MEMORANDUM

TO: Council, SSC and AP Members

FROM: Clarence G. Pautzke
Executive Director

DATE: November 29, 1990

SUBJECT: Bering Sea/Aleutian Islands Groundfish Fishery Management Plan

ACTION REQUIRED

(a) Review final Stock Assessment and Fishery Evaluation (SAFE) report and set 1991 ABCs.

(b) Set groundfish TACs and apportionments to DAP, JVP, and TALFF for 1991.
Determine allowances of the pollock TAC to roe and non-roe seasons for 1991.
Set JVP PSCs for fully U.S.-utilized groundfish species for 1991.
Determine allowances of pollock TAC between bottom and midwater trawl gear.
Consider emergency action request to seasonally apportion the Pacific cod TAC and to synchronize all BSAI trawl fisheries with the opening of the BSAI roe pollock season.

BACKGROUND

SAFE and 1991 ABCs. The Plan Team met November 13-16 in Seattle to prepare the final SAFE report for 1991. An abridged summary of the document is provided as item D-3(a-b)(1). The entire document was sent to you on November 23. It incorporates 1990 survey data and analyses, consequently it is substantially different from September's preliminary SAFE. Changes of note from last year's SAFE include an increased recommended pollock ABC and a markedly decreased recommended cod ABC. The Council needs to establish the final ABCs for each species or species group under management at this meeting. Item D-3(a-b)(2) is a spreadsheet to help with setting ABCs.

TACs and Apportionments. Based upon the ABCs and other environmental and socioeconomic factors, the Council needs to set total allowable catches (TACs), and apportionments to domestic, joint venture and foreign fisheries for each target species or species group under management in the Bering Sea/Aleutian Islands. The DAP requests from the NMFS survey of processors will be distributed at the meeting. There were no foreign fisheries requests this year. I assume JVP will be whatever is left after DAP is subtracted from the 2 million metric ton OY cap.

The Council's preliminary specifications from September are attached as item D-3(a-b)(3). Under Amendment 16 to the BSAI FMP, 25% of the Council's preliminary specifications will carry over into 1991 until superseded by publication of the final specifications. The sum of the Council's final TACs must fall within the OY range of 1.4 to 2.0 million metric tons.

Seasonal Pollock TAC. Amendment 14 to the BSAI Groundfish FMP authorizes the Council to establish seasonal allowances of the pollock TAC between roe (January 1 - April 15) and non-roe (June 1 - December 31) seasons. At its September meeting, the Council made preliminary specifications of 25% of the pollock TAC to be available during the roe season, and 75% during the non-roe season. In making this preliminary specification, however, the Council noticed the public that it would consider other splits including, but not limited to, 40:60 and 60:40.

Amendment 14 requires the Council to consider the following nine factors in deciding upon seasonal allowances:

1. Estimated monthly pollock catch and effort in prior years.

2. Expected changes in harvesting and processing capacity and associated pollock catch.

3. Current estimates of and expected changes in pollock biomass and stock conditions, conditions of marine mammal stocks, and biomass and stock conditions of species taken as bycatch in directed pollock fisheries.

4. Potential impacts of expected seasonal fishing for pollock on pollock stocks, marine mammals, and stocks of species taken as bycatch in the directed pollock fisheries.

5. The need to obtain fishery-related data during all or part of the year.

6. Effects on operating costs and gross revenues.

7. The need to spread fishing effort over the year, minimize gear conflicts, and allow participation by various elements of the groundfish fleet and other fisheries.

8. Potential allocative effects among users and indirect effects on coastal communities.

9. Other biological and socioeconomic information that effects the consistency of seasonal pollock harvests with the goals and objectives of the FMP.

The Plan Team report on seasonal allowances comprises Appendix B to the SAFE report. Item D-3(a-b)(4) has pages 1-5 of that appendix.

Bycatch of Fully-DAP Groundfish Species. JVP fisheries for flatfish will take bycatches of groundfish species that are fully utilized. The following table shows bycatch rates for other species in the 1990 joint venture yellowfin sole and other flatfish fisheries. At this meeting staff will be able to calculate the anticipated bycatches if joint ventures are allowed in 1991. The Council can limit the amount of bycatch and make it retainable or non-retainable. For 1990, the Council requested the Regional Director to allocate quantities of bycatch to JVP from the non-specified reserve and allowed retention to minimize discard waste. Is that the Council's desire for 1991?

1990 JVP FISHERIES

Allocations:

Yellowfin sole: 163,753 mt; Other flatfish: 40,927 mt

Bycatch Species	Anticipated 1990 Bycatch Rate (mt/mt YFS)	Bycatch Allocation (mt)	Actual 1990 Bycatch Rate (mt/mt YFS)
Pollock	0.1371	22,451	0.321
P. cod	0.0429	7,025	0.116
G. turbot	tr.	0	tr.
Arrowtooth	0.0002	33	0.0094
Rock sole	0.0999	16,359	0.151
Sablefish	tr.	0	0
Other species	0.0112	1,834	0.047

Pollock Allocation to Midwater Trawls. Amendment 16a, approved by the Council in September 1990, authorizes the Regional Director, in consultation with the Council, to set a limit on the proportion of the pollock TACs that may be taken with other than pelagic trawl gear. Normally pelagic gear takes 75% of the pollock TAC. The amendment will be submitted to Secretarial review in January and implemented by June. If the Council wishes to establish gear allocations for pollock in 1991, it should make a recommendation to NMFS which can be incorporated into the Notice of Proposed Rulemaking and sent out for public comment. The record supporting such a recommendation should address:

(a) PSC limits
(b) projected prohibited species bycatch levels with and without a limit on the amount of pollock that may be taken with other than pelagic trawl gear;
(c) the cost of the limit on the bottom-trawl and pelagic trawl fisheries; and
(d) other factors that determine the effects of the limit on the attainment of FMP goals and objectives.

The analysis presented for Amendment 16a in September provided our most current information concerning the impacts of pollock gear allocations. Item D-3(a-b)(5) is an excerpt from that analysis. To it is attached a table with bycatch model runs. Runs 9 and 13 most closely depict the Council's final action on 16a.

Mid-year implementation of the amendment can meet the Council's intent assuming that (1) all directed pollock fishing during the roe season is taken with midwater gear, and (2) directed bottom trawl fishing for pollock starts only after the June 1 opening of the non-roe pollock season.

Emergency Requests

The Council received the petition under item D-3(a-b)(6) requesting emergency action to (1) seasonally apportion Pacific cod TAC, (2) seasonally apportion halibut PSC, and (3) synchronize the opening of BSAI trawl fisheries, that otherwise would open January 1, with the start of the pollock roe season.

Seasonal Cod Allocation. During the November 15 teleconference, the Council agreed to consider a seasonal apportionment of cod at the December meeting. The petition requests 35% of the TAC in the first quarter and 25% in the second quarter. The groundfish team has not analyzed this issue.

Seasonal Halibut PSC. This is allowed already by the plan and regulations, though there is some question whether sufficient notice was given in the preliminary specifications notice in the Federal Register. This item is considered under agenda topic D-3(c).

Trawl Seasons. The Council did not approve for the December agenda, the third item in the petition concerning the opening of the trawl fisheries. However, the Council may wish to reconsider this topic because, at the teleconference, I mistakenly summarized the request as wanting to open trawl fisheries when the non-roe season started (June 1) rather than with the roe season (January 1), as requested in the petition. This whole issue will be moot, of course, if the Council takes no emergency action to delay the pollock roe season from January 1.

Stock Assessment and Fishery Evaluation Report for Groundfish Resources in the Bering Sea/Aleutian Islands Region as Projected for 1991

SUMMARY

The Stock Assessment and Fishery Evaluation (SAFE) report for groundfish fisheries of the Bering Sea/Aleutian Islands region was compiled by the North Pacific Fishery Management Council's (NPFMC) Plan Team for the groundfish fisheries of the Bering Sea/Aleutian Islands from contributions by various authors from the Alaska Fisheries Science Center, National Marine Fisheries Service. The report describes the biological status of the stocks and economic condition of the fisheries.

The SAFE report describes how the acceptable biological catches (ABCs) for each of the species are estimated. The ABC values, together with socioeconomic considerations, are to be presented to the NPFMC for determining total allowable catches (TACs) and other management strategies for the fishery.

Members of the Plan Team who compiled this SAFE document were: Loh-Lee Low (chairman), Hal Weeks (team coordinator), Jay Ginter, Phil Rigby, Greg Williams, Grant Thompson, Sam Wright, Jeremy Collie and Richard Merrick. The chapters on status of individual stocks were authored by scientists from the Alaska Fisheries Science Center, National Marine Fisheries Service.

MANAGEMENT AREAS AND SPECIES

The Bering Sea/Aleutian Islands management area lies within the 200-mile U.S. Exclusive Economic Zone (EEZ) of the United States (Fig. 1). International North Pacific Fisheries Commission (INPFC) statistical areas 1 and 2 make up the EBS. The Aleutian region is INPFC area 5.

Four categories of finfishes and invertebrates have been designated for management purposes (Table 1). They are (a) prohibited species, (b) target species, (c) other species, and (d) non-specified species. This SAFE document describes the status of the stocks in categories (b) and (c) only.

HISTORICAL CATCH STATISTICS

Catch statistics since 1954 are shown for the eastern Bering Sea (EBS) subarea in Table 2. The initial target species was yellowfin sole. During the early period of these fisheries, total catches of groundfish reached a peak of 674,000 metric tons (mt) in 1961. Following a decline in abundance of yellowfin sole, other species were targeted upon, principally pollock, and total catches rose to 2.2 million mt in 1972. Catches have since varied from 1.2 to 1.9 million mt as catch restrictions and other management measures were placed on the fishery.

Catches in the Aleutian region have always been much smaller than those in the EBS and target species have been different (Table 3).

Pacific ocean perch (POP) was the initial target species and during the early years of exploitation overall catches of groundfish reached a peak of 112,000 mt in 1965. With a decline in abundance of POP, the fishery diversified to other species. Total catches in recent years have been about 100,000 mt annually.

RECENT TOTAL ALLOWABLE CATCH

Amendment 1 to the Bering Sea/Aleutian Islands groundfish FMP provides the framework to manage the groundfish resources as a complex. The MSY of this complex was originally estimated at 1.8 to 2.4 million mt. The optimum yield (OY) was set at 85% of the MSY range, or 1.4 to 2.0 million mt.

Total allowable catches (TAC) established by the NPFMC since implementation of extended jurisdiction under the Magnuson Fishery Conservation and Management Act in 1977 are given in Table 4. The sum of TACs equals OY for the groundfish complex, which is currently constrained to a range of 1.4 to 2.0 million mt by its Fishery Management Plan (FMP). Optimum yield for all species combined increased steadily from 1.4 million mt in 1977 to 2.0 million mt in 1984-89.

ACCEPTABLE BIOLOGICAL CATCH LEVELS FOR 1991

The estimates of ABC are based upon status of stock assessments described in individual species chapters of this report. The Plan Team received technical presentations by the chapter authors and, in some cases, may deviate from the author's views and, estimates of ABC. Tables 6-8 provide a summary of the Team's estimates of stock conditions.

The sum of individual species MSYs has been estimated to be in excess of 2.71 million mt.

The sum of ABC's for the groundfish complex has been estimated to be 2,908,400 mt for 1991, about the same as 2,938,500 mt in 1990. Increases in ABCs have been determined for pollock (+157,500 mt), arrowtooth flounder (+9,900 mt), rock sole (+30,200 mt), and other flatfish (+31,700 mt). A major decrease was detected for Pacific cod (-188,000 mt). Other declines were detected for yellowfin sole (-28,300 mt), sablefish (-900 mt), Pacific ocean perch (-9,100 mt), Other rockfish (-100 mt), squid (-6,200 mt), and other species (-26,800 mt).

In general, condition of stocks have remained relatively good and high, except for Greenland turbot which remained low due to prolonged low recruitment. The Pacific cod resource is still relatively high despite a large decline in abundance from 1989 to 1990.

Descriptions of the status of the stocks follows:

Walleye Pollock:

EBS	1990 ABC = 1,450,000 mt	1991 ABC = 1,676,000 mt
Aleutians	1990 ABC = 153,600 mt	1991 ABC = 85,100 mt

EBS Projected 1991 exploitable biomass = 6,667,146 mt
Aleutians Projected 1991 exploitable biomass = 340,407 mt

Pollock abundance in the EBS was estimated with two age-structured methods, cohort analysis and CAGEAN, with data up to and including the 1989 catch-at-age and 1988 combined hydroacoustic and bottom trawl survey. Cohort analysis indicates a minor decrease in abundance while the CAGEAN results indicate a sharp drop in biomass since the peak value in 1985. The confidence interval around the 1989 CAGEAN estimate overlaps the cohort analysis and trawl survey biomass estimates. The cohort analysis biomass estimates were chosen over CAGEAN because the cohort analysis uses more age-specific information from the surveys than does CAGEAN.

Current abundance is above B_{MSY}(5.9 million mt). The strong 1982 and 1984 year-classes now contribute substantially to the fishery. Recruitment of age-three pollock in 1990-1992 is projected to be slightly below the median of the past decade. The ABC for this stock was computed with an exploitation rate corresponding to $F_{0.1}$=0.31 which is close to F_{MSY}=0.335obtained by Quinn and Collie. Application of this fishing mortality rate gives a 1991 EBS ABC of 1,676,000 mt. The ABC is greater than in 1990 because 1991 projected biomass is higher than the value projected for 1990 in 1989. Exploitation at the $F_{0.1}$ rate when abundance is greater than B_{msy} does not violate the Council's overfishing definition.

The Aleutian Islands pollock stock has not been surveyed since 1986, when the exploitable biomass was 524,074 mt. Biomass in 1991 was projected by assuming that the proportional decline in abundance since 1986 in the Aleutians was the same as in the EBS (0.77 x 1986 biomass = 340,407 mt). Application of a catch to biomass ratio of 0.25 yielded an ABC of 85,102 for the Aleutian stock. This is lower than the 1990 ABC because a different approach was used to estimate exploitable biomass.

Pollock taken near Bogoslof Island have a consistently different age composition and slower growth rates compared with the EBS stock. A hydroacoustic survey in the winter of 1989 estimated the abundance of Bogoslof pollock to be 2.1 million mt. Projecting this biomass to 1991 and applying u=0.25 resulted in a 1991 ABC of 286,000 mt for the Bogoslof fishery. In setting a Bogoslof ABC, the Plan Team is recognizing the distinctness of the Bogoslof pollock. However, it is likely that these pollock are also caught outside the U.S. EEZ and that the entire Bogoslof ABC may be caught in international waters. Therefore the Plan Team does not recommend that the Bogoslof ABC be added to the EBS ABC for the purpose of determining the EBS TAC. The Plan Team also recognizes that progeny of pollock spawning in the Bogoslof area may contribute to the EBS stock.

Large catches continue to be removed from the international zone of the Aleutian Basin (donut hole). The 1988 catch of 1.5 million mt exceeded the catch from the U.S. EEZ. Data collected to date suggest that donut-hole pollock are connected through spawning and recruitment processes to pollock on the surrounding continental shelves. It is conceivable that future pollock ABCs in the U.S. EEZ may need to be adjusted for catches taken elsewhere.

Pacific Cod:

EBS and
Aleutians 1990 ABC = 417,000 mt 1991 ABC = 229,000 mt

EBS and
Aleutians Projected 1991 exploitable biomass = 1,030,000 mt

Pacific cod in the eastern Bering Sea (EBS) and Aleutian Islands are managed are a unit, although nearly all of the assessment research focuses on the EBS portion of the stock. Annual trawl surveys indicate that the biomass of Pacific cod in the EBS remained high and stable throughout the 1980s. However, the 1990 survey showed a 26% drop in biomass relative to 1989. The chapter author expresses concern over this decline and the poor recruitment observed during the past two years, noting that the stock's dynamics may be entering a new phase defined by different environmental conditions or ecological relationships.

The stock assessment model used to calculate ABC for Pacific cod was retuned this year, incorporating survey and catch data from 1988, 1989, and 1990, as well as a greatly expanded supply of age data. This resulted in new estimates for all parameters in the model (except natural mortality), and led to a reduction in F_{MSY} from 0.182 to 0.156. Because it is tuned in part to the survey results, the model showed a decline in biomass between 1989 and 1990. However, the decline indicated by the model was smaller than that indicated by the survey (14% vs. 26%, respectively).

The EBS cod model calculates ABC by applying the target exploitation rate (in this case the F_{MSY} rate) to projected biomass through a complex schedule of age- and time-dependent fishing mortality rates. This procedure produces a 1991 ABC of 204,000 mt for the EBS portion of the stock, which can be scaled upward by a factor of 1.124 to give a 1991 ABC of 229,000 t for the EBS and Aleutian Islands combined.

Because model projections indicate that the EBS portion of the stock will be above B_{MSY} at the start of 1991 [B_{1991} = 916,000 mt vs. B_{MSY} = 824,000 mt], exploiting the stock at the F_{MSY} rate does not violate the Council's overfishing definition.

Yellowfin Sole:

1990 ABC = 278,900 mt 1991 ABC = 250,600 mt
Projected 1991 exploitable biomass = 1,790,000 mt

Exploitable biomass was calculated from cohort analysis and is high and stable. Biomass is also estimated from research surveys, but has been variable since 1982 because of changes in trawl gear and net calibration. ABC was calculated using an $F_{0.1}$ exploitation rate. While 1991 exploitable biomass increased approximately 9% over 1990, the recommended ABC decreased due to a change in the exploitation rate associated with the $F_{0.1}$ harvest strategy (0.14 vs. 0.17).

The recommended fishing mortality rate of $F_{0.1}$ is less than the rate that would reduce the biomass-per-recruit ratio to 30% of its

pristine value (F=0.17); therefore the recommended ABC is consistent with the Council's overfishing definition.

Greenland Turbot:

1990 ABC = 7,000 mt 1991 ABC = 7,000 mt
Projected 1991 exploitable biomass = 325,552 mt

Continuous poor recruitment has been observed throughout the 1980s which indicates that biomass of the adult population is expected to decline well into the 1990s. Forecasts for a number of conservative fishing strategies, including no fishing, all show projected declines in biomass through at least 1996. No threshold level has been determined for this species. We are unable to develop any justification for a major directed fishery on Greenland turbot at this time.

The ABC should be set at a level approximating its low actual catch levels in recent years. This will allow any incidental catches to be retained and thus prevent wastage. It will also preclude development of any new effort directed at this resource in its currently depressed state. An ABC estimated from the $F_{0.1}$ exploitation strategy (20,600 mt) was considered and reduced because of concerns for continued low levels of recruitment. The exploitable biomass is less than the MSY biomass (384,628 mt). Consequently, an upper limit on ABC is imposed by the Council's overfishing definition at $F = [(325,552/384,628) \times F_{MSY}] = 0.846 \times 0.08 = 0.068$. The fishing mortality rate corresponding to the recommended ABC is substantially lower than this limit.

Arrowtooth Flounder:

1990 ABC = 106,500 mt 1991 ABC = 116,400 mt
Projected 1991 exploitable biomass = 590,400 mt

The resource is in excellent condition. The biomass continues to be high and increasing. This trend has been confirmed from the 1990 and earlier summer trawl surveys.

Given the present high level of abundance and lacking a stock-recruitment relationship for this stock, an $F_{0.1}$ harvest strategy ($F_{0.1} = 0.18$) was used to recommend the 1991 ABC at 116,400 mt. B_{MSY} and F_{MSY} are unknown. Therefore, the upper limit on ABC is imposed by a fishing strategy which would reduce the spawning biomass per recruit to [illegible] of its pristine value. This fishing mortality rate is 0.25.

For purposes of this review, Kamchatka flounder is included as part of arrowtooth flounder. Historically, these two species have not been distinguished in the catch data. This combination of species as arrowtooth flounder has no significant effect on biomass estimates since Kamchatka flounder is a minor component of the combined species' population.

Rock Sole:

1990 ABC = 216,300 mt 1991 ABC = 246,500 mt
Projected 1991 exploitable biomass = 1,363,700 mt

Rock sole was separated from "other flatfish" in 1987 for management purposes. Trawl survey results indicate that the biomass of rock sole is high and stable. Because of uncertainties in annual point estimates, the estimated exploitable biomass is the mean of the 1989 and 1990 survey estimates. The MSY exploitation rate is applied to calculate ABC. The increase in ABC from 1990 reflects the increase in biomass. Because the exploitable biomass is well in excess of B_{MSY}, the F_{MSY} fishing exploitation strategy is consistent with the Council's overfishing definition.

Other Flatfish:

1990 ABC = 188,000 mt 1991 ABC = 219,700 mt
Projected 1991 exploitable biomass = 1,223,000 mt

Exploitable biomass is high and stable. Fishing mortality rates at F_{MSY} have not been calculated for other flatfish, so the rock sole rate is used. To smooth out the variability in biomass estimates, the mean of the 1989 and 1990 survey values is used as the estimate of exploitable biomass.

The Team believes that a good estimate of B_{MSY} does not exist for this complex. The maximum fishing mortality rate allowable under the Council's overfishing definition is 0.23 (based on parameters given for male Alaska plaice), which reduces the biomass-per-recruit ratio to 30% of its pristine value. The fishing mortality rates recommended for this complex (0.159 for flathead sole, 0.176 for all other species) are below this limit.

Sablefish:

EBS	1990 = 2,700 mt	1991 ABC = 3,100 mt
Aleutians	1990 = 4,500 mt	1991 ABC = 3,200 mt

EBS	Projected 1991 exploitable biomass = 26,400 mt
Aleutians	Projected 1991 exploitable biomass = 27,700 mt

Catches in 1989 were 1,252 mt in the EBS and 3,248 mt in the Aleutians, well below the average 11,700 mt harvested from the EBS in the 1960s. The 1990 longline survey indicates substantial decreases in relative abundance in both the EBS and Aleutians. These decreases are not entirely attributed to mortality; migration may also affect relative abundance indices. Absolute biomass was calculated by calibrating the relative abundance trends to trawl survey biomass estimates. A single calibration factor was adopted for the EBS, Aleutian and Gulf of Alaska.

No strong recruitment has been detected since the very strong 1977 year class. Stock reduction analysis was applied to catch data from 1979-1990. Because migration occurs between the Gulf of Alaska, Bering Sea, and Aleutian Islands, the three regions were combined into one analysis. Maximum sustainable yield was estimated with the delay-difference equation and an assumed average constant recruitment of 33,656 mt. The results suggest that MSY occurs at only 15% of pristine biomass because recruitment was not assumed to decrease at low abundance.

Recognizing that the stock-recruitment relationship is poorly defined for sablefish, the Plan Team decided that B_{MSY} is

inestimable with the current model. Without a reliable B_{MSY} estimate, ABC is constrained by the fishing mortality rate that would reduce spawning biomass per recruit to 30% of its pristine value. This fishing mortality rate is 0.175.

Because MSY estimates are uncertain, ABC was calculated by applying the $F_{0.1}$ mortality rate to the 1991 projected biomass for each area. Exploitation at the $F_{0.1}$ rate is below the overfishing reference value of 0.175. The 1990 EBS ABC was calculated with a more conservative calibration factor than the 1991 value, which explains why the 1991 ABC is higher despite the decline in relative abundance. In the Aleutians, the 1991 ABC is lower than the previous year, reflecting the decline in relative abundance observed in the longline survey.

Pacific Ocean Perch (Complex)

EBS	1990 ABC = 6,300 mt	1991 ABC = 3,800 mt
Aleutians	1990 ABC = 16,600 mt	1991 ABC = 10,000 mt

EBS	Projected 1991 exploitable biomass = 127,900 mt
Aleutians	Projected 1991 exploitable biomass = 334,100 mt

The Pacific ocean perch (POP) complex consists of true POP (Sebastes alutus) and four other red rockfish species (northern rockfish, rougheye rockfish, shortraker rockfish, and sharpchin rockfish). The complex is managed as two separate stocks--the eastern Bering Sea (EBS) stock and the Aleutian Islands stock. The stock assessment has been based mainly on S. alutus, which has the most data and is the most abundant species in the complex.

Model results (cohort analysis, virtual population analysis, and stock reduction analysis) indicate that the S. alutus stocks in both areas underwent sharp declines in abundance due to intensive fisheries during the 1960s. The decline has been estimated to be 60-99% for the EBS stock from 1963 to 1979, and 77-98% for the Aleutian stock from 1964 to 1979. Abundance remained low through the early 1980s.

In recent years, the Council has often set TAC well below (normally at 50% of) ABC to promote rebuilding of the stocks. Through a combination of these management actions and improved recruitment, the stocks have been recovering slowly. Stock reduction analysis indicates that the biomass of S. alutus in each area has recovered to a level above B_{MSY}. For the EBS stock, B_{MSY}= 80,664 mt and B(1990) = [illegible],447 mt. For the Aleutian stock, B_{MSY}= 182,108 mt and B(1990) = [illegible],497 mt.

For the EBS POP complex, ABC was estimated initially at 7,700 mt (5,500 mt for S. alutus and 2,200 mt for the other four species). For the Aleutian Islands POP complex, ABC was estimated initially at 20,000 mt (12,900 mt for POP and 7,100 mt for the other four species). However, the Team agrees with the chapter author that these amounts should be reduced by 50% to guard against excessive catches of rougheye and shortraker rockfish. Recent information from the domestic observer program confirms that the fishing fleet tends to target on rougheye and shortraker rockfish, which command higher prices than the other species in the complex. The 50% figure is based on last year's Council action to reduce ABC for

Gulf slope rockfish by 50% in order to protect minor components of that complex.

The recommended ABCs are consistent with the Council's overfishing definition. The current exploitable biomass for S. alutus (the dominant member of the complex) is greater than B_{MSY} and the recommended ABCs represent a fishing mortality rate that is roughly half of the F_{MSY} rate.

The Team suggests that it may be appropriate to consider splitting the POP complex at a future date. Such action might help to prevent disproportionate harvest of shortraker and rougheye rockfish and permit full exploitation of S. alutus. Retaining the present POP complex requires the Council to reduce the allowable harvest of S. alutus in order to protect less abundant minor stock components or risk overharvest of those components in order to allow full exploitation of S. alutus. On the other hand, splitting the complex could lead to additional problems, such as the creation of new bycatch constraints.

Finally, the Team notes that rockfish are notoriously difficult to assess using standard trawl survey methodology. The Team would like to encourage further research into improved methods for survey assessment of rockfish species.

Other Rockfish Complex:

EBS	1990 ABC = 500 mt	1991 ABC = 500 mt
Aleutians	1990 ABC = 1,100 mt	1991 ABC = 1,000 mt

EBS	Projected 1991 exploitable biomass = 8,000 mt
Aleutians	Projected 1991 exploitable biomass = 18,500 mt

The "other rockfish" complex includes both of the thornyhead (Sebastolobus) species and all Sebastes species not included in the Pacific ocean perch complex. U.S. observers have identified 15 confirmed species within this complex, and another 14 species have been tentatively identified. The complex is managed as two separate stocks, one in the eastern Bering Sea (EBS) and one in the Aleutian Islands.

Little is known about the species in this complex. Commercial catch and effort data are of little use in examining abundance trends for these species since most of the catch is probably incidental. Because biomass estimates are derived from the cooperative shelf/slope trawl surveys in the EBS (the last of which was conducted in 1988) and trawl surveys in the Aleutian Islands (the last of which was conducted in 1986), no new biomass estimates are available for the present assessment.

With no new information available, the chapter author recommended setting the ABCs equal to last year's levels. However, since estimates of biological parameters are lacking for this complex, the Council's overfishing definition requires that ABC not exceed the average catch observed since implementation of the MFCMA (594 mt for the EBS and 1,048 mt for the Aleutian Islands). Therefore the Team recommends setting the EBS ABC at last year's level of 500 mt and reducing the Aleutian Islands ABC to 1,000 mt.

Atka Mackerel:

1990 ABC = 24,000 mt 1991 ABC = 24,000 mt
Projected 1991 exploitable biomass = unknown

The status of Atka mackerel is difficult to assess for three reasons: 1) the stock tends to occur in localized concentrations, making survey estimates higher variable; 2) surveys that cover the stock's range in the Aleutian region were last conducted in 1986; and 3) two of the last three surveys were unable to sample shallow waters successfully. Trends in abundance cannot be inferred from survey and catch data. Since the status of this species cannot be assessed, there is no current information on which to recommend an ABC. In cases when a biomass estimate is unavailable, overfishing is defined as exceeding the average catch since implementation of the MFCMA. The average catch of Atka mackerel for the years 1978-1989 is 24,000 mt. The 1990 ABC was 24,000 mt, and the TAC was set at 21,000 mt. Catches in the range of 20,000 - 24,000 mt are probably sustainable.

Squid and Other Species:

Squid 1990 ABC = 10,000 mt 1991 ABC = 3800 mt
Projected 1991 exploitable biomass = unknown

Other Species 1990 ABC = 55,500 mt 1991 ABC = 28,700 mt
Projected 1991 exploitable biomass = 827,400 mt

In recent years, catches of squid and Other Species have represented 1% or less of the total catch of all groundfish. Biomass estimates for Other Species were derived from demersal trawl surveys. The survey data suggest that sculpins and skates constitute most of the Other Species biomass but it is recognized that the abundance of pelagic species of smelts and sharks may be substantially underestimated by demersal trawls. Increasing exploitable biomass of this category is largely attributable to the substantially increased biomass of skates. Survey abundance for squid are unavailable because squid are mainly pelagic over deep water.

Due to insufficient data, MSY for squid and Other Species is unknown. The Council's overfishing definition caps the ABCs for squid and other species at 3,800 mt and 28,700 mt, respectively. These caps are based on average catches from 1977 - 1989.

PLAN TEAM POLICY ON ACCEPTABLE BIOLOGICAL CATCH

The Plan Team's procedure for calculating ABCs that was presented in the 1989 SAFE Document (Page 3) was modified in light of the Council's new definition for "overfishing". The Team approved the following policy regarding acceptable biological catch (ABC) at its September 1990 meeting.

1) The Teams endorse the definition of ABC contained in the 602 Guidelines, which states, "ABC is a preliminary description of the acceptable harvest (or range of harvests) for a given stock or stock complex. Its derivation focuses on the status and dynamics of the stock, environmental conditions, other ecological factors, and prevailing technological characteristics of the fishery."

2) ABC values are chosen after consulting with individual scientists responsible for conducting assessments on the various stocks. The Teams would like to make clear that these guidelines are in no way intended to constrain the assessment scientists in their efforts to apply new and innovative techniques; rather, the Teams encourage creativity in stock assessment research. In particular, the Teams would like to encourage assessment scientists to explore new methods of incorporating uncertainty, recruitment variability, and multispecies considerations into their assessments.

3) The ABC values recommended by the Plan Teams must not exceed the catch levels obtained by applying the overfishing definition selected by the Council in Amendment 21/16. Whether or not ABC is set at the limit of overfishing or at some lower value will depend on factors such as recruitment trends, multispecies interactions, and the degree of uncertainty in data or parameter estimates. The overfishing definition adopted by the Council defines a maximum fishing mortality rate that declines at low stock sizes. Because data availability varies between stocks, the definition contains some flexibility, as shown below:

a) Data available: stock-recruitment, fecundity, maturity, growth, and mortality parameters. The maximum allowable fishing mortality rate will be set at F_{MSY} for all biomass levels in excess of B_{MSY}. For lower biomass levels, the maximum allowable fishing mortality rate will vary linearly with biomass, starting from a value of zero at the origin and increasing to a value of F_{MSY} at B_{MSY}.

b) Data available: fecundity, maturity, growth, and mortality parameters. The maximum allowable fishing mortality rate will be set at the value that results in the biomass-per-recruit ratio (measured in terms of spawning biomass) falling to 30% of its pristine level.

c) Data available: growth and mortality parameters. The maximum fishing mortality rate will be set at the value that results in the biomass-per-recruit ratio (measured in terms of exploitable biomass) falling to 30% of its pristine level.

d) Data available: natural mortality rate. The maximum allowable fishing mortality rate will be set equal to the natural mortality rate.

In cases where a biomass estimate is unavailable, overfishing is defined as exceeding the average catch since implementation of the MFCMA.

MARINE MAMMAL CONSIDERATIONS

Three marine mammal species are of particular concern in the Bering Sea and Aleutian Islands - northern sea lion (Eumetopias jubatus), northern fur seals (Callorhinus ursinus), and harbor seal (Phoca vitulina). The intensity of declines in northern sea lion numbers as determined from surveys conducted in 1989 were sufficient to lead to an emergency listing on 7 April 1990 of the species as

threatened throughout its range under the Endangered Species Act (ESA). Regulatory measures instituted as part of this listing included the designation of three mile buffer zones around all major Alaskan sea lion rookeries west of 150°W longitude. This regulation effectively precluded fishing in waters near sea lion rookeries. In addition, a 11 person recovery team (including three fishing industry representatives) was established with the goal of developing a recovery plan in final form by December 1990. A final decision on the status of the species is scheduled to be available by December 1990. Northern fur seals have also declined in abundance in the last 20 years, and as a result were listed as depleted under the Marine Mammal Protection Act (MMPA) in 1988. Harbor seals, although not listed under either the ESA or MMPA, have also undergone considerable numerical declines in most of Alaska.

Aerial and ship based surveys of adult and juvenile northern sea lions were conducted in the Aleutian Islands by NMFS (Merrick et al. in press) and U.S. Fish and Wildlife Service (USF&WS unpub. data) during June and July 1990. Numbers counted in the eastern Aleutian Islands (Unimak to Umnak Islands) increased from 3,032 animals in 1989 to 3,801 in 1990 (+25%). Numbers also increased slightly in the central Aleutian Islands (Delarof to Kiska Islands) from 7,572 in 1989 to 7,988 in 1990 (+5%). However, surveys conducted by U.S. Fish and Wildlife Service personnel in the western Aleutian Islands found that sea lion numbers there had decreased by 31% in the past year, and by 64% to 85% since 1976.

Northern fur seals were surveyed in July-August 1990 at their breeding rookeries in the Bering Sea. Preliminary results (York in prep.) indicate that there have been no significant changes in numbers there over the past three years. Numbers at Bogoslof Island, the site of a newly formed breeding colony, continue to increase (Baker pers. comm.).

Harbor seals were surveyed at trend sites on the north side of the Alaska Peninsula during June 1990. These surveys indicate seal numbers there have declined 20% during the past 5 years (NMFS unpub. data).

STATUS OF PACIFIC HALIBUT STOCKS

The International Pacific Halibut Commission's report on the status of the Pacific halibut stocks is appended as Appendix A.

ECONOMIC DEVELOPMENTS IN THE FISHERIES

Landings data presented in the economic section was extracted from PacFIN on October 22, 1990. This data may differ from more recent catch data presented elsewhere in the SAFE, due to lags in processing fish tickets and the presence of discards. Caution should be used in judging reductions in harvest during 1990 because of the incomplete data. Total domestic landings of groundfish in the BSAI increased in both 1989 and 1990. Domestic landings of pollock showed the largest increase in tonnage, rising by 470,000 mt in 1989 and by more than 100,000 mt in 1990. The 1990 PacFIN estimate of BSAI landings of Pacific cod, Atka mackerel and rockfish increased by 56,000 mt, 19,500 mt, and 14,000 mt over 1988 totals. Area-wide increases in landings were observed in trawl and

longline gear groups. Shoreside and at-sea processors also benefitted from increased domestic landings.

These increases in domestic landings were obtained at the expense of substantial reductions in the joint-venture (JV) harvest of several species. From a high of over 1,000,000 mt in 1987, JV harvest of pollock in the BSAI dropped to less than 25,000 mt in 1990. JV catch of Pacific cod fell from a high of 110,000 mt in 1988 to 8,100 mt in 1990. Annual JV harvest of flatfish and Atka mackerel also fell by 230,000 mt and 20,000 mt, respectively, between 1988 and 1990.

The ex-vessel value of domestic landings (excluding the value added by at-sea processing) increased during 1989 and 1990 for trawl and longline gear groups. The trawl fishery gained the most revenue from landings of pollock, which increased in value from roughly $90 million in 1988 to more than $250 million during 1990. The percentage of BSAI domestic revenue earned from pollock rose from 62% in 1988 to 76% in 1990. Ex-vessel trawl revenues from Pacific cod rose by nearly $9 million in 1989, and held steady during 1990, while revenue from Atka mackerel rose by $5.6 million in 1989, falling slightly during 1990. The increase in ex-vessel longline revenue occurred despite a loss of over $3 million in sablefish revenue in 1989, due to lower prices and quantity landed. Balancing this loss, revenue from Pacific cod rose by $5.5 million in 1989, and an additional $12.4 million in 1990.

SEASONAL ALLOWANCES OF THE POLLOCK TAC

Amendment 14 to the BSAI Groundfish Fishery Management Plan provides for the allocation of the pollock TAC between a roe season (Jan. 1 - April 15) and non-roe season (June 1 - Dec. 31). The Plan Team's report on this topic is attached as Appendix B.

SEASONAL ALLOWANCES OF CRAB AND HALIBUT PSC APPORTIONMENTS

Amendment 16 to the BSAI Groundfish Fishery Management Plan provides for the allocation of crab and halibut bycatch apportionments on a seasonal basis. The Plan Team's report on this topic is attached as Appendix C.

Table 5 -- Bering Sea/Aleutian Islands groundfish apportionments and foreign allocations in metric tons, 1986-89.

	1987	1988	1989	1990, through October 24
ABC	2,245,780	2,876,100	2,700,700	2,938,500
TAC	2,000,000	2,000,000	2,000,000	2,000,000
DAP	336,723	708,520	1,341,387	1,733,720
JVP	1,484,110	1,282,784	656,257	257,992
Reserve	46,471	8,696	2,356	8,288
TALFF	132,696	0	0	0
Japan	101,446	0	0	0
ROK	29,900	0	0	0
West Germany	0	0	0	0
Portugal	0	0	0	0
Poland	0	0	0	0
USSR	0	0	0	0
China	1,350	0	0	0
Unallocated	0	0	0	0

Table 6. Summary of stock abundance and exploitation (F_{OF} = $F_{Overfishing}$) in relation to the biomass estimates for the eastern Bering Sea (EBS) and Aleutian Islands (AI) for 1991.

Species	Region	Exploitable Biomass (mt)	B_{MSY}	F_{OF}	Exploitation Strategy
Pollock	EBS	6,667,146	5,900,000	0.335	$F_{0.1}$=0.31
	AI	340,407			
Pacific cod		1,030,000	926,000	0.156	F_{MSY}=0.156
Yellowfin sole		1,790,000		0.17	$F_{0.1}$=0.14
Greenland turbot		325,552	384,628	0.068	F=0.02
Arrowtooth flounder		590,400		0.25	$F_{0.1}$=0.18
Rock sole		1,363,700	904,000*	0.176	F_{MSY}=0.176
Other flatfishes		1,223,000*		0.176	F_{MSY}=0.176
Sablefish	EBS	26,400		0.175	$F_{0.1}$=0.13
	AI	27,700		0.175	$F_{0.1}$=0.13
POP	EBS	127,900	80,664**	0.06	F_{MSY}=0.06
	AI	334,100	182,108**	0.06	F_{MSY}=0.06
Other rockfish	EBS	8,000		0.06	F_{MSY}=0.06
	AI	18,500		0.06	F_{MSY}=0.06
Atka mackerel		unknown			$F_{History}$
Squid		unknown			
Other species		827,400*		0.20	$F_{History}$

* Eastern Bering Sea only
** Sebastes alutus only

Table 7.--Estimates of maximum sustainable yields (MSYs) and comparisons of acceptable biological catches (ABCs) for 1989 and 1990 for groundfish in the eastern Bering Sea (EBS) and Aleutian Islands. The 1990 estimates were made in September 1989 and updated in November 1989.

Species/Region	MSY (mt)	Acceptable Biological Catch (mt)	
		1990	1991
Pollock			
EBS	1,800,000	1,450,000	1,676,000
Aleutians	98,000	153,600	85,100
Pacific cod	192,000	417,000	229,000
Yellowfin sole	155,000-284,000	278,900	250,600
Greenland turbot	27,100	7,000	7,000
Arrowtooth flounder	59,000	106,500	116,400
Rock sole	136,400-184,000	216,300	246,500
Other flatfish	148,500	188,000	219,700
Sablefish			
EBS	3,600	2,700	3,100
Aleutians	3,800	4,500	3,200
Pacific ocean perch			
EBS	6,400	6,300	3,800
Aleutians	16,000	16,600	10,000
Other rockfish			
EBS	400	500	500
Aleutians	900	1,100	1,000
Atka mackerel	unknown	24,000	24,000
Squid	unknown	10,000	3,800
Other species	62,900	55,500	28,700
Groundfish Complex	> 2,710,000	2,938,500	2,908,400

Table 8 -- Summary of stock abundance and ABC estimates for groundfish in the eastern Bering Sea (EBS) and Aleutian Islands (AI) applicable for management of the 1991 fishery.

Species/Region	Exploitable Biomass (mt)	Exploitation Strategy	ABC (mt)	Abundance and trend
Pollock EBS	6,667,146	$F_{0.1}$	1,676,000	Moderately high, declining
AI	340,407	$F_{0.1}$	85,100	Unknown
Pacific cod	1,030,000	F_{msy}	229,000	High, declining
Yellowfin sole	1,790,000	$F_{0.1}$	250,600	High, stable
Greenland turbot	325,552	--	7,000	Low, declining
Arrowtooth flounder	590,400	$F_{0.1}$	116,400	Very high, rapid increase
Rock sole	1,363,700	F_{msy}	246,500	Very high, increasing
Other flatfishes	1,223,000	F_{msy}, F_{prx}*	219,700	Very high, stable
Sablefish EBS	26,400	$F_{0.1}$	3,100	Average, declining
AI	27,700	$F_{0.1}$	3,200	Average, declining
Pacific Ocean perch				
EBS	127,900	$F_{0.1}$	3,800	Average, slow increase
AI	334,100	$F_{0.1}$	10,000	Average, slow increase
Other rockfish				
EBS	8,000	$F_{0.1}$	500	Average, stable
AI	18,500	$F_{0.1}$	1,000	Average, stable
Atka mackerel	--	$F_{history}$	24,000	Unknown
Squid	--	--	3,800	Unknown
Other species	827,400	$F_{history}$	28,700	High, increasing
Groundfish complex			2,908,400	High, stable

* F_{prx} = proxy F taken from related species
$F_{history}$ = historical average catch, 1977-89.

BERING SEA/ALEUTIAN ISLANDS GROUNDFISH

1991 Plan Team and SSC recommended ABC, AP recommended TAC and apportionments (metric tons)

		1990			ABC		Advisory Panel				
Species	Area	ABC	TAC *	Catch **	Plan Team	SSC	Seasons	Area	TAC***	DAP	JVP
Pollock	EBS	1,450,000	1,310,751	1,336,694	1,676,000		Roe (Jan 1- Apr 15)	EBS			
	AI	153,600	85,000	67,455	85,100			AI			
							Non-Roe (Jun 1 - Dec 31)	EBS			
								AI			
Pacific cod		417,000	199,975	164,023	229,000						
Yellowfin sole		278,900	176,502	84,158	250,600						
Greenland turbot		7,000	7,000	8,891	7,000						
Arrowtooth flounder		106,500	10,533	9,502	116,400						
Rock sole		216,300	67,359	33,589	246,500						
Other flatfish		188,000	51,128	34,172	219,700						
Sablefish	EBS	2,700	2,294	2,319	3,100						
	AI	4,500	3,826	2,039	3,200						
Pacific ocean perch	EBS	6,300	6,300	7,231	3,800						
	AI	16,600	16,600	13,790	10,000						
Other rockfish	EBS	500	500	417	500						
	AI	1,100	935	583	1,000						
Atka mackerel		24,000	23,500	23,117	24,000						
Squid		10,000	925	617	3,800						
Other species		55,500	28,584	23,237	28,700						
BERING SEA/ALEUTIAN ISLANDS TOTAL		2,938,500	1,991,712	1,811,834	2,908,400				0	0	0

* TAC reflects inseason adjustments.
** DAH catch data through November 10, 1990.

***Recommended TAC less 15% reserve

WORKSHEET

BERING SEA/ALEUTIAN ISLANDS GROUNDFISH

1991 Council Recommendations for ABCs, TACs and Apportionments (metric tons)

Species	Area	ABC	TAC	Reserve (15%)	Seasons		Seasonal Allowances	DAP	JVP
Pollock	EBS				Roe (1/1- 4/15)	EBS			
	AI					AI			
					Non-Roe (6/1 -12/31)	EBS			
						AI			
Pacific cod									
Yellowfin sole									
Greenland turbot									
Arrowtooth flounder									
Rock sole									
Other flatfish									
Sablefish	EBS								
	AI								
Pacific ocean perch	EBS								
	AI								
Other rockfish	EBS								
	AI								
Atka mackerel									
Squid									
Other species									
TOTALS		0	0	0				0	0

TABLE 1

BERING SEA/ALEUTIAN ISLANDS GROUNDFISH

Preliminary 1991 Council Recommendations for ABCs, TACs and Apportionments (metric tons)\1

Species	Area	ABC	TAC	Reserve (15%)	Seasons\2		Seasonal Allowances\3	DAP	JVP\4
Pollock	EBS	1,450,000	1,280,000	192,000	Roe (1/1- 4/15)	EBS	25%	272,000	0
	AI	153,600	100,000	15,000		AI	25%	21,250	0
					Non-Roe (6/1 -12/31)	EBS	75%	816,000	22,451
						AI	75%	63,750	0
Pacific cod		417,000	227,000	34,050				192,950	7,025
Yellowfin sole		278,900	207,650	31,148				12,750	163,753
Greenland turbot		7,000	7,000	1,050				5,950	1
Arrowtooth flounder		106,500	10,000	1,500				8,500	33
Rock sole		216,300	60,000	9,000				51,000	16,359
Other flatfish		188,000	60,150	9,023				10,200	40,927
Sablefish	EBS	2,700	2,700	405				2,295	1
	AI	4,500	4,500	675				3,825	
Pacific ocean perch	EBS	6,300	6,300	945				5,355	1
	AI	16,600	6,600	990				5,610	
Other rockfish	EBS	500	500	75				425	1
	AI	1,100	1,100	165				935	
Atka mackerel		24,000	21,000	3,150				17,850	0
Squid		10,000	500	75				425	0
Other species		55,500	5,000	750				4,250	1,834
TOTALS		2,938,500	2,000,000	300,000				1,495,320	204,680

\1 Preliminary specifications subject to change upon incorporation of 1990 groundfish survey data and application of overfishing definition.
\2 Seasonal allowances of pollock TAC are made after deduction for reserves.
\3 The Council will consider other possible seasonal allowances of the pollock TAC including but not limited to 40:60 and 60:40.
\4 Directed JVP fishing for yellowfin sole and other flatfish only; other JVP allocations are re-allocations from reserves as retainable bycatch.

APPENDIX B

SEASONAL ALLOWANCES OF THE POLLOCK TAC

Amendment 14 to the BSAI Groundfish FMP authorizes the Council to allocate the pollock TAC between a roe season (January 1 - April 15) and a non-roe season (June 1 - December 31). The FMP language calls for the Council to consider nine factors in deciding upon these seasonal allowances. The Amendment 14 EA/RIR/IRFA document contains the bulk of the pertinent information discussed below. Appropriate tables from this document are attached.

1. Estimated monthly pollock catch and effort in prior years.

Tables 2.1, 2.2 and 2.3 of the Amendment 19/14 document provide a perspective on past pollock harvests by month. Japanese fisheries from 1971 - 80 took an average of 18.8% of the total annual pollock harvest during the months of January through April (Table 2.1). DAP pollock fisheries in the BSAI and GOA took from 21.5% to 35.8% of the combined annual pollock harvests during the months of January - April for the years 1986-1989 (Tables 2.2a, 2.3). JVP harvests during the same months and years ranged from 23.6% to 76.5% (Tables 2.2b, 2.3). In 1990, a total of 389,722 mt of pollock was taken in the BSAI management area through April 14. This is 35.8% of the initial TAC for this area (Council's TAC less 15% reserve).

2. Expected changes in harvesting and processing capacity and associated pollock catch.

1990 was the first year that domestic (DAP) demand for pollock exceeded available supply. The Council set a TAC of 1,280,000 mt for the BSAI management area, while total requests for pollock made by processors in the 1989 NMFS survey for this area were 2,935,843 mt. Based on this survey, NMFS projected processor demand at 1,861,537 mt (or 45% over the Council's TAC). The attainment of the Bering Sea pollock TAC on October 13, 1990, and the Council's September request for emergency action by the Secretary of Commerce to reallocate uncaught JVP flatfish into DAP pollock is further indication of the excess demand. Substantial additional processing capacity has come on line since the 1989 NMFS survey of processors; demand is therefore expected to exceed supply by a larger margin in 1991 than 1990. Table 1 presents expected duration of the roe season based upon hypothetical 1991 pollock TAC levels and percentage splits of that TAC.

3. Current estimates of and expected changes in pollock biomass and stock conditions, conditions of marine mammal stocks, and biomass and stock conditions of species taken as bycatch in directed pollock fisheries.

Chapter 1 of this document addresses the status of and projected changes in the BSAI pollock stocks. Halibut and crab are taken as bycatch in directed pollock bottom trawl fisheries. The status of halibut stocks are discussed in Appendix B of this document; a summary of the NMFS crab survey is attached to this report. Condition of marine mammal populations is discussed in the summary section of this SAFE

report.

4. **Potential impacts of expected seasonal fishing for pollock on pollock stocks, marine mammals, and stocks of species taken as bycatch in directed pollock fisheries.**

Section 2.3.3 (pp. 15 - 21), and Appendices I - III, of the Amendment 19/14 EA/RIR document discuss the potential impacts of a pollock roe fishery concentrated in time and space on productivity of pollock stocks. No firm conclusions can be drawn from these discussions.

Section 2.3.5 (p. 23) of the Amendment 19/14 EA/RIR discusses the potential effects of the timing of the pollock fisheries on Stellar's sea lion and other marine mammal populations. It has been suggested that intense early year fisheries have contributed to the decline in Stellar's sea lion populations by depriving them of energy-rich, easily obtained forage. However, the document points out that insufficient data exist to test the hypothesis of a causal relationship.

Section 2.3.4 (pp. 21 - 23) of the Amendment 19/14 EA/RIR addresses the potential impact of a pollock roe fishery on crab and halibut. The document suggests that bycatch of these species is reduced in proportion to the degree that a roe fishery, prosecuted with mid-water trawl gear, diverts effort from bottom trawling. Mid-water trawl fisheries are relatively clean (i.e., are prosecuted with low bycatch of crab and halibut) compared to bottom trawling. Herring have been taken in some mid-water trawl operations, but the analysis does not provide a discussion of the impact of pollock roe fisheries on herring stocks. However, the Bering Sea pollock roe fishery is generally prosecuted in the Bogoslof area, which is far from the herring wintering area northwest of the Pribilof Islands. Assuming future BSAI roe fisheries operate in the same area, early year roe fisheries would be less likely to impact herring than pollock fisheries (bottom or mid-water trawl) later in the year.

5. **The need to obtain fishery-related data during all or part of the year.**

It is generically preferable to obtain fishery related information of all sorts - biological samples, catch/effort data, bycatch data - over the course of the entire year as opposed to only a portion of the year. The "need" to obtain this information over a full calendar year relative to shorter periods is not quantifiable.

6. **Effects on operating costs and gross revenues.**

Impacts of a seasonal allowance of pollock on fishery costs and revenues are discussed in Sections 2.3.6.3, 2.3.6.4, and 2.3.6.5 of the Amendment 19/14 EA/RIR (pp. 29 - 35).

Additional information was developed from the 1990 fishery. Weekly catch and production data for 1990 from the Weekly Processor Reports were used to estimate first wholesale value and first wholesale value per metric ton of pollock catch on a weekly basis. The following wholesale prices were used to calculate weekly product value:

pollock roe $3.50/lb
pollock fillets $1.60/lb
minced pollock $0.51/lb
surimi $0.80/lb
meal $480/mt

The weekly estimates of value per metric ton of pollock catch were then multiplied by the projected weekly pollock catch rates for 1991 to estimate weekly value for 1991. Weekly catch rates of 60,000 mt and 70,000 mt were used. The projections of weekly catch and value were used to calculate cumulative weekly catch, value, and value per metric ton of catch for five alternative starting dates. They are the first, third, fourth, fifth, and sixth weeks of 1991. The estimates of catch, value, and value per metric ton of catch for 1990 by week, month, and quarter, respectively, are in Tables 2, 3, and 4. The 1991 projections for various sets of assumptions concerning weekly catch rates and starting dates are in Tables 5 through 14.

The information in the latter set of tables can be used to estimate what the first period value per metric ton of catch will be with various weekly catch rates, starting dates, and first period apportionments. These estimates can then be used with a second period value per metric ton of $443 to $459 (the value/mt for the fourth and third quarters) to estimate the effect of different apportionments on the total wholesale value of the 1991 BSAI pollock fishery.

In summary, value of the pollock harvest on a per metric ton basis reaches a distinct peak during February, and fluctuates at lower levels during the balance of the year.

The Amendment 19/14 EA/RIR/IRFA suggests that operating costs for harvesting pollock will not substantially differ between the roe and non-roe seasons. Table 2.15 compares benefits per metric ton of pollock harvest between these seasons. The difference between gross and net wholesale values is indicative of costs. These do not differ substantially between seasons.

7. **The need to spread fishing effort over the year, minimize gear conflicts, and allow participation by various elements of the groundfish fleet and other fisheries.**

The biological impacts of a fishery concentrated in time are discussed under No. 3 above. Mid-water gear used to take pollock during the roe season, in general, does not conflict with other gear types. Bottom trawl gear, which would likely be used to a greater degree to take pollock outside the roe season, is likely to conflict with fixed pot and longline gear fisheries.

8. **Potential allocative effects among users and indirect effects on coastal communities.**

Allocative impacts of seasonal allowances of pollock are indirect. Sufficient processing demand, and harvesting capacity, exists to take the pollock TAC in a relatively short period of time. When the pollock fishery closes, whether due to attainment of a seasonal allowance or the full pollock TAC, harvesters can then prosecute other fisheries for which quota remains available. Other fishing opportunities may be distant from pollock fishing areas, providing catcher-processor

vessels with an advantage relative to shore-based harvesters and processing plants. Consequently, shore-based fisheries may be more vulnerable to disruption due to intense seasonal fisheries than fisheries caught and processed offshore. This concern is applicable to all groundfish fisheries, and is currently the subject of intensive Council analysis which cannot be duplicated or predicted here.

9. **Other biological and socioeconomic information that effects the consistency of seasonal pollock harvests with the goals and objectives of the FMP.**

None have been brought to the attention of the Plan Team.

ATTACHMENTS:

Tables 1 - 14: New Material
Tables 2.1, 2.2, 2.3, 2.15: from Amendment 19/14 EA/RIR/IRFA
Executive Summary of NMFS Bering Sea Crab Survey

TABLE 1: Possible Seasonal Allowances of the BSAI Pollock TAC

Roe season Allowance %	Pollock TAC (mt)	Roe Season TAC mt[1]	Projected Season Duration (weeks)[2]	Closure
25	1,200,000	255,000	3.9	Jan 28
	1,400,000	297,500	4.6	Feb 2
	1,600,000	340,000	5.2	Feb 6
40	1,200,000	408,000	6.3	Feb 14
	1,400,000	476,000	7.3	Feb 21
	1,600,000	544,000	8.4	Mar 1
50	1,200,000	510,000	7.8	Feb 24
	1,400,000	595,000	9.2	Mar 6
	1,600,000	680,000	10.5	Mar 15
60	1,200,000	612,000	9.4	Mar 8
	1,400,000	714,000	11.0	Mar 19
	1,600,000	816,000	12.5	Mar 29

[1] FMP provisions require that seasonal allowances be calculated **after** deduction of 15% non-specific reserve. The resultant split of the entire TAC can be calculated as follows:

Percentage Split of ITAC (TAC less 15% reserve)	=	Percentage Split of TAC
25/75	=	21.2/78.8
40/60	=	34/66
50/50	=	42.5/57.5
60/40	=	51/49

[2] Harvest by fleet is assumed to be 65,000 mt/week (B. Larkins, D. Gordon, pers. comm. 13 XI '90)

6.1.2.2 Limits on the Percentage of Pollock Taken in Bottom Trawl Fisheries

The Council is considering an option that would allow for a limit to be annually established for the percentage of the pollock TACs that can be taken in bottom trawl fisheries. The bycatch model was runs with approximately 75% and 50% of the pollock TACs being apportioned to the mid-water pollock fishery. Comparison between runs 3 to 5 and runs 6 to 8 are used to evaluate the effects of changing the percentage of the pollock TACs taken with bottom trawls. For the former set of runs, 75% of the pollock TACs is taken in the mid-water pollock fisheries; in the latter set, only 50% is taken by these fisheries.

These two percentages were selected because about 75% is expected to be taken with mid-water gear in 1991 and it is unlikely more than 50% would be taken with bottom trawls. The direction of the changes that results when the percentage taken by bottom trawl gear changes from 25% to 50% is expected to hold for other changes.

An increase in the percentage of pollock taken in the bottom trawl fisheries did not consistently increase bycatch. When comparisons are made for the same levels of PSC limits, halibut bycatch increase but not by much, herring bycatch decreases, crab bycatch only increases for some PSC limits, and in no case is the change in crab bycatch significant. The total effect on bycatch can be compared by considering the effect on estimated bycatch impact cost. When the percentage taken with bottom trawl gear increases from 25% to 50%, bycatch impact cost decreases from $12.6 million to $12.2 million for the 50% PSC limits, from $22.2 million to $21.5 million for the 100% PSC limits, and from $25.5 million to $25.3 million for the 150% PSC limits. These reductions in bycatch impact costs of about $0.4 million, $0.7 million, and $0.2 million are associated with estimated reductions in trawl groundfish gross revenue net of operating cost of $74 million, $29 million, and -$10 million. With the 150% PSC limits, net revenue is higher when 50% of the pollock in taken with bottom trawl gear due to the combination of relatively few PSC closures and higher net revenues per metric ton of pollock in the bottom trawl pollock fishery than in the mid-water pollock fishery.

This potentially surprising result that a substantial increase in the percentage of pollock taken with bottom trawls reduces herring bycatch and has little effect on the bycatch of crab or halibut can be explained by two factors. First, there are changes in intended fishing patterns and the apportionments of PSC limit caused by the increased apportionment of pollock to the bottom trawl fishery. Second, there are subsequent changes in PSC closures and fishing patterns.

Table 6.2--A comparison of bycatch model simulation results.

	RUN 1 No PSC Caps No Penalty Box 75% MW Pol.	RUN 2 No PSC Caps Penalty Box 75% MW Pol.	RUN 3 -50% Caps Penalty Box 75% MW Pol.	RUN 4 100% Caps Penalty Box 75% MW Pol.	RUN 5 150% Caps Penalty Box 75% MW Pol.	RUN 6 -50% Caps Penalty Box 50% MW Pol.	RUN 7 100% Caps Penalty Box 50% MW Pol.	RUN 8 150% Caps Penalty Box 50% MW Pol.
BYCATCH AMOUNTS								
Halibut (mt)	8,528	6,084	2,672	5,071	5,926	2,713	5,106	6,175
Herring (mt)	5,073	5,073	3,117	4,570	5,074	2,192	3,119	3,132
Red king crab (no.)	246,004	172,867	76,521	120,410	152,037	75,491	120,250	152,803
C. bairdi (no.)	3,450,042	2,133,393	1,935,777	2,491,519	2,042,105	1,855,979	2,454,975	2,210,664
GROUNDFISH CATCH (mt)								
Atka Mackerel Trawls	26,270	26,270	26,270	26,270	26,270	26,270	26,270	26,270
Pollock Bottom Trawls	299,288	299,288	78,831	194,695	299,288	118,211	352,739	655,891
Deepwater Flatfish Trawls	16,873	16,873	5,967	9,389	16,039	5,967	9,389	14,372
Flatfish Bottom Trawls	30,295	30,295	26,061	39,560	36,504	26,061	32,938	26,684
JV Flatfish Bottom Trawls	287,979	287,979	198,479	282,502	287,979	198,479	282,502	287,979
Midwater Pollock Trawls	862,854	862,854	862,854	862,854	862,854	556,879	556,879	556,879
Other Bottom Trawls	230,831	230,831	109,314	209,291	237,778	97,049	197,135	205,536
Rock Sole Bottom Trawls	117,920	117,920	53,075	104,563	107,456	53,075	104,282	107,174
All Fishery-Gear Groups	1,872,310	1,872,310	1,360,851	1,729,124	1,874,168	1,081,991	1,562,134	1,880,785
BYCATCH IMPACT COSTS ($1,000s)								
Halibut	$28,142	$20,077	$8,818	$16,734	$19,556	$8,953	$16,850	$20,378
Herring[a]	$2,876	$2,876	$1,767	$2,591	$2,876	$1,243	$1,768	$1,775
Red king crab	$3,272	$2,299	$1,018	$1,601	$2,022	$1,004	$1,599	$2,032
C. bairdi	$1,773	$1,097	$995	$1,281	$1,050	$954	$1,262	$1,136
TOTAL:	$36,063	$26,349	$12,597	$22,207	$25,504	$12,154	$21,479	$25,322
GROSS REVENUE ($1,000s)								
DAP	$1,142,227	$1,142,227	$806,275	$1,029,192	$1,142,943	$625,364	$934,846	$1,181,494
JVP	$43,773	$43,773	$30,169	$42,940	$43,773	$30,169	$42,940	$43,773
TOTAL:	$1,186,000	$1,186,000	$836,444	$1,072,132	$1,186,716	$655,533	$977,786	$1,225,267
GROSS REVENUE-VARIABLE COSTS ($1,000s)[b]								
DAP	$491,944	$491,944	$370,833	$425,887	$475,218	$296,465	$397,269	$484,817
JVP	$21,338	$21,338	$15,068	$21,334	$21,338	$15,068	$21,334	$21,338
TOTAL:	$513,282	$513,282	$385,901	$447,220	$496,556	$311,533	$418,603	$506,155
GROSS REVENUE-TOTAL COSTS ($1,000s)[b]								
DAP	$209,033	$209,033	$152,084	$166,135	190,690	$132,728	$172,213	$200,730
JVP	$ 10,284	$ 10,284	$ 7,562	$10,607	10,284	$7,562	$10,607	$10,284
TOTAL:	$219,317	$219,317	$159,646	$176,742	200,974	$140,290	$182,820	$211,014

Table 6.2--continued.

	RUN 9 100% Caps Penalty Box 75% MW Pol. 1% Herring Winter-B	RUN 10 100% Caps Penalty Box 75% MW Pol. 2% Herring Winter-B	RUN 11 100% Caps Penalty Box 75% MW Pol. 4% Herring Winter-B	RUN 12 100% Caps Penalty Box 75% MW Pol. 8% Herring Winter-B	RUN 13 100% Caps Penalty Box 50% MW Pol. 1% Herring Winter-B	RUN 14 100% Caps Penalty Box 50% MW Pol. 2% Herring Winter-B	RUN 15 100% Caps Penalty Box 75% MW Pol. 1% Herring Winter-C	RUN 16 100% Caps Penalty Box 75% MW Pol. 2% Herring Winter-C	RUN 17 100% Caps Penalty Box 75% MW Pol. 4% Herring Winter-C	
BYCATCH AMOUNTS										
Halibut (mt)	5,055	5,054	5,070	5,071	5,075	5,102	5,058	5,057		5,073
Herring (mt)	3,128	3,761	4,557	4,570	2,555	3,028	2,875	3,508		4,304
Red king crab (no.)	120,531	119,506	120,410	120,410	120,389	119,347	120,531	119,506		120,410
C. bairdi (no.)	2,495,559	2,487,187	2,491,416	2,491,519	2,452,597	2,449,959	2,495,635	2,487,262	2,491,491	
GROUNDFISH CATCH (mt)										
Atka Mackerel Trawls	26,270	26,270	26,270	26,270	26,270	26,270	26,270	26,270		26,270
Pollock Bottom Trawls	199,970	196,732	194,695	194,695	352,739	352,739	199,970	196,732		194,695
Deepwater Flatfish Trawls	9,389	9,389	9,389	9,389	9,389	9,389	9,389	9,389		9,389
Flatfish Bottom Trawls	39,717	38,545	39,560	39,560	33,095	31,923	39,717	38,545		39,560
JV Flatfish Bottom Trawls	282,502	282,502	282,502	282,502	282,502	282,502	282,502	282,502		282,502
Midwater Pollock Trawls	862,752	861,047	862,854	862,854	556,817	556,838	862,752	861,047		862,854
Other Bottom Trawls	217,207	212,190	209,291	209,291	200,350	197,135	217,207	212,190		209,291
Rock Sole Bottom Trawls	104,563	104,563	104,563	104,563	104,282	104,282	104,563	104,563		104,563
All Fishery-Gear Groups	1,742,370	1,731,238	1,729,124	1,729,124	1,565,444	1,561,078	1,742,370	1,731,238	1,729,124	
BYCATCH IMPACT COSTS ($1,000s)										
Halibut	$16,682	$16,678	$16,731	$16,734	$16,748	$16,837	$16,691	$16,688		$16,741
Herring	$1,773	$2,132	$2,583	$2,591	$1,448	$1,717	$1,630	$1,989		$2,440
Red king crab	$1,603	$1,589	$1,601	$1,601	$1,601	$1,587	$1,603	$1,589		$1,601
C. bairdi	$1,283	$1,278	$1,281	$1,281	$1,261	$1,259	$1,283	$1,278		$1,281
TOTAL:	$21,341	$21,678	$22,196	$22,207	$21,058	$21,400	$21,207	$21,545		$22,063
GROSS REVENUE ($1,000s)										
DAP	$1,039,453	$1,031,033	$1,029,192	$1,029,192	$937,414	$934,034	$1,039,453	$1,031,033	$1,029,192	
JVP	$42,940	$42,940	$42,940	$42,940	$42,940	$42,940	$42,940	$42,940		$42,940
TOTAL:	$1,082,393	$1,073,974	$1,072,132	$1,072,132	$980,355	$976,974	$1,082,393	$1,073,974	$1,072,132	
GROSS REVENUE-VARIABLE COSTS ($1,000s)										
DAP	$438,620	$428,571	$424,519	$425,294	$402,612	$396,184	$437,205	$427,156	$423,104	
JVP	$21,318	$21,319	$21,334	$21,334	$21,334	$21,334	$21,334	$21,334		$21,334
TOTAL:	$459,938	$449,890	$445,853	$446,628	$423,946	$417,518	$458,539	$448,490		$444,438
GROSS REVENUE-TOTAL COSTS ($1,000s)										
DAP	$178,694	$169,141	$164,473	$165,242	$179,053	$171,143	$177,283	$167,731		$163,063
JVP	$10,592	$ 10,592	$ 10,607	$ 10,607	$10,607	$10,607	$10,607	$10,607		$10,607
TOTAL:	$189,286	$179,733	$175,080	$175,849	$189,660	$181,750	$187,890	$178,338		$173,670

a This estimate is based on the value per metric ton of catch in the commercial herring fishery. To the extent that value per unit of catch is higher in subsistence fisheries and that bycatch reduces subsistence catch, this estimate tends to understate the actual impact costs.
b The estimates do not include bycatch control costs other than those associated with area specific CPUEs and foregone catch.

AGENDA D-3(a-b)(6)
DECEMBER 1990

ACTION

NOV 15 1990

November 9, 1990

Dr. Don Collinsworth, Chairman
North Pacific Fishery Management Council
P.O. Box 1031136
Anchorage, AK 99501

RE: Emergency Rule - 1991 Trawl Management

Dear Dr. Collinsworth:

The undersigned associations represent fishermen and processors who are are heavily dependent upon the Pacific cod fishery in the Bering Sea.

Recent actions of the North Pacific Fishery Management Council with respect to the 1991 flatfish and pollock fisheries in the Bering Sea, and further actions which will be taken in December, may have severe unintended impacts on the fishery for Pacific cod. These possibilities give rise to serious concerns.

The Council has determined that the flatfish fishery in the Bering Sea should be delayed in 1991, to minimize bycatch of prohibited species. The Council also plans an apportionment of pollock between the roe and non-roe fisheries. It is the potential impact of these actions on the fishery for Pacific cod and the possible PSC bycatch implications of that fishery which prompt us to ask for emergency action.

The harvesting capacity of the trawl fleet is huge. It has been estimated that the fleet will be able to harvest as much as 70,000 mt of pollock weekly at the beginning of 1991. If - as seems likely - only 25 to 40 per cent of the pollock TAC in the Bering Sea is apportioned to the roe season for 1991, the roe fishery will last only four to seven weeks. Pollock fishermen who concentrate on the roe fishery will likely ask for a postponement of the roe season so that the pollock can be harvested when the roe is mature. Since flatfish will not be available, we anticipate that a significant portion of the trawl fleet may concentrate its effort on Pacific cod at the beginning of the year. This unprecedented early effort on the cod stocks could have several undesirable consequences.

First, the markets for Pacific cod pay a considerable premium for high quality product, supplied steadily throughout the year. If there are gluts or variations in supply or quality, returns diminish substantially. Selective markets may even disappear. Trawlers, longliners, pot vessels, factory trawlers, and shoreside processors are all capable of producing high quality cod product if they

are careful - but in order to take advantage of the realities of the marketplace, they must do so at a controlled and steady rate, throughout the year. If there is uncontrolled effort in the cod fishery early in the the year there could be a glut of cod product - of varying quality - dumped on the market. The negative market consequences could be serious.

A second concern is that if the TAC for Pacific cod is taken early in the year, the small trawlers, longliners, and pot fishermen who rely on a steady cod fishery would be put out of business.

Bycatch in this fishery could also be a problem. Testimony at the September council meeting suggested that if no preventive measures are taken, displaced vessels inexperienced in trawling for cod could decimate the halibut PSC. The result could be the early closure of bottom trawling to vessels which depend upon it.

It is difficult to accurately monitor any fishery which experiences a sudden surge of effort. Uncontrolled effort on Pacific cod in the first half of 1991 would pose the additional risk of exceeding the cod TAC, and PSC for halibut.

Finally there is the question of the impact of heavy fishing on spawning stocks, which may affect the reproductive capacity of any species (the well-known "bedroom effect"). This was one of the considerations which prompted the Council and the Secretary to split the pollock season. Pacific cod spawn at about the same time as pollock, and biological concerns for one species certainly should apply to the other.

In order to avert the undesirable consequences noted above, we respectfully request that the Council adopt an emergency rule effective January 1, 1990, to implement the following measures:

1. Apportion the Pacific cod TAC in the Bering Sea/Aleutian Islands Area between the first two quarters of 1991, 35% in the first quarter, 25% in the second;

(This would require a renewal of the rule after 90 days, for an effecive period of 180 days - the maximum effective period for an emergency rule. Note that fishing is slower in the second half of the year, and quarterly apportionments may not be necessary. Note also that an anticipated increase in pot fishing for Pacific cod will help to assure that TAC [OY] is achieved.)

2. Apportion halibut PSC in the Bering Sea/Aleutian Islands Area between the first two quarters of 1991, 35% in the first quarter, 25% in the second; and

(This would also require a renewal of the rule after 90 days.)

3. Synchronize the opening of all groundfish trawl fisheries in the Bering Sea/Aleutian Islands Area until the opening date of the roe pollock fishery.

These measures would prevent the adverse market impacts of a cod rush, and would assure that the nation maximizes its economic return from the valuable cod resource. They would augment the trawl bycatch incentive program, and help prevent the trawl fleet from putting itself out of the bottom trawl business by taking or exceeding halibut byactch limits. Possible overfishing of Pacific cod would be avoided. Virtually every sector of the groundfish industry would be able to produce high quality cod products throughout the year, to the benefit of all concerned.

Thank you for your help in this matter.

Yours Very Truly,

R. Barry Fisher
Midwater Trawlers' Assoc.

Dennis Peterson
NPFVOA

Eric Olsen FIV LORELEI II
President, FVOA

Thom Smith
Freezer-Longliner Group

NPFVOA

NOV 15

November 13, 1990

Dr. Don Collinsworth, Chairman
North Pacific Fishery Management Council
P.O Box 1031136
Anchorage, AK 99501

Dear Don,

The North Pacific Fishing Vessel Owners' Association (NPFVOA) was signatory to a November 9, 1990 letter to you requesting the Council to adopt an emergency rule concerning 1991 trawl management in the Bering Sea. Further study reveals that the proposals in that letter are really aimed at allocating the cod resource and the NPFVOA strongly opposes emergency regulations as a means of allocating fish to user groups. Further, the proposals would not result in a steady supply of cod to the marketplace as claimed. Rather, the supply would be turned on and off which would have serious negative impacts on cod being a marketable product, particularly in the restaurant trade. Also, quarterly allocations would result in cod fishing during seasons of lower CPUE's which result in higher PSC by-catch as claimed.

For the above reasons the NPFVOA withdraws its support for the proposals in that letter and urges the Council not to adopt them. We apologize for any confusion we may have caused.

Respectfully submitted,

Dennis Petersen

Dennis Petersen
Interim Director

North Pacific Fishing Vessel Owners' Association
1800 W. Emerson, Suite 101, Fishermen's Terminal, Seattle, WA 98119
Telephone (206) 285-3383 FAX (206) 286-9332

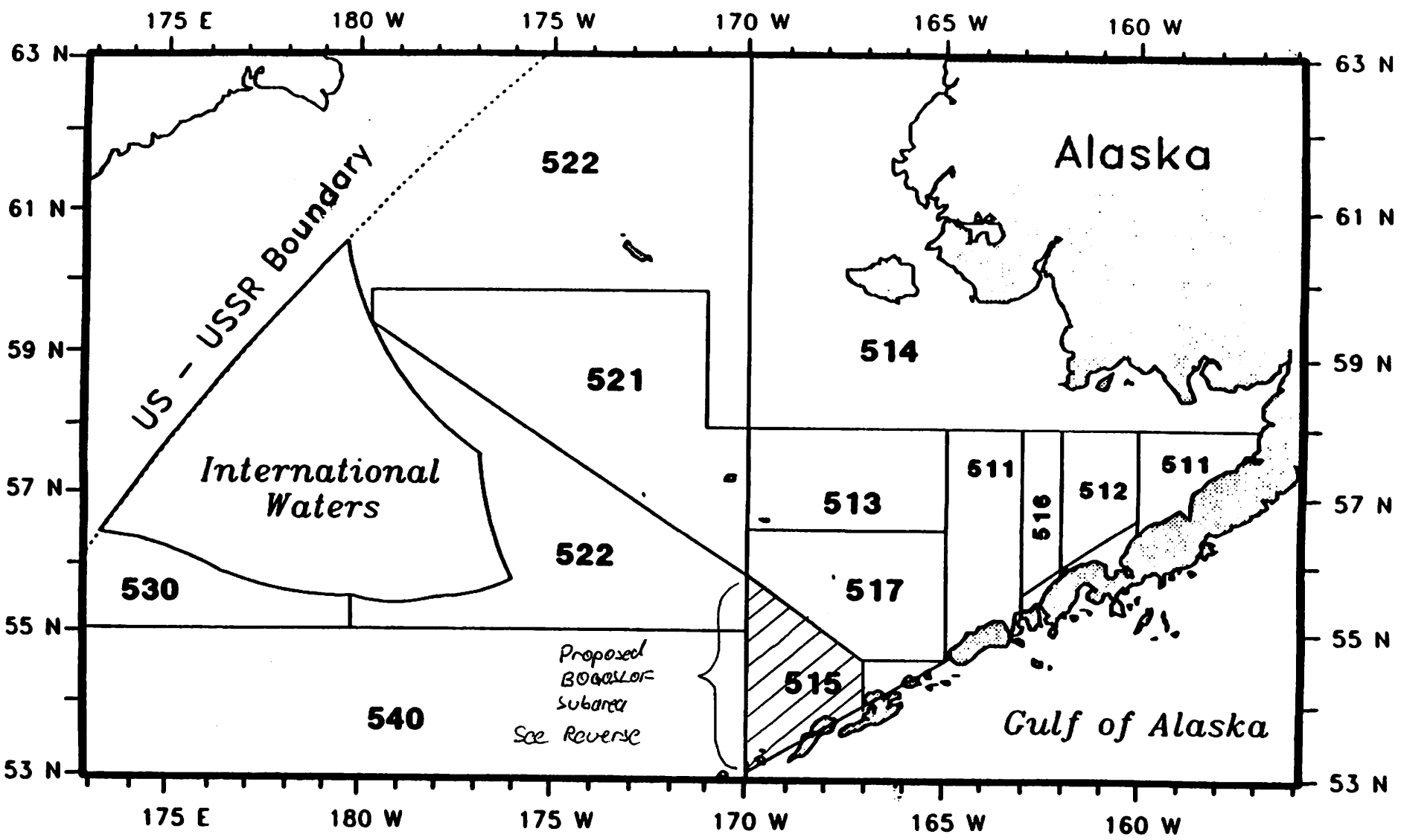


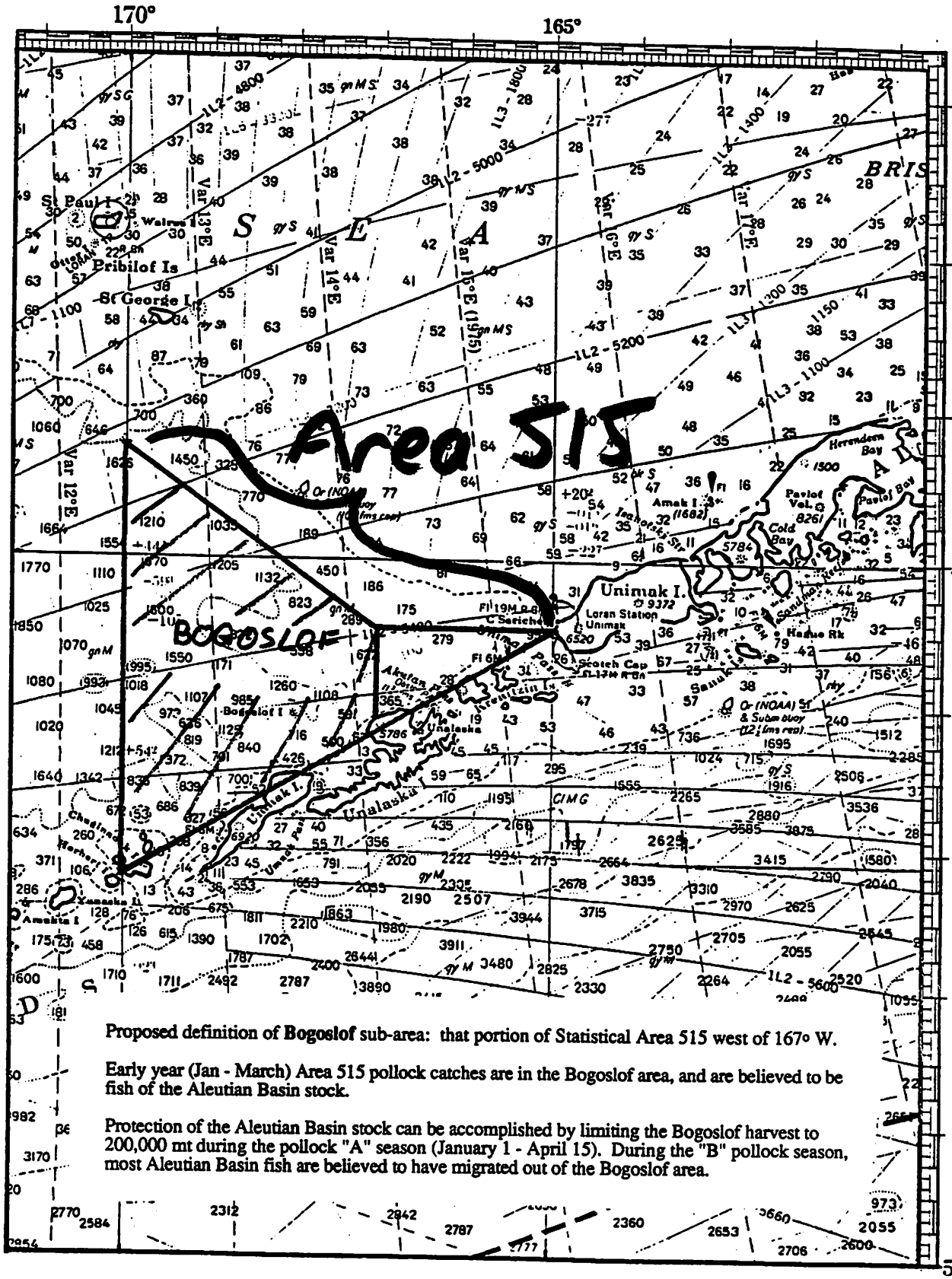
Figure 2. Statistical reporting areas and bycatch limitation zones in the Bering Sea and Aleutian Islands Management Area

ZONE 1 = 511+512+516
ZONE 2 = 513+517+521
ZONE 2H = 517

5/16/90

Agenda D-SCC (1)
SUPPLEMENT
DECEMBER 1990

AGENDA D-3 (4-6)
SUPPLEMENT
DECEMBER 1990



CHARTLET 4 - EASTERN ALEUTIANS

NOV 29 '90 12:35 YUKON QUEEN

YUKON QUEEN FISHERIES

ACTION	ROUTE TO	IN

November 29, 1990

My name is Jim Beaton. I own the freezer longliner Yukon Queen and have just purchased another vessel for the same purpose. I have just read the SAFE document for Pacific Cod. I am alarmed at the sudden 26% drop in cod biomass and the resulting 200,000 ton reduction in the ABC. With this sudden drop in cod biomass I am concerned about the effects of heavy fishing on spawning cod stocks. With the poor recruitment observed during the past few years combined with heavy fishing going on during spawning times we could devastate the Pacific Cod stocks if we are not careful.

I am also concerned with the effects of the delay in the Flatfish and Pollock fisheries in the Bearing Sea. This will cause an unprecedented effort on the cod stocks by factory trawlers early in the year and could have many undesirable effects.

First, this could cause a glut on the market, and there could be many variations in the quality of the product. The markets for Pacific cod historically pay a premium for high quality product delivered steadily throughout the year. A glut of cod of varying quality dumped on the market early in the year could cause serious negative consequences.

A second concern is that if the TAC for Pacific cod is taken early in the year, many longliners , pot fisherman and small trawlers who rely on a steady cod fishery will be put out of business.

Historically the Pacific cod fishery has been processed slowly throughout the year. A sudden surge of uncontrolled effort in the first half of 1991 would have devastating effects both biologically on spawning stocks and economically on those who are in the fishery for the long term.

Sincerely yours,

James Beaton

James Beaton

Agenda D-3(b)

- TRANSMITTED VIA FAX -

FREEZER-LONGLINER GROUP

November 28, 1990

Dr. Don Collinsworth, Chairman
North Pacific Fishery Management Council
P.O. Box 1031136
Anchorage, AK 99501

RE: Emergency Rule - 1991 BSAI Pacific Cod Fishery

Dear Dr. Collinsworth:

On November 9, 1990, the Freezer-Longliner Group joined other associations in requesting that the Council adopt an emergency rule effective January 1, 1991, which would apportion TAC for BSAI Pacific cod and PSC for halibut between the first two quarters of the year, 35% to the first quarter, and 25% to the second. The requested rule would also synchronize the opening dates of most trawl fisheries. Now that the SAFE docuement has been published, we would like to offer comments on biological and economic considerations which support this proposal.

I. The Problem

Our concerns stem from current Council actions which for the first time will postpone the opening of the flatfish fishery in the BSAI region, and which will apportion pollock between the roe and non-roe seasons. We fear that a substantial amount of trawl effort displaced from these fisheries will cause a disproportionately large harvest of Pacific cod during the first four months of the year (the spawning season). This could have unintended adverse economic and biological effects. Please note that owners and operators of shoreside delivery longliners, shoreside delivery trawlers, and certain head-and-gut factory trawlers share these worries.

II. Pollock Management - A Precedent

In 1989 the Council expressed its concern about pollock roe stripping, its allocative effect and its potential biological implications. (55 FR 37908) At the request of the Council an emergency rule imposing a limit on this practice was implemented early in 1990.

The Secretary of Commerce has now approved Amendments 14 and 19 to the BSAI and GOA Groundfish Plans. The first allows the Council to apportion the pollock resource between the roe and non-roe seasons each year in the BSAI region, while the second divides the pollock TAC for the Central and Western Regulatory Areas of the GOA into four equal seasonal allowances (25% per quarter). In addition to reducing waste, **stated purposes of the amendment are to avoid an "inappropriate and unintended allocation of the pollock TAC among seasons and between industry sectors" (provide for an equitable distribution of the pollock resource among users of the groundfish fishery), "prevent possible adverse effects on the...reproductive potential of pollock, and, generally, promote the conservation and management objectives of the FMPs."** (55 FR 37907-8)

The pollock emergency rule and amendments anticipate precisely our concerns regarding the Pacific cod fishery, and establish a clear precedent for its management.

III. Economic Impacts

The November 9 request for an emergency rule describes the huge harvesting capacity of the trawl fleet and the negative market implications of a flood of cod product during the first half of the year, coupled with a shortage of product in the second. Testimony on the latter issue will be offered at the December Council meeting.

The request also makes the point that longliners and pot fishermen could simply be put out of business if a disproportionate share of the BSAI Pacific cod TAC is taken in the first half of the year. Freezer-longliners, for example, are almost entirely reliant on the BSAI Pacific cod resource. They catch their fish one at a time, and have no way to accelerate their harvest rate - they must have a year-long cod fishery if they are to survive economically. Unlike their competitors, longliners cannot fish for pollock or yellowfin sole when the cod TAC is exhausted.

IV. Biological Considerations

A. The SAFE Document

The recently-published SAFE document states that the 1990 trawl survey showed a 26% drop in Pacific cod biomass in the BSAI relative to 1989. ABC has been reduced from 417,000 mt to 229,000 mt. The author of the cod chapter expresses concern over this decline and the poor recruitment observed during the last two years.

B. Fishing on Spawning Stocks

A recent international conference on fisheries in Halifax, Nova Scotia, focused on the overexploited state of cod stocks off the Atlantic Provinces of Canada. **Each of the Canadian speakers familiar with the fishery called for control and limitation on the number of fish harvested during sensitive spawning aggregations.** There was no disagreement on this point.

An earlier report submitted to the Canadian Minister of Fisheries in February, 1990, "Independent Review Of The State Of The Northern Cod Stock", also addresses the question. It is careful to point out that "...there is little if any substantiated evidence supporting the claim that fishing by trawls during the spawning season damages survival of the spawning products or that such removals are more damaging than taking fish during other periods of the year." (p. 90) The report continues, "Nevertheless, we cannot leave this subject without injecting a cautionary note. **The state of our current knowledge is such that we cannot easily answer the question whether intense fishing on spawning cod populations disturbs either the mating behaviour or the spawning success of the aggregate...further study is indicated and...should be treated as a matter of some urgency."** (p. 90, emphasis added)

The report concludes, **"...because the Panel is uncertain of the effects upon mating behaviour and spawning success of intense fishing during the spawning season, it proposes that there be a limit upon mortalities imposed during the spawning period** proportionally with the general reduction in total fishing mortality. Whether this can best be achieved through a straight reduction in the winter catch (i.e. during the spawning period)...is a matter the DFO should explore at the earliest possible date with affected sectors of the fishing industry." (p. 149)

Note that no claim is made here that Pacific cod stocks in the BSAI have been overexploited, or that trawling for cod is inappropriate. The Canadian experience is cited only in support of the proposition that **there is uncertainty regarding the effects of fishing on spawning stocks - and that given the substantial decline in Pacific cod stocks over the last year, a modest reduction in harvest during the spawning period in the BSAI may be justified.**

V. Fairness and Equity

The requested apportionment of the 1991 Pacific cod TAC in the BSAI region - 35% to the first quarter, 25% to the second (60% taken together) - will not disrupt recent

harvest patterns unreasonably. In 1988 47.6% of the Pacific cod were harvested in the first quarter of the year, and 69.7% had been taken by the end of the second quarter. In 1989 the figures were 49.1% and 61.2%, respectively. On average the reduction imposed by the requested rule would be 15.9% of the total harvest for the first quarter, and only 5.5% by the end of the second. The largest part of the reduction would be imposed during the sensitive spawning period, and the net impact on harvests by the end of the second quarter would be negligible.

The Council's regulatory actions with respect to pollock have stressed "equitable distribution of the pollock resource among users of the groundfish fishery." (55 FR 37907) There is no reason why this standard - applied to pollock trawl fisheries - should not also apply to other fisheries. In 1988 longliners harvested 0.4% of the overall groundfish TAC for the BSAI region. In 1989 the figure was 0.9%. Through October, 1990, longliners had harvested only 2.3% of the total TAC for the BSAI. Where a gear group harvests less than 3% of the total TAC and is almost entirely dependent upon a single stock (87% of the 1990 harvest has been Pacific cod), it does not seem unreasonable to request that the stock be managed conservatively so that TAC is not harvested in the first part of the year. This is especially true where the requested emergency measures make sense biologically, and do not threaten the economic survival of other participants in the fishery. Our competitors have a lot of other fisheries - we don't.

In this context it should be kept in mind that a number of pot vessels and shoreside delivery longliners will likely participate in the Pacific cod fishery in the BSAI for the first time in 1991. Many of the pot vessels will be crab boats fishing for cod after the Opilio season. These folks will need some TAC in the second half of the year.

Finally, there is the question of synchronizing the starting date of the trawl fisheries. Historically all of these fisheries have opened on the same date, giving everyone a fair start. To the extent possible, the Council should maintain this policy. The staggering of opening dates can have dramatic unintended and inequitable effects, given the harvesting capacity of the fleets.

VI. The Emergency Rule - A Negotiated Compromise

The division of Pacific cod TAC and halibut PSC between the first two quarters of 1991 - 35% and 25% - is the result of negotiation and compromise among several trawl and longline groups. The Freezer-Longliner Group preference would be more conservative - a delayed opening date of February 1 for all groundfish fisheries in the BSAI, an apportionment of Pacific cod TAC and halibut PSC at 20%,

15%, 30%, and 35% over the four quarters (unharvested TAC and PSC rolling into the following quarter), and a post-spawning Pacific cod harvest closure from April 15 to June 1.

VII. Conclusion

There is a well-founded fear that current Council actions with regard to the pollock and yellowfin sole trawl fisheries in the BSAI will have severe unintended effects on the fishery for Pacific cod. Established management policy with regard to pollock in the region suggests that the Pacific cod resource should also be equitably distributed among users, and that possible adverse effects on the reproductive potential of the declining stock - through excessive harvest during the spawning season - should be avoided. It is our sincere hope that the Council will remain consistent in its approach to the groundfish fisheries by approving the requested emergency rule.

Sincerely,

Thorn Smith

Thorn Smith
Executive Director

AGENDA D-3(b)
DECEMBER 1990
SUPPLEMENTAL

PACIFIC FRONTIER ENTERPRISES, INC.

11049 8TH AVENUE N.E.
SEATTLE, WASHINGTON 98125
PHONE (206) 367-4599
FAX (206) 367-4668

Nov. 28, 1990

NORTH PACIFIC FISHERY MANAGEMENT COUNCIL,

We manage the Longline vessel Alaskan Venture (170 ft., H & G). The vessel has just begun fishing operations as of late October, primarily targeting on Pacific Cod. Having both the company and vessel new to this fishery we are spending alot of time learning as we go from any source we can, one source is the Freezer Longliner Group which our company belongs to. The F.L.G. supports a 4/15/91 - 6/1/91 closure of P. Cod in the BSAI to coincide with the trawler closures. We understand too that the F.L.G. supports a delayed opening of P. Cod in BSAI and also a form of quarterly allocations for the TAC of P. Cod with the lighter efforts and allocations being in the first half of 1991 and the stronger efforts and allocations being in the last half of 1991. Based on the idea that these ideas are for the biological benefit of the fishery our company would like to fully support these ideas and the F.L.G. in connection with them.

It seems to me that we have a very viable, productive and lucrative fishery and if it is managed well and smartly it should be able to be around for many years to come. Since it is in your hands to see that done I would hope you consider this letter when you make decisions that directly or indirectly affect the P. Cod fishery. Once this, or any fishery, is depleted no matter what name you call it the fact of the matter is it is depleted. Please take these factors into consideration when the time comes in regards to the P. Cod fishery so that it will be beneficial for this user group and any others that care to concentrate on it.

Sincerely,

Jim Brady

Jim Brady
Operations Manager
Pacific Frontier Enterprises, Inc.

Gorton's® of Gloucester
GLOUCESTER, MASSACHUSETTS 01930-5041
TELEPHONE NO. (508) 283-3000
FACSIMILE NO. (508) 281-7308
TELEX 24-7318

December 1990

TESTIMONY BEFORE THE NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

Mr. Chairman, members of the Council, ladies and gentlemen. My name is Matthew Weber and I represent Gorton's of Gloucester, which is a division of General Mills, Inc. We are a major producer and merchandiser of retail fish sticks and portions in the United States, and, as such, are one of this country's biggest purchasers of domestically caught and processed Alaskan Pollock blocks.

My purpose in appearing before you today is to underscore the need for careful and thorough deliberation before determining the 1991 Alaskan Pollock quota allocation.

Today the cupboard is bare, with few, if any, Pollock products available. This market condition has been caused by the unprecedented early closure of the 1990 fishery. This closure has caused disruptions in the marketplace, threatening five years of extensive work with producers and processors to give the American consumer the opportunity to purchase truly American products.

I have always been impressed by the manner in which the Council has assumed its many responsibilities. In setting the 1991 TAC's, I respectfully submit that we all remember the Council's and our industry's obligation under the Magnuson Act to provide the optimum amount of fish "which will provide the greatest overall benefit to the Nation, with particular reference to food production..." The country has come to depend on Pollock products. I therefore urge the Council to set the 1991 TAC's for Pollock at the ABC level of 1,676,000 M/T for the Bering Sea and 85,100 M/T for the Aleutian Islands.

Setting the 1991 Pollock quotas at these levels will provide for the conservation of the resource, as these are the harvest levels the scientific community assures us are safe.

Because the two million metric ton cap in the Bering Sea forces the Council to choose between individual groundfish species, the Council should give first priority to the TAC's for those species which will generate the greatest quantity of products for the U.S. consumer i.e. Pollock. The harvesting, processing and sales of this specie create substantial levels of economic activity not present when the U.S. exports whole fish or relatively unprocessed product.

We and companies like ourselves are in production on a year-round basis and we must have a constant supply of raw materials. We cannot afford interruptions in delivery schedules nor can we live with uncertainties in future programs. It logically follows, that if America's secondary producers cannot rely upon a predictable flow of product from Alaska, they will have no choice but to look overseas for substitute raw material, increasing the $3.2 billion net deficit in fishery products.

While the setting of quotas at the ABC levels is important to our industry, it is also necessary for the Council to implement comprehensive by-catch disincentive programs for all species. For the industry, larger Pollock harvested in bottom trawl operations are very important sources of supply. We urge the Council to move forward with programs that will enable sufficient quantities of Pollock to be harvested throughout the year.

Therefore, I call upon you to give earnest consideration to allocating the full Pollock ABC in all areas for 1991 to ensure that there will be a programmable, realistic, regular supply of Pollock blocks entering the domestic marketplace.

I thank you for your time and attention.

AQUATIC RESOURCES CONSERVATION GROUP
4110 WHITMAN AVE. N., #9
SEATTLE, WA 98103

STATEMENT
TO THE NORTH PACIFIC FISHERY MANAGEMENT COUNCIL ON SETTING THE ABCs AND TACs FOR THE 1991 GROUNDFISH FISHERIES IN ALASKA WATERS.

The Aquatic Resources Conservation Group in Seattle is a non-profit, independent research group of scientists, lawyers, economists and policy analysts concerned with maintaining healthy, diverse ecosystems in the face of increasing pressure to exploit their resources.

We are submitting our recommendations for setting the 1991 allowable biological catches (ABCs) and total allowable catches (TACs) for two species groups in Alaska waters of particular concern to us, the walleye pollock and the rockfishes. Our recommendations for ABC of these species groups differ from those made by the groundfish plan teams, and we wish to elaborate here on the reasons for it, and also make some recommendations for setting appropriate TACs.

Our recommendations are as follows.

Gulf of Alaska

SPECIES	REGION	ABC	TAC
W. Pollock	Total	103,400mt	71,010mt
	W/Central	100,000mt	70,710mt
	Eastern	3,400mt	300mt
Slope Rockfish	Total	2,425mt	< 2,425mt

Bering Sea

SPECIES	REGION	ABC	TAC
W. Pollock	Eastern B.S.	1,450,000mt	1,150,000mt
	Aleutians	85,100mt	67,500mt
POP complex	Eastern B.S.	1,100mt	< 1,100mt
	Aleutians	3,560mt	< 3,560mt

1. GULF OF ALASKA

1.1. Walleye Pollock: 1991 recommended ABC and TAC in the Gulf of Alaska.

Our knowledge about the status of the walleye pollock stock in the Gulf of Alaska is equivocal at best. The newly estimated exploitable biomass of 1.303 million tons (Hollowed and Megrey, 1990), which is 46% higher than in previous years and on which the plan team's estimate of ABC is based, was derived from a stock synthesis model. The model included new information on pollock mortality rates, biomass from trawl surveys, and population age structure. The result of the biomass estimating exercise led to a paradoxical conclusion to increase the ABC of 1991 by 81.7%, from 73,400mt in 1990 to 133,400 t in 1991, while the stock biomass itself showed a declining trend in recent years.

While it is clear that backcalculations also yielded higher historical biomasses, the increases in estimated biomass and in ABC are so dramatic that extreme caution should be taken in verifying the model's results. However, some critical verifications are lacking. Thus, the Gulf of Alaska 1990 trawl survey pollock biomass estimates, to which the model was tuned, has 95% confidence intervals of $\pm$ 25% around the mean. The 1990 trawl biomass estimates were not significantly different from the survey estimates of 1984 and 1987. The model results do not reflect the variations in the trawl survey estimates. Furthermore, it appears that the stock synthesis model strongly responds to age-structure information, yet no sensitivity analysis was undertaken to compare the relative influences of age structure variations, survey biomass estimate and mortalities on the results.

When evaluating factors for determining ABC, biological considerations other than those concerning the species concerned should be taken into account. Neither the SAFE chapter (Hollowed and Megrey, 1990), nor the team's summary on pollock (Gulf of Alaska Groundfish Plan Team, 1990) discuss such considerations. Currently, Steller sea lions, which feed on pollock, are listed as threatened, and numbers of adult and juvenile counts in the Central and Western Gulf of Alaska, where >95% of Gulf of Alaska pollock fishing occurs, have declined by 12% between 1989 and 1990, at nearly the same annual rate as the 11.3% annual decline that occurred between 1985 and 1989 (Gulf of Alaska Groundfish Plan Team, 1990; Merrick et al., in press).

Furthermore, harbor seals around the Alaska Peninsula, which could also prey on pollock, have declined by 20% over the last 5 years (Gulf of Alaska Groundfish Plan Team, 1990). In the case of Steller sea lion, NMFS scientists have expressed concern that competition for pollock food by fisheries may be a factor contributing to the ongoing decline. Until currently ongoing research on interactions between pollock fisheries and Steller sea lion feeding and living habits reveals quantifiable information, and a sea lion feeding quota can be established, the ABC should be set as conservatively as possible to take into account such ecosystem factors.

At least, therefore, given the uncertainties of the modeling approach and the ecosystem considerations, the team should have recommended a more cautionary approach,

such as proposing an ABC that is the average between the old (1990: 73,400mt) and new (1991: 133,400mt) values, i.e. 103,400 t, of which 100,000 t would be for the central/western gulf regions. However, as it stands, the increase in pollock ABC in the Gulf of Alaska is not justifiable without further modeling review and detailed ecosystem recommendations. We therefore recommend that the ABC for pollock be set to 103,400mt for the entire Gulf of Alaska.

In recent years, the TAC of Gulf of Alaska pollock has been set equal to ABC. There is now evidence that such a policy will lead to catches far in excess of ABC, due underestimates of catch, and due to pollock discards both in the directed pollock fishery and in other groundfish operations. Data from fish tickets, which are provided by industry, indicate that pollock discards in 1989 increased the gulf-wide landed catch of 1989 by 8.83% (Hollowed and Megrey, 1990).

In 1990, both TAC and ABC for pollock were exceeded by 8.8% gulf-wide, by 12.9% in the western/central sections, and by 21.4% in Shelikof strait (c.f.: Gulf of Alaska Groundfish Plan Team, 1990; Table 1). The excesses are due to discards and delays in season closures (R. Berg, NMFS Juneau, pers. comm.) The discard data from fish tickets are not verifiable, and discard rates have yet to be confirmed by independent observer observations. Our preliminary analysis of NMFS observer data indicates that the 8.8% number is a minimal average amount, at best, and could have been as high as 33% for all groundfish operations combined.

Thus, the 1991 TAC should be reduced from ABC by at least two factors:

- 1. by the tonnage of pollock taken in 1990 in excess of ABC (at least 7,950mt in the central/western Gulf, and 1,340mt in Shelikof strait); and

- 2. by a factor accounting for discards and for uncertainties of catch estimates due to delay of in-season data processing, set at 20% of ABC.

- In the eastern Gulf, the TAC should be set at a level not exceeding the 1990 catch (about 300mt, cf. Gulf of Alaska Groundfish Plan Team, 1990, Table 1), until better information about the stock status and related ecosystem parameters there become available.

In summary, we recommend a TAC of 70,710mt for the central/western Gulf, and of 300mt in the eastern Gulf, for a total of 71,010mt, as compared to 73,400mt in 1990.

1.2. Slope rockfish: 1991 recommended ABC in the Gulf of Alaska.

Several factors point towards adopting a more conservative ABC than recommended by the Plan Team. We agree with Heifetz and Clausen (1990) that the slope rockfish complex should be managed to protect the most vulnerable species, the rougheye and shortraker rockfishes, from depletion. These two species are more long-lived than Pacific ocean perch (POP): Rougheye rockfish have been aged to 140 years (Nelson 1986) and

shortraker rockfish aged to 120 years (Chilton and Beamish 1982) in comparison to 90 years for POP (Chilton and Beamish 1982). Furthermore, they have a later age of recruitment and low natural mortality rates. The life history characteristics of rockfish that make them more prone to overexploitation than shorter-lived species. Obviously, rockfishes demand conservative quotas first because of these life history characteristics and secondly because they are managed as a complex. One or two species in this complex can easily be overharvested.

In the past, the Council has set rockfish ABCs conservatively to promote rebuilding of the stocks. In addition, the Plan Team has suggested that ABC should be reduced to guard against excessive removals of rougheye and shortraker rockfish that are targeted upon by fishermen because they command a higher price than other species in the complex. In the future, we recommend that the slope rockfish complex be broken up to reflect the habitat and depth specific associations as well as the different life history characteristics of the individual species. However, until that time, the ABCs and TACs should be set most conservatively to protect rougheye and shortraker rockfishes. Until these species are managed separately, we recommend that the ABC for the slope rockfish complex simply be the ABC for shortraker and rougheye rockfishes, the two species of most concern.

Special problems in the Gulf of Alaska also indicate that the ABCs should be set conservative. Analysis of length-frequency data from the 1990 survey indicates that although POP and northern rockfish show some possible strong year classes entering the fishery, there was little evidence of recruitment for the other species. In addition, although the TAC for 1990 was set at 17,700 mt, this quota was exceeded by 19% by October 27, 1990. Most importantly, the 1990 trawl survey biomass estimates for most species declined dramatically compared to the 1987 survey (Heifetz and Clausen 1990). Stock assessments of rockfish are very difficult especially over rough bottom. Whether or not there has been a significant decline in slope rockfish is unknown. We agree with the Plan Team that innovative new techniques and approaches be attempted to better determine the distribution and abundance of slope rockfish. Until that time we recommend an ultra conservative approach.

An additional major problem in managing the slope rockfish complex is that an ABC is set with theoretical allotments for the different species within the complex, e.g. an ABC of 15,390 mt would hopefully result in catches of about 2262 mt of shortraker and rougheye rockfishes, 6736 mt of POP, and 6389 mt of the rest of the species in the complex. However, fishermen are able to target upon and catch all 15,390 mt of any one species within the complex. In fact, Dan Ito in the POP SAFE document for the Eastern Bering Sea (Ito, 1990) stated "Theoretically, it is possible for this quota to be taken entirely from the rougheye and shortraker rockfish stocks only." In other words, if the TAC for the GOA is 15,390 mt, fishermen could go out and legally catch 15,390 mt of rougheye and shortraker rockfishes, which is well above the MSY for both species.

Furthermore, in deriving ABC's for the slope rockfish assemblage many of the assumptions were invalid or simply unknown, as the authors pointed out. These assumptions include:

- 1. All species in the complex are similar to S. alutus in productivity and stock condition.

- 2. Species composition for the commercial fishery harvesting the slope rockfish complex will be the same species composition as that of the trawl surveys. Preliminary observer coverage suggests this is not true (Heifetz and Clausen 1990), with higher proportions of rougheye and shortraker rockfishes caught in commercial catch.

- 3. In deriving separate ABCs for each member of the complex, acceptable exploitation rates for POP are used. However, since rougheye and shortraker rockfish are considerably longer-lived than POP, they have lower natural mortality rates and lower exploitation rates need to be applied.

Thus, to protect rougheye and shortraker rockfishes, a more realistic harvest level related to their natural mortality should be set at F=0.03 instead of the F=0.05 used. We recommend that the complex quota be the ABC for shortraker and rougheye combined, because fishermen can fill the quota with those 2 species. This ABC equals 2,424 mt. Thus, if fishermen target upon the higher valued shortraker and rougheye rockfishes, the lower quota will protect them from overexploitation.

The calculations are as follows:

Region	Estimated Biomass	Recommended ABC	Plan Team ABC
GOA shortraker& rougheye	549,682 *.147=80,803mt	80803* 0.03= **2,424mt** (=slope rockfish ABC)	15,400mt

2. BERING SEA/ALEUTIAN ISLANDS

2.1. Walleye Pollock: 1991 recommended ABC and TAC in the Eastern Bering Sea and Aleutian Islands.

Determination of ABC.

The 1991 SAFE document recommends an increase in ABC of walleye pollock in the Eastern Bering Sea (EBS) from 1.45 million to 1.676 million tons, an increase of 15.6% from the 1990 level (Bering Sea/Aleutian Islands Groundfish Plan Team, 1990). This apparently resulted from adjustments of the recommended cohort biomass assessment model to revised and new trawl and hydroacoustic survey data (Wespestad et al., 1990). Those adjustments gave revised historical and projected estimates of exploitable pollock

biomass which are from 6 to 12% above estimates made in previous years. Since this recommended increase in ABC is substantial, every effort should be made to verify that the increased pollock biomass estimates indeed are significant and reflect biological reality. Closer scrutiny of the results demonstrates some uncertainty.

- 1. The revised biomass estimates of the CAGEAN model, which also was employed for stock assessment but which was not used in the final analyses, fall within the confidence interval range of previous results (i.e. $\pm$ 17-29% around the mean in the 1990 SAFE document; Wespestad, 1989). The cohort model, which is used for the final analyses, does not give any confidence intervals or other ranges of variability. It would be fair to assume that they should be of the same order as those of the trawl survey estimates (i.e. $\pm$ 14-25% around a mean value), since the cohort model is tuned to the trawl estimates. Hence, the revised biomass estimates are not significantly different from previous ones, and no significant changes in biomass have occurred. Similarly, given those approximate confidence intervals, the projected EBS pollock biomass of 6.7 million tons is not significantly above the Bmsy estimate of 5.9 million tons, as indicated by the authors (Wespestad et al., 1990).

- 2. Regardless of those revised biomass estimates, the trawl surveys and the assessment models show a stagnating-to-declining pollock population trend over recent years. It must be noted that the declining trend was used by the plan team to justify the downward revision of the ABC for pollock in the **Aleutian** region from 153,600 t in 1990 to 85,100 t in 1991.

- 3. There have been no new strong year classes recruiting to the population in recent years, and none are projected to occur until at least 1992. If that trend continues, one might expect more precipitous declines of the population biomass in the future.

Furthermore, there are other factors related to the stock structure of the species in the region, as well as ecosystem factors, which should be considered when setting the pollock ABC in the EBS for 1991.

First, there are uncertainties about the relationships between walleye pollock occurring over the EBS shelf and those living in the deeper waters of the Donut area of the Aleutian basin (Wespestad et al., 1990). While many differences in the size and age compositions between Donut-area and EBS shelf pollock have been found, there is also evidence that those fish are genetically linked and connected through yet unknown spawning and recruitment processes (Dawson, 1989; Wespestad et al., 1990). Until those connections are quantified, we must assume that at least a part of the EBS exploitable pollock biomass derives from pollock that spend part of the year in the Donut area. It should be emphasized that catches of pollock in the Donut area have increased dramatically in recent years, currently exceeding pollock catches in the Exclusive Economic Zones (EEZ's) of both the U.S. and the U.S.S.R. (Wespestad et al., 1990, Fig.1.2, p.46). Currently, U.S. catcher-processors are fishing pollock in the Donut hole, against a stated NPFMC policy recommendation. Scientists expect a future downturn in the biomass of Donut-area pollock, since it currently consists of older animals only, and the CPUE reported by several nations has recently decreased by about

50% (V. Wespestad, pers. comm., NPFMC plan team meetings, Seattle, 13 Nov. 1990).

Second, populations of several marine mammal and bird species living at least partially within the range of EBS and Aleutian islands fisheries have declined dramatically in recent years. These include Steller sea lions, harbor seals (Merrick et al., in press), and black-legged and red-legged kittiwakes (Hatch et al., 1990). Scientists have raised concern about the potential direct (habitat interference) and indirect (competition for food) interactions between fisheries and mammal/bird feeding and living habits (Steller sea lion recovery team meetings, Anchorage, AK, 1990). Until quantifiable information is available concerning these interactions, and if the populations do not rebound from their declining trend, the ABC for fish species on which those mammals and birds are known to feed should be set conservatively.

In summary, therefore, due to

- the statistical uncertainties in the revised EBS pollock population estimation,
- the declining trend of pollock numbers and biomass without a prospect for strong new recruitment,
- the uncertainties about the pollock stock structure with regard to the donut hole population, and
- ecosystem considerations,

an increase in the ABC for pollock in the EBS is not appropriate and we recommend that the ABC for 1991 be set to 1.45 million mt.

Furthermore, the ABC for pollock in the Aleutian region should be set to 85,100 mt, as recommended by the groundfish plan team, due to the uncertainties about the pollock biomass levels there.

Determination of TAC.

For determining the TAC, several important factors must be considered.

- 1. Pollock discards from both directed pollock fisheries and from other fishing operations.

- 2. Underestimates of landed catch due to delay in data processing for setting season closure dates.

- 3. Uncertainties from estimating landed catches using product recovery rates. Those rates may continuously change due to advances in fishing and processing technologies, and size composition of the fish.

- 4. Illegal fishing of foreign vessels in the U.S. EEZ, and

- 5. Fishing of U.S. and foreign vessels in the Donut Hole on that portion of the stock there which intermingles with the EBS and Aleutian stocks.

The factors are quantified as follows (Table 1).

- 1. Discards. NMFS observer data for the first 8 months of 1990 indicate discard rates of pollock in the EBS of 4-6% in midwater trawls, and of approximately 23% in bottom-trawl operations for the major species where pollock was retained (i.e. pollock, cod, yellowfin sole, sablefish, rockfish). Assuming that 75% of pollock were taken by midwater trawl (Baldwin, 1990), and without counting pollock discards from longline and pot fishing, discards are estimated to be at least 134,350 mt in the EBS, or about 9.3% of the 1990 pollock ABC.

- 2. Product recovery rates. It can easily calculated that, for example, a change in 1% of the product recovery rate for surimi, from 15% to 14%, requires an upward adjustment of 3-4% of the current ABC in the estimated landed pollock catch (e.g. ARC, 1990). Thus, this adjustment would minimally amount to about 50,000 mt.

- 3. Errors due to data-processing delays should allow for a buffer of 3-4 days of fishing. This equals about 40,000 mt, when assuming an expected fleet capacity of 70,000 t per week (B. Larkins, pers. comm., NPFMC plan team meeting, Seattle, 14 Nov. 1990).

- 4. and 5. No estimates of illegal international fishing, and of U.S. fishing on portions of the EBS pollock stock can be made at this time. However, one might choose a minimum factor of 5% of current ABC, or 73,000 mt.

In summary, the **minimum** amount of adjustments required for EBS pollock to prevent ABC from being exceeded would roughly equal 300,000 mt, or 20.7% of current ABC.

We therefore recommend that the 1991 TAC for pollock in the EBS be set at a maximum of 1.15 million mt (1,450,000mt minus 300,000mt), and in the Aleutian region to 67,500 mt (79.3% of 85,100mt). We furthermore recommend that increased efforts are undertaken to investigate the stock structures and relationships of pollock populations found in the entire easter Bering Sea, Aleutian Basin (Donut Hole) and Aleutian Island region.

Table 1. Recommended minimum TAC adjustments for the 1991 Eastern Bering Sea pollock harvest.

FACTOR	DERIVATION	QUANTITY
Discards	9.3% of 1990 ABC	134,350mt
P.R.R.error	3-4% of 1990 ABC	50,000mt
Delay errors	4 days fishing	40,000mt
Donut/illegal fishing	5% of 1990 ABC	73,000mt
TOTAL		297,350mt

2.1. Pacific Ocean Perch (POP) Complex: 1991 recommended ABC in the Eastern Bering Sea and Aleutian Islands.

Several factors point towards adopting a more conservative ABC than recommended by the Plan Team. We agree with the Dan Ito, the author of the POP chapter in the 1991 SAFE document (Ito, 1990), that the POP complex should be managed to protect the most vulnerable species, the rougheye and shortraker rockfishes, from depletion. These two species are more long-lived than Pacific ocean perch: rougheye rockfish have been aged to 140 years (Nelson 1986) and shortraker rockfish aged to 120 years (Chilton and Beamish 1982) in comparison to 90 years for POP (Chilton and Beamish 1982). Furthermore, they have a later age of recruitment and low natural mortality rates. The life history characteristics of rockfish that make them more prone to overexploitation than shorter-lived fishes.

Obviously, rockfishes demand conservative quotas first because of these life history characteristics and secondly because they are managed as a complex. One or two species of this complex can easily be overharvested. In the past, the Council has set TAC well below the ABC to promote rebuilding of the stocks. In addition, the Plan Team has suggested that ABC should be reduced to guard against excessive removals of rougheye and shortraker rockfish that are targeted upon by fishermen because they command a higher price than other species in the complex. In the future, we recommend that the POP complex be broken up to reflect the habitat and depth specific associations as well as the different life history characteristics of the individual species. However, until that time, the ABC and TAC should be set even more conservatively to protect rougheye and shortraker rockfishes. Until these species are managed separately, we recommend that the ABC for the POP complex simply be the ABC for shortraker and rougheye rockfishes, the species of most concern.

One major problem in the POP complex is that an ABC is set with theoretical allotments for the different species within the complex. Thus, for the EBS, a TAC of 3,800 mt hopefully would result in catches of about 2,700 mt of POP and 1,100 mt of the other species in the complex. However, fishermen can target upon and catch all 3,800 mt of any species within the complex. In fact, Ito (1990) stated that in the eastern Bering Sea, "theoretically, it is possible for this quota (POP complex) to be taken entirely from the rougheye and shortraker rockfish stocks only." In other words, if the TAC for the EBS is 3,800 mt, fishermen could go out and legally catch 3,800 mt of rougheye and shortraker rockfishes, which is well above the MSY for either species.

Furthermore, in deriving ABC's for the POP complex many of the assumptions were invalid or unknown as the author pointed out. These assumptions include:

- 1. All species in the complex are similar to S. alutus in productivity and stock condition.

- 2. Species composition for the commercial fishery harvesting the POP complex will be the same species composition as that of the trawl surveys. Preliminary observer coverage suggests this is not true (Heifetz and Clausen 1990) with higher proportions of rougheye and shortraker rockfishes caught in commercial catch. And
- 3. In deriving separate ABCs for each member of the complex, acceptable exploitation rates for POP are used for each member. However, rougheye and shortraker rockfish are considerably longer-lived than POP and so have lower natural mortality rates and hence should be exploited at lower rates.

Thus, in order to protect rougheye and shortraker rockfishes, a more realistic harvest level related to their natural mortality and to a possibly more pessimistic, or at least unknown stock recruitment relationship should be set at F=0.03 instead of the F=0.06 used. We furthermore recommend that the complex quota simply be the ABC for shortraker and rougheye, because fishermen can fill the quota with those 2 species. Our recommendation for the ABC for the POP complex in the Eastern Bering Sea is then 1,100 mt, and for the Aleutian Islands it is 3,560 mt. Thus, if fishermen target upon the higher valued shortraker and rougheye rockfishes, the lower quota will protect them from overexploitation.

The calculations are as follows:

Region	Estimated Biomass	Recommended ABC	Plan Team ABC
EBS			
shortraker& rougheye cmplx.	36,500mt	36,500* 0.03= **1,095mt**	3,800mt
Aleut. Islands			
shortraker& rougheye cmplx.	118,600mt	118,600* 0.03= **3,558mt**	10,000mt
		(= POP complex ABC)	

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Prepared by:

Hans J. Hartmann, Ph.D.
Kathleen R. Matthews, Ph.D.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

DIVISION OF COMMERCIAL FISHERIES

STEVE COWPER, GOVERNOR

P.O. BOX 3-2000
JUNEAU, ALASKA 99802-2000
PHONE: (907) 465-4210

November 30, 1991

Clarence Pautzke
Executive Director
North Pacific Fisheries Management Council
P.O. Box 103136
Anchorage, AK 99510

Dear Clarence:

Amendment 16A to the Bering Sea/Aleutians Groundfish Fishery Management Plan specifies that herring PSC caps would be established at 1% of the biomass of Bering Sea herring stocks from Port Moller to Norton Sound. The Alaska Department of Fish and Game herring forecast estimates the biomass of these herring stocks to total 83,406 metric tons for 1991. The 1991 herring cap would therefore be established at 834 metric tons, slightly higher than the 772 ton figure on which the Amendment 16A Environmental Assessment/Regulatory Impact Review analysis was based. A document summarizing the Bering Sea portion of the herring forecast is enclosed.

Herring biomass estimates will be updated when we receive new stock assessment data during the spring 1991 herring spawning period. We will advise the Council as soon as possible if there are any substantial revisions to the herring biomass estimates at that time.

Sincerely,

Denby S. Lloyd
Director
Division of Commercial Fisheries

11-K5LH

Agenda D-3(c)
December 1990
Supplemental

PRELIMINARY FORECASTS OF CATCH AND ABUNDANCE FOR BERING SEA HERRING STOCKS IN 1991

A Report to the North Pacific Fisheries Management Council

Edited By:

Fritz Funk

REGIONAL INFORMATION REPORT[1] NO. 5J90-09

Alaska Department of Fish and Game
Division of Commercial Fisheries
P.O. Box 3-2000
Juneau, Alaska 99802-2000

November 1990

[1] The Regional Information Report Series was established in 1988 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate needs for up-to-date information, reports in this series may contain preliminary data.

ACKNOWLEDGEMENTS

This report is based on information contributed by Division of Commercial Fisheries biologists and biometricians located in offices throughout the state. Jim McCullough supplied the information about the Port Moller area, Kathy Rowell contributed the information about the Togiak stock, Charley Burkey supplied information about Kuskokwim area stocks, and Helen Hamner, Sue Merkouris, and Charles Lean contributed information about the Cape Romanzof and Norton Sound areas.

EXECUTIVE SUMMARY

Amendment 16A to the Bering Sea/Aleutians Groundfish Fishery Management Plan would establish Prohibited Species Caps (PSC) caps for Bering Sea groundfish trawl fisheries at 1% of the aggregate biomass of herring stocks that spawn at Port Moller, Togiak, Security Cove, Goodnews Bay, Cape Avinof, Nelson Island, Nunivak Island, Cape Romanzof, and Norton Sound. The total Bering Sea herring biomass is estimated to be 83,406 metric tons. The herring PSC cap under amendment 16A would be set at 1% of the Bering Sea-wide biomass, or 834 metric tons. Bering Sea herring biomass is projected to continue to decline due to the senescence of the strong 1977-78 year classes of herring which had previously been making substantial contributions to the biomass of each area. The declines in abundance due to this effect are somewhat offset by the increases in biomass in Norton Sound due to recruitment from the 1981 and 1986 year classes. Herring biomass is projected to be below thresholds for commercial harvests at Nelson and Nunivak Islands.

Herring biomass estimates will be updated during the 1991 sac roe season in areas where aerial survey conditions are good and rapid data summary is possible. If time permits the forecasts will be revised prior to the herring sac roe season for Cape Romanzof and Norton Sound where population dynamics studies are in progress.

INTRODUCTION

Amendment 16A to the Bering Sea/Aleutians Groundfish Fishery Management Plan identifies an aggregate of nine Bering Sea herring stocks that are taken as bycatch by groundfish trawl fisheries in the Bering Sea. These nine herring stocks, identified by their spawning grounds, are the Port Moller, Togiak, Security Cove, Goodnews Bay, Cape Avinof, Nelson Island, Nunivak Island, Cape Romanzof, and Norton Sound herring stocks (Figure 1). Amendment 16A specifies that 1% of the aggregate biomass of these stocks would be used to establish herring bycatch caps that, if exceeded, would trigger certain time-area closures for groundfish trawlers. The purpose of this document is to summarize the best currently available estimates of the biomass of these nine herring stocks. This summary is based on more detailed stock assessment documents which are prepared for each of the stocks. Summaries of stock assessment information for 1990 were given by Funk and Savikko (1990). All harvests and biomasses in this report are reported using the short ton (2,000 lbs) unit used extensively in the herring harvesting and processing industry, unless otherwise noted. The metric ton unit (2,204.62 lbs) is the standard unit used to manage the groundfish fishery.

A booklet describing regulations for all Alaska herring fisheries is available from ADF&G offices. The management of many herring fisheries is further described in fishery management plans. In some cases these management plans are regulations adopted by the Alaska Board of Fisheries and appear in the herring regulation booklet. In other cases, separate fishery management plan documents are available from the local ADF&G area management office(s) responsible for each fishery.

Herring harvest projections are based on a number of sources of information. For the major stocks harvested during spring sac roe fisheries, estimates of the spawning biomass and age composition of the stock are derived each spring. Spawning biomass is estimated either from spawn deposition surveys or from aerial surveys. The age composition of the spawning biomass is estimated by sampling the commercial catch and from test fishing conducted by the Department of Fish and Game. Herring stock assessment forecasts for 1991 consist of projecting the numbers and average weight of each age class of the population, as assessed in 1990, forward to 1991, allowing for an age-specific level of annual natural mortality and growth. Attempts are also made to predict the number of recruit age-class fish (age 3, 4, or 5, depending on the area) that will appear in the 1991 spawning population for the first time. In most cases these estimates are derived from the number of 2, 3, or 4 year old fish which appeared on the spawning grounds in 1990. These recruitment estimates contain a very large amount of uncertainty. In a few instances, additional growth and age composition information will be obtained from overwintering herring schools prior to the spring 1991 fishery. While hydroacoustic estimates of biomass are used to assess some populations harvested by food and bait herring fisheries, these methods are not used for quantitative assessment of herring stocks fished in spring roe fisheries at this time.

Herring biomass estimates will be updated during the 1991 sac roe season in areas where aerial survey conditions are good and rapid data summary is possible. Herring biomass estimates will be updated during the 1991 sac roe season in areas where aerial survey conditions are good and rapid data summary is possible. If time permits the forecasts will be revised prior to the herring sac roe season for Cape Romanzof and Norton Sound where population dynamics studies are in progress.

PORT MOLLER

Since 1986, herring sac roe harvests in the Port Moller fishery have ranged from 270-880 tons. In 1990, the Port Moller herring sac roe fishery was opened by emergency order on May 30. Herring appeared to be running late and most of the harvest occurred June 6-8. The entire harvest of 273 short tons was taken from Herendeen and Inner Moller Bay sections. Although 19 purse seine vessels indicated an interest in fishing at Port Moller, only 5 permit holders made deliveries. The average roe recovery was 7.35% with an average price of $600 per ton for 10% roe recovery +/- $60 for each percentage point above or below 10%, and the ex-vessel value of the fishery was worth $123,251.

For 1991 the Port Moller forecasted herring catch is 300 tons. The forecast is based on the 1985-90 average catch of 572 tons adjusted for the lower than normal observed biomass in Port Moller aerial surveys during 1990. The fishery is being managed for 15% exploitation on the preseason forecast biomass of 2,000 short tons. Age class data from the 1990 catch indicates that in 1991 ages 4 and 7 herring should dominate North Peninsula catches.

TOGIAK

Summary of the 1990 Togiak Sac Roe Fishery

The peak aerial survey biomass estimate of 72,000 short tons was observed on May 8, and the fishery was managed on that inseason estimate. By Board of Fisheries directive, the fishery is to be managed with a maximum exploitation rate of 20 percent. Fifteen hundred short tons are reserved for the spawn-on-kelp fishery, and 7% of the remaining available harvest set aside for the Dutch Harbor food and bait fishery. The remainder of the harvestable surplus is allocated to the sac-roe fishery, of which 25 percent is allocated to the gill net fleet, and 75 percent to the seine fleet. Thus, the allocation by gear type of the harvestable surplus of 14,400 short tons was as follows:

Spawn-on-kelp equivalent:	1,500 short tons
Dutch Harbor Food/Bait:	900 short tons
Gill Net Fleet:	3,000 short tons
Seine Net Fleet:	9,000 short tons
TOTAL:	14,400 short tons

One seine opening occurred May 9, and 9,129 short tons were harvested throughout the district. The first of six gill net openings occurred on May 8. The gill net fishery did not conclude until May 21, when the gill net fleet completed their allocated harvest of 3,000 tons.

The spawn-on-kelp fishery harvested 415,418 pounds of product in one four hour opening on May 11. Most of the product was reported as good quality, and some as excellent quality. This was the first year that participation in the fishery was limited. Using the formula adopted in 1984 by the Board of Fisheries, the 415,418 lbs of spawn-on-kelp harvest was converted to an equivalent of 1,625 short tons of spawning adult herring for computing the exploitation rate.

Sac roe prices were estimated at $550 per short ton for 10% mature roe, with +/- $50 for each percentage change. Using the estimated roe recovery of 9.6% for the sac roe harvest yielded an overall exvessel price of $530 per short ton. Spawn-on-kelp sold for $0.87 per pound. The estimated exvessel value of product sold during the 1990 Togiak District herring and spawn-on-kelp fishery was as follows:

Seine/Gill Net Sac Roe Herring:	12,137 short tons	@ $530/s.t.=	$6,432,610
Seine/Fill Net Food/Bait Herring:	170 short tons	@ $ 50/s.t.=	$ 8,500
Spawn-on-kelp product:	415,418 pounds	@ $0.87/lb.=	$ 361,414

1990 Total Exvessel Value: = $6,802,524

Togiak 1990 Stock Assessment Summary

Biomass estimates of herring in the Togiak District are attained by converting surface area estimates of herring schools into tons (Lebida and Whitmore 1985). The location, number, and size of herring schools observed during aerial surveys are recorded by index areas throughout the fishing district. Herring school surface areas are multiplied by depth specific conversion factors to attain a biomass estimates. Conversion factors are updated and aerial survey data calibrated each year by the following process. The biomass and surface area of a herring school is estimated from the air. Then the same school is captured by a purse seine, pumped aboard, and weighed to calibrate the original estimate.

In 1990, aerial surveys began on April 22, and the first herring were sighted on May 1 (earlier sightings of fish, beginning on April 28, turned out to be smelt). Survey conditions were generally fair to good from April 22 through May 8, when the peak daily biomass estimate of 72,000 short tons was observed. Viewing conditions deteriorated after May 8, as high winds and rain caused turbid water and poor visibility. Although a shift in age composition was observed in the gill net harvest during this time, a new biomass estimate was not possible, and the fishery continued to be managed on the peak daily 72,000 short ton biomass estimate. Post-season aerial surveys were conducted until June 5, and confirmed the presence of late-season spawning activity and a significant amount of herring still present on the grounds. Preliminary spawn deposition surveys were conducted for the first time in 1990 to determine the feasibility of applying this method at Togiak to estimate spawning herring biomass.

Post-season analysis of the aerial survey and age composition data identified several distinct movements of herring onto the spawning grounds. Peak aerial survey biomass estimates from each of the distinct spawning events was summed to obtain the preliminary estimated inshore return of herring to the Togiak District in 1990 of 88,105 short tons. This estimate is above the forecast return of 56,020 short tons. It appears that survival of older aged fish was underestimated in the pre-season forecast and the aerial surveys may have underestimated herring biomass in earlier years.

Herring biomass is forecasted applying age-specific growth and survival rates to the age-specific biomass estimate from the preceding year. The forecasted 1991 herring biomass for the Togiak District is 54,772 tons. The 1977 and 1978 year classes which have dominated the biomass since 1985 have diminished in importance. These year classes will be returning as age 13 and 14 herring, and will comprise 21% of the biomass. Age 8, 10, and 7 (1983, 1981, and 1984 year classes) will represent 22%, 21% and 14% of the biomass. By number, the contribution of the 1983 year class (age 8), exceeds all others and will comprise 25% of the total population. Some age 3 herring (1987 year class) were present in the 1990 return for the first time in several years. Because this year class was only partially recruited in 1990, quantitative estimates of the strength of the 1987 year class will not be available until 1991.

In recent years, the forecasted biomass has been less than the observed return because of the inability to perform aerial surveys during poor weather periods in some years and because of the better than expected survival of older-aged herring which were dominating the population. For 1991, survival estimates were revised, reflecting the increased survival rates for older herring.

The continuing decline in abundance of the previously very strong 1977 and 1978 year classes, coupled with the lack of substantial recruitment, is the cause of the projected decline in abundance of the Togiak stock. The Alaska Board of Fisheries has established an abundance threshold of 35,000 short tons, below which commercial fisheries would not be allowed. Because some modest recruitment has been observed from the 1981, 1983, and 1984 year classes, the Togiak stock is expected to begin to stabilize at relatively low levels of abundance, near threshold, unless substantial new recruitment is observed.

Based on the 54,772 ton forecast biomass, a 10,954 ton harvest would be allowed at a 20% exploitation rate. The Bristol Bay herring management plan developed by the Alaska Board of Fisheries reserves 1,500 tons of the allowable exploitation to allow for losses to the spawning population from the spawn on kelp fishery. Of the remaining 9,454 tons, 7% (662 tons) is allocated to the Dutch Harbor food and bait fishery of which Togiak is the dominant stock. The remaining 93% is allocated 75% to the purse seine fleet (6,594 tons) and 25% to the gill net fleet (2,198 tons).

KUSKOKWIM AREA

The Kuskokwim area includes herring stocks that spawn in Security Cove, Goodnews Bay, Cape Avinof, Nelson Island and Nunivak Island. A total of 50 aerial surveys were flown throughout the herring spawning season in all districts to determine relative abundance, timing, distribution, and biomass of Pacific herring. Occurrence and extent of milt, numbers of fishing vessels, and visibility factors affecting survey quality were also recorded.

Standard conversion factors of 1.52 tons (for water depths of 16 feet or less), 2.58 tons (water depths between 16 and 26 feet), and 2.83 tons (water depths greater than 26 feet) per 538 ft^2 of surface area were used to convert estimated herring school surface areas from aerial surveys to biomass within all districts.

Security Cove

The estimated biomass of herring in the Security Cove District has ranged from 2,300 tons in 1987 to 8,300 tons in 1981. The Alaska Board of Fisheries has established a commercial harvest threshold of 1,200 short tons for Security Cove. The 1990 commercial fishery was managed on the inseason biomass estimate of 2,650 short tons. The total 1990 harvest of 234 tons of herring was taken during two openings on May 12 and May 13. Nine processors and 52 fisherman were involved in this fishery. Fishermen received approximately $500 per ton for 10% sac roe herring. The total ex-vessel value of the harvest was approximately $94,000.

During 1990, six aerial surveys were flown in the district from May 9 to May 31 to estimate herring biomass and spawning activity. Half of these surveys were flown under poor or unacceptable survey conditions. Herring were first seen in the Security Cove District on May 9. The season's largest biomass of 1,561 tons was observed during an aerial survey flown under excellent conditions on May 10. A second peak of 1,089 tons was sighted during a May 31 survey. The total biomass of herring in the district was estimated to be 2,650 tons by combining these surveys. On May 19, 4.0 miles of spawn was observed which marked the peak in spawning activity for the district.

Department test fishing was conducted from May 9 to May 17 using variable mesh gill nets. Approximately 447 herring from test nets were sampled for biological analysis. A sample of 308 herring was also taken from the commercial harvest.

Herring in this area are near full recruitment by age 5. Substantial recruitment

in the Security Cove District was last observed in 1982 and 1983 when approximately 12 million and 6.4 million age 5 herring from the 1977 and 1978 year classes were estimated in the spawning population. In 1990, nearly 75% of the biomass consisted of age 9 and older herring. Recruits, ages 4 and 5 herring, represented only 0.5% of the run by weight.

Based on the 1990 aerial survey biomass estimate and recent averages of growth and survival, the 1991 projected return is 1,490 tons which at a 15% exploitation rate would result in a harvest of about 225 tons. Age 9 and older herring are expected to comprise 72% of the biomass.

Goodnews Bay

Since 1981, the estimated biomass of herring in the Goodnews Bay District has ranged from 2,000 tons in 1987 to 4,479 tons in 1988. The Alaska Board of Fisheries has established a commercial harvest threshold of 1,200 short tons for Goodnews Bay. The 1990 fishery was managed on the inseason biomass estimate of 2,577 short tons. The 1990 herring harvest in the Goodnews Bay district occurred from May 18-23 and totalled 455 tons. There were 126 fishermen who made 530 deliveries to three processors. Fishermen received approximately $550 per ton for 10% sac roe herring. The total ex-vessel value of the harvest was approximately $314,000.

In 1990, ten aerial surveys were flown in the Goodnews Bay district. Half of these surveys were flown under poor to unacceptable conditions. During a survey flown on May 16, 1,184 tons of herring were estimated to be present in the district. An additional 1,393 tons of additional herring were observed during an aerial survey flown on May 31. The total biomass estimate of 2,577 tons for Goodnews Bay was calculated by combining the biomass estimates from these two surveys. Only 0.5 linear miles of milt was sighted during the season.

The Department test fish crew first documented spawning activity on May 9. A total of 1,143 herring were sampled from variable mesh gill nets from May 8 to May 26. A total of 534 herring were sampled from the commercial harvest. Similar to Security Cove and Togiak Districts, the 1977 year class, which returned as 5 years old in 1982, represents the largest year class in the data series.

In 1990, ages 7 and 6 comprised 17% and 18% of the biomass, respectively. Nearly 54% of the total run by weight was age 9 and older herring. Recruits, ages 3,4, and 5 herring, represented only 2.6% of the biomass.

The 1991 projected return is approximately 1,470 tons which at a 15% exploitation rate would result in a harvest of about 220 tons. Ages 7 and 8 herring are expected to contribute the most to the spawning biomass. Age 9 and older herring are expected to comprise approximately 59% of the biomass.

Cape Avinof

Aerial surveys have been conducted systematically in the Cape Avinof are since 1985. An estimated herring biomass of 2,000 tons, 1,225 tons, and 4,110 tons were observed in 1985, 1987, and 1988, respectively. Weather conditions in 1986 and ice conditions in 1989 precluded biomass estimates by aerial survey. The Alaska Board of Fisheries has established a commercial harvest threshold for Cape Avinof of 500 short tons. The 1990 fishery was managed on the preseason forecast biomass of 2,020 short tons. Only 50 tons out of the 300 tons guideline harvest was taken at Cape Avinof due to problems with product quality and the availability of processing vessels.

In 1990, two commercial openings were scheduled in the Cape Avinof District.

Fishermen harvested 10.1 tons during a one hour opening on May 29. Because of this low harvest, the district was reopened the same day for two hours. The harvest from both openings was 49.1 tons of sac roe herring with an average roe content of 12.1% and 0.6 tons of bait-quality herring. Only one tender was present in the district on May 29. After the opening the tender left the district. When a tender became available again on June 4, commercial test fishing failed to find herring with acceptable roe quality due to the presence of young and spent fish. The district was closed to commercial fishing on June 12 since Department test fish samples showed poor roe quality and no processors were available. The harvest was 2.4% of the projected biomass. One hundred-one fishermen made deliveries to one processor. Fishermen received approximately $500 per ton for 10% sac roe herring. The value of the catch to fishermen was about $35,000.

In 1990, only two of the seven aerial surveys of the Cape Avinof District were flown under acceptable conditions. No spawn was observed during these surveys. During an aerial survey May 22, Department biologists counted 152 tons of herring. Since unsatisfactory aerial survey conditions prevailed during the 1990 season, the projected biomass of 2,020 tons was assumed to be the biomass available in the district.

Spawning activity was first documented by the test fish crew on May 31. A total of 728 herring were sampled from variable mesh gill nets for age, sex, length, and weight data. A total of 119 herring were sampled from the commercial harvest. Age 6 herring represented 26% of the run by weight. Age 9 and older herring comprised 24% of the biomass. Younger herring, age 3, 4 and 5, represented approximately 16% of the return.

Since the peak aerial survey estimate of biomass was observed under unacceptable survey conditions, the 1990 preseason projection of 2,020 tons was used to estimate the 1991 return. The return to the Cape Avinof District in 1991 is expected to be 1,708 tons, which at an exploitation rate of 15% would result in a 255 ton harvest. Age 7 herring are expected to be the largest age group in the return. Age 9 and older herring are expected to comprise 27% of the return.

Nelson Island

Since 1985, the biomass estimates of herring in the Nelson Island District have ranged from a low of 2,705 tons in 1990 to 9,500 tons in 1985. The Alaska Board of Fisheries has established a commercial harvest threshold of 2,500 short tons for Nelson Island. The fishery was managed using the inseason aerial survey estimate of 2,705 short tons.

No commercial openings occurred in the district in 1990. Fishermen were placed on 2 hour notice of a possible opening on June 2 when results of the May 31 aerial survey were known. The allowable harvest was set at 205 tons based on the difference in the estimated available biomass (2,705 tons) and the 2,500 ton threshold mandated in the Bering Sea Herring Fisheries Management Plan. Test fishing catches indicated that product quality was poor due to a high proportion of spawned out herring in the catch and no processors registered to buy herring in the district. The district was closed on June 12 without any commercial harvest due to the poor roe quality of the Department's test samples and lack of processor interest.

During the 1990 herring season, fifteen aerial surveys were flown from May 20 to June 6. Half of these surveys were rated either poor or unacceptable. On May 31, under fair to poor aerial survey conditions, 2,705 tons of herring were observed. Large amounts of unattached eggs were observed washed up on the beach at Cape Vancouver on May 23.

Age 6 herring represented 17% of the 1990 biomass. Recruits, ages 3, 4 and 5, comprised only 5% of the run by weight. Fifty-seven percent of the biomass consisted of age 9 and older herring.

The spawning biomass projected to return to the Nelson Island District during 1991 is 1,900 tons. This is below the 2,500 ton threshold required to open the fishery. However, processors and fishermen are advised that management of the 1991 fishery will be based on inseason observed biomass, if acceptable aerial survey conditions are achieved. If the observed biomass does not exceed the threshold of 2,500 tons of herring, the fishery will not be opened.

In 1991, age 7 herring are expected to be the dominant age group. Herring of age 9 and older are expected to comprise 54% of the biomass. The harvest level will be maintained at 10% unless available biomass significantly exceeds the 2,500 ton threshold level.

Nunivak Island

Since 1985, the estimated biomass in the Nunivak Island District has ranged from 422 tons in 1990 to 6,000 tons in 1986. The Alaska Board of Fisheries has established a 1,500 short ton commercial threshold for the Nunivak Island area.

During 1990, seven aerial surveys were flown between May 21 and June 1. Five of these surveys were flown in fair to excellent survey conditions. Spawning activity was first documented in the district on May 22 when approximately 4 linear miles of milt was observed during an aerial survey. The total biomass estimate for the district was calculated to be 422 tons based on an aerial survey flown on May 28. Since this biomass estimate was below the 1,500 tons threshold mandated in the Bering Sea Herring Fisheries Management Plan, no commercial herring fishery occurred in the district in 1990.

Department test fishing was conducted from May 15 to June 4 using variable mesh gill nets. Approximately 690 herring from test nets were sampled for biological analysis. Since 1985, the strongest year class as determined by the abundance of 5 year old in the spawning population was the 1981 year class which contributed 3.4 million recruits to the 1986 run. Age 11 herring comprised 28% of the 1990 return. Ninety-three percent of the biomass consisted of age 9 and older herring. Younger fish, age 3, 4, and 5 herring, represented only 0.2% of the run.

The biomass of herring projected to return to the Nunivak Island District during 1991 is 235 tons. This is below the threshold of 1,500 tons needed to open the fishery. However, as with Nelson Island, processors and fishermen are advised that management of the 1991 fishery will be based on observed biomass. If the observed biomass does not exceed the threshold of 1,500 tons of herring, the fishery will not be opened. Ages 10 and above are expected to dominate the spawning population in both biomass and numbers of fish. Age 9 and older herring are expected to comprise 94% of the return.

CAPE ROMANZOF

The Cape Romanzof herring population spawns primarily in Kokechik Bay, just south of Cape Romanzof. Since 1975 the estimated biomass of herring in the Cape Romanzof District has ranged from a low of 2,400 tons in 1990 to 7,500 tons in 1986.

Because the Department was not able to update the forecast biomass estimate inseason, the forecast biomass of 2,410 tons was used to manage the fishery in

1990. The 1990 commercial herring sac roe season at Cape Romanzof consisted of one three hour period on May 23-24. A total harvest of 329 short tons (st) was taken by 95 fishermen utilizing 90 fishing vessels. Approximately 318.2 short tons was purchased as sac roe and 10.8 short tons was purchased as bait herring. The average sac roe recovery was 8.4%. Wastage was not a problem during the 1990 season. The estimated value of the total harvest to the fishermen was $154,940. Average price for Pacific herring sac roe was $566 st at 10% roe recovery, plus or minus $49 per percentage point of roe recovery.

Due to excessive water turbidity in the Cape Romanzof area, it is generally not possible to estimate herring biomass from aerial surveys. Biomass has been estimated using a combination of information from test and commercial catches, spawn deposition, and age composition. In 1990, five aerial surveys were flown from mid-May to early June. All surveys flown during May were unacceptable due to poor weather and/or turbid water conditions. Department test fishing was conducted from May 17 to June 6 using variable mesh gill nets. A total of 2,220 herring were caught, of which 1,112 herring were sampled for biological data. A total of 308 herring were sampled from the commercial harvest. Daily spawn deposition surveys in the Kokechik Bay began May 15. On May 19, the first observations of spawn were recorded and spawn deposition peaked on May 29.

Projected biomass estimated for 1991 is 2,983 short tons. Twenty-one percent of the biomass was composed of age 9+ herring, with 23% of the biomass being age 6. Recruit fish, aged 3,4, and 5 comprised only 4% of the biomass. At a 15% exploitation rate, the commercial harvest is projected to be 447 short tons. The threshold for the Cape Romanzof area is 1,500 short tons.

Many residents of the villages near Kokechik Bay utilize the Cape Romanzof stock both for commercial and subsistence harvests. Subsistence herring harvest survey questionnaires were mailed to known fishing families in the villages of Hooper Bay, Chevak, and Scammon Bay. Based on the results of this survey, the minimum subsistence harvest from the area is estimated at 9 short tons. Subsistence catches should be considered minimum estimates becauser not all fishing families are contacted and not all questionnaires are completed and returned.

NORTON SOUND

Herring biomass in Norton Sound has fluctuated from a low of 5,300 short tons in 1978 to 39,000 tons in 1990. The primary spawning areas within Norton Sound have been from Stuart Island to Tolstoi Point. Additional spawning areas have been documented along Cape Denbigh and occasionally along the north shore of Norton Sound.

The 1990 commercial fishery opened on May 28 and was managed on the peak aerial estimate of 35,522 short tons which was observed on May 27. A total of 357 gill net fishermen harvested 6,380 short tons during four openings from May 28-31, while an additional 347 short tons was landed by 8 beach seine fishermen. Fishermen received $686 per ton for 10% roe content herring. The total value of the harvest is estimated to be $3,605,597.

During 1990, 23 aerial surveys were flown in Norton Sound on 18 different days. Two biomass peaks were observed during the aerial surveys. The first peak was observed on May 27 and the second peak was observed on June 7. Approximately one-fourth of the fish in the second peak were young fish, primarily age 4, indicating that the 1986 year class is of at least moderate strength. Better assessment of the strength of the 1986 year class will be possible in 1991 when the year class becomes more fully recruited.

Department test fishing crews sampled 1,831 herring with variable mesh gill nets

for age, sex, length, and weight, and an additional 1,217 herring from the commercial catch. Unlike herring fisheries to the south, year classes after the 1977 and 1978 year classes are contributing substantially to the Norton Sound herring fishery.

For 1991 the projected biomass is 25,371 short tons with a projected harvest of 5,075 short tons allowed at a 20% exploitation rate. The biomass is projected to be dominated by age 10 fish (29%), followed by age 5 fish (1986 year class) at 18% of the biomass.

BERING SEA-WIDE BIOMASS

Summaries of the projected harvests and biomass for each area are given in Table 1. The total Bering Sea herring biomass is estimated to be 91,939 short tons (83,406 metric tons). The herring Prohibited Species Catch (PSC) cap under amendment 16A would be set at 1% of the Bering Sea-wide biomass, or 834 metric tons.

The biomass of Bering Sea herring is projected to decline (Figure 2) due to the senescence of the strong 1977-78 year classes of herring which had previously been making substantial contributions to the biomass of each area. The declines in abundance due to this effect are somewhat offset by the increases in biomass due to recruitment of younger year classes in Norton Sound.

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Table 1. Forecast harvest and biomass of Bering Sea herring stocks for 1991. Harvests and biomasses are in the short ton (2,000 lbs) units used to manage herring sac roe fisheries, unless otherwise noted.

Fishery/Stock	Forecast Harvest (st)	Biomass (st)	Exploitation Rate	Threshold (st)	Percent of Bering Sea Biomass
Dutch Harbor[a]	662	[a]	[a]	[a]	
Port Moller	300	2,000	15%	1,000	2.2%
Togiak	10,293	54,772	20%	35,000	59.6%
Security Cove	225	1,490	15%	1,200	1.6%
Goodnews Bay	220	1,472	15%	1,200	1.6%
Cape Avinof	260	1,722	15%	500	1.9%
Nelson Island	0	235	0%	2,500	0.3%
Nunivak Island	0	1,897	0%	1,500	2.1%
Cape Romanzof	447	2,980	15%	1,500	3.2%
Norton Sound	5,075	25,371	20%	7,000	27.6%
Total (short tons)	17,481	91,939	19%	51,400	100.0%
Total (metric tons)	15,859	83,406		46,629	

Herring PSC Cap (1% of Biomass): 834 metric tons

[a] The Dutch Harbor food and bait fishery harvests stocks from other areas, primarily Togiak.

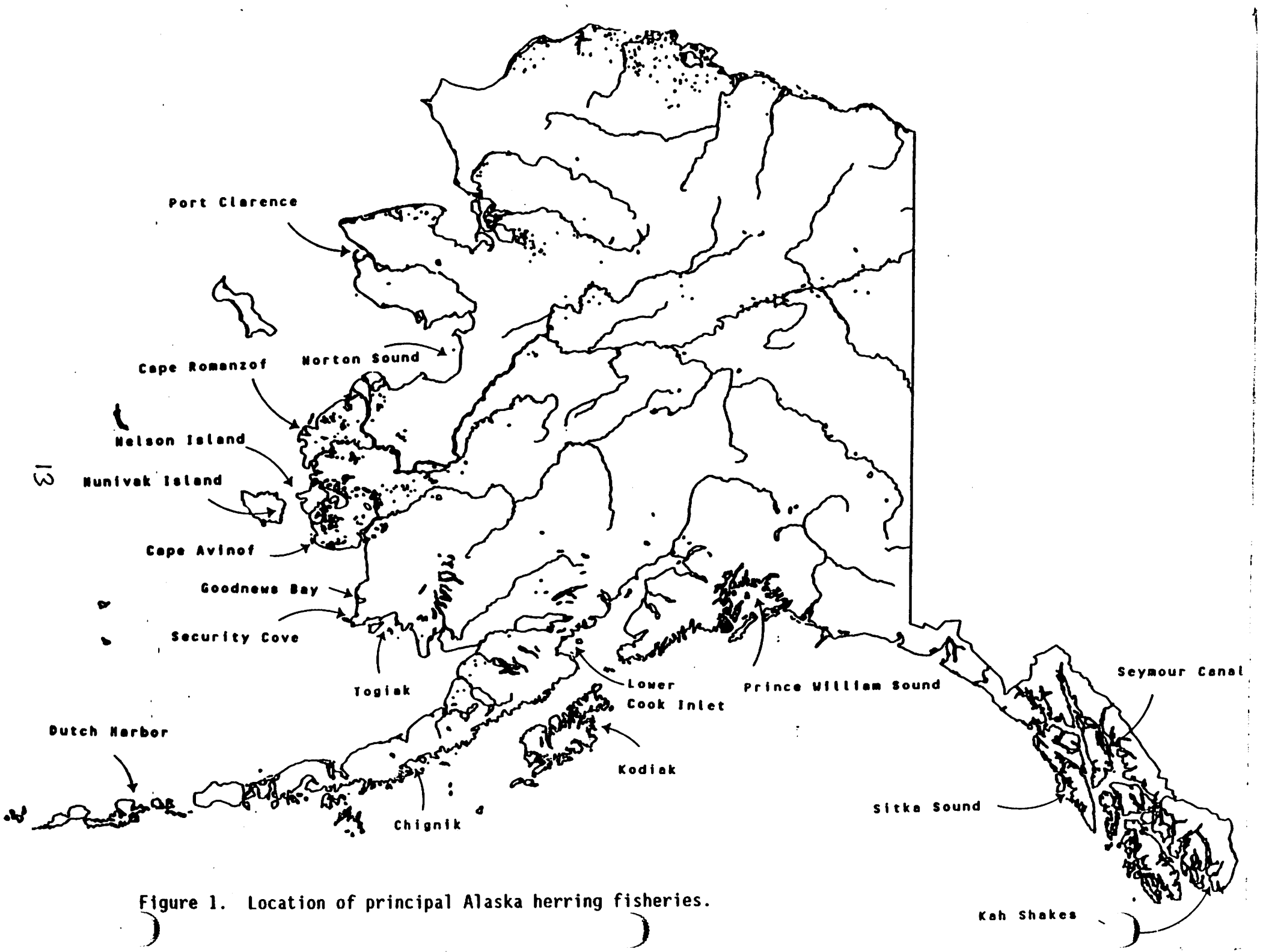

Figure 1. Location of principal Alaska herring fisheries.

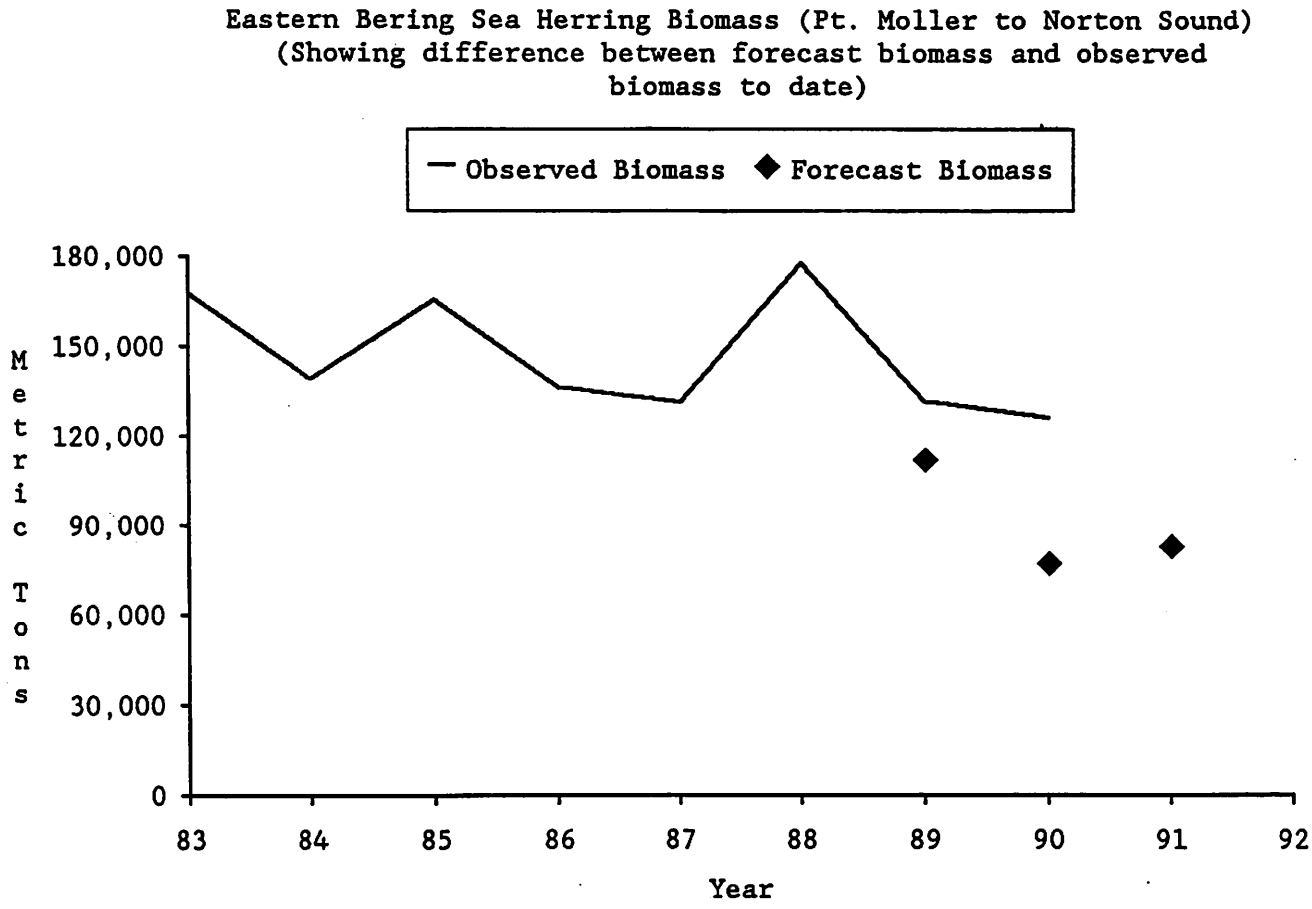

Figure 2. Biomass of eastern Bering Sea herring stocks (Port Moller to Norton Sound), from 1983-90, with the forecast biomass for 1991.


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