M E M O R A N D U M

TO: Council, AP and SSC Members

FROM: Clarence G. Pautzke
Executive Director

DATE: April 5, 1988

SUBJECT: Bering Sea/Aleutian Islands Groundfish Fishery Management Plan

ACTION REQUIRED

Approve Amendment 12 for public review.

BACKGROUND

The Council reviewed amendment proposals in January and selected six for further development during the current cycle. The six amendment topics are:

(a) Bycatch controls.
(b) Federal permit requirements.
(c) Non-retainable groundfish catch limits.
(d) Resource Assessment Document (RAD) deadline.
(e) JVP prohibition on roe rock sole.
(f) Optimum yield (OY) range.

The plan team has incorporated the proposals with several alternatives into an Amendment 12 package that includes an Environmental Assessment (EA) and draft Regulatory Impact Review (RIR) for the first five proposals and a Supplemental Environmental Impact Statement (SEIS) for the optimum yield (OY) range proposal.

The Council needs to approve Amendment 12 for public review. The proposed alternatives are summarized in item D-4(a). The draft EA/RIR and SEIS sent to you on April 4 contain the presentation of amendment topics and environmental and economic analyses of the alternatives. Draft implementing regulations for some of the proposals also were provided.

A 30-day public comment period on the EA/RIR is scheduled to run from about April 25 to May 25. A 45-day comment period is required for the SEIS. The Council will review public comments and take final action in June and the amendment could be implemented by November/December 1988.

BS/AI AMENDMENT 12 SUMMARY

1. Implement the Bycatch Committee's management program for red king crab, Tanner crab, and halibut bycatch.

   Alternative 1: Maintain the status quo (i.e., do nothing). Current bycatch controls under Amendment 10 expire December 31, 1988.

   Alternative 2: Continue Amendment 10 controls indefinitely.

   Alternative 3: Implement the Bycatch Committee's framework to annually establish bycatch caps for specific target fisheries, based upon annual assessment of bycatch species' population size and groundfish TACs.

2. Require all vessels receiving groundfish caught in the U.S. EEZ to have federal permits.

   Alternative 1: Maintain the status quo (i.e., do nothing). Only vessels fishing in the EEZ are required to have a federal permit. Processing vessels located within three miles or outside 200 miles, that receive fish from the EEZ are not required to report their processed catch weekly as do processers operating in the EEZ. No report or one that is delayed could lead to overharvests.

   Alternative 2: Require all vessels receiving groundfish from the EEZ to have a federal permit regardless of processing location.

3. Establish non-retainable groundfish bycatch limits that are outside the groundfish OY.

   Alternative 1: Maintain status quo (i.e., do nothing). Currently no bycatches of fully U.S. harvested groundfish are available to TALFF. In addition there is no limit on the discarded bycatch of a groundfish species after its TAC has been reached.

   Alternative 2: Establish non-retainable groundfish bycatch limits, outside the groundfish OY, but within each species ABC, that would be allocated to DAP, JVP, and TALFF as required in other species' target fisheries.

   Alternative 3: Establish non-retainable groundfish bycatch limits that are not within the groundfish OY for groundfish species applicable only to JVP and foreign fisheries (i.e., no specified limit to DAP bycatch of non-targeted groundfish).

4. Remove July 1 deadline for Resource Assessment Document.

   Alternative 1: Maintain status quo (i.e., do nothing). The Resource Assessment Document now must be produced by July 1, even though summer survey results are unavailable.

Alternative 2: Remove July 1 deadline, but maintain Council policy to require draft RAD prior to September meeting and final RAD prior to December meeting.

5. Prohibit joint venture targeting on roe-bearing rock sole.

Alternative 1: Maintain status quo (i.e., do nothing). Rock sole now is part of the "other flatfish" TAC for purposes of apportionment to DAP and JVP.

Alternative 2: Prohibit the retention of more than 30% rock sole by joint ventures between Janaury 1 and April 1 (rock sole spawning season).

Alternative 3: Create separate TAC for rock sole and apportion on a split-season (spawning and non-spawning) basis.

6. Revise upper limit of optimum yield (OY) range.

Alternative 1: Maintain status quo (i.e., do nothing). Current upper limit to OY, and sum of TACs, is 2.0 million metric tons.

Alternative 2: Set upper limit of OY equal to the annual sum of groundfish ABCs (currently 2.6-2.8 million mt). Three options are considered; upper limit of OY equal to:

(a) Sum of ABCs.
(b) 90% of sum of ABCs.
(c) Sum of ABCs, limited to a 5% increase per year.

Alternative 3: Set upper limit of OY equal to groundfish complex MSY (currently estimated at 3.4 million mt). Three options are considered; upper limit of OY equal to:

(a) Groundfish complex MSY.
(b) 85% of complex MSY.
(c) Complex MSY, limited to a 5% increase per year.

One other doc. I didn't get

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SUMMARY OF ROE ROCK SOLE AMENDMENT PROPOSAL

PURPOSE: To enable domestic operations to exercise the domestic processor preference in the roe rock sole fishery, a fishery that was developed by DAP.

PROBLEM: Currently, rock sole is managed as part of the "other flatfish" complex, which includes rocksole, Alaskan plaice and flathead sole. Roe-bearing rock sole is the most highly valued specie in this complex.

Except for roe rock sole, DAP operations do not target on species in the "other flatfish" category. Although DAP operations can harvest and process enough roe rock sole to fill demand, they do not harvest and process the entire TAC for "other flatfish." Therefore, foreign processors have access to roe rock sole through the surplus in the "other flatfish" TAC.

SOLUTION: Two possible solutions have been proposed.

1) Prohibit joint venture "targeting" on rock sole prior to April 1. Experience over the past three years reveals that rock sole roe is at its peak in February and early March. The rock sole are schooled at this time. Joint venture for yellowfin sole, which need rock sole as bycatch, have started in mid-March. This proposal allows the JVs ample rock sole as bycatch to conduct their yellowfin sole operations. Most of this rock sole will not be in prime roe bearing condition.

This proposal would ensure that the DAP operations that pioneered this fishery are allowed to prosecute the fishery in the future. It would also allow the JV yellowfin sole fishery to continue.

2) Establish a separate "total allowable catch" category for roe rock sole. An ABC is already determined for rock sole on an annual basis. This proposal would go a step further and set up a separate TAC for roe bearing rock sole (rock sole harvested from January 1 through April 1).

This proposal would allow the DAP processor preference to be exercised. If biologic and economic information so justified, the TAC for roe rock sole could be set at DAP request.

DRAFT

ENVIRONMENTAL ASSESSMENT

AND

REGULATORY IMPACT REVIEW/INITIAL REGULATORY FLEXIBILITY ANALYSIS

FOR

AMENDMENT 12

(Excluding Consideration of the Optimum Yield Range)

TO THE FISHERY MANAGEMENT PLAN FOR THE

GROUNDFISH FISHERY OF THE BERING SEA/ALEUTIAN ISLANDS

Prepared by the Plan Team for the
Groundfish Fishery of the Bering Sea/Aleutian Islands
and the Staff of the
North Pacific Fishery Management Council

APRIL 1988

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SUMMARY OF AMENDMENT 12
TO THE
FISHERY MANAGEMENT PLAN FOR THE GROUNDFISH FISHERY
OF THE BERING SEA/ALEUTIAN ISLANDS

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

At their meeting on January 20-22, 1988, the Council directed the Bering Sea/Aleutian Islands PT to analyze six proposals by April (an additional proposal to redefine "directed fishing' was placed on an extended amendment cycle). The six proposals include:

(a) Bycatch Controls - to establish bycatch limits on the incidental harvest of red king crab, C. bairdi and C. opilio Tanner crab, and halibut.

(b) Federal Permit Requirements - to require all floating processors receiving fish from federal waters are not currently required to hold a federal permit and make weekly reports on catch.

(c) Non-Retainable Groundfish Catch Limits - to establish catch limits on the bycatch of groundfish species for which the TAC has, or soon would be, attained.

(d) Resource Assessment Document Deadline - to remove the current requirement that the RAD be produced by July 1 of each year.

(e) Roe-bearing Rock Sole/JVP Prohibition - to prohibit joint venture targeting on roe-bearing rock sole during a period January 1 to April 1.

(f) Upper Limit to the Optimum Yield (OY) Range - to remove the current 2.0 million metric ton upper limit to optimum yield. The analysis for this topic is presented in a separate supplemental environmental impact statement (SEIS).

This draft EA/RIR/IRFA presents the PT's assessment of likely impacts resulting from the implementation of these proposals.

1.0 INTRODUCTION

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

The Council solicits public recommendations for amending the FMP on an annual basis. Amendment proposals are then reviewed by the Council's Bering Sea Plan Team (PT), Plan Amendment Advisory Group (PAAG), Advisory Panel (AP), and Scientific and Statistical Committee (SSC). These advisory bodies make recommendations to the Council on which proposals merit consideration for plan amendment. Amendment proposals and appropriate alternatives accepted by the Council are then analyzed by the PT for their efficacy and for their potential biological and socioeconomic impacts. After reviewing this analysis, the AP and SSC make recommendations as to whether the amendment alternatives should be rejected or changed in any way, whether and how the analysis should be refined, and whether to release the analysis for general public review and comment. If an amendment proposal and accompanying analysis is released for public review, then the AP, SSC, and the Council will consider subsequent public comments before deciding whether or not to submit the proposal to the Secretary of Commerce for approval and implementation.

1.1 List of Amendment Proposals

Six amendment proposals were forwarded to the PT for analysis of their biological and socioeconomic impacts. If subsequently approved, these will constitute Amendment 12 to the FMP:

(a) Implement Bycatch Committee plan for crab and halibut.
(b) Revise permit requirements to include floating processors that operate in state waters.
(c) Establish non-retainable groundfish catch limits.
(d) Eliminate July 1 deadline for RAD.
(e) Prohibit joint venture targeting on roe rock sole.
(f) Replace upper limit to OY range.

1.2 Purpose of the Document

This document provides background information and assessments necessary for the Secretary of Commerce to determine that the FMP

amendment is consistent with the Magnuson Act and other applicable law. Other principal statutory requirements that this document is intended to satisfy are the National Environmental Policy Act (NEPA), the Regulatory Flexibility Act (RFA), and Executive Order 12291 (E.O. 12291); other applicable law addressed by this document include the Coastal Zone Management Act, the Endangered Species Act, and the Marine Mammal Protection Act.

1.3 Description of the Domestic Fishing Fleet

The domestic fleet in the Gulf of Alaska and Bering Sea/Aleutian Islands is made up of vessels targetting on several species of fish, including halibut and groundfish. The halibut fleet is larger than the groundfish fleet. Some of the halibut vessels fish groundfish and some of the groundfish vessels fish halibut.

1.3.1 Halibut Fleet

Information obtained from the International Pacific Halibut Commission shows that 3,893 U.S. vessels reported halibut landings in 1987, which is an increase of 14% from 1986. Increases by area within the Gulf of Alaska were 10% in Area 2C, 19% in Area 3A and 4% in Area 3B. In 1987, about 63% of the fleet was larger than 5 net tons and 23% were larger than 20 net tons, which represented only slight increases from 1986.

1.3.2 Groundfish Fleet

As of March 11, 1988, NMFS has issued 1,421 permits to fish groundfish in the Bering Sea and Gulf of Alaska in 1988 (Table 1.1). This number includes vessels that engage only in harvesting operations (catcher vessels), vessels that harvest and process their catches (catcher/processor vessels), vessels that will only process fish (motherhip/processor vessels), and support vessels that will engage in transporting fishermen, fuel, groceries, and other supplies.

Seven percent of the total vessels, or 98 vessels, are less than 5 net tons. Ninety-three percent, or 1,323 vessels are 5 net tons or larger.

They are located (see Table 1.2, below) in non-Alaska ports, including Seattle, and Alaska ports, including Sitka, Kodiak, and Dutch Harbor, and others. The numbers of vessels that come from Alaska is 896; the number from the Seattle area is 324 and the number from other areas is 201.

Table 1.1--Numbers of groundfish vessels that are less than 5 net tons or 5 net tons and larger that are Federally permitted in 1988 to fish off Alaska.

	Number of Vessels		
	Less than 5 net tons	Over 5 net tons	Total
HARVESTING ONLY	90	1,167	1,257
HARVESTING/PROCESSING	8	136	144
PROCESSING ONLY	0	3	3
SUPPORT ONLY	0	17	17
Total vessels	98	1,323	1,421

Table 1.2--Numbers of groundfish vessels Federally permitted to fish off Alaska in 1988 from the Seattle area, Alaska, and other areas.

	Number of Vessels			
Mode	Seattle Area	Alaska	Other Areas	Total
HARVESTING ONLY	256	824	177	1,257
HARVESTING/PROCESSING	58	70	16	144
PROCESSING ONLY	3	0	0	3
SUPPORT ONLY	7	2	8	17
Total	324	896	201	1,421

The total number of catcher vessels (harvesting only) and catcher/processor vessels (harvesting/processing) is 1,257 and 144, respectively. Net tonnages of catcher vessels and catcher/processor vessels varies widely. The total net tonnage of the catcher vessels is 26,565 net tons, and the total net tonnage of the catcher/processor vessels is 54,936 net tons.

Most catcher vessels employ three types of gear: hook-and-line (longline), trawls, or pots. The predominant gear type is hook-and-line (Table 1.3). Hook-and-line vessels are the generally small vessels in the fleet, having average capacities of 27 net tons and average lengths of 45 feet.

Most catcher/processor vessels also employ hook-and-line, trawls, or pots. The predominate gear type is hook-and-line gear (Table 1.4). They are the smallest of the catcher/processor vessels, having average capacities equal to 51 net tons and average lengths of 59 feet, but are larger than the catcher vessels using hook-and-line gear.

The next most numerous catcher/processor vessel are trawl vessels, which number 49 vessels and have average capacities of 374 net tons and average lengths of 146 feet. Pot vessels number 9 and have capacities of 428 net tons and average lengths of 143 feet. Other catcher/processor vessels that may have combinations of other gear may exist but have not registered with NMFS as of March 11, 1988 to be found in the data base.

Table 1.3--Numbers and statistics of catcher vessels by gear type that are Federally permitted to fish off Alaska.

	Number	Ave Net Tons	Ave Length (ft)
HOOK-AND-LINE	1,017	27	45
POTS	13	122	88
TRAWL	214	122	91
OTHER GEAR 1/	13	18	38
TOTAL	1,257		

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

Table 1.4--Numbers and statistics of catcher/processor vessels by gear type that are Federally permitted to fish off Alaska.

	Number	Ave Net Tons	Ave Length (ft)
HOOK-AND-LINE	86	51	59
POTS	9	428	143
TRAWL	49	374	146
OTHER GEAR 1/	0	N/A	N/A
TOTAL	144		

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

2.0 BYCATCH CONTROLS

2.1 Description of and Need for the Action

Trawl, hook-and-longline and pot fisheries are at least partially non-selective harvesting technologies; species composition of the catch is typically diverse, including targeted species and unavoidable bycatch species. A major conflict is created when the bycatch by one group of fishermen significantly impacts the level of resource availability to a second, separate group of fishermen. Thus, any development of a new fishery can have important adverse economic ramifications with respect to existing resource users. These can take the form of compromising conservation needs of certain resources (spawning stock/juvenile impacts) or simply reducing the average amount of harvest available to the traditional users (harvestable surplus impacts). Bycatch management is the balance of these conflicting needs.

For the Bering Sea/Aleutian Islands, bycatch rate controls were first introduced in the foreign groundfish fishery in 1983. These rates (usually expressed in terms of units of bycatch per metric ton of groundfish) acted as a triggering mechanism at which point fishing operations either moved to another area or modified fishing strategies. A declining bycatch rate schedule was implemented by plan amendment to encourage foreign fisheries to reduce their bycatch. Depth restrictions, a form of time/area closures, were also used successfully to keep both foreign longline and domestic fishing operations out of known areas of high bycatch.

Specific, numerical bycatch controls or "caps" were implemented by emergency rule for the 1986 fishing season and by Amendment 10 to the Bering Sea/Aleutian Islands Groundfish FMP for the 1987 and 1988 fishing seasons. The caps were applied by management area for C. bairdi Tanner crab, red king crab and Pacific halibut in the yellowfin sole fishery. At their December 1986 meeting, the Council created the Bycatch Committee with membership including representation from most Bering Sea resource users. The duties included formulation of recommendations for all bycatch species in all groundfish fisheries.

Many potential solutions are available to address bycatch issues. These range from the more traditional approaches (time/area closures, numerical caps, gear restrictions) to the more innovative (selling bycatch, managing groups of fisheries as a complex). For example, a number of management jurisdictions use mesh restrictions as a means to target on marketable groundfish species and avoid bycatch of smaller-sized fish. Another view is that bycatch is inevitable and that a solution must (1) encourage fishermen to land all their catch (not dump their bycatch at sea); but (2) still discourage targeting on the bycatch species. Yet another possible approach is use of an "Individual Transferable Quota" (ITQ) System which allows fishermen to obtain quota for all species, including bycatch, encountered in a

fishery. Incidentally caught fish are then sold with the target species. The bycatch is not discarded because there is value in its delivery to a processor but it cannot be targeted upon because there is insufficient quota made available to support targeted operations.

Simple retention of bycatch is also a possibility but would have to be limited to marketable products. In addition, fishermen and processors cannot be forced into costly special landing procedures solely for the purpose of dealing with retained bycatch. Any retention should also be limited to bycatch species with a high mortality rate since there would be little net benefit in retaining bycatch that survives well and eventually contributes to traditional fisheries and/or spawning stocks. Bycatch control measures can be implemented by a variety of methods such as permit conditions, emergency rules, plan amendments or voluntary controls. Some examples of actual use can be seen in the nearby Gulf of Alaska. Reduced TACs for Pacific cod and flounders have been used to limit bycatch, especially halibut. Amendment 14 established a framework procedure for setting the halibut bycatch level on an annual basis. 1986, several areas around Kodiak Island were closed by emergency rule to protect a depressed king crab population. A plan amendment continued the closures.

Unfortunately, this seemingly wide array of potential solutions is severely constrained by prevailing conditions in the Bering Sea/Aleutian Islands area. Some possibilities such as mesh restrictions are simply incapable of addressing major bycatch concerns regarding large specimens such as crab and halibut. Other potential options such as ITQs must realistically await implementation of a system capable of controlling the units of "fishing power" which are allowed to participate in the fishery. The ability to sell bycatch is also contingent upon it being of marketable size and quality - a situation often lacking in Alaskan waters. A final but important constraint is the fact that the fisheries are in transition. Foreign harvesting has ceased but the evolution from joint venture to full domestic harvesting is still in progress. With this changing mixture, the target species, fishing areas, and types of fishing operations are all evolving simultaneously. This in turn creates changes in bycatch rates, total bycatch harvests and mortality rates of bycatch species. Alternatives for plan amendment now must address the expected situation for the near-term future and, by necessity, carry the connotation of "interim".

2.2 The Alternatives

2.2.1 Alternative 1: Do nothing - status quo.

Adoption of this alternative would essentially eliminate the use of direct bycatch limitation measures since the bycatch cap provisions from Amendment 10 would expire on December 31, 1988. These prohibited species catch (PSC) limits are as follows:

(a) C. bairdi Tanner crab: 80,000 animals in Zone 1 applicable to DAH fishery for yellowfin sole and other flatfish.

(b) C. bairdi Tanner crab: 326,000 animals in Zone 2 applicable to DAH fishery for yellowfin sole and other flatfish.

(c) Red king crab: 135,000 animals in Zone 1 applicable to DAH fishery for yellowfin sole and other flatfish.

(d) Pacific halibut: 828,000 animals in BSAI applicable to JVP fishery for yellowfin sole and other flatfish. When limit is reached, only Zone 1 closed to JVP.

Some measure of indirect by-catch control would also be eliminated when the time/area closure south of 58 degrees N and between 160 and 162 degrees W and its associated exemption for Pacific cod fishing expires.

Thus, regulatory bycatch control measures would be limited mainly to the prohibited species classification itself that prevents retention. This would remain an effective deterrent to targeted fishing for crab species, Pacific halibut, Pacific salmon, herring and any other fisheries resources managed outside the Baring Sea/Aleutian Islands Groundfish FMP, but would provide no particular incentive to fish cleanly.

Another possibility under this alternative is industry self-imposed measures. The fishing industry has, on several occasions, applied voluntary bycatch control measures on operators in an effort to deal with the bycatch problem and avoid governmental regulation. These measures have taken the form of bycatch rates, time/area closures, and PSC limits, either singularly or in some combination.

However, anything approaching uncontrolled incident taking of crab species and Pacific halibut by groundfish harvesters is unacceptable to those who target on these species. Industry negotiations and internal industry guidelines have been effective in resolving some of the difficulties caused by the competition for crab species and Pacific halibut between target fisheries and non-target groundfish fisheries. It has generally been necessary, however, to establish a regulatory regime within which the negotiation process can take place. A good example of effective industry cooperation within a specific regulatory constraint was the system developed for managing bycatch in the 1988 Bering Sea joint venture flounder fishery.

2.2.2 Alternative 2: Extend the specific bycatch limitation provisions from Amendment 10 to the Bering Sea/Aleutian Islands FMP.

Adoption of this alternative would extend (for either an indefinite or specified period) the bycatch provisions of Amendment 10 with regard to bycatch caps for C. bairdi Tanner crabs, red king crab and Pacific halibut. The use of management Zones 1,2, and 3 would also continue as presently described. The area closure south of 58°N latitude and between 160° and 162°W longitude would be retained.

As noted in the previous section, crab limits would apply only in certain zones to the DAH fishery for yellowfin sole and other flatfish. The Pacific halibut limit applies only to the joint-venture fishery for yellowfin sole and other flatfish, but is for the entire BS/AI area. In addition, attainment of this halibut quota would only result in a joint venture closure in Zone 1.

This alternative originally resulted from industry negotiations but it would be improper to characterize it as a "compromise" beyond the agreed to expiration date of December 31, 1988. The nature of the fishery as well as the status of stocks have both changed significantly since negotiations occurred several years ago. Two major factors driving this approach toward obsolescence are (1) a marked improvement in the abundance for several crab species; and (2) development of a major domestic fishery with somewhat greater bycatch needs in order to operate effectively (due mainly to a different target species emphasis, not necessarily a reduced ability to minimize bycatch).

2.2.3 Alternative 3: Establish a framework management procedure to control bycatch of Tanner crab, red king crab and Pacific halibut in the Bering Sea.

Adoption of this alternative would result in a FMP amendment describing a framework procedure for managing bycatches of three fisheries resources: C. bairdi Tanner crab, red king crab and Pacific halibut. This alternative was developed by the Bycatch Committee of the North Pacific Fishery Management Council (see Appendices 2.1, 2.2, and 2.3).

2.3 Biological and Physical Impacts

To facilitate the analysis of all three alternatives, the basic data on bycatch impacts for the three relevant species is presented in Tables 1 through 4. Crab data are for the Bering Sea only but Pacific halibut data are by necessity, presented in a broader context due to significant stock interchanges between groundfish management areas.

To understand bycatch management and its various alternatives, it is necessary to define and describe the principle components of the issue. These are as follows:

Target fishing is defined as planned, deliberate operations designed to harvest certain individuals within a species or a group of species in the most cost-effective legal manner

possible. Pots for hard shell male crab over a certain size, longlines for halibut over the minimum size limit, and trawls for a mixture of marketable flounder species are all examples of targeting. All major regulatory restrictions which are applied to the target fishery will limit the options available to fishermen to some degree. However, controls specific to the target species (such as protection of female crab) are intended to increase sustained yields from the resource (in this case male crab). Similarly, minimum size limits are used in the halibut fishery since it is believed that the estimated 25% hooking mortality on small fish (plus additional natural mortality) will be more than offset by weight gains in the survivors. Target fisheries are managed to harvest the available surplus production and commonly exhibit significant year-to-year changes in both amount of harvest and percentage of biomass taken. It is important to note that this short-term surplus production does not necessarily parallel changes in overall biomass.

Bycatch is the reverse of targeting since the catch is an incidental byproduct of operations directed at other fisheries resources. Examples would be female or soft shell male crab taken in pots, undersized halibut taken on longlines, or crab and halibut taken in trawls. In contrast to target fishing, the single most important variable determining amount of bycatch is size of the population susceptible to the gear. Thus, a large bycatch of small crab might be taken in the same year that the directed crab fishery was completely shut down due to a low abundance of legal-sized males. However, size of the bycatch biomass is not the only variable. Magnitude of the target fishery (both amount and rate of fishing) is important along with harvesting areas and times. For example, most of the salmon bycatch problems in the Gulf of Alaska have occurred late in the year.

Obviously, substantial modifications in bycatch can also occur due to specific bycatch regulatory controls. In this case, regulations are intended to indirectly benefit sustained yields in the target fishery and not the fishery being directly regulated for bycatch. Whenever this latter group's ability to harvest from the greatest concentrations of fish is impaired, then significantly greater total effort will be required to take the same level of target harvest. Costs of fishing invariably go up. In addition, catches of other bycatch species (which were not the reason for the original regulations) can increase markedly due to forced changes in operations.

Fishing rates are expressed in a number of different ways and this sometimes adds unnecessary confusion to the bycatch issue. For example, a 40% annual exploitation rate on crab normally means that, on the average, 40% of the available male crab over a certain minimum size are taken each year by the target fishery. The situation is similar for the halibut fishery since quotas and rates of harvest are generally computed for the exploitable or legal-sized biomass. However, bycatch is normally computed as

impact on the entire biomass that is available to the gear. Thus, a crab bycatch averaging 1% of the biomass per year would take 1% of the sublegal males that are susceptible to capture by the gear. The latter group might be the same individuals that must support the target crab fishery for the next five years. In this example, the real impact on availability of legal male crab would be 5% (1% taken for each of five years).

Bycatch mortality is the sum of (1) catch retained, (2) non-retained catch that is dead or dies soon after release, and (3) individuals that are somehow killed by the gear but are not observed in the landed catch. There can be a great deal of variability depending upon gear and mode of operation as well as size and condition of the individuals present. An example at the "low end" of the possible mortality range is the 1.2% mortality rate observed by ADF&G personnel during 1978-81 for trawl-caught hard shell king crab in the Kodiak area (this estimate did not include mortality caused by deck time or delayed mortality caused by injuries once the crab were returned to the sea). At the high end of the range is the common assumption of 100% crab and halibut mortality in trawl fisheries with codend transfers or long towing times. Examples of intermediate values would be the halibut rates of 50% for short trawl tows with rapid sorting 25% from longline gear. The common round numbers often cited (100, 50, 25) bear witness to the uncertainty of these estimates. Still, these are the generally accepted mortality rates for halibut and estimates of actual losses can be made. Crab estimates are much more controversial and there are no commonly accepted values at the present time. The issue of unseen losses due to gear damage is especially tenuous.

Adult equivalents is another relatively simple concept that is often made confusing by different modes of expression and use of variable mortality rates. It is the process of expressing two different catches in standardized units and requires use of growth estimates as well as fishing and natural mortality rates. The most common fishery management application on the west coast deals with Pacific salmon in Washington and Oregon. Here, for example, sport catches of immature chinook salmon must be equated with runs of mature adults in order to achieve the required allocations between treaty and non-treaty fishermen.

The same basic process is useful in the Bering Sea to present bycatches and target catches of common species in the same units. For example, pounds of halibut observed in the trawl catch are adjusted for expected mortality of discarded fish and then multiplied by 1.58 to convert to adult equivalents in pounds. The 1.58 value incorporates estimates for growth and natural mortality. The poundage numbers derived can then be directly compared to harvests made by the target longline fishery. The potential for confusion comes from the three different numbers (capture, mortality, loss). In addition, if the conversion was made for numbers of halibut instead of pounds, then the

conversion factor would be significantly less than 1.0 (due to natural mortality) and three new numbers would be generated.

To even make these types of calculations, definite decisions must be made with respect to the growth and mortality factors, including average age at capture. The following example shows what would happen to 1,000 small crabs taken six years before the expected directed fishery harvest under two different assumptions of high and low natural mortality rates:

Assume 70% Annual Loss (30% survival)		Assume 10% Annual Loss (90% survival)	
	1,000 Crabs		1,000 crabs
Year 1	x 0.3 = 300 crabs	Year 1	x 0.9 = 900 crabs
Year 2	x 0.3 = 90 crabs	Year 2	x 0.9 = 810 crabs
Year 3	x 0.3 = 27 crabs	Year 3	x 0.9 = 729 crabs
Year 4	x 0.3 = 8 crabs	Year 4	x 0.9 = 656 crabs
Year 5	x 0.3 = 2 crabs	Year 5	x 0.9 = 590 crabs
Year 6	x 0.3 = 1 crab	Year 6	x 0.9 = 531 crabs

This example, while admittedly extreme, illustrates the dead end that any analysis will reach if widely variable rates are tested. Unlike halibut, there are no commonly accepted conversion rates for crab at the present time.

Biological Risks from Bycatch

As is evident for the preceding discussion, bycatch is primarily an issue of allocating surplus production among different resource users. When healthy fish and crab resources are involved there is essentially no biological risk associated with anticipated levels of bycatch.

However, when any population is reduced to a low level, potential for risk appears and accelerates rapidly as the population declines further. In some recent years, there has been no target fishery for red king crab and C. bairdi in the Bering Sea; thus only bycatch mortality took place.

With any population, arealistic assessment of risk requires an understanding of types of mortality and relationships between spawners and recruits. Unfortunately, this type of understanding is limited for Bering Sea bycatch species. The absence of this information requires that management of bycatch must be particularly conservative for depressed populations such as red king crab and C. bairdi.

2.3.1 Alternative 1: Do nothing - status quo

This alternative would result in no action and the bycatch limitations from Amendment 10 would be allowed to expire on December 31, 1988. These measures would not be extended or replaced with different bycatch control procedures. The technical data base describing the recent history of the fishery (Tables 2.1 through 2.4) provides some useful information but its utility is severely limited by the fact that the fishery is in transition. In the case of any relatively stable fishery, its recent history is normally valuable for predicting the outcome of proposed future resource management options. In this case, however, the recent 10-year history begins with a domination by foreign fishing activities that have now largely disappeared. Thus, these historical data have only nominal value in attempting to predict fishery results from a future situation expected to be dominated by domestic factory trawler operations.

Under this alternative, the primary measure to control bycatch would be the prohibited species classification that prevents retention. Any additional control would have to come mainly via voluntary industry restrictions. Emergency regulation action would remain as a management tool for any really unforseen circumstances. However, no direct regular controls on bycatch would exist in terms of either rates of capture or total numerical quantities of animals taken. Catches of C. bairdi Tanner crab could be expected to vary mainly with the size of the crab population and could reach levels as high as the 7.5 million animals taken in 1977 (or 1.63% of the population). A 3 to 7% catch reduction could be expected for the directed crab fishery. This level could be pushed substantially higher by any concentration of JVP and DAP trawling operations in areas of high C. bairdi abundance. Red king crab catch levels would again vary to some degree with population size but could easily reach the high of 1.17 million animals (2.92% of the population) recorded in 1985. This could have a 6 to 12% impact on the directed fishery where crab stocks are healthy but the potential conservation impact on depressed stocks would be much greater.

The situation for Pacific halibut needs to be examined in a somewhat broader context since there is a major migration of fish between management areas. There is a general eastward migration from the Bering Sea to the Gulf of Alaska and a southward shift from Alaskan waters to areas off British Columbia, Washington and Oregon. The proportion of Bering Sea bycatch yield loss that occurs in any area depends on the migration rate from the Bering Sea, however these rates are currently unknown. As a preliminary estimate, the IPHC distributes bycatch loss by area in the same proportion as the exploitable biomass is present in those areas. Under this distribution, about 95% of the Bering Sea yield lost as bycatch occurs outside of the Bering Sea. This has international allocation implications to the degree that Bering Sea bycatch causes reduced harvest allowances for Canada.

Table 2.1 Bering Sea Population Estimates of C. bairdi Tanner Crab, Estimated Bycatch and Bycatch expressed as a Percentage of the Population, 1978-1987.

	Population in Millions					Bycatch	
Year	Legal Males	Other Males	Total Males	Females	Total Crabs	Number	% of Pop
1978	45.9	279.2	325.1	318.4	643.5	4.1	0.64
1979	31.6	211.4	242.9	216.2	459.1	7.5	1.63
1980	31.1	572.7	603.7	543.3	1147.0	3.7	0.32
1981	14.2	375.7	389.9	458.3	848.2	1.6	0.19
1982	11.4	188.9	200.3	513.8	714.1	0.4	0.05
1983	7.1	211.7	218.8	280.6	499.4	0.6	0.12
1984	6.0	121.2	127.1	154.4	281.5	0.7	0.25
1985	4.5	56.9	61.3	58.1	119.4	0.9	0.75
1986	3.2	134.9	138.0	87.6	225.6	0.6	0.27
1987	8.3	279.8	288.1	250.6	538.7	-	-

Table 2.2 Bering Sea Population Estimates of Red King Crab, Estimated Bycatch and Bycatch Expressed as a Percentage of the Population, 1977-1987.

	Population in Millions					Bycatch	
Year	Legal Males	Other Males	Total Males	Females	Crabs	Number	% of Pop
1977	37.6	144.1	181.7	183.6	365.3	-	-
1978	46.6	110.8	157.4	166.6	324.0	0.32	0.10
1979	43.9	85.3	129.2	156.0	285.2	0.08	0.03
1980	36.1	80.7	116.8	112.5	229.3	0.34	0.15
1981	11.3	75.0	86.3	103.6	189.9	1.14	0.60
1982	4.7	124.6	129.3	132.0	261.3	0.27	0.10
1983	1.5	53.7	55.2	34.0	89.2	0.81	0.91
1984	3.1	94.5	97.6	75.1	172.7	0.49	0.28
1985	2.5	23.8	26.3	13.7	40.0	1.17	2.92
1986	5.9	24.1	30.0	9.8	39.8	0.26	0.65
1987	7.9	32.7	40.6	35.1	75.7	-	-

Table 2.3 Bering Sea Pacific Halibut Bycatch Mortality 1977-86.

Year	Metric Tons
1977	1950
1978	3297
1979	3563
1980	5623
1981	3876
1982	2826
1983	2757
1984	2977
1985	2543
1986 1/	2894

1/preliminary

Table 2.4 Pacific Halibut Removals, All Areas, 1977-1986.

	Thousand Metric Tons, Round Weight			
Year	Quota	Bycatch1/	Sport	Total Removals
1977	13.3	12.6	0.3	26.2
1978	13.3	11.9	0.2	25.4
1979	12.4	15.0	0.4	27.7
1980	12.2	18.2	0.5	31.0
1981	15.1	7.9	0.6	23.6
1982	16.3	11.1	0.8	28.2
1983	18.5	10.9	1.2	30.6
1984	26.0	9.1	1.3	36.4
1985	33.7	8.3	2.0	44.0
1986	40.1	7.7	2.4	50.2

1/ expressed in adult equivalents (Bycatch mortality x 1.58)

If only the Bering Sea was considered, the halibut bycatch (after conversion to adult equivalents) would equal 40 to 60% of the directed fishery catch even under the types of control measures proposed in Alternatives 2 and 3. However, the Bering Sea only has 5 to 10% of the overall halibut biomass. This, plus the migrations described above, precludes any meaningful examination of Bering Sea halibut in isolation. The outcome of any general lack of halibut bycatch controls is obvious, however, when total removals are examined. In 1980, for example, population impacts from bycatch alone amounted to nearly 60% of total removals. Although halibut abundance is currently at a much higher level than existed in 1980, unrestricted bycatch would still be detrimental to future directed fishing operations. In the Bering Sea alone, the 5623 metric tons taken in 1980 would translate into a 8.9 metric ton directed fishery loss (when converted to adult equivalents by a factor of 1.58).

In view of the information presented, the lack of specific bycatch control measures in the Bering Sea/Aleutian Islands management area would have significant impacts on the directed fisheries for king crab, Tanner crab, and halibut.

2.3.2 Alternative 2: Extend the specific bycatch limitation provisions from Amendment 10 to the Bering Sea/Aleutian Islands FMP.

Under this alternative, specific numerical limitations would continue to apply indefinitely or for a specified period. Thus, C. bairdi bycatch would be limited to 80,000 crab in Zone 1 and 326,000 crab in Zone 2 for the DAH fishery for yellowfin sole and other flatfish. This same fishery would have a 135,000 red king crab cap in Zone 1. In addition, the BS/AI JVP fishery for yellowfin sole would have a halibut cap of 828,000 fish. Attainment of this quota would result in a zone 1 closure to JVP.

Continuation of these restrictions would keep bycatch levels substantially below the higher values recorded in some recent years. With restriction of the major fishery taking C. bairdi Tanner crab, the total bycatch in all fisheries can probably be held well under 1 million animals or far below the 7.5 million potential under Alternative 1 (status quo). Similarly, restriction of the primary red king crab bycatch fishery would insure a low overall bycatch for all fisheries (probably about one-quarter million crab). Restrictions in Zones 1 and 2 would, however, force the fleets to operate in areas of much higher C. opilio Tanner crab abundance. This alternative would provide no direct bycatch controls for this species. The halibut cap for the JVP fishery would, at least in the short-term, keep overall bycatch well below the potential high recorded in 1980. Still, the "short-term" connotation is important in a fishery where JVP operations are rapidly being replaced by domestic processors. The latter would not be subject to halibut bycatch controls under this alternative. For the next few years, it is expected that halibut bycatch can be held within the range of 2500 to 3000

metric tons annually. (This would have a directed fishery impact of a 4000 to 4700 mt loss).

Problems for this alternative are the fixed, inflexible crab number by zone (plus the JVP - only halibut application mentioned previously). Fixed bycatch numbers are not responsive to (1) population changes in the bycatch species, (2) status changes for the target species or (3) different mixes of harvesters. From 1985 to 1987, the biomass estimate for Bering Sea C. bairdi Tanner crab has increased from 119.4 to 538.7 million individuals. The abundance of red king crab remains low but did show a modest increase from 39.8 million crab in 1986 to 75.7 million in 1987. As crab abundance increases, fixed bycatch controls will make it increasing more difficult to actually harvest the target species in a cost-effective manner. In addition, with fixed numbers, the percentage impact on the population will decrease as it becomes larger. Conversely, fixed numbers will increase the percentage impact if the crab populations are further depressed. Thus, the highest percentage impacts on the population will occur when they are severely depressed and need the most protection. When crab populations are depressed, numerical bycatch needs should be less. Thus, fixed numbers can provide an unnecessarily high bycatch allowance - a net resource wastage (since there are no positive target fishery benefits).

Finally, the use of fixed numbers is not responsive to changes in the nature of the fishery itself. For example, a developing fishery will generally have higher bycatch needs since the experience factor is missing. New domestic fisheries will have different bycatch needs even after their development period. Alternative 2 does not meet any of the needs described above.

2.3.3 Alternative 3: Establish a framework management procedure to control bycatch of Tanner crab, red king crab and Pacific halibut in the Bering Sea.

This alternative, which was designed by the Council's Bycatch Committee, is designed to remedy the deficiencies inherent in the fixed bycatch numbers from Alternative 2 (continuation of Amendment 10 controls). The basic thrust of the Committee's proposal is to allow the bycatch limit to move up or down with the population size of the bycatch species. Another important feature is that bycatch needs would be limited to realistic expectations attainable in "clean" fishing operations. These would be computed annually based on the best available evidence. By this approach the direct users of bycatch species (crab and halibut fishermen) would essentially be assured that total bycatch impacts would be limited to a certain maximum allocation percentage.

For example, it is estimated (based on a range of various age and natural mortality assumptions) that the Committee's recommended program for C. bairdi Tanner crab represents a two to four

percent potential loss of the total harvestable population. This means that the directed crab pot fishery is guaranteed access to a minimum of 96% of the harvestable adult populations.

Similar management assurances would be provided to the direct users of red king crab and halibut. Both the direct users and the groundfish harvesters who need specific bycatch allocations would know what to expect in the future. This is essential to any meaningful planning by the fishing industry.

2.4 Socioeconomic Impacts

As discussed above, current regulations controlling bycatch in the Bering Sea/Aleutian Islands management area are due to expire at the end of the year, thus Alternative 1 implies a removal of all bycatch controls except maintenance of the ban on retention of the species. Alternative 2 would continue the current set of controls, and Alternative 3 would implement the recommendations of the Council's Bycatch Committee.

2.4.1 Analysis of the Alternatives

To project the possible consequences of Alternative 1, 2 or 3, it is useful to predict the bycatch that might occur under each alternative. This is difficult due to a lack of specific ability to predict a future target catch or TAC, bycatch rates that will occur in the future, and the magnitude of the biomass of the bycatch species and how that biomass will be distributed spatially and temporally.

However, projection of TACs into 1989 and 1990 for Bering Sea/ Aleutian Islands groundfish fisheries is part of the analysis of the consequences of raising the upper limit on OY (see Amendment 12, Raising the OY Limit, Draft SEIS, 1988). In that analysis, several alternative revised upper limits and procedures for moving to that limit are considered. The quantitative analysis, however, considers two scenarios for the future--status quo, which is an upper limit for the sum of TACs of 2.0 mmt and an upper limit equal to the sum of the current ABCs (about 2.6 mmt in 1989 and 1990).

Choosing a preferred alternative under this amendment proposal and a preferred action under the OY limit proposal are not independent actions. Raising the upper limit on OY has bycatch implications which need to be considered in the current analysis. Therefore, in this chapter, two scenarios will be examined: likely bycatch should the OY limit not be raised; and predicted bycatch under an OY limit equal to the sum of the ABCs.

A second analytical issue is choice of an appropriate bycatch rate. Future bycatch rates are unknown; only historically observed rates are available. This means that the rates used will be at least two years out of date (1987 vs. 1989). Bycatch rates are extremely variable, however, if the annual variation

contributes a minor part of the total variability, using historic annual rates to predict future bycatch rates may not be greatly in error. This is because much of the variation in bycatch rates occurs seasonally, by area, and by vessel. This analysis therefore relies on 1987 and 1986 bycatch rates in evaluating impacts under Alternative 2 and 3.

It would be inappropriate to use 1986 and 1987 rates for examination of the impacts of Alternative 1, however, since the observed rates of the last two years occurred in a fishery operating under bycatch controls. For Alternative 1, therefore, the situation that existed in the last year of the uncontrolled fishery, 1985, is used to derive future bycatch.

The distribution of the bycatch species, is, of course, not independent of the issue of determining bycatch rates. Moreover, the relationship between biomass of the bycatch species and biomass of the target fisheries with regard to influencing the bycatch rate is poorly understood. The Council's Bycatch Committee recognized the importance of this issue and suggested that the Plan Teams and NWAFC staff attempt to quantify how the target and bycatch biomass, fishing practice, and spatial and temporal distribution of the fishery influence bycatch rates (see Bycatch Committee Report, Appendix 2.1).

In the interim,however, the best available information relating changes in biomass to changes in bycatch rates is from recent fisheries. In the 1988 joint venture fishery for yellowfin sole and other flatfish the bycatch rate for C. bairdi Tanner crab declined (later in the season) relative to 1987 although there is evidence from the 1987 crab survey that biomass has increased (NMFS, 1987; Russ Nelson, pers. comm., 1988). Given this, unadjusted observed bycatch rates are used to predict future bycatch.

A final issue, the need for projections of future biomass levels and distribution for crab and halibut for use in bycatch prediction, can not currently be resolved. First, as stated above, the relationship between the biomass of the bycatch species and bycatch rates is poorly understood. Second, NMFS and ADF&G do not currently project population estimates into the future. In the analysis to follow, therefore, the most current population estimates, those of 1987 (NMFS, 1987) are used. The Bycatch Committee in its recommendations (Appendix 2.1) recognized this problem and suggested that estimates from the current summer survey be used to predict next year's bycatch.
To allow comparisons of predicted bycatch to current bycatch levels, estimates of current (1987) total bycatch in the various target fisheries and in the management zones of Amendment 10 is presented in Table 2.5, and Table 2.6.

Alternative 1 -- Status quo.

Under this alternative, preserving the status quo allows the provisions of Amendment 10 to expire on December 31, 1988. Thus, in 1989 and beyond, there would be no PSC limits in effect in the joint venture fisheries. The incidental catch of C. bairdi and C. opilio Tanner crab, red king crab, and halibut would be non-retainable. As is currently the case, there would be no PSC limits in place for DAP fisheries. Foreign fisheries (TALFF), if they exist, would operate under the bycatch provisions of Amendment 3.[1]

The joint venture flatfish fishery (yellowfin sole and other flatfish) reached its fullest, non-area restricted development, in 1985. Bycatch restrictions, by area, were introduced in 1986 and have continued since. The bycatch rates and amounts for flatfish fishing by this part of the fleet in 1985 were as indicated in Table 2.7.

The projected yellowfin sole and other flatfish ABCs and the expected JVP portion of these ABCs are included as part of the analysis of raising the upper limit on OY (Table 4.6, Table 4.7, Amendment 12, BSAI SEIS). The two possible upper limits on the amount of groundfish available for all user groups are 2.0 mmt or the sum of the ABCs (approximately 2.6 mmt). This means that the total bycatch is expected to increase, all else equal, because total harvest is projected to increase. However, the JVP portion of the combined ABCs is expected to decline during this period as DAP utilizes more of the resource. Additionally, the overall TAC for these species is expected to drop during these two years due to a decrease in the yellowfin sole ABC of 54,000 mt from 1988 to 1990.

Using these projected ABCs, JVP portions, and bycatch rates, and, for the moment, assuming no changes in fishing patterns or bycatch population abundance, the unrestricted 1989 and 1990 joint venture bycatch amounts in the flatfish fishery would be as indicated in Table 2.8.

These projections assume that the joint venture fleet would return to fishing practices used in 1985. There are changes which have occurred both in relation to fishing areas and markets which may change these projected bycatch rates. When the JVP fleet was closed out of Zone 1 in 1986 they went to other areas of the Bering Sea to search for yellowfin sole. Through these searches they found harvestable concentrations. These yellowfin sole were still harvested along with a bycatch of prohibited species but the average bycatch rates were, for the most part, lower. The red king crab bycatch was greatly reduced, the C. bairdi rate reduced, the halibut rate virtually unchanged, and the C. opilio rate greatly increased (Amendment 10, EA/RIR/IRFA,

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[1] Rates in effect for 1989 and beyond would be: .122 % halibut (mt halibut/mt groundfish); 0.53 red king crab/mt groundfish; and, 9.22 Tanner crab/mt groundfish.

Table 2.5 Bycatch summary, prohibited species, Bering Sea, 1987, by target fishery.

Prohibited species	Target fishery	Incidental Catch, 1000s of animals	Bycatch rate, animals/mt of groundfish
Halibut	JV, flounder	222	0.90
	JV, other	314	0.29
	Foreign	271	3.93
	TOTAL	308	0.57
C. bairdi	JV, flounder	216	0.88
	JV, other	161	0.15
	Foreign	90	1.31
	TOTAL	467	0.33
Other Tanner Crab	JV, flounder	6,146	25.04
	JV, other	341	0.31
	Foreign	265	3.83
	TOTAL	6,751	4.78
Red King Crab	JV, flounder	76	0.31
	JV, other	48	0.04
	Foreign	1	0.02
	TOTAL	125	0.09

Source: Report from foreign observer program, NWAFC, February 1988.

Table 2.6 Bycatch summary, prohibited species, Bering Sea, 1987, by zone.

Prohibited Species	Zone	Incidental Catch, thousands of animals	Bycatch Rate, animals/mt of groundfish
Halibut	1	140	0.70
	2	463	0.71
	3	205	0.36
C. bairdi	1	121	0.61
	2	281	0.43
	3	65	0.11
Other Tanner crab	1	45	0.23
	2	3,139	4.84
	3	3,567	6.32
Red king crab	1	104	0.52
	2	10	0.02
	3	12	0.02

Source: Report from foreign observer program, NWAFC, February 1988.

Table 2.7 Incidental catch and bycatch rate in joint venture yellowfin sole/other flatfish fishery in 1985.

1985 Harvest

JVP Yellowfin sole/other flatfish 157,000 mt

1985 Bycatch

Species	Animals	Bycatch rate, (#/mt flatfish)
Red king crab	886,000	5.6
C. bairdi	344,000	2.2
C. opilio	321,000	2.0
Halibut	266,000	1.7

Table 2.8 Predicted bycatch, 1989-1990 joint venture yellowfin sole/other flatfish fishery, with and without 2.0 mmt upper limit on OY.

	2.0 mmt OY		Sum of ABCs OY	
	1989	1990	1989	1990
All flatfish JVP (mt)	280,000	200,000	357,000	175,000
Predicted bycatch (animals)				
Red king crab	1,568,000	1,120,000	1,999,200	980,000
C. bairdi	616,000	440,000	785,400	385,000
C. opilio	560,000	400,000	714,000	350,000
Halibut	476,000	340,000	606,900	297,000

Tables 2.9,2.10,2.11). The extent to which the fleet would continue to operate in these waters if the bycatch restrictions were lifted is unknown. It is probable that at least some of the fleet would return to the areas fished in 1985 while some would remain in the areas discovered in 1986 and 1987. The combination of resulting bycatch rates is not estimable at this time.

Market factors are also shaping the future flatfish fishery. Japanese markets are beginning to develop for roe-bearing sole. This was evident in 1987 with a relatively large market demand for roe-bearing rock sole. In 1988 there is anecdotal evidence of a developing market for roe-bearing yellowfin sole. It has not been possible to estimate the size of the roe-bearing sole market nor is it possible to anticipate the growth of yellowfin sole in this market (see Chapter 6, this EA/RIR/IRFA). However, to the extent that the roe market affects the temporal or areal take of yellowfin sole or other flatfish, the associated bycatch rates will also change.

Understanding the above cautions, comparing the projections of Table 2.8 to current bycatch levels (Table 2.5) indicates large potential increases in the joint venture yellowfin sole/other flatfish bycatch should the Amendment 10 restrictions be removed. Those projections indicate an approximate doubling of the bycatch of red king crab, Tanner crab, and halibut in 1989 assuming no change in the upper limit on OY. Part of this increase is due to expected higher bycatch rates with removal of current Zone restrictions and part to predicted increased harvest levels for this fleet.

These projections only include part of the total fleet. As DAP harvest replaces JVP harvest under either OY scenario, bycatch will continue to occur and, in the case of the wholly domestic fleet, may go unreported. In the aggregate, if the OY upper limit were amended to equal the annual sum of the ABCs, the overall bycatch of crab and halibut would be expected to increase in roughly the same proportion as the overall harvest increases.

Alternative 2

This alternative would continue the bycatch controls implemented under Amendment 10. The limits apply to the DAH yellowfin sole/other flatfish fishery but, in the absence of any accounting of DAP bycatch, pragmatically, to only the joint venture yellowfin sole and other flatfish fishery (although the DAP fishery could be shut down by closure of the JVP fishery).

The existing PSC limits of 80,000 C. bairdi in Zone 1, 326,000 C. bairdi in Zone 2, 135,000 red king crab in Zone 1 and 828,000 halibut Bering Sea wide, may be viewed as potential constraints to the full prosecution of the JVP yellowfin sole/other flatfish fishery. An approximate analysis of the impacts of continuing the Amendment 10 provisions into 1989 is presented in Table 2.9 and Table 2.10 using bycatch rates as shown in Table 2.11. The

Table 2.9. Bycatch scenario, Alternative 2 - continuation of the Amendment 10 bycatch caps

OY upper limit equal to 2.0 mmt, 1989

		JVP Yellowfin sole/other flatfish	All other fisheries	TOTAL
Predicted bycatch, animals:	Halibut	240,800	300,120	540,920
	Bairdi	369,600	68,880	438,480
	Red king crab	243,600	152,520	396,120
Amendent 10 PSC limits:	Halibut	828,000	N/A	N/A
	Bairdi - Zone 1	80,000	N/A	N/A
	Bairdi - Zone 2	326,000	N/A	N/A
	Red king crab - Zone 1	135,000	N/A	N/A
"Excess" bycatch, Zone 1:	Halibut	0	N/A	N/A
	Bairdi - Zone 1	289,600	N/A	N/A
	Red king crab - Zone 1	108,600	N/A	N/A
TAC equivalent of cap, mt:		42,424	N/A	N/A
Predicted Zone 1 bycatch, animals:				
	Halibut	36,485	N/A	N/A
	Bairdi	80,000	N/A	N/A
	Red king crab	36,909	N/A	N/A

Assumptions: Predicted bycatch is calculated using rates for Zone 1 in Table 2.11. Assumes all fishing occurs in Zone 1 until cap is reached. TAC equivalent is the constraining species' cap divided by the species' bycatch rate. Zone 1 bycatch is an estimate of the cumulative bycatch prior to closure.

Table 2.10. Bycatch scenario, Alternative 2 - continuation of the Amendment 10 bycatch caps

OY upper limit equal to sum of the ABCs, 1989

		JVP Yellowfin sole/other flatfish	All other fisheries	TOTAL
Predicted bycatch, animals:	Halibut	283,800	366,000	649,800
	Bairdi	435,600	84,000	519,600
	Red king crab	287,100	186,000	473,100
Amendent 10 PSC limits:	Halibut	828,000	N/A	N/A
	Bairdi - Zone 1	80,000	N/A	N/A
	Bairdi - Zone 2	326,000	N/A	N/A
	Red king crab - Zone 1	135,000	N/A	N/A
"Excess" bycatch, Zone 1:	Halibut	0	N/A	N/A
	Bairdi - Zone 1	355,600	N/A	N/A
	Red king crab - Zone 1	152,100	N/A	N/A
TAC equivalent of cap, mt:		42,424	N/A	N/A
Predicted Zone 1 bycatch, animals:				
	Halibut	36,485	N/A	N/A
	Bairdi	80,000	N/A	N/A
	Red king crab	36,909	N/A	N/A

Assumptions: Predicted bycatch is calculated using rates for Zone 1 in Table 2.11. Assumes all fishing occurs in Zone 1 until cap is reached. TAC equivalent is the constraining species' cap divided by the species' bycatch rate. Zone 1 bycatch is an estimate of the cumulative bycatch prior to closure.

Table 2.11. Bycatch rates used for the bycatch predictions under Alternative 2 and 3.

(animals/mt of groundfish, all zones)

Species	User Group/Fishery	Yellowfin sole	Other flatfish	Pacific cod	Pollock
Halibut					
	DAP	0.9	0.9	0.29	0.29
	JVP	0.9	0.9	0.29	0.29
	TALFF	3.93	3.93	3.93	3.93
C. bairdi					
	DAP	0.88	0.88	0.15	0.15
	JVP	0.88	0.88	0.15	0.15
	TALFF	1.31	1.31	1.31	1.31
Red king crab					
	DAP	0.31	0.31	0.04	0.04
	JVP	0.31	0.31	0.04	0.04
	TALFF	0.02	0.02	0.02	0.02

(animals/mt of groundfish, Zone 1)

Species	User Group/Fishery	Yellowfin sole	Other flatfish	Pacific cod	Pollock
Halibut					
	DAP	0.86	0.86	0.61	0.61
	JVP	0.86	0.86	0.61	0.61
	TALFF	0.90	0.90	0.90	0.90
C. bairdi					
	DAP	1.32	1.32	0.14	0.14
	JVP	1.32	1.32	0.14	0.14
	TALFF	24.44	24.44	24.44	24.44
Red king crab					
	DAP	0.87	0.87	0.31	0.31
	JVP	0.87	0.87	0.31	0.31
	TALFF	0.26	0.26	0.26	0.26

Bycatch rates are per mt of total groundfish and are taken from a bycatch summary for 1987 produced by the observer program, NWAFC, NMFS, September 1987. Rates are for the aggregated fisheries JV flounder, JV other, foreign.

analysis is approximate as it is impossible to predict the behavior of the fishery following closure of Zone 1 or Zone 2. Accordingly, projections were made using a procedure which: (1) calculates "potential" bycatch using projected TACs (all zones) and bycatch rates with units of animals/mt of groundfish catch; (2) assumes that the fishery preferentially occurs in Zone 1, and, therefore, examines which of the Zone 1 caps is most constraining (C. bairdi in both cases); (3) determines the target amount that would result in attainment of that cap; (4) recalculates the portion of the bycatch occurring in Zone 1 assuming that the target amount calculated in (3) is taken.[2]

The key issue is whether closure of Zone 1 or Zone 2 would preclude full attainment of the TAC when the fleet moves outside the closed zone. Evidence from the fishery in 1986 and 1987 indicates that it is possible for this fishery to attain the full TAC for yellowfin sole and other flatfish in areas outside Zone 1, and that the Zone 2 cap for C. bairdi has not been attained. Whether this would remain true in the future is unknown.

Of course, forced relocation of the fishing fleet imposes costs on the harvesters. These costs include those resulting from any increased running time (fuel costs, opportunity cost of lost fishing time), should harvesters and processors be forced to operate further apart (unlikely for joint ventures), and those resulting from decreased fishing opportunities, such as lowered CPUE (assuming that the fleet was fishing in the "best" area), or grounds preemption due to ice.

In relative terms, continuation of the Amendment 10 controls, into 1989 and 1990, would not be more constraining to the joint venture yellowfin sole/other flatfish fishery than is currently the case. This is because the projected trend for JVP TACs for flatfish is roughly downward under the scenario of a 2.0 mmt cap (254,000 mt - 1987; 332,000 - 1988; 280,000 - 1989; 200,000-1990); and roughly level under the scenario of a 2.6 mmt cap (254,000 mt - 1987; 332,000 - 1988; 330,000 - 1989; 305,000-1990).

However, since this result is due to a reduction in JVP because of projected increases in DAP, bycatch overall may not be

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[2] Applying bycatch rates in units of animals/mt of groundfish against the TAC underestimates total bycatch as the TAC underestimates the total groundfish weight. A second approach is to use units of animals/mt of target species. This rate applied against the TAC overestimates bycatch as the target fishery is not responsible for the harvest of the entire TAC. The first method of estimation was chosen over the second as the bias is believed to be smaller. Work on a more refined projection which explicitly accounts for the weight of the target species and the simultaneous prosecution of the fishery is underway.

reduced. Relative to the current controls of Amendment 10, however, the future joint venture flatfish fishery may not be any more constrained than they are currently.

Alternative 3

The analysis of Alternative 3 is problematic as it is necessary to specify certain regulatory authorities not present in the Committee's regulations. This is not a criticism of the report, but rather a translation of the document, which is an industry agreement, into a regulatory regime. Appendix 2.3, therefore, is presented to identify those issues that require further regulatory definition.

If Alternative 3 had been in place for the 1988 fishing year the overall PSC limits for C. bairdi, halibut, and red king crab would be as shown in Table 2.12. Note that these calculations are based on 1987 biomass estimates as specified in the Committee's recommendations. This is because when the estimates are made only the current year's estimate (1987 in this case) is available. As mentioned above, it would be preferable to use biomass projected into the next year so that the caps and predicted bycatch would be computed contemporaneously.

To examine the nature of the potential constraints on groundfish fisheries given the adoption of Alternative 3, bycatch predictions for each fishery are summed across all fisheries (Table 2.13) and contrasted with the percentage determined totals of Table 2.12.

If 4% of the total Tanner crab are C. bairdi, the Tanner crab totals translate to 719,000 crabs under an OY limit of 2.0 mmt and to 9.5 million crabs for an OY limit equal to the sum of the ABCs. Note that this latter number includes an estimated bycatch of 8.7 million crab by potential TALFF, and that TALFF bycatch is controlled by the provisions of Amendment 3. Therefore, the relevant predicted bycatch number for C.bairdi bycatch in the DAH fisheries would be about 800,000 crab.

For red king crab, projections are that, in 1989, a total of 812,000 animals would be taken as bycatch in the groundfish fisheries if current OY limit were not modified, and just under a million crabs if the OY limit were raised to equal the sum of the ABCs. Excluding potential TALFF from this latter total produces a total of about 890,000 crab.

For halibut, some 1.3 million animals would be taken under the 2.0 mmt limit on OY, and 1.7 million animals (1.4 million in DAH) should the limit be raised and the TAC and apportionments be as projected in the Bering Sea SEIS.

It appears, therefore, that none of the lower limit caps of Table 2.12 would be exceeded. Regarding the special Zone 1 provisions

Table 2.12. Overall guidelines for prohibited species catch limits under Alternative 3, 1988.

SPECIES	LOWER LIMIT		UPPER LIMIT	
	Type	Amount	Type	Amount
C. bairdi Tanner crab, animals	0.75%	2,592,000	1.00%	3,456,000
Halibut, weight, mt	mortality	2,925	mortality	3,900
Halibut, animals	mortality	928,571	mortality	1,238,095
Red king crab, animals-Zone 1				
JVP Y. sole/O. flatfish		N/A	0.50%	380,000
Other JVP		N/A	0.25%	190,000

Notes:

C. bairdi and red king crab percentages are applied to current biomass (1987) derived from summer population survey.
Halibut mortality is calculated from halibut bycatch assuming: 100% mortality for cod end transfers; 50 % mortality for small trawlers; and 25% mortality for longliners. This table assumes 100% mortality.
Halibut numbers are calculated from halibut weight using 3.15 kg/animal (observed - 1987).

Table 2.13. Total predicted bycatch, 1989, Bering Sea/Aleutian Islands, using TAC projections under two scenarios for an upper limit to OY.

	User Group	OY limit of 2.0 mmt TOTAL	OY limit equal to sum of ABC TOTAL
Predicted TAC	DAP	1,161,000	1,161,000
	JVP	772,000	930,000
	TALFF	0	357,400
	TOTAL	1,933,000	2,448,400
Predicted Bycatch, number of animals			
Halibut	DAP	733,210	733,210
	JVP	540,920	649,800
	TALFF	0	321,660
	TOTAL	1,274,130	1,704,670
Tanner crab	DAP	280,540	280,540
	JVP	438,480	519,600
	TALFF	0	8,734,856
	TOTAL	719,020	9,534,996
Red king crab	DAP	415,910	415,910
	JVP	396,120	473,100
	TALFF	0	92,924
	TOTAL	812,030	981,934

for red king crab, the projections of Table 2.9 and Table 2.10 indicate that the particular limit would also not be exceeded.

Recall that these bycatch predictions are only estimates and that predicting bycatch amounts in a future fishery is difficult at best. However, the numbers presented above represent our best current estimates of future bycatch amounts. If the estimates are correct the implications are that, under Alternative 3, fisheries will be allowed to fish in as unrestrictive manner as possible. In terms of this Alternative, all boats will be required to account for and report all bycatch, but the fishery that they participate in will not be shut down unless an error in prediction is discovered or they greatly exceed their predicted bycatch.

2.4.2 Redistribution of Costs and Benefits

The management of incidental catch is management of a resource (the bycatch species) to minimize losses to those who target on the species and to minimize the cost of avoiding the animal to those who harvest groundfish. Bycatch management is therefore, above all, an allocation of certain amounts of bycatch species to those who target on the species and to those who catch it incidentally while prosecuting other fisheries.

Using this fundamental view of bycatch the three proposed alternatives are characterized as follows:

Alternative 1 would allow unconstrained bycatch of crab and halibut to occur in domestic fisheries. Adoption of the alternative affords no protection to the harvester of crab and halibut and imposes no costs on the groundfish harvester. Unless the amount of bycatch in this situation is by some chance circumstance "optimal" the lack of accountability and control under Alternative 1 does not accomplish rational bycatch management.

Alternative 2 continues the present management regime. This means that the DAH yellowfin sole/other flatfish fishery operates under bycatch controls while other fisheries do not. DAP bycatch is not counted although it would be possible to set DAP so as not to exceed a desired bycatch amount. Regardless, the lessons learned from Amendment 10 apply. The joint venture fishery will bear increased operational costs due to premature closure of Zone 1 and relocation to more distant grounds, but they would be expected to still attain the full JVP allocation of yellowfin sole/other flatfish.

The DAP yellowfin sole/other flatfish fishery would be constrained under Alternative 2 as they are currently constrained: they would be closed out of Zone 1 should JVP take the crab cap. As DAP replaces JVP in this fishery this constraint will become more costly should the JVP bycatch amount close the fishery. Of course, when DAP fully replaces JVP in

this fishery, lack of bycatch accountability implies that the DAP fishery will not be so constrained.

With respect to the harvesters of crab and halibut Alternative 2 provides partial bycatch control, but one which limits the harvest of red king and C.bairdi Tanner crab in Zone 1. If 1987 crab population projections are borne out such bycatch mortality will represent a small fraction of the total crab biomass.

Alternative 3 implements a bycatch management framework that, if successful, will more fully account for and potentially limit, all crab and halibut bycatch in domestic Bering Sea groundfish fisheries. The alternative includes a provision for inseason monitoring of bycatch and a comprehensive definition for regulated groundfish fisheries.

Further, the alternative provides for the primary allocation decision--how much crab and halibut should go the target fishery and how much should go to the groundfish fishery. The upper limits of allowed PSC limits represent approximately 1% of the total crab biomass, and thus, as discussed in Section 2.3 of this chapter, some 4-5% of the legal sized biomass that will recruit to the target fishery.

Whether this allocation is "correct" depends on the relative value of the species as bycatch and as target catch, the importance of the affected fishereies to the local and national economy, and the cost of implementing the allocation. Determination of the marginal value of bycatch is difficult and somewhat controversial and has not been satisfactorily resolved.

Indications of relative valuations of crab and groundfish were part of the analyis contained in the EA/RIR/IRFA for Amendment 10. Without repeating the analysis, the conclusion in that document was that ex-vessel revenue in the joint venture fishery did not fall (although costs increased some unknown amount), but that some $9 million in bycatch savings were realized (present value of ex-vessel revenue using a 10% discount rate). Total value to the industry harvesting and processing crab and halibut, accounting for the value generated in the processing, wholesale and retail markets, would increase this estimate.

It would be possible to repeat these calculations for all the bycatch predictions of the first part of this chapter, but given the uncertainty of future bycatch amounts, such an exercise would not be productive. Moreover, the relationship between a crab and halibut protected today and the likelihood of the future harvest of that animal in the target fishery is poorly understood, and currently defies quantification.

The overall PSC limits of Alternative 3 are negotiated limits with participation from all affected parts of the fishing industry. If the negotiations were successful then the allocation can be viewed as optimal. That is, the agreed to PSC

limits are optimal in the biological, economic, social and political context in which they were negotiated and thus represent the best allocation decision that could be determined at that point in time.

The costs of Alternative 3 depend on the options chosen (Appendix 2.3). Much of those costs relate to reporting, adminstration, and enforcement discussed below. One potentially large cost under Alternative 3 is the lost revenue and increased operational costs engendered by a closure of a part of the Bering Sea to a specific target fishery. The essential conclusion of the analysis of Alternative 3 is that, for the next year or two, predicted bycatch is likely to fall below the negotiated limits and thus the fishery will remain relatively unburdened.

2.4.3 Reporting Costs

Current reporting practice is not expected to change should Alternative 1 or Alternative 2 be adopted. Implementation of Alternative 3, however, will require some kind of bycatch accounting. If an observer program option is not chosen, vessels will have to report bycatch regularly. If they report discards via fish tickets or weekly catcher/processor reports as currently required no increase in reporting costs is expected.

If, as an option, a mandatory logbook program is put in place, reporting costs will increase. The additional time and monetary costs of completing a logbook are not known. Also unknown is the cost to the harvester of reporting poor bycatch performance. If these costs are large, there will be an incentive to misreprent bycatch amounts.

2.4.4 Administrative, Enforcement, and Information Costs

The estimated cost of providing 100% observer coverage for all domestic catcher processors and motherships in the BSAI is $6.25 million. This estimate is based on several assumptions concerning the size and total fishing time of the fleet (number of days of coverage needed) and the cost of coverage including the necessary increase in observer support overhead and data processing requirements.

The number of vessels needing observer coverage under this program is estimated at 100 in 1989 with each vessel operating 250 days a year. Many of these vessels would be longline catcher/processors (Table 3.15, BSAI Amendment 12, SEIS). It is expected that the 32 present in 1987 will increase to 50 by 1989 as the seasons shorten and the need to stay on the grounds makes them more cost efficient. The other major component of this at-sea processing fleet are factory trawlers and motherships. There were 24 of these active at the end of 1987 and 50 expected to be operational in 1989 (AFTA, letter dated Feb. 24, 1988). The 250 day operation schedule for these vessels would allow for steaming

time between fishing grounds and trips to ports but would be the time necessary to have an observer onboard.

The costs for observers, including all overhead and support services, is estimated at $250 per day. This is based on a budgeted cost of $200 per day for foreign observers (USDC, MFCMA Operations Handbook, 1985) and adjusted for inflation and cost increases.

If only domestic catcher/processors and mothership processors were required to carry observers the total cost would be $3.1 million, or about $63,000 per vessel per year. If less than 100% coverage were required costs would be proportionately less.

It is not known who would bear these costs. At present a government funded program is unlikely, and thus costs may be borne by industry. If this is true, an industry funded organization to hire, train, place and maintain observers will be necessary. One possibiltiy for funding would be a per unit assessment on landed catch.

Additionally, under Alternative 3, particularly if the Bycatch Committee's suggestion to count bycatch in all target fisheries is adopted (Option 2), additional personnel and equipment will be needed. As mentioned above, personnel costs are estimated to be two full time statistician/recorders and one part time programmer (approximately $65,000 to $85,000 per year).

Enforcement costs under Alternative 3 would also be expected to be larger than those occuring under Alternative 1 or 2. Given the uncertainity with regards to certain options of Alternative 3 it is not known what manner and level of enforcement will be necessary. The extent to which the available enforcement budget could be redistributed to cover these increased costs is also unknown.

2.4.5 Impact on Consumers

Price effects at the final demand level (consumer demand) are expected to be minimal. This is because the impact of the proposed alternatives on the amount of groundfish, and of halibut, king and Tanner crab supplied to consumers is expected to be small relative to the total U.S. supply.

APPENDIX 2.1 Bycatch Committee Report

REPORT AND RECOMMENDATIONS

OF THE

NORTH PACIFIC FISHERY MANAGEMENT COUNCIL'S

BYCATCH COMMITTEE

DECEMBER, 1987

INTRODUCTION

At the December, 1986 North Pacific Fishery Management Council meeting, the Council expanded both the membership and the duties of the AP Bycatch Subcommittee. Renamed the Council's Bycatch Committee, the membership was expanded to include representation of most fisheries and gear groups from the Bering Sea and the Gulf of Alaska. The Committee's duties were likewise expanded to include the formation of recommendations to manage the bycatch of all species in all groundfish fisheries in the Bering Sea and the Gulf of Alaska. The Committee was to report back to the Council at the December, 1987 meeting.

By-Catch Committee members consist of:

Larry Cotter, Chairman
Bill Woods
Arni Thomson
Chris Blackburn
Barry Fisher
Ed Fuglvog
Bob Alverson
John Peterson
Sam Wright (for Joe Blum)
Harold Thompson
Ted Evans/Bill Orr
Dave Fraser
Bill Jacobson
Rich White

The Committee has met in full session seven times for a total of 20 days, and in sub-committee forum three times. Minutes and supporting documents from each meeting are available. Substantial fishery data was supplied by the Northwest/Alaska Fisheries Center, IPHC, NMFS, the State of Alaska, the Council, and private industry. By-catch control measures in practice in other fisheries and countries around the world were solicited and reviewed.

The Committee has explored many different approaches to bycatch management ranging from the traditional, such as time and area closures, caps, and gear restrictions, to the more innovative, such as selling bycatch or managing groups of fisheries as a complex. The Committee has also spent considerable time analyzing attendant issues to any bycatch control approach. Examples of these include ensuring appropriate accountability for determining the extent of bycatch removals and the retention, or lack thereof, of prohibited species.

The Committee has prepared recommendations for bycatch management of C. bairdi Tanner crab, C. opilio Tanner crab, red king crab, and halibut in the Bering Sea. The bycatch programs developed for each of the species are substantially similar in several key areas. This will become apparent as the recommendations are described. However, there are three issues which similarly affect the various programs and which should be addressed jointly:

1.) DAP Priority

If there is competition for bycatch between DAP and JVP, the Committee intends for DAP to have priority to bycatch providing that DAP needs are reasonable and reflect a genuine effort to minimize bycatch.

2.) Observers/Accountability

The Committee recognizes that accountability of bycatch removals is critical to the success of any bycatch management program. The Committee discussed many different methods of accounting for removals, but did not attempt to develop a recommended program. Regardless of the particular monitoring approach, however, it is the Committee's intent that all removals of Tanner crab, red king crab, and halibut be accounted for. This accounting will not only apply to the specific target fisheries listed below under each bycatch section, but to all fisheries which take these animals as bycatch.

3.) When/How Initial By-Catch Needs Are Determined

The cycle of events for the recommendations outlined below would commence in September of each year. Prior to the September Council meeting, the Plan Team would review the BS/AI RAD, bycatch data from that fishing year, and any other pertinent information, and would issue draft recommendations to the Council. These recommendations would include identification of tentative bycatch ceilings and parameters by species, and tentative bycatch needs by target fishery. The recommendations would be sent out for public review.

Prior to the December Council meeting, a Council committee charged with this obligation would convene, review the Plan Team's earlier recommendation, public comment, and all other pertinent data and

prepare a recommendation to the AP, SSC, and Council on bycatch needs for each target fishery.

The Council would take action on the issue at the December Council meeting.

Committee Recommendations

The following is a explanation of how each of the recommendations work:

C. Bairdi Tanner Crab:

The first step is to use the summer trawl survey to determine the total C. bairdi population.[1] The trawl survey which occurs in one calendar year establishes the population figure to be used for the following calendar year's bycatch calculations.

Once the C. bairdi population has been established, a maximum of one percent of that population, subject to the following provisions, is allocated as potential bycatch in the groundfish fisheries. The one percent figure, if actually removed from the C. bairdi population, represents a subsequent potential loss of two to four percent of the total harvestable C. bairdi population. This means the directed crab pot fishery is guaranteed access to a minimum of 96% of the harvestable adult population.

Although this management program allows for a maximum of one percent of the C. bairdi population to be taken as bycatch in all designated target fisheries, the Committee purposely differentiates between those C. bairdi bycatch removals less than .75% and those which are greater than .75% but less than 1%. Bycatch control management measures which may be imposed by the Regional Director are intended by the Committee to normally be more restrictive and burdensome when bycatch removals will fall between .75% and 1% than when the bycatch removals stay below .75%. It is the Committee's intent to encourage the full prosecution of each

[1] It is the intent of the Committee that the best possible scientific information be used in assessing the stock of C. bairdi. This will include the existing NMFS survey but may also include additional stock assessment surveys and analysis.

target fishery's TAC with as little bycatch regulation as possible. Nevertheless, bycatch removals in excess of .75% of the C. bairdi population, although allowed, are subject to more stringent controls so as not to exceed 1% of the population ceiling.

The second step is to determine the anticipated C. bairdi bycatch needs for each of the designated target fisheries[2] covered by the program. This is accomplished by determining an expected bycatch rate for each target fishery. The expected bycatch rate reflects the preceding year's rate as adjusted by changes in the population of the target species and/or the population of C. bairdi; changes in gear technology, practice, or fishing patterns; or other relevant factors which might affect bycatch rates and needs. The bycatch rate so determined is then multiplied by the expected target species TAC to establish the anticipated C. bairdi bycatch needs, in numbers of animals, for that target species. This number of animals serves as an initial C. bairdi bycatch allocation to that particular target fishery.

This process is followed for each of the designated target fisheries. The anticipated bycatch needs for each of those fisheries are then added together to determine the total anticipated C. bairdi bycatch needs for that year. The following management scenarios may then apply:

A.) If the total anticipated C. bairdi bycatch needs are less than .75% of the C. bairdi population as determined above, the target fisheries will proceed without constraint other than being monitored regarding their bycatch removals. If a target fishery concludes without reaching or exceeding its bycatch allocation the fishery concludes harmoniously for the year.

B.) If, during the course of a fishing season, a target fishery will be unable to harvest its entire TAC without an additional bycatch allocation, the Regional Director will review[3] the fishery to determine the reason(s) for the greater than anticipated bycatch needs and estimate the additional number of bycatch animals that particular fishery needs to fully prosecute its TAC. The Regional

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[2]Designated target fisheries are the bottom trawl fisheries for yellowfin sole and other flatfish (excepting rock sole), pollock, Pacific cod, and rock sole.

[3]It is the Committee's intent the Regional Director conduct his review in advance of the target fishery reaching its initial C. bairdi by-catch cap in order for the target fishery to continue to operate without interruption.

Director shall allow the target fishery to continue and shall specify regulatory or other conditions for continuation of that fishery which "appropriately" address the reason(s) the target fishery's initial bycatch needs were insufficient; providing the total bycatch needs of that target fishery and the total allocated bycatch needs for all other designated target fisheries combined is, or remains, less than .75% of the C. bairdi population.

By using the word "appropriately" the Committee intends to provide the Regional Director with the latitude implied: the Regional Director should have the ability to set in place management conditions which are appropriately commensurate with the reason(s) the anticipated bycatch needs were insufficient.

As discussed above, the Committee views total bycatch removals less than .75% differently from removals in excess of .75%. The Committee recognizes that a variety of legitimate reasons, including a simple mistake at the initial point of estimating a target fishery's anticipated bycatch needs, may contribute to that fishery's bycatch needs being greater than anticipated. In such instances, the Committee assumes the conditions imposed by the Regional Director would not be burdensome to the fishing vessels involved. However, if the Regional Director determines the excess bycatch needs are not the result of legitimate factors (e.g., willful neglect of bycatch considerations by the fishing vessel(s) involved) the conditions imposed may be substantially more restrictive, and may include the types of conditions normally associated with bycatch needs in excess of .75% as described below.

C.) If, in advance of the season, the anticipated bycatch needs for all target fisheries combined fall or are likely to fall within the range of .75% to 1% of the C. bairdi population the Regional Director, in consultation with the Council, shall implement bycatch control measures on the target fisheries which are designed to maximize target harvests while minimizing bycatch removals, and, in any event, ensure that total bycatch removals do not exceed 1%.

The types of management conditions contemplated here are intended to "manage" bycatch removals as opposed to overseeing or monitoring bycatch. Therefore, the bycatch management measures used will normally be more restrictive, such as required observers, time/area closures, and bycatch rate limits.

Unlike target fisheries in Section B above, a target fishery in these circumstances, which has reached its initial bycatch allocation, will be shut down for the remainder of the fishing year or until additional bycatch becomes available.

D.) In the event that pre-season aggregate bycatch projections are estimated to be less than .75% of the total C. bairdi population and those projections are subsequently realized inseason to be incorrect and greater than .75% of the total C. bairdi population, the Regional Director shall undertake and complete a review of all target fisheries as outlined in Section B above and implement management conditions as outlined in Section C above.

E.) If, in advance of the season, the anticipated bycatch needs for all target fisheries combined exceed 1% of the C. bairdi population, the bycatch rates established for each target fishery shall be reviewed and modified as appropriate until the total anticipated bycatch needs combined are less than 1%.

C. Opilio Tanner Crab:

The Committee recognizes that the biomass estimates for C. opilio have been very volatile during the past four years. Additional information is needed regarding this species.

Given the size of the C. opilio biomass according to recent surveys and the need for additional information, the Committee requests NMFS provide it with summaries of new biomass estimates and bycatch results by October 1, 1988 so that, if necessary, a responsible management regime can be developed at that time.

Halibut:

In most respects, the Committee's recommendation for management of halibut bycatch follows the same format as C. bairdi. One major difference, however, is that in the case of halibut we recommend managing on the basis of bycatch *mortality* as opposed to *numbers*. The Committee recommends that there be a halibut mortality cap of 3,900 mt in the Bering Sea/Aleutian Islands.

There is inadequate information available to make biomass estimates on sub-legal halibut and to index the cap on total halibut biomass.

This should be addressed. It is the Committee's desire that the above cap be indexed to halibut populations when appropriate information is developed.

The Committee has adopted the NMFS assumptions regarding the bycatch mortality of halibut: fisheries with cod-end transfers or long towing times result in 100% mortality; shorter tows and rapid sorting results in 50% mortality; and catch by longline gear results in 25% mortality. It is the intention of the Committee that these rates be adjusted as better information on actual handling mortality becomes available. Therefore, the halibut bycatch amounts taken by each of the target fisheries[4] will be recalculated annually to reflect the changes in mortality.

The process used for determining halibut bycatch needs in *numbers of animals* for each target fishery is exactly the same as used for C. bairdi. Once the actual numbers have been determined, however, they are multiplied by the mortality rate applicable to that particular target fishery to determine the halibut *mortality needs* in numbers of animals of that target fishery. These numbers are then converted to weights using the average weight of the halibut taken as bycatch in each of the target fisheries. Thereafter, the program is the same as outlined for C. bairdi except that instead of using 1% and .75%, the halibut measures use 3,900 mt and 2,925 mt, respectively (total mortality).

The Committee will annually review the bycatch needs of the target fisheries and make recommendations to the Council as described for C. bairdi and C. opilio, above. Additionally, the Committee recommends this program be reviewed in three years time such that any amendment to this procedure take place on January 1, 1992.

Red King Crab:

The spirit of the red king crab measures are similar to those suggested above for C. bairdi. In particular, there will be a preseason assessment of the red king crab bycatch needs for each of the target fisheries (as in the C. bairdi section above). The procedure

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[4]Designated target fisheries apply to TALFF, JVP, and DAP. They are the bottom trawl fisheries for yellowfin sole and other flatfish, rock sole, turbot/arrowtooth flounder, and Pacific cod, and the longline fishery for Pacific cod.

that follows differs, however, in that: 1) an explicit JVP cap is specified, and, 2) DAP bycatch of red king crab is monitored but bycatch controls are not used until one of three possible "trigger points" is reached. The specifics are:

A.) The program is limited to fisheries that take place in Zone 1.

B.) An upper limit or cap for the JVP fishery for yellowfin sole and other flatfish will be calculated as 0.5% of the red king crab population, and a cap for all other JVP fisheries shall be 0.25% of the red king crab population. The JVP fisheries shall be managed to control bycatch in as restrictive a manner as used when the bycatch needs of C. bairdi exceed 0.75% of the C. bairdi population (see section C, C. bairdi, p. 5). The caps determined above will be reduced as the JVP proportion of the total TAC is reduced. For example, if JVP takes 100% of the yellowfin sole and other flatfish then JVP would receive 100% of the 0.5% cap. If, in a subsequent year, the JVP portion of the TAC for yellowfin sole and other flatfish were 50%, JVP would receive 50% of the 0.5% cap, or 0.25% of the red king crab population as an upper limit on bycatch.

C.) A management regime for DAP will be established when any one of the following events occurs:

1.) the DAP harvest of yellowfin sole equals 25% or more of the Zone 1 total yellowfin sole harvest.

2.) the DAP bycatch in the Zone 1 yellowfin sole fishery equals .3% or more of the red king crab population; or

3.) the combined DAP harvest of cod, pollock, and other flatfish in Zone 1 is equal to 225,000 mt or more.

When any of these triggers are reached, the bycatch committee will reconvene to determine appropriate DAP red king crab bycatch control measures to be recommeded to the Council for implementation. At the same time, the Regional Director will institute bycatch measures for red king crab for the DAP fishery or fisheries which triggered the review. The measures chosen by the Regional Director to control bycatch will continue until the Council is able to act upon the Committee's recommendations; will be appropriate to the severity of the bycatch problem identified; and

will be in the spirit of the C. bairdi bycatch controls, taking into account total red king crab removals.

D.) DAP will implement a bycatch monitoring system in Zone 1. This monitoring system will include verification by a minimum of 10% on-board audit[5] in the yellowfin sole fishery. Bycatch information in the aggregate will be made public.

E.) The area between 160° - 162° degrees W. will remain closed except for the Port Moller cod fishery out to 25 fm. The Committee intends to review the impact of extending the 25 fm line to 30 fm and determine whether or not to make a recommendation to modify this provision.

F.) It is the intent of the Committee to account for and prevent undue bycatch mortality, therefore the Committee will continue to explore the effectiveness of further protection of red king crab during the molting season. The Committee asks that NMFS, the NWAFC, and ADF&G provide it with all available data on molting crab, including information on unobserved mortality, by October 1, 1988, and that NMFS direct its observers to collect information on molting crab, so that, if necessary, a responsible management regime can be developed at the same time the Committee considers C. opilio bycatch managment.

[5]Rounded up to the next incremental observer.

APPENDIX A

COMMITTEE MOTIONS

A MOTION FOR CONTROL OF THE BYCATCH OF C. BAIRDI TANNER CRAB IN THE BERING SEA GROUNDFISH FISHERIES

Bycatch Committee
North Pacific Fishery Management Council
October 1987

The total number of animals which may be removed as bycatch from all target fisheries combined in any year shall not exceed 1% of the total C. bairdi Tanner crab population as determined by the preceding year's summer trawl survey.

For each fishing year the following will occur:

1. Determine the sum of the anticipated bycatch needs for each target fishery which take C. bairdi Tanner crab as bycatch.

The target fisheries are the bottom trawl fisheries for yellowfin sole and other flatfish, pollock, Pacific cod, and rock sole.

The anticipated bycatch needs for each fishery will be the expected target species allocation to that fishery multiplied by the anticipated bycatch rate (animals/mt of target species) in that fishery. The bycatch rate used shall be the last year's observed rate (or an estimate of that rate) adjusted according to the following criteria:

changes in

(1) the population of the bycatch species;
(2) the population of the target species;
(3) gear technology or practice which bear on the bycatch rate;
(4) fishing patterns which bear on the bycatch rate;

or

(5) any other relevant considerations.

2. Determine whether the sum of the anticipated bycatch needs for all target fisheries combined is likely to exceed .75% of the C. bairdi Tanner crab population.

If the anticipated needs are less than .75% then the following procedures shall apply:

The progress of each target fishery relative to the level of target catch and the level of allocated bycatch shall be monitored. If the target fishery concludes without exceeding its bycatch allocation the fishery concludes for the year. If the Regional Director determines the target fishery will be unable to conclude due to greater than anticipated bycatch needs, the Regional Director shall conduct a review of the fishery to determine the reason(s) for the greater than anticipated bycatch needs. The Regional Director shall allow the target fishery to continue and shall specify conditions for continuation appropriate to the reason(s) the target fishery bycatch needs are exceeded, providing the total bycatch needs of the target fishery and all other target fisheries do not exceed .75% of the C. bairdi Tanner crab population.

If the anticipated needs exceed or are likely to exceed .75% of the population of C. bairdi Tanner crab the Regional Director shall, in consultation with the Council, implement bycatch control measures which are designed to minimize bycatch and maximize target harvests. Such implementation may take place at the start of the fishing year or inseason. The bycatch control measures may include, but not be limited to, required observers, time/area closures, and bycatch rate limits.

A MOTION FOR CONTROL OF THE BYCATCH OF HALIBUT IN THE BERING SEA GROUNDFISH FISHERIES

Bycatch Committee
North Pacific Fishery Management Council
October 1987

The halibut mortality cap for the Bering Sea/Aleutian shall be 3,900 mt.

Biological data on halibut populations at this point is inadequate for making biomass estimates for sub-legal halibut. It is the desire of the Committee that the cap be indexed to halibut populations when the appropriate method is found.

Until better information is available, we assume that: fisheries with cod-end transfers or long towing times cause 100% mortality on halibut taken as bycatch; shorter tows and rapid sorting cause 50% mortality; and longline gear is assumed to cause 25% mortality on halibut taken as bycatch.

As the proportion of the catch taken by factory trawlers and shorebased vessels increases, we assume that halibut bycatch mortalities will diminish. Therefore, the bycatch amounts for each target fishery will be adjusted annually to reflect any mortality changes.

For each fishing year the following will occur:

1. Determine the sum of the anticipated bycatch needs for each target fishery which take halibut as bycatch. Target fisheries shall be defined as bottom trawl fisheries for yellowfin sole and other flatfish, rock sole, turbot/arrowtooth flounder, and Pacific cod, and the longline fishery for Pacific cod.

   The anticipated bycatch needs for each fishery will be the expected target species allocation to that fishery multiplied by the anticipated bycatch rate (kg/mt of target) in that fishery.

The bycatch rate used shall be the last year's observed rate (or an estimate of that rate) adjusted according to the following criteria:

changes in

1. The population of the target species;
2. gear technology or practice which bear on the bycatch rate;
3. fishing patterns which bear on the bycatch rate; or
4. any other relevant consideration.

2. Determine the anticipated mortality of the bycatch needs for each fishery by multiplying each anticipated bycatch need by the mortality rates specified above.

3. Determine whether the sum of the anticipated bycatch mortality for all target fisheries combined is likely to exceed 75% of the halibut limit of 3,900 mt.

If the anticipated needs are less than 75% then the following procedures shall apply:

The progress of each target fishery relative to the level of target catch and the level of allocated bycatch shall be monitored. If the target fishery concludes without exceeding its bycatch allocation the fishery concludes for the year. If the Regional Director determines the target fishery will be unable to conclude due to greater than anticipated bycatch needs, the Regional Director shall conduct a review of the fishery to determine the reason(s) for the greater than anticipated bycatch needs. The Regional Director shall allow the the target fishery to continue and shall specify conditions for continuation appropriate to the reasons the target fishery bycatch needs are exceeded providing the total bycatch needs of the target fishery and all other target fisheries do not exceed 75% of the halibut cap of 3,900 mt.

If the anticipated needs exceed or are likely to exceed 75% of the halibut cap of 3,900 mt, the Regional Director, in consultation with the Council, shall implement bycatch control measures which are designed to minimize bycatch and maximize target harvests. Such implementation may take place at the start of the fishing year or inseason. The bycatch control measures may include, but not be limited to, required observers, time/area closures, and bycatch rate limits.

If there is any TALFF and the calculated bycatch needs indicate a need for some restrictions, those restrictions will be made on TALFF in January inseason management.

This program will be reviewed in three years time such that any amendment to this procedure should take effect on January 1, 1992.

APPENDIX 2.2 Outline of Required Activities for Alternative 3

Bycatch management in groundfish fisheries of the Bering Sea/ Aleutian Islands would be divided into preseason and inseason actions by the groundfish Plan Team (PT), the NMFS Regional Director, and the Council. This amendment also continues the existing trawl closure of an area south of 58 degrees N between 160 and 162 degrees W, except that the Port Moller cod fishery is allowed within 25 fathoms.

Implementation of these measures would utilize existing, as well as require new, data analyses and regulatory authorities. The following discussion presents a schedule of actions to be taken on an annual basis.

PRESEASON ACTIVITIES

August: PT identifies bycatch species population sizes and target fishery bycatch needs, and makes recommendations on target fishery bycatch allowances:

C. bairdi: (1) Determine total population from summer trawl surveys, calculate 0.75% and 1% of population. (2) Calculate expected bycatch rates for each target fishery: DAP and JVP trawling for yellowfin sole/other flatfish (excluding rock sole), pollock, Pacific cod, and rock sole. (3) Estimate next year's TAC for each target species. (4) From above, estimate anticipated C. bairdi bycatch needs for each target fishery. (5) Sum anticipated bycatch needs and compare to 0.75% and 1% of C. bairdi population. (6) If necessary, adjust fishery bycatch ceilings to fall within total allowance of one percent of population.

Red King Crab: (1) Determine population from summer trawl surveys, calculate 0.25% and 0.50% of Zone 1 population. (2) Calculate expected bycatch rates for JVP yellowfin sole/other flatfish fishery and all other JVP fisheries in Zone 1. (3) Calculate proportion of yellowfin sole/other flatfish fishery apportioned to JVP (versus DAP); same for other fisheries in Zone 1. (4) From above, estimate JVP bycatch needs for each target fishery. (5) Sum anticipated bycatch needs and and compare to 0.25% (for other fisheries) and 0.50% (for yellowfin sole/other flatfish) of red king crab population in, as reduced by changing proportion of JVP to DAP apportionments of yellowfin sole/other flatfish and other fisheries in Zone 1 (see Note). (6) If necessary, adjust JVP bycatch ceilings to fall within bycatch allowances.

[Note: 0.50% and 0.25% apply only if JVP harvests all of the yellowfin sole/other flatfish and other fisheries in Zone 1. In subsequent years, as DAP takes some portion of these fish, then JVP bycatch allowances will be reduced proportionately.]

Pacific Halibut: (1) Calculate expected bycatch rates, in numbers of halibut, for each target fishery: trawling for yellowfin sole/other flatfish, rock sole, Greenland turbot/arrowtooth flounder and Pacific Cod; longlining for Pacific cod. (2) Estimate next year's TAC for each target species. (3) From above, estimate anticipated halibut bycatch needs, in numbers, for each target fishery. (4) Convert bycatch numbers into halibut mortality in numbers. (5) Convert mortality numbers into mortality weight. (6) Sum anticipated mortality weights and compare to 2,925 metric tons and 3,900 metric tons. (7) If necessary, adjust fishery bycatch, in mortality weight, to fall within total allowance of 3,900 mt.

September Council meeting: Council reviews PT recommendations and releases for public comment.

November: Bycatch Committee reviews PT and Council recommendations and public comments, and prepares final recommendations to AP, SSC, and Council.

December Council meeting: Council establishes bycatch ceilings for each bycatch species in each target fishery.

C. bairdi:

If total anticipated C. bairdi bycatch is greater than 0.75% but equal to or less than 1% of population, then NMFS Regional Director, in consultation with the Council, establishes active management of bycatch for each target fishery to assure that no more than 1% of C. bairdi population is captured.

Red King Crab:

NMFS Regional Director, in consultation with the Council, establishes active management of bycatch for each target species to assure that JVP trawl fisheries for yellowfin sole/other flatfish in Zone 1 capture no more than 0.50% of the red king crab population (as reduced by changing proportion of JVP to DAP) or that other JVP trawl fisheries in Zone 1 capture no more than 0.25% of the red king crab population (as reduced by changing proportion of JVP and DAP).

[Note: 0.50% and 0.25% apply only if JVP harvests all of the yellowfin sole/other flatfish and other fisheries in Zone 1. In subsequent years, as DAP takes some portion of these fish, then JVP bycatch allowances will be reduced proportionately.]

Halibut:

If total anticipated halibut mortality is greater than 2,925 mt, but less than or equal to 3,900 mt, then NMFS Regional

Director, in consultation with the Council, implements active management of bycatch for each target fishery to assure that no more than 3,900 mt of halibut is killed.

INSEASON ACTIVITIES

Fisheries begin. NMFS monitors harvests and bycatch of each fishery, and implements necessary bycatch restrictions:

C. bairdi:

If total anticipated C. bairdi bycatch is greater than 0.75% but less than or equal to 1% of the population, then NMFS Regional Director enforces control of bycatch as established in December to assure that no more than 1% of the C. bairdi population is captured.

If total anticipated C. bairdi bycatch is equal to or less than 0.75% of population:

(1) If target fishery requires additional bycatch allowance, NMFS Regional Director estimates additional bycatch required.

(2) NMFS Regional Director allocates additional bycatch, and specifies "appropriate" conditions on continued fishing, providing that additional bycatch allocation does not bring total C. bairdi bycatch in all target fisheries beyond 0.75% of C. bairdi population.

If total C. bairdi bycatch is reestimated to exceed 0.75% of population, then NMFS Regional Director institutes active management of bycatch to assure that no more than 1% of C. bairdi population is captured.

Red King Crab:

JVP Fisheries

NMFS Regional Director enforces control of bycatch as established in December to assure that no more than 0.50% of red king crab population is captured by JVP trawling for yellowfin sole/other flatfish in Zone 1 and no more than 0.25% of red king crab population is captured by JVP trawling in other fisheries in Zone 1, including closure of Zone 1 to JVP target fisheries.

[Note: 0.50% and 0.25% apply only if JVP harvests all of the yellowfin sole/other flatfish and other fisheries in Zone 1. In subsequent years, as DAP takes some portion of these fish, then JVP bycatch allowances will be reduced proportionately.]

DAP Fisheries

NMFS Regional Director will institute interim bycatch controls for the DAP fishery/fisheries that trigger one or more of the following conditions:

(1) DAP harvest of yellowfin sole equals 25% or more of Zone 1 total yellowfin sole harvest,

(2) DAP bycatch of red king crab in the Zone 1 yellowfin sole fishery equals 0.3% or more of the red king crab population, or

(3) Combined DAP harvest of Pacific cod, pollock, and other flatfish in Zone 1 is equal to 225,000 metric tons or more.

JVP and DAP Fisheries

DAP bycatch restrictions, combined with those for JVP fisheries, will assure that no more than 0.50% of the red king crab population in Zone 1 is captured by all trawling for yellowfin sole/other flatfish in Zone 1 and that no more than 0.25% is captured by all other trawl fisheries in Zone 1.

Halibut:

If total anticipated halibut bycatch mortality is greater than 2,925 mt but less than or equal to 3,900 mt, then NMFS Regional Director enforces bycatch controls as established in December to assure that no more than 3,900 is killed.

If total anticipated halibut bycatch mortality is equal to or less than 2,925 mt:

(1) If target fishery requires additional bycatch allowance, NMFS Regional Director estimates additional bycatch required.

(2) NMFS Regional Director allocates additional bycatch, and specifies "appropriate" conditions on continued fishing, providing that additional bycatch allocation does not bring total halibut bycatch mortality in all target fisheries beyond 2,925 mt.

If total halibut bycatch mortality is reestimated to exceed 2,925 mt, then NMFS Regional Director institutes active management to assure that no more than 3,900 mt is killed.

APPENDIX 2.3 Options for Regulatory Regime

An outline of the nature, timing and responsibility of management actions which would be necessary to implement Alternative 3 are included as Appendix 2.2; the Bycatch Committee's report is included as Appendix 2.1.

Problems related to (1) the definition of target fisheries; (2) accounting for bycatch in the DAP fishery; and, (3) miscellaneous operational refinements are presented in this section along with a suggested solution or solutions.

Monitoring of caps (Inseason, all species) The predicted bycatch needs calculated for each named target fishery are to become PSC limits for that species in that target fishery.

To accomplish this, it will be necessary to monitor, on a regular (e.g., weekly) basis, the progress towards attainment of the cap for halibut in 10 different target fisheries; the cap for C. bairdi in 8 different fisheries; and the cap for red king crab in 2 fisheries (assuming no DAP "triggers" are activated). The administrative burden of this monitoring is at least several times larger than the current overhead due to the monitoring of bycatch in the joint venture yellowfin sole/other flatfish fishery. NMFS estimates that two additional staff persons and a programmer will be needed to accomplish the inseason oversight (Janet Smoker, pers. comm.).

Additionally, the assignment of a particular tow's or vessel's bycatch to a specific target fishery depends on the ability to uniquely define the species being targeted. Currently, directed fishing is defined as:

> "..fishing that is intended or can reasonably be expected to result in the catching, taking, or harvesting of quantities of such fish that amount to 20 percent or more of the catch, take, or harvest, or to 20 percent or more of the total amount of fish or fish products on board at any time."[3]

If directed fishing is presumed to imply "targeting", it is possible to satisfy several target fisheries' definitions on any one haul or trip. Problems of this nature have led to a Council request that the Bycatch Committee review the definition with recommendations for amendment to both the Gulf of Alaska and Bering Sea groundfish FMPs.

The definitional problem with targeting/directed fishing greatly complicates the monitoring difficulties mentioned above. It will be necessary to either make a judgement call as to the classification of a haul or daily catch report or to use some mathematical ranking system for assignment of the bycatch to a particular cap.

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[3] 50 CFR Part 675 at 675.2.

There are two possible solutions to this definitional difficulty:

Option 1. Target fisheries as enumerated above will be used for accounting purposes only. That is, predicted bycatch amounts will be calculated for each defined fishery as outlined in the Committee report. Caps so determined will be applied in the aggregate to gear group fisheries: DAP bottom trawl, JVP bottom trawl, DAP longline, JVP longline. Attainment of any of these four caps will terminate the relevant fishery as follows: red king crab - Zone 1 closed to relevant gear group; halibut or C. bairdi Tanner crab - Bering Sea managment area closed to relevant gear group. Closure means that fishing with (possession of) the relevant gear in the closed area(s) will be prohibited.

Option 2. Provide definitions for the named target fisheries that do not rely on the "20% directed fishing rule" and which are constructed so as to define a set of fisheries into which bycatch can be uniquely assigned. The Bycatch Committee has suggested the following definitions and rules:

Target Fishery	Rule
P. cod, Longline	70% or more of the catch is P. cod
P. cod, Trawl, inside 25 fm, Zone 1	Any fishery is defined as a P. cod trawl fishery
P. cod, Trawl, all other	60% or more of the catch is P. cod
Rock sole, Trawl	35% or more of the catch is rock sole
Pollock, Trawl	50% or more of the catch is pollock
Turbot, Trawl	35% or more of the catch is G. turbot
Y. sole/o. flatfish	Any bottom trawl operation not classified into one of the above

Notes: If any fishery satisfies two of the above definitions simultaneously and one of the target fisheries is rock sole (Rock sole/pollock, rock sole/cod, rock sole/turbot) it is classified as a rock sole fishery. If any bottom trawl fishery fails to be defined by the above rules it shall be defined as a yellowfin sole/other flatfish fishery. All target fisheries are defined for both DAP and JVP.

Bycatch Accounting (Inseason, all species)

The proposal requires that all removals of Tanner crab, red king crab, and halibut be accounted for. However, the Committee did not specify the nature of the bycatch accounting system. The bycatch occurring in JVP and TALFF operations is observed, the bycatch in DAP is not.

This problem can be resolved in several ways:

Option 1. Require observers on all DAP vessels. The percentage coverage necessary is (arbitrarily) set at 100%. (As sub-options observers would be required only on catcher/processors,

mothership/processors, and less than 100% coverage. These sub-options will be discussed in the next section.)

Option 2. Require the maintenance and submission of bycatch reporting logs on all DAP vessels.

Option 3. Require reporting of all discards on fish tickets. This last alternative is currently in place, as is reporting of discards on the weekly catcher/processor reports, but it is not clear to what extent the regulations are being enforced or whether the data are being entered into a database.

Target fisheries (Preseason, C. bairdi Tanner crab)

The proposal calls for determination of predicted bycatch amounts for the following target fisheries:

DAP - Yellowfin sole/other flatfish,
Pollock,
Pacific cod,
Rock sole;

JVP - Yellowfin sole/other flatfish,
Pollock,
Pacific cod,
Rock sole.

However, there is currently no separate TAC for rock sole for DAP or JVP; bycatch rates in the rock sole "fishery" are unknown.

One solution would be to establish a separate TAC for rock sole, and to allocate this TAC to DAP and JVP.

Zone 1 accounting (Preseason, red king crab)

The proposal suggests that bycatch requirements will be calculated from the appropriate TACs in Zone 1 for the target fisheries listed above. This is because the red king crab bycatch caps are to be applied only to Zone 1. However, there are no separate TACs for Zone 1; all TACs are management area wide (Bering Sea or Aleutian Islands or Bering Sea/Aleutian Islands).

This is essentially a calculation problem: to predict bycatch a summary of catch and bycatch by zone and target fishery must be derived. This is already being done in all joint venture fisheries listed above except that rock sole is not currently managed as a distinct fishery.

DAP Exemption (Preseason, red king crab)

Called for in the proposal is an exemption of bycatch controls on DAP until any one of the following events occurs:

(1) DAP harvest of yellowfin sole > 25% of Zone 1 total yellowfin sole harvest.

(2) DAP bycatch of red king crab in Zone 1 in yellowfin sole > 0.3% of red king crab biomass.

(3) Sum of DAP harvest for cod, pollock, and other flatfish > 225,000 mt.

These are preseason controls, therefore the harvest in Zone 1 is unknown. Also, DAP bycatch of red king crab is unknown at program start up.

This problem can be solved by changing the word "harvest" to the word "allocation" in (1) and (3). Trigger (2) would not be operational in the first year of the amended plan.

Target fisheries (Preseason, halibut)

As above, the halibut bycatch controls are to apply to named target fisheries. They are:

DAP - yellowfin sole/other flatfish,
- rock sole,
- greenland turbot/arrowtooth flounder,
- Pacific cod - trawl,
- Pacific cod - longline,

JVP - (same as above)

As in the case of C. bairdi controls the difficulty is that there is no separate rock sole allocation. Additionally, at the present time, the TAC for Pacific cod is not allocated to gear group.

Preseason: Predicted bycatch for longline versus trawl caught cod could be estimated by making an assumption on the appropriate share to be taken by each gear group.

Inseason: The bycatch being taken will count against the appropriate cod gear group (Option 2 - targeting) or against the longline gear group (Option 1 - targeting).

Regional Director's Authority (Inseason, all species)

Under this proposal, the Regional Director (RD) is given authority to regulate the fisheries so that the various PSC limits are not exceeded. The restrictions will ensure that the total bycatch removals do not exceed the relevant upper limit.

The method of controlling bycatch is not specified. Possibilities mentioned are required observers, time/ area closures, and bycatch rate limits.

One solution would be to have the RD close Zone 1 to further fishing when the overall PSC limit for red king crab is attained. The RD may close the Bering Sea management area to further fishing when the overall PSC limit for C. bairdi or halibut is attained. Under the Option 1 targeting definition fishing with

the gear of the group attaining its cap (DAP trawl or longline, JVP trawl or longline) would be prohibited. Under the Option 2 definition targeting in the fishery attaining its cap would be not allowed.

3.0 FEDERAL PERMIT REQUIREMENTS

3.1 Description of and Need for the Action

Under regulations implementing the FMPs for Groundfish of the Gulf of Alaska and for the Bering Sea and Aleutian Islands area, vessels that are fishing in (i.e., harvesting and/or processing) the Exclusive Economic Zone (EEZ) are required to have Federal permits. Those vessels that have Federal permits are then subject to Federal regulations. Such regulations, in part, require catcher/processor vessels and mothership processor vessels to submit hail weight reports of groundfish caught and processed at sea. Regulations also require all catcher vessels, including catcher/processor vessels, to submit fish ticket reports of groundfish catches to the Alaska Department of Fish and Game. NMFS uses these reports for determining the progress of ongoing fisheries, closing fisheries when harvest quotas are reached, and for making reapportionments of surplus groundfish to joint venture processing (JVP), and to total allowable level of foreign fishing (TALFF).

If vessels are not fishing in the EEZ, they are not required to have Federal permits. Thus, they are not required under Federal regulations to submit hail weight reports to NMFS or to submit catch reports to ADF&G, even though they may be processing catch taken from the EEZ. Such vessels may be operating in the 0-3 mile Territorial Sea, in the internal waters of the State of Alaska, or seaward of the EEZ, i.e, beyond 200 miles.

This reporting/permit loophole is caused by wording in current regulations at 50 CFR Parts 672 and 675 for the Gulf of Alaska and Bering Sea/Aleutian Islands, respectively. Sections 672.4 and 675.4 of the regulations read:

> "No vessel of the United States may fish for groundfish in the Gulf of Alaska [Bering Sea and Aleutian Islands Area] without first obtaining a permit issued under this part".

Since the definitions in 672.2 for the Gulf of Alaska and 675.2 for the Bering Sea and Aleutians Islands refer to management areas that exclude those waters outside of the EEZ, vessels outside the EEZ are not required to have Federal permits. Thus, they can receive EEZ-caught groundfish and not report them to NMFS. These regulations are based on the Gulf of Alaska and Bering Sea/Aleutians Islands Area FMPs at Chapters 4.3.1.1. and 14.4.1., respectively. Since the text in both FMPs explicitly supports the regulations, changes to regulations require FMP amendments.

This reporting/permit loophole presents an opportunity for vessels that are not currently required to have Federal permits to avoid the weekly reporting requirements imposed on all U.S. processing vessels operating within the EEZ. In 1987, six vessels were in this category. They received and processed

approximately 41,280 mt of EEZ-caught groundfish. Although the catches were eventually reported to ADF&G via fish tickets, NMFS received the information at intervals that were much later than would have occurred had the vessels also submitted weekly hail weight reports to NMFS. One or more such vessels could cause inseason management problems, especially if they received amounts of EEZ-caught groundfish that were large relative to the size of the quota. Information on such catches could be important to NMFS for inseason management actions, such as time/area closures and reapportionments of surplus groundfish among user groups. Under the present management regime contained in the two FMPs, NMFS is responsible for conducting orderly fisheries with the objective of allowing fair starts and finishes for each of the fisheries such that fishermen are allowed equal opportunities to harvest the available quotas.

3.2 The Alternatives

Alternatives considered by Amendment 12 include, (1) maintaining the status quo, (i.e., maintain current regulations), and (2) the proposed action, which would require all U.S. vessels receiving groundfish caught in the EEZ to have a Federal permit.

3.2.1 Alternative 1: Status quo

Under this alternative, only those U.S. vessels that are fishing in the EEZ would be required to have a Federal permit. This alternative does not resolve potential management problems identified above.

3.2.2 Alternative 2: Proposed action

All vessels of the United States receiving EEZ-caught fish would have to hold a Federal permit and thus would have to comply with weekly reporting requirements.

3.3 Environmental Impacts of the Alternatives

Both the status quo and the proposed alternative could have some impact on the environment. Requiring vessels to have Federal permits will, in turn, require vessels to report catches from the EEZ. NMFS uses catch reports for obtaining information on total fishing mortality, which is used to assess condition of groundfish stocks. Information is also obtained for managing groundfish stocks inseason to avoid overharvesting quotas, thereby lessening the risk of overfishing and optimize utilization of the resource. Such information is especially important when the available quotas are numerically small and/or they are harvested in a short time period. For example, if a large U.S. vessel located outside the EEZ was engaged in processing EEZ-caught sablefish, but did not submit reports to NMFS, NMFS might underestimate the actual harvest and allow the fishery to continue too long. The actual harvest would be the sum of the reported and unreported sablefish harvests. In this

example, a sablefish quota could be overharvested, which would increase the risk of overfishing and reduce the long-term productivity and economic yield of the resource.

3.3.1 Alternative 1: Status quo

Under this alternative, a groundfish species could be overharvested. To the extent that overharvesting the groundfish resource increases the risk of overfishing which reduces the long-term productivity of the resource, a cost is incurred under this alternative.

3.3.2 Alternative 2: Proposed action

Under this alternative, the reporting loophole would be closed. U.S. processor vessels that locate outside the EEZ but which process groundfish that were caught in the EEZ would be required to be Federally permitted. They would, therefore be required to report amounts of groundfish being received for processing. To the extent that the risk of overfishing is decreased through proper management, resulting from timely and comprehensive harvest information, a benefit accrues under this alternative. This benefit is attributable to maintenance of the long-term productivity of the resource.

3.4 Socioeconomic Impacts

3.4.1 Alternative 1: Status quo

Under this alternative, the potential exists for non-Federally permitted U.S. vessels to locate outside the EEZ, receive and process fish which were caught inside the EEZ, and not submit weekly catch reports to NMFS or fish tickets to ADF&G. Historically, few vessels have fallen into this category. However, if even a single vessel were to operate in this manner, efficient and timely management of some groundfish stocks could be jeopardized, given the large processing and holding capacity of some U.S. catcher/processors and mothership vessels.

Fishery costs and benefits

In some circumstances, if even a single vessel did not report weekly receipts of catches, NMFS might not obtain adequate harvest information for necessary inseason management actions. Section 3.1 presents an example of six such vessels which, in 1987, did not report to NMFS, in a timely way, 41,280 mt of groundfish received for processing. NMFS currently lists 147 catcher/processors and mothership processors in its permits data base. All could potentially operate, for some period of time, outside of the EEZ, receiving catches made within the EEZ. Under the status quo alternative, these vessels would not be required to report receipt of catches to NMFS, in a timely way. The result could be that NMFS would inadvertently allow an

overharvest of the resource for lack of complete landings information.

The immediate effect of failure to take an inseason action to prevent overharvesting might be a short-term increase in gross fishing revenues to some vessels. However, these transient increases must be weighed against the long-term adverse effects resulting from a reduction in physical and economic productivity of the resource, and the consequential inefficiencies which would be imposed on the U.S. fishing industry. To the extent that TACs are set, using the best available scientific information, at levels which maximize the net social benefit attainable from the resource, any departure from the optimum TAC harvest level imposes costs in terms of a net social welfare loss. That is, if overfishing causes harm to the resource, fishermen, processors, and consumers could be forced to forego benefits in the future that otherwise could have been realized.

Reporting costs

No additional reporting costs would be incurred as a result of maintenance of the status quo.

3.4.2 Alternative 2: Proposed action

Under this alternative, NMFS would have more complete and timely information upon which to base its inseason management decisions.

Fishery costs and benefits

If all U.S. processing vessels receiving fish from the EEZ complied with a requirement to provide weekly groundfish catch reports, NMFS would have the data upon which to make efficient decisions regarding optimum inseason management of the numerous U.S. groundfish fisheries. This would reduce the likelihood that the TAC would be inadvertently exceeded, which, in turn, would diminish the risk of overfishing, and thus result in a net benefit to the nation. While some individual vessels could realize a short-term reduction in total gross operating revenues from the fishery as landings are constrained to TAC limits, the aggregate long-term benefits to the fishing industry and the nation deriving from sustained optimum productivity of the resource will exceed any short-term losses. That is, to the extent that OYs, by definition, reflect long-term optima, and TACs deriving from OYs are benefit maximizing harvest levels, then departure from TAC levels are suboptimum and result in net costs to the nation.

Reporting costs

There is no cost to the U.S. operator to obtain a Federal permit, except that associated with completing and submitting a simple application form. Some additional reporting costs may be imposed upon U.S. processing vessels operating outside the EEZ, and

receiving fish captured within the EEZ, under the proposed amendment, although no estimate of these additional costs can be made, a priori. In 1987, for example, only six vessels from the U.S. processing fleet operated in a manner which would have been affected by the proposed action. Had this alternative been in place in that year, thus requiring all U.S. processors including these six particular vessels, to supply weekly hail weight reports of fish received from the EEZ, the attributable increase in reporting cost would have been negligible.

It has been suggested that, on average, the cost of transmitting a ship-to-shore hail weight report, such as would be required under the proposed action, would be approximately $2.50.

4.0 NON-RETAINABLE GROUNDFISH CATCH LIMITS

4.1 Description of and Need for Action

Eight years ago, when the Bering Sea and Aleutian Islands (BSAI) groundfish FMP was being developed, the principal management concern was preventing groundfish harvest from exceeding total allowable catch (TAC) and controlling the incidental or bycatch of prohibited species (i.e., salmon, crab and halibut). This is reflected in the fact that the FMP makes no provision for controlling the bycatch of groundfish species in directed fisheries for other groundfish species. Original FMP implementing regulations required all fishing for groundfish to cease if it could catch a groundfish species for which the TAC was fully harvested. Hence, in addition to preventing fishing for a species for which the current TAC had been taken, also prohibited was fishing for other species that might take incidental catches of the species for which the TAC had been reached.

This problem was partially corrected with the implementation of a regulatory amendment in 1987 commonly known as the single species rule (published April 14, 1987 at 52 FR 11992). This rule provided authority to the Secretary of Commerce (Secretary) to (1) slow the harvest rate of any species of groundfish as its total catch approached its TAC by prohibiting directed fishing for that species, and (2) prohibit retention of any species of groundfish for which the TAC had been reached. The overall intent of this rule was to maintain fisheries for groundfish species for which the TAC had not been reached despite the bycatch of groundfish species for which the TAC had been (or soon would be) reached, providing that overfishing of the bycatch species would not occur.

This rule has worked well to prevent or delay the premature closure of profitable directed fishing on a groundfish species due to the fully harvested TAC of another groundfish species. However, it fails to resolve two related conservation and management problems. The first is that the single species rule places no limit on the amount of a species discarded after its retention is prohibited because its TAC has been fully harvested. The second problem is that the single species rule does not apply to foreign fishing.

The first problem concerns the biological conservation of groundfish resources. The harvest limit, represented by the TAC, for each species is the primary control preventing excessive fishing mortality and ultimately overfishing. When the catch of a species approaches its TAC, the single species rule allows the Secretary to prohibit further directed fishing for that species. This means that a fisherman may retain bycatches of that species providing such bycatches are less than 20 percent of his total

fish catch or harvest at any time, or amount to less than 20 percent of the total amount of fish or fish products onboard the vessel. Such retained bycatches are counted against the remaining TAC for that species. However, when the catch of a species reaches its TAC, under the single species rule, any further bycatches of it may not be retained and must be treated in the same manner as a prohibited species. Although the resulting discard of further bycatches of this species contributes to its total fishing mortality, the amount of additional fishing mortality from this source is not counted against or controlled by any quota or limit, and is restrained only when fishing mortality will result in overfishing.

Initially, fishing mortality resulting from bycatch discard was an insignificant part of the total fishing mortality for any groundfish species. This would remain true if directed fishing for and retainable bycatches of most groundfish species continued for all or most of the fishing year. The character of BSAI groundfish fisheries is rapidly changing, however, with the persistent increase in domestic fishing effort. This increasing fishing effort will translate into shorter periods of allowable directed fishing for key high-valued species. Decreased time for directed fishing on a species means increased time during which it will be caught as a bycatch before and after its TAC is reached.

This trend began in 1986 when the single species rule was first implemented on an emergency basis. In 1986, JVP fishing for pollock in the Bering Sea subarea remained open for the entire fishing year (January 1 through December 31). In 1987, JVP directed fishing for pollock was allowed initially for 156 days (January 1 through June 6) and then subsequently for 26 days (September 8 through October 3) for a total of 182 days. The JVP fishery for yellowfin sole followed a similar course. It remained open for the entire fishing year in 1986 but in 1987 was open for only 179 days. Generally, high value species' TACs will be taken more quickly than low value species. Domestic fishing (JVP and DAP) for sablefish in the Bering Sea subarea remained open 246 days in 1985 but only 190 days in 1986. Although directed fishing for sablefish in 1987 lasted longer (226 days) than in 1986, retention of sablefish bycatches was allowed for only an additional 93 days August 15 to November 16). Bycatches of sablefish for the remaining 45 days of the 1987 fishing year were required to be treated in the same manner as prohibited species (i.e. discarded).

This trend toward decreasing periods of allowable directed fishing is likely to continue as fishing effort increases for most species. The resulting increase in bycatch discard is likely to be a significant portion of the total fishing mortality for many groundfish species. If it remains unlimited, the

bycatch discard rate could lead to excessive fishing mortality and increase the risk of overfishing.

The second problem concerns the management of allocations among domestic and foreign fisheries. Any allocation of BSAI groundfish to foreign directed fishing must also include an allocation of species that are taken as bycatch. Because the single species rule does not apply to foreign fisheries, a foreign fishery may not retain or discard bycatches of groundfish without accounting for such catches against an allocation for each species caught. In short, without a bycatch allocation, a foreign directed fishing allocation may not be harvested. For example, Japanese directed fishing for Pacific cod with longline gear also catches small amounts of virtually all other groundfish species with the possible exception of Atka mackerel. The TACs of most of these other species of groundfish, however, can be fully harvested by domestic (DAP and JVP) fisheries. The Magnuson Act provides for preferential access to the groundfish optimum yield by domestic fishermen. Foreign fisheries may be allocated only amounts of the OY surplus to domestic fishery needs. Therefore, if no amounts of the OY are surplus to expected domestic harvests, then the Japanese fishery, in this example, would be required to forgo its allocation of Pacific cod because they would receive no allocation of necessary bycatch.

From a domestic fishery perspective, a groundfish resource left unharvested by foreign fisheries may not appear to be a problem. However, the Magnuson Act specifically provides for foreign fishing for fish surplus to domestic needs. An additional policy question is whether a foreign nation should necessarily forgo a specified allocation of a target species due to the lack of an allocation of bycatch species. For example, if the Council recommends and the Secretary approves a specific allocation of a groundfish species to a foreign nation, does that allocation imply a reasonable opportunity for that nation to harvest the allocated species regardless of bycatches of other species of groundfish? This question can be complicated by business arrangements between domestic firms and the foreign nation that are contingent on that nation's access to its groundfish allocation.

A similar policy question exists with respect to a specification of groundfish for JVP. The processor preference amendments to the Magnuson Act provide for DAP priority access to allowable harvests of groundfish. This has been interpreted to mean that the specified DAP for any species is not a limit on DAP harvests if there is an unharvested amount of that species specified for JVP. The practical effect of this is similar to the foreign fishing problem; specified amounts of a species necessary for JVP bycatches may be taken instead by DAP fisheries. Unlike foreign fisheries, however, this event does not cause the elimination of directed fishing by JVP fishermen for a different species, but it

does require the discard of the JVP bycatch species for which the specified JVP apportionment has been, or will be, fully harvested by DAP fishermen. The policy question, therefore, is whether this source of fishing mortality (ie. discard of JVP bycatch species which are fully harvested by DAP fisheries) should be unlimited as it is now, prohibited as it is with foreign fisheries, or reasonably limited to allow harvest of a directed fishing apportionment while preventing overharvest of the bycatch species.

4.2 The Alternatives

4.2.1 Alternative 1: Status quo

Under this alternative, no changes would be made in the FMP to provide for specified limits on groundfish bycatches that are not within the groundfish OY. This alternative does nothing to resolve the two problems described which are expected to become more severe as fishing effort grows.

4.2.2 Alternative 2: Establish non-retainable catch limits that are not within the groundfish OY for groundfish species.

Under this alternative, Section 14.3 of the FMP would be amended to require the annual specification of retainable and non-retainable catch quotas for all groundfish species or species groups. A retainable catch quota would be composed of an amount available for directed fishing and an amount available for retainable bycatch when directed fishing was prohibited. A non-retainable catch quota would be defined as the maximum amount that may be harvested as bycatch in directed fisheries for other groundfish species but that must not be retained and must be treated in the same manner as prohibited species. In addition, the non-retainable catch quota would be defined as outside of the TAC but within the ABC of each species. This would make the non-retainable catch quota additional to optimum yield (OY), defined as the sum of all species' TACs. This additional amount would not create a significant risk of overfishing a species, however, since it would be expected to fall within the ABC for that species. Any inseason increase in the non-retainable catch quota for any species could only occur after published findings by the Regional Director that such increase would not cause overfishing of the species. Retainable and non-retainable catch quotas would be annually apportioned among DAP, JVP and foreign fisheries.

This alternative resolves the first problem by establishing for all fisheries a specific limit on non-retainable fish catches in the same way that specification of TACs limits retainable catches. A control is provided under this alternative that prevents inadvertant overfishing from unlimited catches of groundfish for which the TAC has been achieved. The second

problem is resolved also by this alternative as a result of defining the non-retainable catch quota as outside of the TAC. This provides assurance that a specific allocation will be available for harvest regardless of bycatch requirements and the priority that DAP fisheries have on those bycatch species. Nevertheless, this would not unjustly transfer harvesting rights from DAP fisheries to foreign or JVP fisheries since the amounts of fish specified in the non-retainable catch quota would not be within the OY and would not otherwise be available for harvest. Moreover, there would be an inherent incentive to maintain non-retainable catch limits as small as reasonable to provide necessary bycatch flexibility, in order not to unduly restrict retainable TACs below ABCs.

4.2.3 Alternative 3: Establish non-retainable catch limits that are not within the groundfish OY for groundfish species applicable only to JVP and foreign fisheries.

This alternative is essentially the same as Alternative 2 except that it would not apply to DAP fisheries. Retainable and non-retainable catch quotas would be annually apportioned among JVP and foreign fisheries. The effectiveness of this alternative in resolving the two problems described above is diminished by the exclusion of DAP fisheries.

4.3 Biological and Physical Impacts

The effects of Alternative 1 on the biological and physical environment of BSAI area groundfish would be those related to retainable catches of a groundfish species up to its TAC with unlimited amounts of non-retainable bycatch in the fisheries for other groundfish species. Without such limits to bycatch, the fishing mortality of incidentally caught groundfish could risk their being overfished. The extent to which a groundfish species is at risk of being overfished depends on (1) at what point in the fishing year its TAC is reached and further catches must be discarded, (2) the rate at which it is incidentally caught in directed fisheries for other groundfish species, and (3) resulting mortality from discard. This analysis does not attempt an impact assessment of every possible combination of bycatches in all directed fisheries. Instead, hypothetical but realistic examples focusing on sablefish illustrate the potential effect of each alternative.

In each of the following examples, assume the following:

(a) The TAC and ABC for yellowfin sole is 250,000 mt;

(b) The TAC for Pacific cod is 200,000 mt;

(c) The bycatch rate of yellowfin sole in the directed trawl fishery for Pacific cod is 30 percent by weight of the

Pacific cod catch during the last half of the fishing year; and

(d) Reapportionments from the non-specific reserve to the yellowfin sole TAC do not occur because they would exceed the yellowfin sole ABC.

4.3.1 Alternative 1: Status quo

For the first example, assume that the yellowfin sole TAC is reached on June 30 and the TAC for Pacific cod continues to be available throughout the fishing year. Under the single species rule, fishing for Pacific cod may continue but incidental catches of yellowfin sole must be treated in the same manner as prohibited species (i.e., discarded). Further, assume that only 30 percent of the TAC for Pacific cod has been taken by June 30. The potential bycatch and discard of yellowfin sole in the directed fishery for Pacific cod during the remaining six months therefore is 70 percent of 200,000 mt times 30 percent or 42,000 mt. This amount of yellowfin sole in addition to that which was retained as TAC sums to 292,000 mt. This amount exceeds the yellowfin sole ABC by 42,000 mt or 17 percent.

In the second example, assume that prohibition of directed fishing for yellowfin sole under the single species rule effectively slows its rate of retainable harvest such that achievement of its TAC is delayed to September 30. Again, the TAC for Pacific cod continues to be available throughout the fishing year but 80 percent of it has been taken by September 30. The potential bycatch and discard of yellowfin sole in the directed fishery for Pacific cod is calculated as in the first example to be 12,000 mt (.30 (.20 x 200,000)). This amount of yellowfin sole in addition to that which was retained as TAC sums to 262,000 mt or 5 percent in excess of the yellowfin sole ABC.

Although a definite determination that overfishing of yellowfin sole in either of these examples may not be made, it is reasonable to assume that fishing mortality in excess of the ABC increases the risk of overfishing. Further, successive years of fishing mortality in excess of the ABC plus the bycatch and discard of yellowfin sole in multiple directed fisheries for other groundfish species will substantially increase the risk of overfishing. This risk is compounded by the expectation that ABCs for yellowfin sole in future years will be reduced to account for previous years' excesses. This implies that TACs for yellowfin sole also will be reduced and that discarded amounts in excess of its ABC will increase. Under an assumption of constant recruitment to the exploitable yellowfin sole population, both of the above examples suggest (to differing degrees) scenarios of decreasing yellowfin sole ABCs with increasing risk of overfishing. These scenarios would be mitigated only by years of

extraodinarily good recruitment but, conversely, would be exacerbated by years of poor recruitment.

The biological impact of unlimited bycatch and discard of groundfish in the directed fisheries for other groundfish species could range from negligible to a significant risk of overfishing depending on certain variables pertinent to any particular instance. For example, the bycatch of sablefish in a directed fishery for pollock on the upper shelf may be minor but the bycatch of yellowfin sole and other flatfish in a directed trawl fishery for Pacific cod in the same area may be significant. Negative biological effects of this alternative may be mitigated by the use of area closures and gear restrictions. However, the highly variable nature of the groundfish species and fishery prevents any certainty that acceptably low levels of overfishing can be maintained as fishing seasons become shorter in response to increasing fishing effort.

If other means of controlling bycatch discards are not effective, then the biological degredation of discard waste would return nutrients to the sea. The biological effects of this waste are expected to be highly localized and immeasurable in the Bering Sea ecosystem as a whole. Physical impacts on the environment also are impossible to predict but are expected to be inconsequential given the naturally variable and turbulent characteristics of this ecosystem.

4.3.2 Alternative 2: Establish non-retainable catch limits

The biological effects of this alternative would involve less risk of overfishing compared to Alternative 1 due to predetermined limits on the amount of groundfish bycatch discarded in directed fisheries for other groundfish species. The Council would annually recommend specifications of these non-retainable catch limits so that the total fishing mortality of any groundfish species would not exceed its ABC. The only exception would be when the Regional Director finds that exceeding the ABC of a species within certain constraints will not lead to overfishing.
Illustration of how this alternative would work can be based on the same examples used above. If the TAC for yellowfin sole is anticipated to be reached early in the fishing year (based on previous years' experience) as in the first example, the Council would reduce the TAC for yellowfin sole say by 42,000 mt to accommodate an estimated bycatch of this species in the directed trawl fishery for Pacific cod occurring after achievement of the yellowfin sole TAC. This 42,000 mt would then be specified as the non-retainable catch limit of yellowfin sole. This limit would be smaller (e.g., 12,000 mt) if achievement of the TAC is anticipated later in the fishing year as in the second example. In either case, the trawl fishery for Pacific cod, or any fishery with substantial bycatches of yellowfin sole, would be closed if

the non-retainable catch limit for yellowfin sole were reached before the end of the fishing year. Exceptions to such a closure could be made under conditions of gear or area restrictions and for fisheries which do not take substantial incidental catches of yellowfin sole.

Risk of overfishing a groundfish species from uncontrolled discard of it as a bycatch would be substantially reduced under this alternative relative to Alternative 1 (status quo). Waste would be reduced as a result of the strong incentive to avoid high bycatch rates of species required to be discarded.

To the extent that overall discarding of groundfish is reduced by this alternative, the return of nutrients to the sea also would be reduced. In addition, the physical effects of fishing gear on the sea bottom also would be decreased under this alternative if it increased the length and frequency of fishery closures. These physical effects probably would not be distinguished against the natural variability of the ecosystem.

4.3.3 Alternative 3: Establish non-retainable catch limits applicable only to JVP and foreign fisheries

The biological risk of overfishing is less under this alternative than under Alternative 1 (status quo) but more than under Alternative 2 (which includes DAP). This is because the JVP and foreign fisheries compose only a portion of the total commercial groundfish harvest off Alaska. Although currently JVP and foreign fisheries account for the dominant portion of this groundfish harvest, the DAP portion is growing and rapidly replacing foreign and JVP access to groundfish resources under the domestic priority provisions of the Magnuson Act. In 1987, DAP groundfish harvest off Alaska (BSAI and Gulf of Alaska areas combined) amounted to about 400,000 mt or about 28 percent of the total 1,840,000 mt groundfish harvest. However, DAP groundfish harvests increased by about 168 percent from 1986 to 1987. Assuming a more conservative rate of 100 percent increase in DAP harvests for the next several years, DAP groundfish harvests could exceed current total TACs of all groundfish species off Alaska by 1990. With an even slower rate of growth in DAP groundfish fisheries, it is highly likely that groundfish harvests off Alaska will be wholly domestic within five years. Hence, excluding DAP fisheries from non-retainable catch limits will result in rapidly decreasing effectiveness in the control of discard wastage. Currently, the biological and physical effects of Alternative 3 would be similar to alternative 2 but within five years these effects would become increasingly and ultimately similar to Alternative 1.

4.4 Socioeconomic Impacts

4.4.1 Fishery Costs and Benefits

It is impossible to precisely predict the behavior of the groundfish fisheries with respect to groundfish bycatches in the BSAI area due to several unknown and highly variable factors. Among these are future market values and opportunities for different species of groundfish. A high value for rock sole may attract increased fishing effort for it which may cause increased bycatches of pollock and Pacific cod, but similar increased effort on sablefish may not cause significant bycatches any other species. Markets also may affect the timing of fishing effort which will affect bycatch rates. For example, the JVP fishery for pollock at depths of less than 100 fathoms in 1986 took virtually no Atka mackerel as bycatch in the winter but the bycatch rate of this species in the summer was over 13 percent of the pollock catch. Changes in fishing technology and locations also will significantly affect bycatch rates.

Nevertheless, certain basic trends appear to be reasonably clear which allow some qualitative analysis. First, DAP groundfish fisheries are growing rapidly and probably will harvest virtually all groundfish species TACs within several years. Second, as JVP and foreign fisheries are phased out over this time, specific allocations of certain species for bycatch purposes, that are within the TAC and surplus to DAP requirements, will be increasingly difficult to make. This will jeopardize the harvest of these specific allocations by JVP and foreign fisheries which may detrimentally affect domestic fishermen and business arrangements dependent on these harvests, at least in the short term. Foreign fisheries will not be allowed for allocated target species without also having specific allocations of bycatch species. Although JVP fisheries are not similarly restricted, they would be required to discard bycatches of species for which no JVP apportionment exists. Without limit in the long term, discarding could be biologically and economically detrimental.

Finally, and most importantly, open fishing seasons for the more valuable species will become shorter as fishing effort increases, assuming continuation of open-access and quota-based management of the BSAI groundfish fisheries. This will result in longer periods during which some bycatch species will be required to be discarded in the same manner as prohibited species. Again, without limit, such discard is anticipated to result in fishing mortality that significantly exceeds ABCs for some species which could result in an unacceptably high risk of overfishing for these species.

Generally, the costs of not providing a control or limit on the discard of non-retainable bycatches (Alternative 1) are those associated with potential long-term overharvesting of some groundfish species which will results in future years' TACs that are less than they would have been if the overharvesting had not occurred. In this instance, overharvesting means harvesting a

species in excess of its ABC which may or may not lead to overfishing as defined in the Magnuson Act. It may be reasonably assumed that overharvesting over time will reduce future harvest potential and increase the risk of overfishing.

The benefit of Alternative 1 generally would be increased short term revenues to the fishery from unrestricted access to harvest the entire TAC of all target species even when doing so will cause the overharvest of other groundfish species taken as bycatch. Conversely, the costs of providing non-retainable catch limits (Alternative 2 and, to a limited extent, Alternative 3) are those associated with the occasional closure of directed fishing for a groundfish species in a particular area before its TAC is reached because a non-retainable catch limit for another groundfish bycatch species is reached. Another cost is the marginal reduction of retainable TAC below ABC in order to provide for a non-retainable catch limit.

The benefits of non-retainable catch limits generally are long-term conservation of groundfish species and the assurance to JVP and foreign fisheries that DAP use of bycatch allocations will not limit directed fishing operations.

A more refined estimate of costs and benefits would ideally examine the marginal losses and gains of non-retainable catch limits quantitatively in terms of current dollars. Without the information necessary for such analysis, description of the marginal aspects must suffice. First, since discard of groundfish bycatches would not be prohibited, the assummed economic benefit of higher future harvests under Alternative 2 results from the difference between the amount of groundfish bycatch discarded without limit and that discarded within the limits. For some species this difference and resulting marginal benefit will be larger than for other species. Second, part of the effect of Alternative 2 would be a stronger incentive than currently exists for fishermen to avoid high bycatches of groundfish for which there is a non-retainable catch limit. Some marginal cost may accrue to fishermen who change their fishing strategy or location to avoid high groundfish bycatches. Third, Alternative 2 is not intended to make it impossible to achieve the TACs of all target groundfish species. It may be assummed that care would be taken in specifying non-retainable catch limits that are truely effective in limiting discards while not being excessively costly to the fishery in terms of lost fishing time. It is anticipated that non-retainable catch limits may not be specified for all groundfish species and that specified limits will balance the short-term economic factors facing the fishery with the long-term conservation benefits to the groundfish resource. Moreover, certain discretionary provisions are intended to allow the Secretary to continue allowing discards above a non-retainable catch limit if doing so has significant economic urgency and would not cause an excessive risk of

overfishing the bycatch species. The interaction of these factors inevitably will affect the marginal costs and benefits of a non-retainable catch limit over time in varying and unknown ways.

4.4.2 Reporting Costs

No change in reporting or paperwork costs are indicated under any of the alternatives. Onboard observers monitoring the catches of foreign and JVP catches already routinely collect bycatch data. Weekly reports of DAP catcher/processors also require the submission of discard data. Under Alternative 2, a new risk of penalty to DAP fishermen for reporting high groundfish discards may be expected to result in under reporting. Onboard observers on DAP vessels collecting bycatch and other data as is currently done on foreign fishing vessels would implement Alternative 2 most effectively. Onboard observers on DAP vessels involves policy questions that are separate from this amendment proposal. Nevertheless, if DAP vessels have onboard observers in the future, the costs of such a program would be counted against the benefits of all the biological data collected and cannot be attributed to any one monitoring purpose such as a non-retainable catch limit. In lieu of DAP observers, reporting of discard along with retained catch must suffice.

4.4.3 Administrative, Enforcement and Information Costs

Under Alternatives 2 and 3, discard data currently being collected would require more careful monitoring and analysis than it currently receives. The marginal cost for this extra effort, however, would be minimal since the data collection and monitoring systems already are in place. Added enforcement costs also would be minimal since any area closure that may occur by implementing non-retainable catch limits would be enforceable by ongoing surveys and would require no extra at sea enforcement.

4.4.4 Distribution of Costs and Benefits

To the extent that the costs and benfits of any of the three alternatives will be measurable, they would be largely distributed among and absorbed by fishermen. Any marginal costs to fishermen of non-retainable catch limits may be expected to be passed on to subsequent purchasers of groundfish products. These costs, however, are not expected to be of large enough magnitude that they would have significant effects on retail prices of groundfish products.

5.0 RESOURCE ASSESSMENT DOCUMENT DEADLINE

5.1 Description of and Need for the Action

Amemdment 1 to the Bering Sea/Aleutian Islands groundfish FMP established a requirement for an annual Resource Assessment Document (RAD) to be prepared by the Plan Team outlining the status of stocks and making estimates of acceptable biological catch. The original amendment established a deadline for delivery as July 1 of each year. This deadline, however, has become ineffective, because summer stock biomass surveys are generally not completed until August - October, thereby relegating a July 1 RAD to information from the previous year. In 1987, the July RAD was simply a restatement of information that had already been presented to the Council at their previous meeting in December 1986.

5.2 The Alternatives

5.2.1 Alternative 1 -- Do nothing - status quo.

The status quo will retain a requirement that the Plan Team prepare and distribute a RAD by July 1 of each year.

5.2.2 Alternative 2 -- Remove the July 1 RAD deadline.

The proposed action would remove the requirement to produce a RAD by July 1. Removal of the July 1 deadline would reduce paperwork and the burden on the Plan Team to produce an unessential document. The proposal would not change existing policy that a draft RAD, based upon current information, will be prepared prior to the Council's early autumn (i.e., September) meeting and that a final RAD will be prepared prior to the Council's early winter (i.e., December) meeting.

5.3 Biological and Physical Impacts

This amendment addresses an administrative revision; neither alternative would result in biological or physical impacts to the Bering Sea/Aleutian Islands. The issue is simply one of efficiency in a portion of the bureacracy associated with management of the groundfish fisheries.

5.4 Socioeconomic Impacts

Neither alternative would result in substantial socioeconomic impacts. However, there would be some gains in efficiency, and thereby some administrative cost savings (i.e., one less meeting of the Plan Team, one less document produced and distributed) if the proposal is implemented.

6.0 ROE-BEARING ROCK SOLE/JVP PROHIBITION

Rock sole (Lepidopsetta bilineata) are a constituent of the "other flatfish" species complex which is managed as a unit in the eastern Bering Sea and the Aleutian Islands. The nine species which comprise the "other flatfish" category are usually caught incidentally in the yellowfin sole summer fishery at levels below the total allowable catch (Walters and Halliday, 1987). Rock sole have been an important element of this incidental catch in most years and have recently become the object of a domestic roe fishery targetting on sexually mature female rock sole.

6.1 Description of and Need for the Action

Roe-bearing rock sole has become an important target species for domestic (DAP) fishermen and 1988 saw joint venture (JVP) fishermen entering the directed fishery.

Rock sole composition in Bering Sea Area 51 JVP flatfish fishery

Year	%Rock sole	Rock sole (mt)	Flatfish (mt)
1983	26.5%	9,013	34,034
1984	23.7%	11,791	49,743
1985	15.8%	27,259	172,403
1986	7.4%	15,916	215,904

Source: NMFS U.S. Foreign Observer Program, NWAFC, Seattle, WA.

While roe-bearing rock sole had once been harvested by foreign fisheries (TALFF), the JVP fisheries had, prior to 1988, only taken rock sole incidentally to target fisheries on yellowfin sole. Estimates presented in the original proposal claim that an annual market exists in Japan for approximately 15,000 mt of roe-bearing rock sole at a price of $625 per mt, that DAP fishermen can supply this market demand, and that additional product supplied by JVP would result in drastic price reductions which would adversely affect DAP fishermen. In the interest of DAP priority embodied in the Magnuson Act, this proposal to amend the Bering Sea/ Aleutian Islands groundfish FMP would prohibit the retention of more than 30% of rock sole in JVP catches during the presumed spawning period January 1 to April 1.

6.2 The Alternatives

6.2.1 Alternative 1 -- Status quo

Currently, the harvest of rock sole is loosely controlled under a combined total allowable catch (TAC) restriction for a group of "other flatfish." Much of this TAC is apportioned to JVP in

order to provide sufficient bycatch for the established yellowfin sole fishery. Apportionment to DAP in 1988 was requested to satisfy the roe-bearing rock sole market as well as to provide bycatch for other fisheries. Under the status quo, there is no specific limitation to the amount of roe-bearing rock sole that can be retained by JVP, so long as harvests are within the overall JVP apportionment of other flatfish (85,261 mt plus some portion of possible reserves of 19,705 mt).

6.2.2 Alternative 2 -- JVP Prohibition on Rock Sole between January 1 and April 1.

The proposal would establish a limit on the possible retention of rock sole in JVP fisheries during the spawning season, calculated to allow reasonable bycatch for the yellowfin sole fishery. Specifically, JVP retention of rock sole would be limited to 30% of catch during the period January 1 to April 1.

6.2.3 Alternative 3 -- Establish a separate TAC for rock sole, possibly subdivided into two seasons.

This alternative would separate rock sole from the "other flatfish" category, establish a TAC specifically for rock sole, and would further develop a split-season apportionment to isolate harvest of roe-bearing rock sole from harvests outside of the spawning season. Precedent for such a management action exists in the split-season JVP apportionment of pollock passed under Amendment 11.

6.3 Biological and Physical Impacts

General Biology

The rock sole is distributed from California waters north into the Gulf of Alaska and Bering Sea to as far north as the Gulf of Anadyr. The distribution continues along the Aleutian Islands westward to the Kamchatka Peninsula and then southward through the Okhotsk Sea to the Kurile Islands, Sea of Japan and off Korea. Centers of abundance occur off the Kamchatka Peninsula (Shubnikov and Lisovenko, 1964; Shvetsov, 1976), in British Columbia (Forrester and Thompson, 1969), the western Gulf of Alaska, and in the southeastern Bering Sea (Alton and Sample, 1975).

Wilimovsky et al, (1967) recognize three subspecies based on counts of gill rakers and lateral line pores. Lepidopsetta bilineata bilineata (Ayers) off the west coast of North America, L. bilineata peracuata (Cope) of the Gulf of Alaska, Bering and Okhotsk Seas and L. bilineata mochigaeri Snyder of the northwestern Pacific Ocean. Reproductive intermingling of stocks at the eastern and western extremities of the peracuata range is suspected to occur.

Throughout their range, rock sole spawn during the winter-early spring period of February-June. In the eastern Bering Sea, spawning reportedly takes place from about March-June (Fadeev, 1965, Shubnikov and Lisovenko, 1964). Concentrations of rock sole during winter and early spring were found from research conducted by Soviet investigators in the early 1960's. Additionally, ripe and spent fish were encountered off Bristol Bay at depths of 70 to 140 m at bottom temperatures above 0 degrees Centigrade. Winter temperatures on the shallow shelf waters frequently remain below 0 degrees Centigrade where small sexually immature rock sole remain during the winter at depths of less than 150 m.

Sampling of spawning rock sole for size and age at maturity in the eastern Bering Sea has not been extensive enough to construct age and size at maturity relationships. Available data from two samples of adult rock sole from British Columbia show the smallest observed mature fish were 31 cm for females and 28 cm for males (Forrester and Thompson, 1969). Conversely, the largest immature fish were 43 cm for females and 36 cm for males. The size of 50% maturity in females is reportedly 32-33 cm which would correspond to an age of 8-9 years old (NWAFC aged rock sole) and some length less than 30 cm in males or an age less than 8 years old.

Male and female rock sole exhibit similar growth rates through the first five years at which point female rock sole growth continues at a faster rate (Levings, 1967; Weber and Shippen, 1975). Rock sole growth in the eastern Bering Sea is reported to be exclusive to the period from the end of March to August when they feed primarily on benthic invertebrates and to a lesser extent small fish (Figure 1; Shubnikov and Lisovenko, 1964). Levings (1967) analyzed rock sole growth rates from age samples collected from British Columbia, the western Gulf of Alaska, and the northwest Bristol Bay area and concluded that rock sole growth is slower at the northern end of their distribution.

Spawning female rock sole deposit a mass of eggs which are demersal and adhesive (Alton and Sample, 1975). Fertilization is believed to be external. Incubation time is temperature dependent and may range from 6.4 days at 11 degrees C to about 25 days at 2.9 degrees C (Forrester, 1964). Newly hatched larvae are pelagic and have occurred sporadically in eastern Bering Sea plankton surveys (Waldron and Vinter, 1978). Kamchatka larvae are reportedly 20 mm in length when they assume their side-swimming, bottom-dwelling form (Alton and Sample, 1975). Forrester (1969) reports that by age 1 they are found with adults on the continental shelf during summer.

Available data on the fecundity of rock sole in the southeastern

Bering Sea from Fadeev (1965) is presented in Table 1 for 35 females.

Status of Stocks

Information on eastern Bering Sea rock sole abundance is available from NWAFC bottom trawl surveys conducted annually from 1979 to the present. Survey results indicate an increasing trend of population density and estimated biomass since 1975 (Figure 2; Walters and Halliday, 1987). Exploitable biomass from the 1986 and 1987 surveys is estimated to be over 1 million metric tons, a more than five fold increase over the 1979 estimates. Rock sole ages from the 1984 survey suggest that strong recruitment from the 1975-1980 year classes have supported the increased biomass. Size composition data from survey years since 1984 indicate that this trend of strong recruitment is continuing.

Species of the "other flatfish" category remain underutilized and are usually taken in the yellowfin sole fishery during the late spring and summer. The all-nation catch quota for this species group has never been realized. The eastern Bering Sea rock sole resource is thought to be at a level above virgin biomass (Walters and Halliday, 1987).

Distribution of Spawning Rock Sole

Throughout their range, rock sole are known to spawn between February and June usually in areas near the shelf/slope margin. Soviet investigators in the early 1960's reported wintertime concentrations of rock sole southeast of the Pribilof Islands and northwest of Unimak Island (Shubnikov and Lisovenko, 1964; Fadeev, 1965). Recent biological sampling of the spawning population has not been completed since the NWAFC Bering Sea demersal trawl surveys occur from June through August and observer coverage is usually commensurate with the summertime yellowfin sole foreign and joint venture fisheries.

Available data on the catch of rock sole from February-April by foreign and joint venture vessels from 1980-1987 is presented in Figures 3-10. Although these geographic catch distributions are partially a function of available observer coverage and fishing strategy, rock sole captured during these months are assummed to be in spawning condition and were usually caught in the areas identified as spawning concentrations by the Soviet investigators.

Rock sole larvae were present from Japanese plankton sampling during 1955-1958 (Waldron, 1976). More recently, ichthyoplankton sampling with bongo nets at 64 locations in the eastern Bering Sea during mid April to mid June 1977 produced rock sole from 31% of the samples. Rock sole larvae were caught over the continental shelf at depths between 100-200 m and were

distributed from the Alaska Peninsula-Aleutian Islands area northwest to the Pribilof Islands (Figure 11; Waldron and Vinter, 1978). Rock sole larvae were also caught in this same area during a similar ichtyoplankton survey June 1-July 23, 1979 (pers. comm. Jay Clark, NWAFC).

Impact of the Roe Fishery

Rock sole ovaries are a highly desired food item in Asian countries such as Japan. The DAP fishery in 1987 was characterized by locating spawning concentrations of rock sole and then heading, gutting and freezing the females while discarding the males. The total catch of rock sole by month (February-June) from the all nation fisheries in the eastern Bering Sea (Table 2) indicates that removals of spawning rock sole throughout the 1980's have been insignificant compared to the magnitude of the total allowable catch levels allocated to this species (conceivably 100 % of the quoata in any year, 131,369 t for 1988). The rock sole proportion of the "other flatfish" catch category has ranged from 23 to 58% of the total catch for the years 1963-1986 (Walters and Halliday, 1987). Harvesting spawning rock sole at these levels has not inhibited the total resource from increasing to its present abundant level during this decade, and therefore, no conservation reason presently exists to limit the roe fishery. This is particulary true if the total harvest remains at present levels.

There appears to be no discernible impact of the roe fishery and no distinction among the alternatives.

6.4 Socioeconomic Impacts

Available Information

Although considerable effort was made to obtain information on which to base a reliable socioeconomic analysis of the proposal, historical data on the fishery, on price and quantity in the Japanese roe rock sole market (including demand trends, market substitutes, and alternative sources of supply), and on the production capabilities of DAP and JVP fleets are apparently not available.

Rock sole is not distinguished from "other flatfish" in catch reporting systems, making accurate estimation of total production difficult and estimation of roe-bearing rock sole harvest somewhat suspect. Attempts to compile rock sole landings, particularly for the DAP directed roe fishery, have relied upon limited observer coverage onboard DAP vessels (11 sampling days in 1987 and 15 sampling days thus far in 1988). However, data on rock sole landings for the months February through June indicate that, beginning in 1982, JVP has taken increasing amounts of roe-bearing rock sole from Area 1 in the Bering Sea, mostly

attributable to incidental catch in the yellowfin sole fishery (Table 2). DAP production has also increased, reportedly from 5,000 mt in 1986 to 9,000 mt in 1987 (PacFIN landing data for Area 1 estimate DAP rock sole landings for February through June at 2,982 mt for 1986 and 10,307 mt for 1987).

Information on roe-bearing rock sole market characteristics are not available from secondary public sources but, because the proposal is predicated on an assertion of market saturation at 15,000 mt and price sensitivity, these data are essential to any economic examination of the need for and impact of the proposal.

Some limited information was obtained from seafood industry reports. For example, historic Japanese market price data have been compiled from issues of Bill Atkinson's News Report (BANR), which provided periodic observations on port of landings, and consumer and wholesale prices beginning in 1983. These nominal price series suggests some seasonality in demand for rock sole roe, but the series are too short to confirm seasonal price trends. Moreover, these price statisitics, which are reported to reflect estimates of bid prices including assumed fixed commission rates and handling charges (not actual transaction prices), are not accompanied by equivalent market supply (quantity) information. Without the associated quantity data, these price series cannot be used to draw conclusions about the size and characterisitics of the underlying market demand for rock sole roe.

Over roughly the same period of time, the BANR reports sporadic anecdotal information on the Japanese rock sole roe market. When cross-referenced with the price series information described above, however, discrepencies were found. This may result from some of this information referring to single landings or shipments, with occassional price citations, whereas the series are aggregated approximations of general market tendency. While representing some interesting glimpses of temporally or geographically isolated segments of the market, the information is not sufficiently consistent or of suitable breadth to support an analytical assessment. After consultation with the BANR publisher, it is apparent that published sources of price and quantity information on the Japanese roe rock sole market are not available in the U.S. public domain.

Subsequent interviews with several other marketing experts provided no more specific information on the rock sole roe market, beyond a supposition that, while rock sole roe may be a preferred product, other roe-bearing flatfishes such as Alaska plaice and yellowfin sole are potential substitues for rock sole. Although there is some apparent price variation among these species, it is likely that they are relatively close substitutes for one another. Confirmation, however, must also depend upon further information not currently available.

Sources report that nominal Japanese market prices for roe rock sole have taken a sharp down turnover approximately the last 12 to 18 months. While there are, undoubtedly, a number of factors influencing the price movement observed in the Japanese roe rock sole market, the relative importance of each is less apparent. For example, one DAP supplier reported that 1988 prices have decreased between 30 and 40% from the previous two years. This has led to a tentative conslusion that this price decline is a result of increasing supplies of roe rock sole on the Japanese market from greater DAP production and entry of JVP operations.

During approximately the same period of time, however, the currency exchange rate between Japanese yen and the U.S. dollar declined over 51%. Given this dramatic increase in the relative purchasing power of the yen, all else being equal, the nominal Japanese market price would be expected to decline. The precise magnitude of this price change is dependent upon the prevailing elasticities of supply and demand. At present, data with which to evaluate these elasticities are not available. If, however, it is assumed that aggregate demand is indeed highly price inelastic, as reported by several domestic sources, a sharp price decline in the Japanese market (as would be brought on by a precipitous drop in the exchange rate) would not be expected to result in a significant increase in quantity demanded in the market, and would result in a decline in aggregate gross revenues.

There is also some evidence from the trade journals that the exceptionally high prices cited in the Japanese market in early 1987 (reportedly in the range of 900-950 yen/kg; Tokyo wholesale, including handling and commission costs) were an anomaly and unsustainable. These prices reportedly resulted in considerable price resistance at every level of the roe rock sole market in Japan, and this resistance continues to influence the current price structure of the market. Until adequate data are available, more rigorous evaluation of the influence of these factors on the observed price decline is not possible. However, to ascribe the decline in price entirely to the anticipated (or realized) increase in supply of roe rock sole to the Japanese market is clearly incorrect.

Efficacy of the Proposal

It has been reported that JVP operations which actually target upon rock sole have had difficulty exceeding 30% rock sole in their catch, with average hauls at or just below a 30% threshold. Given that the JVP apportionment of yellowfin sole for 1988 equals 189,544 mt (plus some portion of possible reserves of 38,100 mt), much of which could be taken early in the year, the proposed 30% limit could result in retention of 56,836 mt or more of roe-bearing rock sole by JVP. If the market for roe-bearing

rock sole is indeed constrained to 15,000 mt, and any increase in landings above that amount would result in substantial reductionsin price, then the threshold specified in the proposal would not be effective and would not offer assurance of market stability to DAP fishermen.

Moreover, if survey information is correct that rock sole spawning extents into June, the proposed end of JVP prohibition on April 1 would also fail to protect the roe market.

It appears that protection of a purportedly limited rock sole roe market for DAP interests would require severe constraints on allowable bycatch in the JVP yellowfin sole fishery. Although Alternative 3 attempts to outline possible managment measures to isolate DAP apportionment of roe-bearing rock sole, the benefits of such an alternative cannot be evaluated for the same reasons that the rock sole roe market cannot be characterized. Moreover, if the Japanese market is truly limited to 15,000 mt annually, even this alternative would not protect that market unless the rock sole TAC were limited to 15,000 mt or less.

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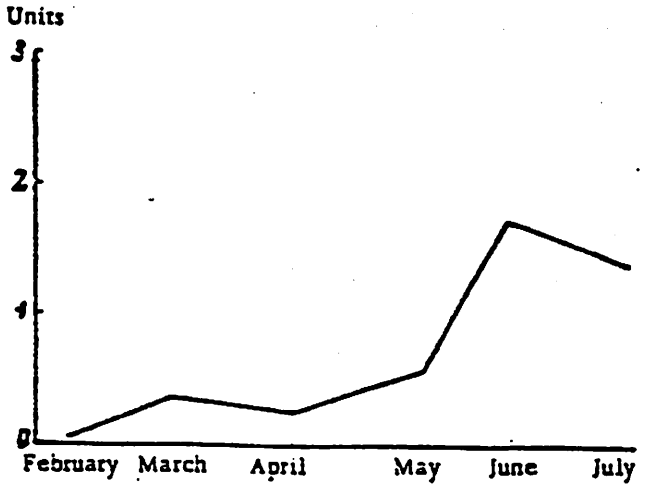

Figure 1.-- Changes in the degree of stomach fullness in southeastern Bering Sea rock sole by month (Shubnikov and Lisovenko, 1964).

Length, cm	Rock sole
14.1–16.0	–
16.1–18.0	–
18.1–20.0	–
20.1–22.0	–
22.1–24.0	151.7
24.1–26.0	–
26.1–28.0	–
28.1–30.0	–
30.1–32.0	180.6
32.1–34.0	179.1
34.1–36.0	226.9
36.1–38.0	287.1
38.1–40.0	297.5
40.1–42.0	404.2
42.1–44.0	–
44.1–46.0	–
46.1–48.0	–
48.1–50.0	–
Number of fish	35
Relative population size, %	12.8
Average egg diameter, mm	0.68

Table 1.-- Fecundity of southeastern Bering Sea rock sole (thousands of eggs; Fadeev, 1965).

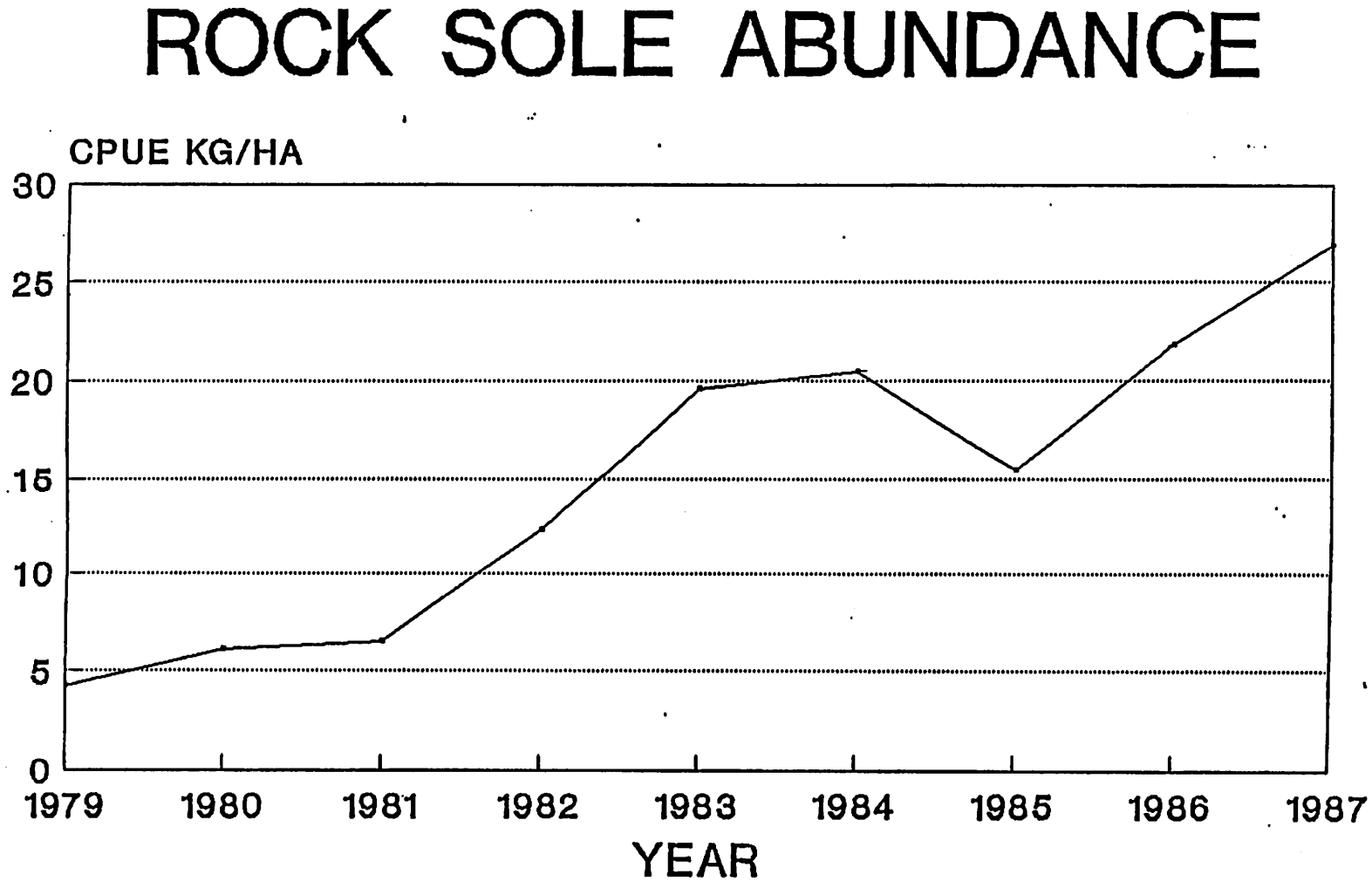

Figure 2.-- Trends of CPUE for eastern Bering Sea rock sole as estimated from NWAFC demersal trawl surveys, 1979-1987.

Table 2.-- Catch of rock sole (t) during February-June 1980-1987 in Bering Sea area 1. The 1985-1987 foreign and joint venture species composition of rock sole from the "other flatfish" category were estimated from observer sampling and are approximate values.

	1981		1982		1983		1984		1985		1986		1987	
month	JV	FRN	JV	FRN	JV	FRN	JV	FRN	JV	FRN	JV	FRN	JV	FRN
February		23	1	20	47	38	62	38	327	115	570		654	1
March		12	33	62	599	81	185	184	303	34	1,004	17	450	tr
April		50	708	115	779	196	1,241	395	803	11	354	88	610	3
May	1,176	130	1,298	174	1,700	288	1,319	215	458	36	1,623	11	79	
June	1,195	221	2,486	193	1,996	240	2,501	309	1,503	250	820	38	220	3
Total	2,371	436	4,526	564	5,121	843	5,308	1,140	3,395	446	4,370	154	2,013	7
Total JV + Foreign	2,807		5,090		5,964		6,449		3,841		4,524		2,021	
Domestic									3		2,982		5,183	
Grand total	2,807		5,090		5,964		6,449		3,844		7,506		7,204	

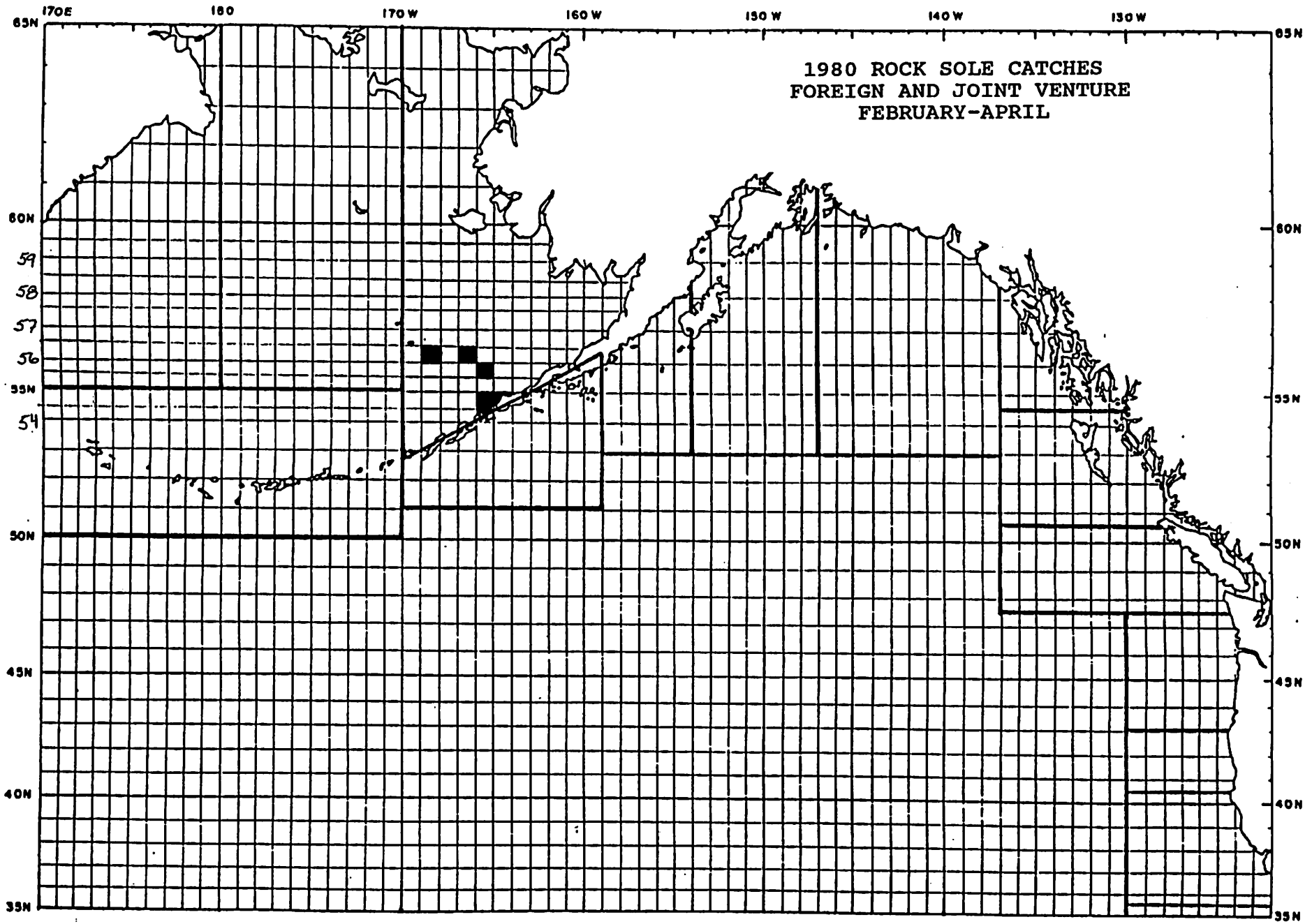

Figure 3.-- Geographical location of foreign and joint venture rock sole catches during February-April 1980 when observers were present.

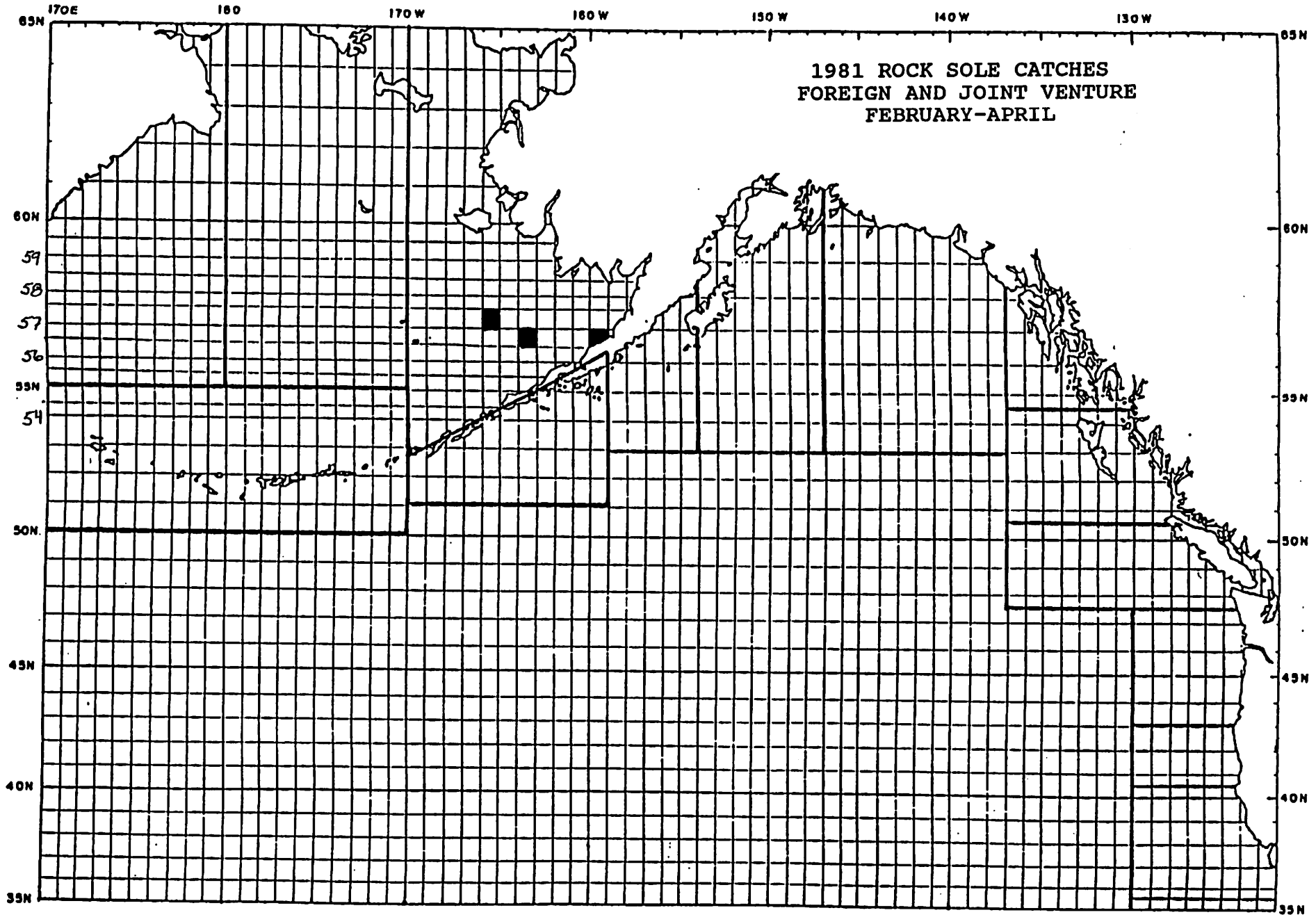

Figure 4.-- Geographical location of foreign and joint venture rock sole catches during February-April 1981 when observers were present.

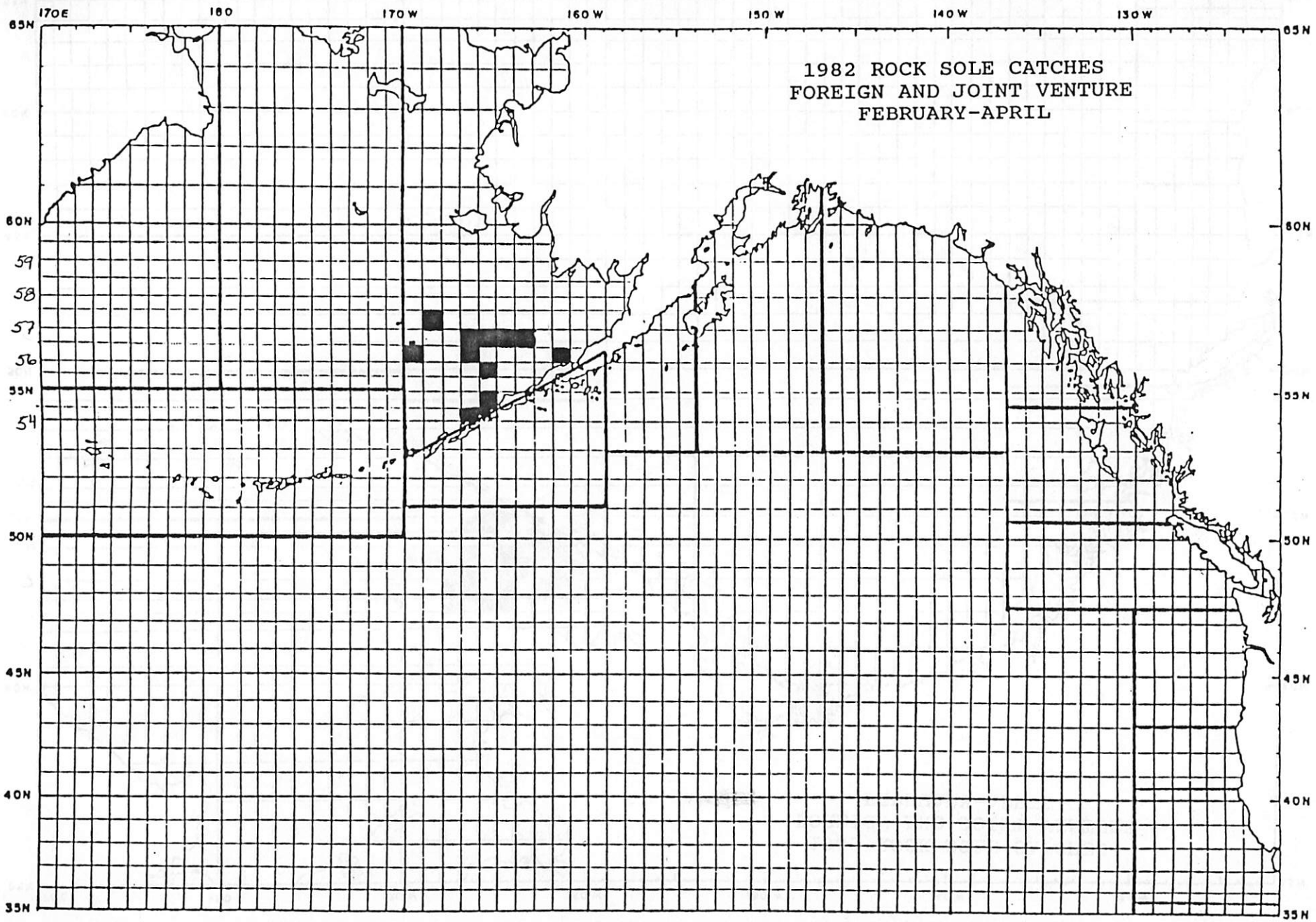

Figure 5.-- Geographical location of foreign and joint venture rock sole catches during February-April 1982 when observers were present.

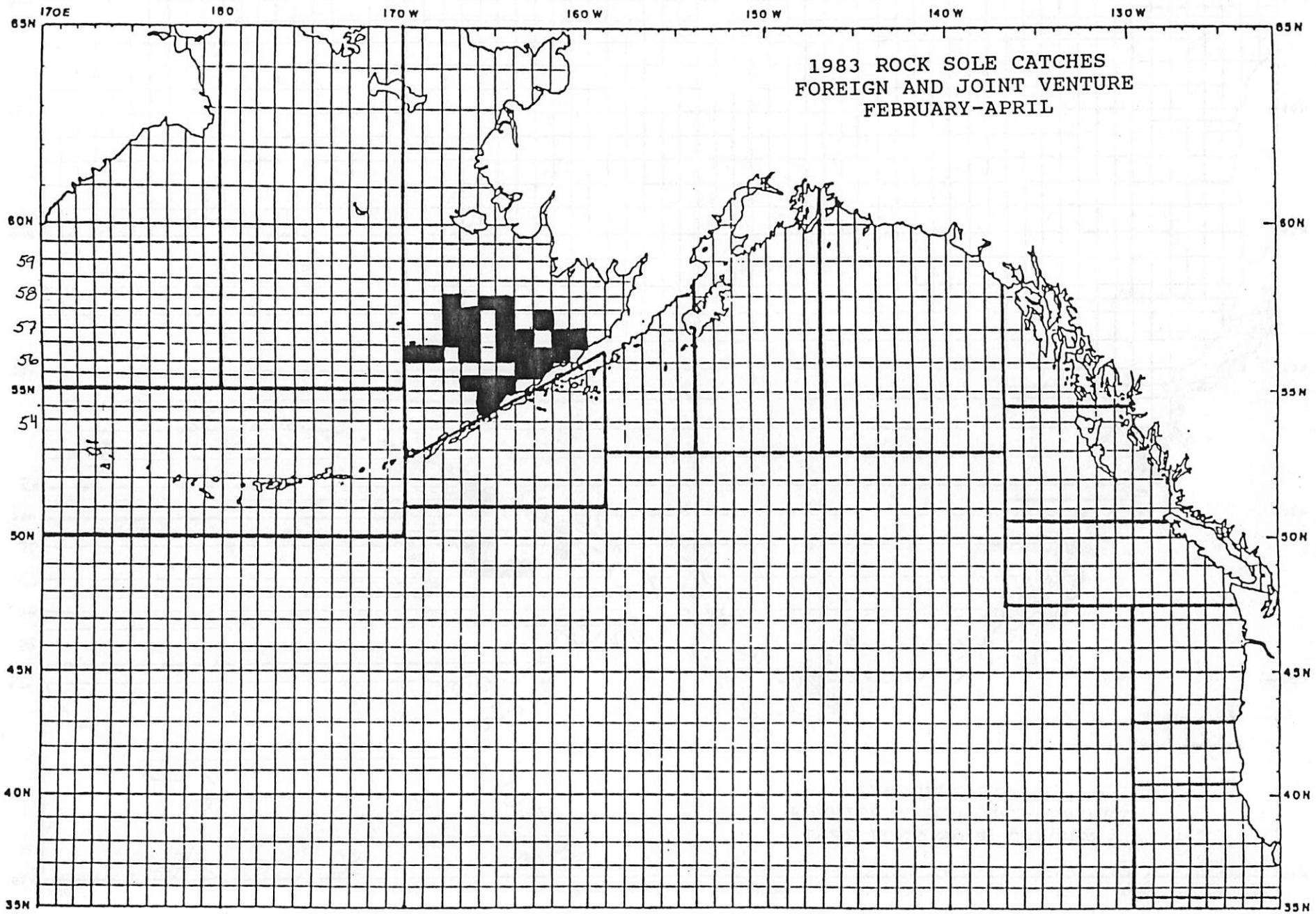

Figure 6.-- Geographical location of foreign and joint venture rock sole catches during Februa April 1983 when observers were present.

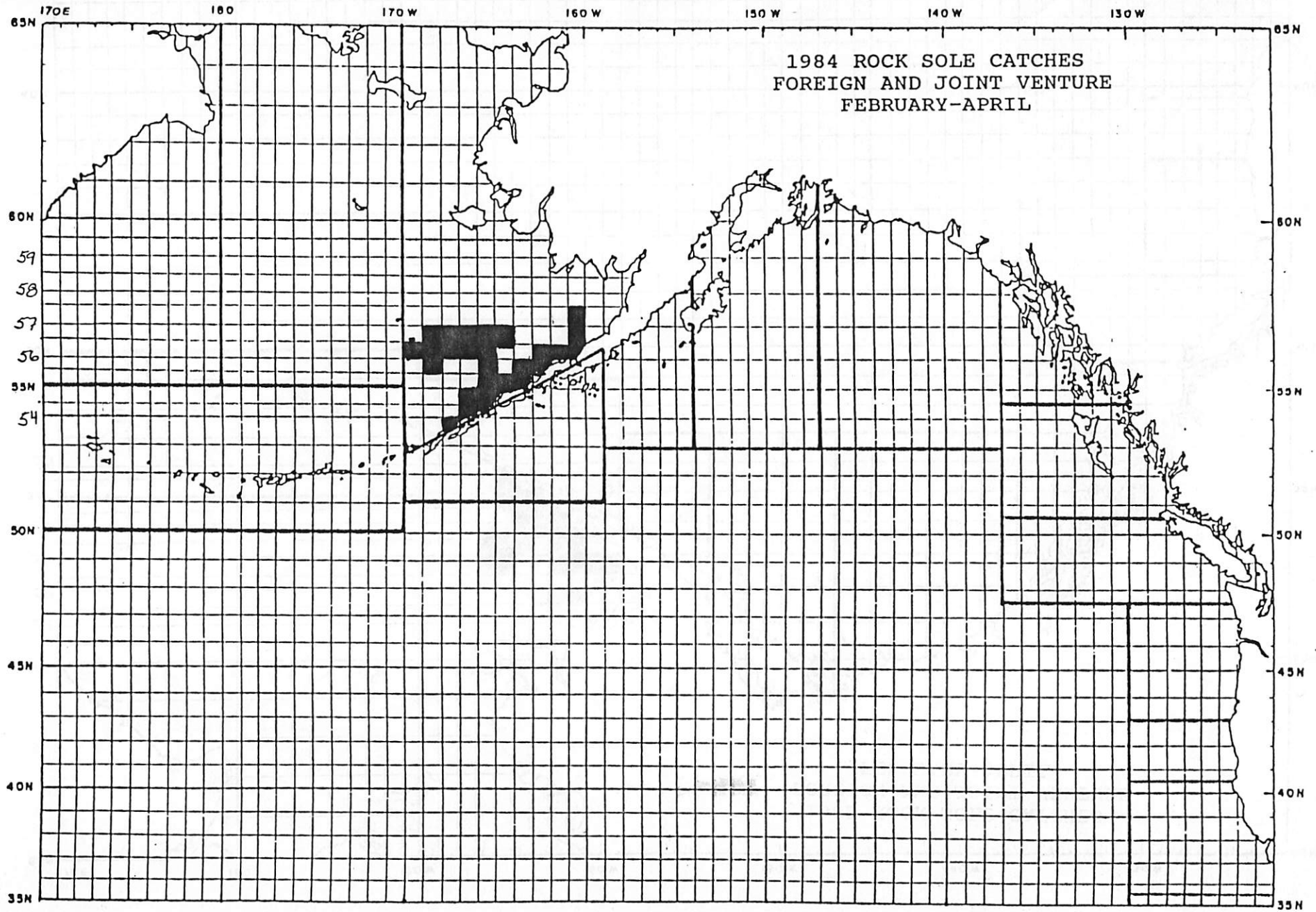

Figure 7.-- Geographical location of foreign and joint venture rock sole catches during February-April 1984 when observers were present.

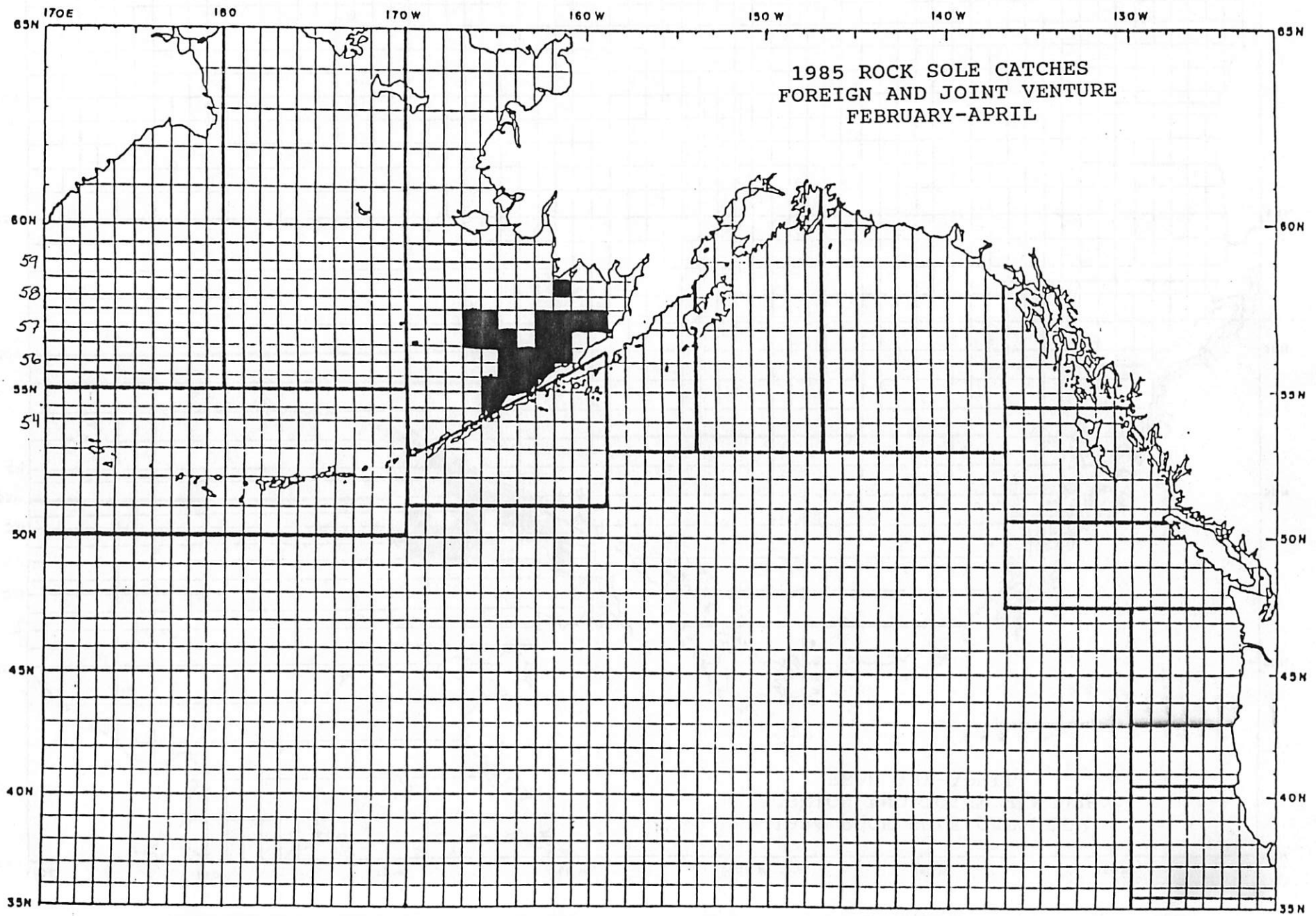

Figure 8.-- Geographical location of foreign and joint venture rock sole catches during February-April 1985 when observers were present.

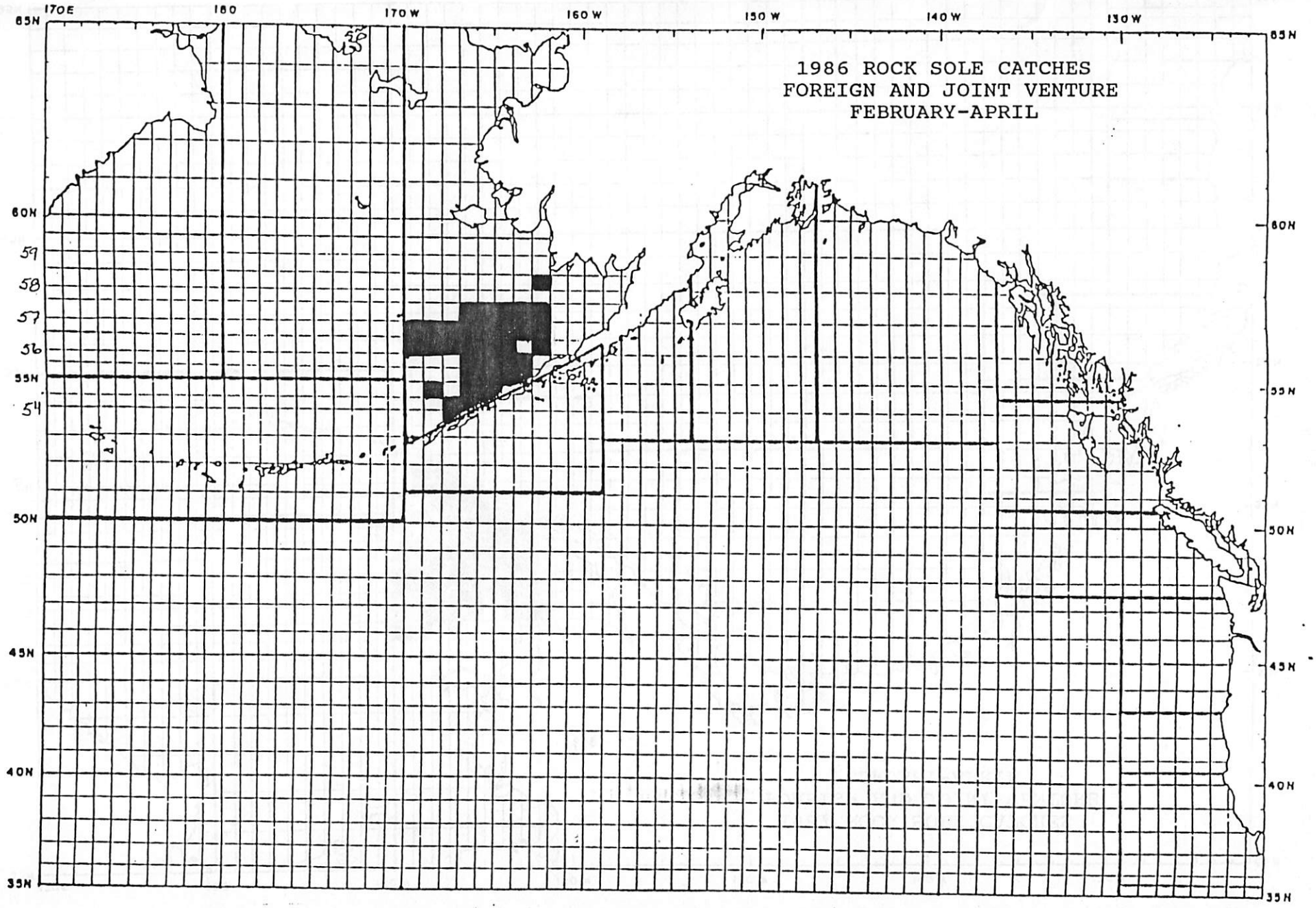

Figure 9.-- Geographical location of foreign and joint venture rock sole catches during February-April 1986 when observers were present.

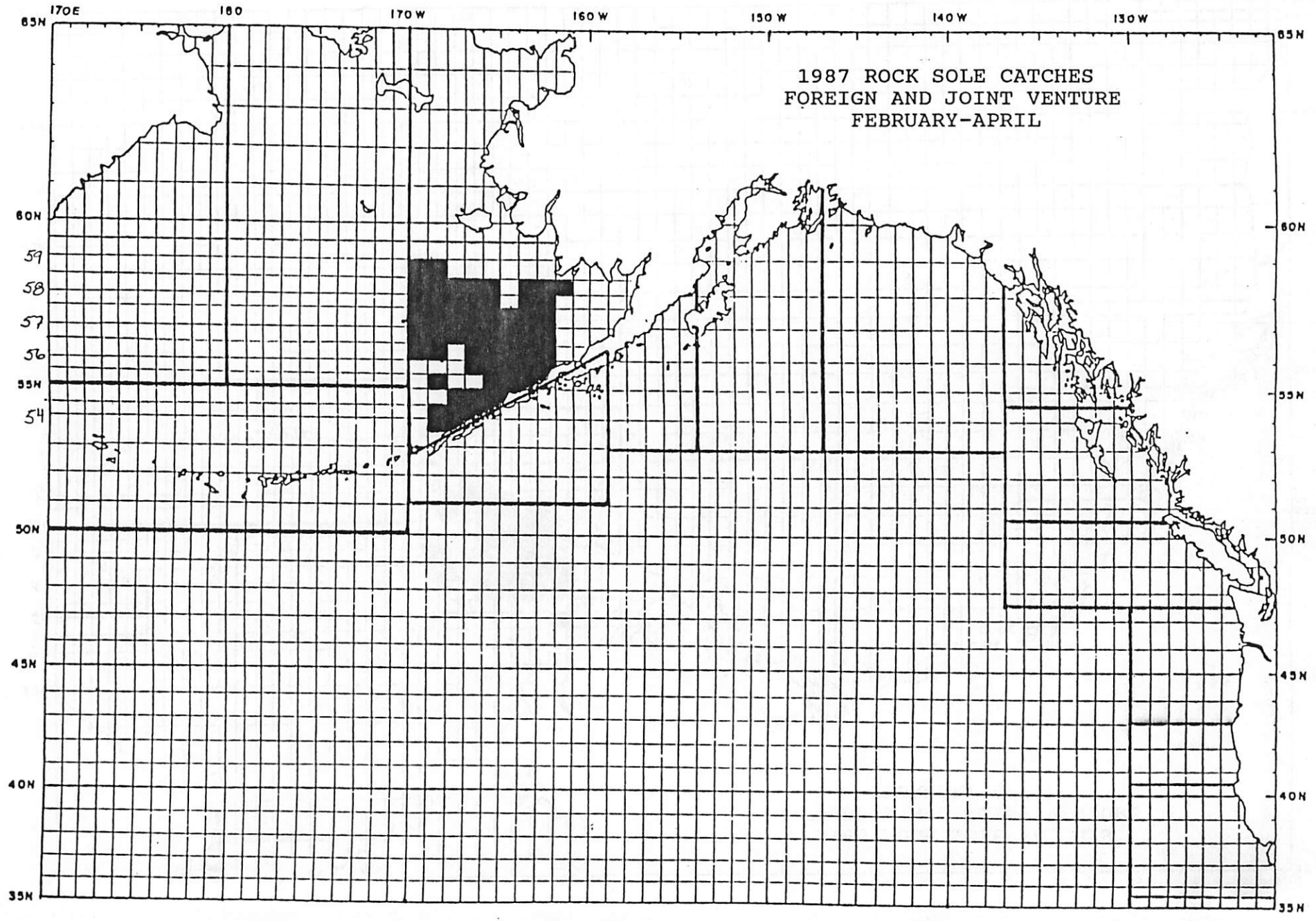

Figure 10.-- Geographical location of foreign and joint venture rock sole catches during February-April 1987 when observers were present.

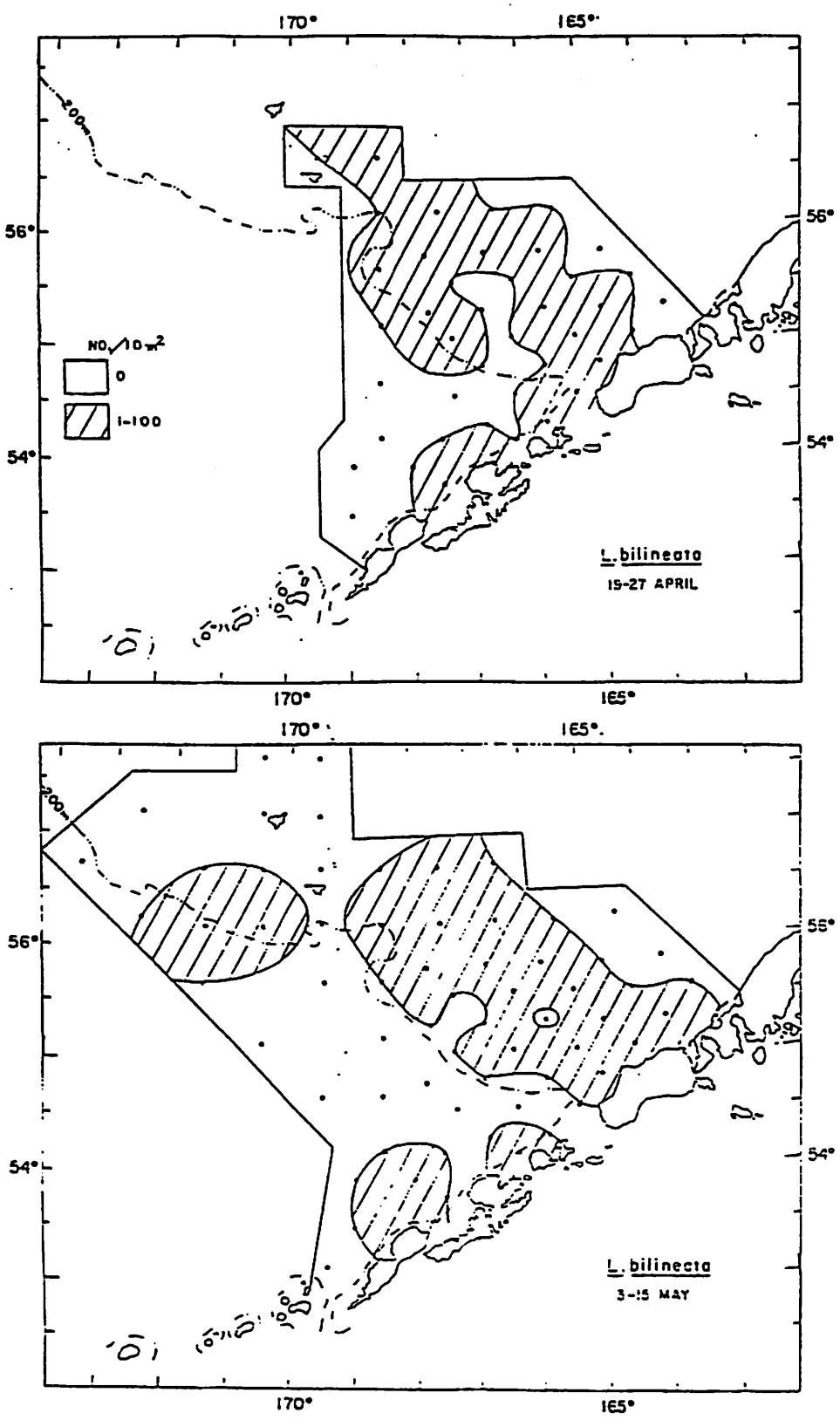

Figure 11.-- Distribution and relative abundance of rock sole larvae in the southeastern Bering Sea, 16 April-15 May 1977. (Miller Freeman cruise MF-77B).

7.0 UPPER LIMIT TO THE OPTIMUM YIELD (OY) RANGE

Description and assessment of this amendment proposal are presented in a separate supplemental environmental impact statement/regulatory impact review/initial regulatory flexibility analysis (SEIS/RIR/IRFA).

8.0 EFFECTS ON ENDANGERED SPECIES AND THE ALASKA COASTAL ZONE

None of the alternatives would constitute actions the "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 each of the alternatives would be conducted in a manner consistent, to the maximum extent practicable, with the Alaska Coastal Management Program within the meaning of Section 307(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

9.0 OTHER EXECUTIVE ORDER 12291 REQUIREMENTS

Executive Order 12291 requires that the following three issues be considered:

(a) Will the amendment have an annual effect on the economy of $100 million or more?

(b) Will the amendment lead to an increase in the costs or prices for consumers, individual industries, Federal, State, or local government agencies or geographic regions?

(c) Will the amendment have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S. based enterprises to compete with foreign enterprises in domestic or export markets?

Regulations do impose costs and cause redistribution of costs and benefits. If the proposed regulations are implemented to the extent anticipated, these costs are not expected to significant relative to total operational costs.

These amendments should not have an annual effect of $100 million, since although the total value of the domestic catch of all groundfish species is over $100 million, these amendments are not expected to substantially alter the amount or distribution of this catch.

The amendments will not have significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S. based enterprises to compete with foreign enterprises in domestic or export markets.

These amendments should not lead to a substantial increase in the price paid by consumers, local governments, or geographic regions since no significant quantity changes are expected in the groundfish markets. Where more enforcement and management effort are required, costs to state and federal fishery management agencies will increase somewhat.

10.0 IMPACTS RELATIVE TO THE REGULATORY FLEXIBILITY ACT

The Regulatory Flexibility Act (RFA) requires that impacts of regulatory measures imposed on small entities (i.e., small businesses, small organizations, and small governmental juridictions with limited resources) be examined to determine whether a substantial number of such small entities will be significantly impacted by the measures. Fishing vessels are considered to be small businesses. A total of 1,421 vessels may fish for groundfish off Alaska in 1988, based on Federal groundfish permits issued by NMFS through March 12, 1988. In addition, 3893 U.S. vessels landed Pacific halibut in 1987. While these numbers of vessels are considered substantial, regulatory measures may only affect a small proportion of them.

[to be continued]

11.0 FINDINGS OF NO SIGNIFICANT IMPACT

For the reasons discussed above, neither implementation of the status quo nor any of the alternatives would significantly affect the quality of the human environment, and the preparation of an environmental impact statement on the final action is not required by Section 102(2)(c) of the National Environmental Policy Act or its implementing regulations.

_____ _____

Assistant Administrator for Fisheries Date

12.0 COORDINATION WITH OTHERS

The Bering Sea/Aleutian Islands Groundfish Plan Team consulted with representatives of the Alaska Department of Fish and Game, National Marine Fisheries Service, members of the Scientific and Statistical Committee and Advisory Panel of the Council, and members of the academic and fishing community.

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14.0 CHANGES TO THE FMP [not complete]

14.1 Summary

Amendment 12 was approved by the Council at its _____ meeting. The amendment makes the following changes to the FMP:

14.2 Changes to Relevant Sections of the FMP

14.2.1 Amendment 12 Summary

In Chapter 2.0, Section 2.1 entitled "History and Summary of Amendments," page 2-2, add the date _____ after Amendment 11.

Also add to the summary, page 2-4:

> Amendment 12 on _____, 1988:
>
> (1) Established ...

14.2.2 Bycatch Controls

14.2.3 Federal Permit Requirement

In Chapter 14, Section 14.4.1 entitled "Permit Requirement," replace the existing sentence with the following:

> "All U.S. vessels that are fishing in the Bering Sea or Aleutian Islands sub management areas or are receiving fish from the Bering Sea or Aleutian Islands sub management area must have a current fishing permit issued annually by the Secretary of Commerce. Information required when applying for a Federal fishing permit is contained in 50 CFR 675.4 of domestic regulations implementing the FMP."

14.2.4 Non-Retainable Groundfish Catch Limits

14.2.5 Resource Assessment Document Deadline

In Chapter 11, page 11-3, remove the phrase "by July 1" from the first sentence in the section entitled "Biological condition of the stocks."

14.2.6 Roe-bearing Rock Sole Prohibition

14.2.7 Upper Limit to the Optimum Yield (OY) Range

This proposal, and accompanying changes to the FMP, are presented in a supplemental environmental impact statement.

15.0 CHANGES TO THE REGULATIONS [not complete]

15.1 Summary

The following draft regulations would implement the preferred amendment alternatives approved by the North Pacific Fishery Management Council on _____ for Amendment 12 to the FMP for Bering Sea/Aleutian Islands groundfish. Final approval by the Secretary of Commerce would change current federal regulations implementing the FMP under 50 CFR 611 and 675 as indicated. After the Secretary receives the Council's approved FMP amendment, analysis and draft proposed implementing regulations, the regulations will be published in the Federal Register as proposed rules with public comment invited. Pending Secretarial approval and after changes are made due to public comments, the proposed rules will be republished as final rules.

15.2 Changes to Relevant Regulations

15.2.1 Bycatch Controls

15.2.2 Federal Permit Requirements

15.2.3 Non-Retainable Groundfish Catch Limits

15.2.4 Resource Assessment Document Deadline

No changes to the regulations are required for this FMP amendment.

15.2.5 Roe-bearing Rock Sole/JVP Prohibition

15.2.6 Upper Limit to the Optimum Yield (OY) Range

This proposal, and accompanying regulations, are presented in a supplemental environmental impact statement.