by making short runs of only a few feet directly away from the doors, mud lines and bridles at roughly a 90° angle. The fish then settle to the bottom again. The ever approaching mud line will route the soles up again for continued short runs until the fish find themselves in the mouth of the trawl. The sketch below is a graphic illustration of this behavior.



Once the soles are concentrated in the mouth of the trawl the approaching footrope constantly pushes the soles and they swim rapidly to stay in front of the footrope. The speed of the oncoming trawl is greater than the fish's sustained capacity to swim. It must be remembered that any fish has a very low sustained rate of speed. For soles this sustained rate of speed is as low as one to one-and-three quarters knots. Forcing the fish to swim faster than its sustained rate of speed will rapidly deplete the sole's oxygen and the fish lose the capacity to outswim the following trawl.

Maintenance of a trawling speed of 2.5 to 3.3 knots then causes the sole to exhaust itself and the fish will then be "caught" by the footrope passing under it. The fish will then be moved down the body of the trawl to the codend by the sustained speed of the trawl net advancing across the sea bed.

The soles will often seek escape when swimming just in front of the footrope. If the fish perceive any gaps or absence of mud cloud in the mouth of the trawl they will make for it and attempt to escape through the gaps.

For this reason, sole trawls in areas of good smooth bottom usually have footropes of 4"to 6" diameter rubber discs hung on chain or cable. Such a footrope presents no gap in the "mud cloud"; the entire footrope generates its own mud cloud and all animals on the bottom in the path of the trawl are subject to capture.

The fishing lines from which the bottom webbing of the trawl is hung are and have to be fastened close to the footrope to prevent any large gaps through which the sole can escape.

The use of such a trawl indiscriminately will also capture crab

species and halibut in the mouth of the trawl. If these species are present in large numbers an unwarranted number will be captured as a by-product or by-catch.

When faced with such a problem the trawlerman has only two alternatives:

1. Leave that particular fishing area immediately and search for an area with lower concentrations of prohibited species and a high abundance of the target species, sole.
2. Modify the trawl gear or trawling tactics to permit easy capture of the free swimming sole and yet allow crab to escape.

Experience in sole trawling in the Bering Sea dictates that when high concentrations of halibut are present mixed in with the sole, that leaving that trawl track is the only real solution to minimize halibut by-catches.

However, experience has also dictated that radical or long distance moves are often not necessary. Halibut have a preference for certain pieces of ground. These grounds are often very finite and limited. In general, halibut seem to prefer low domes or ridges of a somewhat "harder" bottom than the prevalent black volcanic sand of the Bering Sea.

These domes or ridges are often discernible on echo sounders. Careful observation of echo sounder markings will reveal a slight rise in the sea bottom as the trawler traverses such a dome. Usually the bottom markings on a sounder show a "harder echo" (increased red and brownish hues on a video sounder and a darker, deeper bottom echo

return on a paper sounder).

This echo sounder "evidence" should be used in concert with a track plotter to identify, whenever possible, these slight domes or harder bottom and they should be pin-pointed and avoided. The use of track plotters is indispensable in the long flat stretches of the Eastern Bering Sea to remain on the fish as well as to minimize the incidental catch of prohibited species.

Careful notations of catch composition correlated to echo sounder markings can often lead to a slight shift of trawl track to avoid the harder ground or domes and still maintain good catches of soles.

It must also be remembered that halibut may be encountered in such concentrations as to preclude any such slight shifts. In this instance there is little else that can be done but to move to another general area.

However, halibut are notorious travelers and an area that yields high concentrations of halibut by-catches at a given point in time may yield a much lower or almost nonexistent by-catch in a few weeks.

The broad general movements or migratory patterns of halibut behavior in the Eastern Bering Sea are thought to be understood but little accurate data exists of movement within the area over a year's time span.

For this reason, accurate log keeping of trawl tracks where by-catch composition is an important variable will begin to build a data base that can serve to reduce by-catches of halibut.

Crab can be more vulnerable to trawl capture than halibut. These animals crawl and lack the instant but limited ability of fin fish to swim rapidly away from the trawl. Unfortunately, no films or observed

behavior by divers of crab behavior when approached by trawls is available. Such data would probably lead to steps that could significantly lower crab by-catches.

However, some proven efforts can be made in modifying the trawl gear to reduce the incidental catch of crab.

Earlier in this paper a description was given of a typical sole trawl footrope; composed of 4" to 6" diameter rubber discs hung on a chain or cable across the bottom of the mouth of the trawl.

It is felt that crab, when approached by a trawl footrope and its attendant noise and vibration, will "hunker" down or attempt to immerse themselves in the bottom.

Sole species also display characteristic sets of behavior when approached by trawl footropes. The general behavior has been described earlier of moving away from the mud lines (and into the mouth of the trawl). But different species of sole also exhibit different behaviors.

Some soles such as dover or rex sole will tend to bottom and try to bury themselves in the bottom. When fishing such species the footrope must be rigid to maintain a hard bottom contact to root these soles out. Other soles once "tickled" by a mud line or bridle or footrope tend not to bury themselves and will 'free swim' away from the approaching gear in a series of short runs.

Fortunately, all of the sole species in the Eastern Bering Sea seem to exhibit this "free swimming" behavior in contrast to the 'burying' of dover or rex sole (and of crab).

In this instance, the action of the trawl footrope can be modified to capitalize on these different behaviors. The footrope does not have

to "dig" as much to effectively capture these soles. A footrope that tends bottom lightly will still effectively capture sole while allowing the footrope to pass lightly over the crab.

The mechanics involved in lessening or intensifying footrope contact are well understood by experienced sole fishermen. But these modifications are listed for other trawl fishermen who may not be "sole specialists".

A trawl, when properly rigged, is a balance of physical forces in action. Trawl doors operate to keep the mouth of the trawl spread horizontally and to keep the trawl mouth down. The mud lines and bridles "herd" the fish as previously described. Trawl floats keep the mouth open. Weight on the footrope keeps the bottom of the trawl mouth down and in good contact on the sea bed.

However, a complete trawl is kept open (and fishing) by a subtler set of physical forces. The passage of water through the trawl also causes the net to stay open and down. This pressure, or hydrodynamic forces, can also be used to lessen incidental by-catches of crab.

The "tilt" of the trawl mouth or angle of attack of the trawl as it is towed across the bottom can be increased or decreased. An upward tilt can lessen bottom contact of the footrope. Conversely, a downward tilt of the trawl mouth will increase bottom contact. A careful balance must be struck to attain the right combination that maximizes sole production and minimizes incidental catches of crab.

To achieve these results the following rules should be constantly employed.

To decrease footrope digging:

A. Simple modifications

1. Add floats to the headrope and/or;
2. Lighten up footrope weight.

B. Modify the angle (attack of the trawl mouth)

1. Slack the head rope back by adding increments of shackles, chain or wire between the top wing end and top bridle or;
2. Take up incremental amounts of footrope by shortening footrope length on each side.

To increase footrope digging:

A. Simple modifications

1. Take floats off the headrope and/or;
2. Add weight (chains) to the footrope.

B. Modify the angle of attack of the trawl mouth.

1. Shorten the headrope by taking out shackles, chain or wire increments or;
2. Lengthen the footrope by adding shackles, chain or cable increments.

During fishing operations the trawl footrope and the catch composition must constantly be observed for signs of excessive digging of the trawl.

High crab by-catches in themselves are often a symptom of excessive digging of the trawl. Also, the appearance of large numbers of starfish, shells, bottom debris and traces of sand and/or mud in the codend and the catch are signs of excessive digging of the trawl.

Under these conditions, modifications to reduce bottom contact and footrope digging <u>should be undertaken</u>.

Another "tell tale" sign of excessive bottom contact is sand or mud

clinging to the net meshes close to the footrope. If these residues of sand or mud are discerned up several meshes from the bottom on the trailing bottom edges of the wings or well into the bottom belly webbing then the trawl is digging excessively and should be modified for a lighter bottom contact.

Utilization of these tactics should result in significantly lowering the incidental catches of crab.

However, further modifications of sole trawl gear can also be made to lower the by-catch of crab. These modifications again capitalize on the free swimming behavior of the target sole species.

Historically, most sole trawls used throughout the world have had vertical wing ends between headrope and footrope or fish tail or V cuts in the wing ends.

It was felt that a wall of webbing had to be provided in the trawl to prevent the escape of sole over the footrope along the wings.

After some five year's experience sole fishing in the Eastern Bering Sea it has been recognized that the wing ends of the trawl do not require this wall of webbing. Virtually all sole trawls used in the Bering Sea feature a flying wing design. In this design much of the bottom webbing of the wing is cut away and not used. The terminal point of the wing is fastened to the trawl headrope. The wing webbing is then tailored or cut on a taper that is 45° or greater along the wall of the vertical wing webbing so that at the end of the taper the wing terminates on the footrope much farther back than the wing terminated on the headrope. This tailored design still retains high sole capture as the herding action (and attendant mud cloud) of the mud line and bridle is carried on to the footrope end pieces. The crab are

afforded an "extra" opportunity to escape over the now bared footrope end pieces just as they do over the mud lines and bottom bridles.

A great deal of gear modification has been tried by Marine Resources Company International yellow-fin sole joint venture trawlers. Among these modifications has been a constant use of various configurations of footropes with bobbins spaced intermittently along the footrope. The bobbins and bobbins alone in this type of footrope are in contact with the sea bed if the trawl is properly rigged. The remainder of the footrope is still built of 4 inch diameter rubber discs on a chain or cable footrope. Nine inch diameter bunt bobbins in the wings and nine or twelve inch bosom bobbins in the bosom or belly part of the trawl can provide good bottom contact. However, the major portion of the footrope is suspended off bottom and the resultant gap of three to six inches between the disc portion of the footrope and the sea bed will permit the escapement of crab (which "hunker" down or attempt to bury) and still not cause an appreciable loss of the target species as these soles are free swimming and not attempting to bury. A sufficient "mud cloud" is still produced by the footrope and the gaps are not perceived by the soles.

Five years experience sole trawling in the Bering Sea by The MRCI fleet leads to this conclusion. Trawlers using such bobbin/disc footropes have consistently fished "cleaner" with lower by-catches of crab than vessels employing a straight disc footrope.

This bobbin/disc footrope's utility can perhaps be increased by the judicious action of a tickler chain suspended from the footrope wing tips. Tickler chains are widely used throughout the world in sole fisheries. The objective of such a tickler chain is to "tickle" soles,

resting on the bottom or partially buried, up off the bottom slightly to permit easy capture of the soles as the footrope approaches.

Tickler chains should be rigged so that the chain rides some three to six feet in front of the center portion of the footrope. To achieve this position, tickler chains are generally made up so that the length of the chain is some 10-12% less than the length of the footrope to which it is attached. Some trawlermen believe the tickler chain should be made up to be used over the entire footrope length. Others argue that tickler chain should be fastened farther back from the bottom wing ends on each side.

This latter group point out that the footrope of the trawl, when towed, is in a general V shaped position in response to towing forces, while a tickler chain when suspended from the footrope, rides the bottom in a U shaped configuration. They contend that fastening a long tickler chain from wing end to wing end results in the leading ends of the tickler chain being under or outside the footrope wing sections and since it is U shaped when towed that the center section may be too far in front of the trawl to serve as an effective tickler.

In any event, tickler chain use should be encouraged with careful observation of results as the gear is discreetly modified. It is believed that a correct use of tickler chains with footropes made up of bobbins and discs will alleviate by-catches of crab since the sole are constantly tickled by the chain which continues to produce a mud cloud. The sole will be captured as they will exhaust themselves and cannot perceive a gap or break in the mud cloud.

Crab on the other hand, would be tickled off bottom by a light tickler chain and then immediately drop back on bottom and as they hug

the ground will have the footrope pass over them.

Tickler chains need not be heavy to be effective. Tickler chains of 5/16" or 3/8" diameter are of sufficient weight to work well.

Critics of the above may claim that such tactics are not a "sure fire" solution that allows every crab to escape. There is no "sure fire" solution. There is by-catch in virtually every fishery in Alaska. The objective of this paper is to markedly lower the rate of incidental by-catch of crab and other species in order to keep the overall removals of these species by a trawl fishery at a minimum.

There are other details of trawl rigging which deserve mention. Sole trawls used in the Bering Sea sole fisheries are of necessity heavily constructed and robust. Huge volumes of soles exist and catches of from 15-45 metric tons are not uncommon. MRCI's fleet has consistently averaged 14-17 metric tons per tow from 1980-1984.

As these catches build up in the trawl codend, much greater drag is induced since the fish (and any accompanying bottom debris) are of negative buoyancy which, when added to the drag of this increased trawl weight, has a tendency to cause the codend to drag on bottom. It goes without saying that codend wear will increase. As drag increases, the trawl has a tendency to dig more.

These greater drag tendencies can be offset by:

1. Using positive buoyancy chafing gear of the polypropolene "hula" skirt type. Do not use chafing gear of nylon, as nylon is a negative buoyancy material and will also absorb sand and mud.
2. Attaching significant amounts of flotation to the codend top panel riblihes and lower intermediate top panel

riblines. The MRCI fleet uses from 70 to 80 8" diameter spherical trawl floats spread evenly along the codend and from four to six such floats on each top panel ribline of the lower intermediate.

The reduction of drag on the trawl will lower incidental by-catches of crab. There is another naturally occurring phenomenon in the Eastern Bering Sea which will induce drag (and decrease trawl effectiveness). These waters are inhabited by a profusion of plant-like bottom dwelling animals. A sample of their names used by sole trawlermen is a bellwether of the attitudes of the fishermen; "Sea onions, rhino nuts, elephant turds, etc." are among a few of the less scatalogical names.

Areas where these animals are abundant produces a situation in which a large number of animals are picked up by the trawl and are stuck in the webbing of the trawl.

When such conditions are encountered, the laborious practice of keeping the trawl clean by picking these animals out of the trawl is mandatory.

A trawl whose meshes are festooned with these creatures is heavier, harder to tow, and because of the induced extra drag will tend to catch more crab.

There have been occasions in the sole fleet where the net must be picked clean after every tow to keep the trawl working efficiently.

Tactics and Strategies to Reduce Incidental by-catches

It has been pointed out earlier in this discussion that avoidance of prohibited species is a viable tactic when trawling for sole in the

Eastern Bering Sea. Gear modifications have also been described which will lower incidental catches of crab and halibut. A separate set of strategies can also be employed to lower incidental catch rates further. Mention was made earlier of the necessity to reduce drag on the trawl as induced drag can cause a trawl to dig excessively and hence increase incidental catches of crab.

Avoidance and lowered drag can be combined by utilizing some "common sensical" practices.

Long tows or sets of the trawl should be avoided for a number of reasons. Heavy trawl catches seem to increase the chances of heightened catches of prohibited species as extra drag is induced. Rather than attempting to catch "too much" at one time, the tow should be shortened to avoid induced drag. This is particularly beneficial in joint venture or "floater" operations where catcher vessels more often than not have periods of "wait-time" as they can catch faster than the factory ships can process.

Parenthetically, it must be remembered that huge catches also can lower product quality which is not in the best interests of the fishermen. It is felt that tows in excess of 15 metric tons heighten the risk of "extra" catches of prohibited species and tow time and length should be planned to keep volumes at a reasonable level.

A further reason for shortening tow time or extent is to practice avoidance. Often times, prohibited species are encountered in "pockets" along the trawl track. Bottom type preference for halibut has been cited. Higher or lower crab concentrations are also often encountered along a trawl track. Shortening up the tow or laying out a grid of various shorter trawl tracks on a plotter can and will yield

dividends in lower catches of prohibited species. The relatively higher concentrations of prohibited species can be pin-pointed and avoided.

Evidence to support this theory comes from the 1984 yellow-fin sole in the Eastern Bering Sea. One company fleet had a much higher incidental catch rate of crab than did another company's fleet.

In both fleets, the gear was much the same and there was a high overlap in trawl tracks during the season.

The only significant variables between the two fleets were trawl catch volumes and length of tow. Predictably, the vessels with higher average catch volume and longer tows also had greatly increased catches of prohibited species of crabs.

Another strategy which can lower crab by-catches focuses upon the behavior of crab. Crab feeding behavior is scavenger like. Crab are attracted to dead bait whether it be in bait boxes in traps, in lost traps that "ghost fish" or to areas of opportunity where large amounts of dead bait are found on the bottom.

In joint venture or floater type operations where a factory ship processes the catch it has been noted that the incidental catch of crab seems to rise as trawlers prosecute a sole fishery in a given discreet area. If the processor ships (which of necessity must stand by close to their catcher vessels) remain directly on the trawl tracks while processing then there is the provision of a constant banquet of dead bait which will and does attract crab. Everyone loves a "free lunch"; crab are no exception. Discharge of offal from the target species being processed directly onto the trawl tracks will draw crab. Every effort should be made to have the processor move in to pick up

codends from the catcher vessels and then to move immediately off the trawl tracks some 4 to 8 miles distant while processing that catch.

Conversely, the catcher vessels should refrain from trawling immediately adjacent to processor vessels. Coordination of these activities and a resultant separation of the trawling area and processing area should lead to diminished by-catches of crab.

A final strategy should be mentioned which has effectively and radically lowered incidental catches of both crab and halibut. In 1983, and to a greater degree in 1984, Marine Resources Company International imposed a rate limit of prohibited species by-catch on its vessels on a tow by tow basis.

It must be remembered that conservation efforts must be practiced consistently on each tow for optimum success. Setting a season rate or volume or percentage of catch does not necessarily lower incidental by-catch rates of prohibited species on any given tow.

Worse, using such season rates can often times lead individual fishermen to unconsciously fish against a set "quota" of allowable by-catch and/or forces fishermen to think only about the season total catch of prohibited species. A good example of this type mentality can be realized in the following hypothetical example. "Our quota (or allowed limit) of halibut is 1% of the target species tonnage or perhaps X thousand animals. Therefore, in June we caught only three quarters of 1% or minus X thousand animals. Ergo, we can fish a little "dirtier" during the rest of the season and still come out O.K. on the season's percentage or total animals allowed."

Much was made during the Work Study Group's meetings of this rate of catch concept. The fishermen involved in these meetings immediately

grasped the subtleties of such a situation.

Agency personnel did not generally appreciate the significance of the differences, and in fact, some argued against this approach of a rate of catch on an individual tow basis as ineffectual or even meaningless.

Fortunately the fishermen involved in the Work Study Group prevailed when MRCI fishermen and others could demonstrate that following this rate of catch limit concept did indeed help lead to considerably lowered catches of prohibited species in 1984. The allowable rates of by-catch on a per tow basis in the MRCI fleet are: no more than 3 halibut per ton of target species; no more than 5 king crab per ton of target species; and no more than 7 tanner crab per ton of target species.

These figures were not chosen arbitrarily. Adherence to these rate limits per tow will allow an incidental by-catch of prohibited species that is well below the levels of removal that fishery biologists consider safe and equitable for the maintenance and building of the crab and halibut stocks.

The Work Study Group will present a reasoned plan to the North Pacific Fishery Management Council which is a joint product of fishermen from the trawl, crab, and halibut fisheries. This plan will present a rate limit for the 1985 season and call for a volume or season limit for 1986, as well as a 1986 rate limit.

One final factor should be mentioned which can and will lead to reduced by-catches of prohibited species in the Bering Sea sole fishery. The Senior American Captain in each MRCI sole fleet has the exclusive right and authority to order the entire fleet to move if incidental catch rates of prohibited species surpass the company

established rate limits on a tow by tow basis.

The company has also ordered the Senior Company Representatives in each sole fleet and Senior American fleet captain to punish individual catcher boats who fish "dirtier" or at higher rate limits than their colleagues by ordering the offending boats to "take time off to modify your gear and lower your individual by-catch of prohibited species".

Individual and collective discipline voluntarily accepted will probably prove to be the most potent technique that can be employed to minimize incidental by-catches of prohibited species in the Eastern Bering Sea sole fishery.

The same discipline and spirit of cooperation emerged during the strenuous sessions of the Work Study Group. The need for cooperation became ever more discernible during our deliberations. We slowly evolved into a group that was concerned not only about the welfare of our respective fisheries individually but to a common understanding of the welfare of the fisheries in general. Development needs and general conservation needs were balanced; respect and appreciation of each other's viewpoints grew, but above all else, it can be stated that the politics of "total entrance" or "total exclusion" which were bandied about in 1980 or 1981 would serve no useful purposes. Mother Nature put those stocks of soles and other fin fishes along with crab and halibut in the same areas. Responsible men do not deliberately foul their own or other people's nests.

Intelligent and reasonable men from disparate fisheries can continue to work together to solve common problems. The task is not completed. We have made a good start. Additional gear modification will be carried on, tactics and strategies will be further tested, data will be collected for use in determining management strategies.

The impact of our experience should not be lost on the managers, and particularly those managers whose careers have led them into involvement or interests only in a single fishery to the exclusion of all others.

We fishermen too have a responsibility to the resources (plural form deliberately used). The resources are the "bread of our lives" and exist not only now for the present but for our children's if they choose to sail in our wakes in future years.

The author wishes to express his deep gratitude to the North Pacific Fishery Management Council for having had the foresight, patience and courage to convene a user's group to begin the task of limiting the incidental by-catch of prohibited species.