MEMORANDUM

TO: Council, SSC and AP Members

FROM: Clarence G. Pautzke
Executive Director

DATE: November 22, 1991

SUBJECT: Bering Sea/Aleutian Islands Groundfish Specifications for 1992

ACTION REQUIRED

Review final Stock Assessment and Fishery Evaluation (SAFE) report for 1992 and set the following specifications:

1. Annual Total Allowable Catch (TAC), initial TAC (ITAC), and domestic annual processing (DAP);
2. Division of the pollock ITAC into the roe and non-roe seasons;
3. Amount of the pollock TAC that may be taken with bottom trawls;
4. Bycatch allowances, and seasonal apportionments of red king crab, Tanner crab, Pacific halibut, and herring that will be assigned to target fishery categories; and
5. Bycatch rate standards for the Vessel Incentive Program.

BACKGROUND

SAFE and 1992 ABCs

The Plan Team met November 12-15 in Seattle to prepare the final SAFE report for 1992. An abridged summary of the document is provided as item D-2(c)(1). The entire document was sent to you on November 22. It incorporates 1991 survey data and analyses, and therefore differs from September's preliminary SAFE. The sum of recommended ABCs for 1992 is 3.08 million mt (2.9 million mt was recommended for 1991). Changes of note from last year's SAFE include a decrease in the recommended pollock ABC, creation of a 107,000 mt ABC for pollock in the Bogoslof district and large increases in the yellowfin sole and Atka mackerel ABCs. Overall, the status of the stocks continues to appear relatively favorable. The Council needs to establish the final ABCs for each species or species group under management at this meeting. Item D-2(c)(2a-b) are spreadsheets to help with setting ABCs.

At its November meeting the Plan Team also recommended splitting the Aleutian Islands subarea at 180° longitude for the purpose of apportioning the True POP (Sebastes alutus) and the Atka mackerel ABCs. The reason for this recommendation is to prevent the possibility of localized depletion. This change would require a plan amendment. The Plan Team also recommended splitting the EBS "Other POP complex" into two rockfish categories: (1) shortraker/rougheye, and (2) sharpchin/Northern rockfish, and setting separate ABCs. This change was made for the Aleutian Islands for 1991. This change can be accomplished in the specifications process.

TACs and Apportionments for 1992

Based upon the ABCs and other environmental and socioeconomic factors, the Council needs to set total allowable catches (TACs) and apportionments to the domestic fisheries for each target species or species group under management in the Bering Sea/Aleutian Islands.

The Council's preliminary specifications from September are attached as item D-2(c)(3). Under Amendment 16 to the BSAI FMP, 25% of the Council's preliminary specifications will go forward as interim specifications for management of the 1992 groundfish fisheries until superseded by publication of the Council's 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 Allowances for the Pollock Fishery

Pollock in the BSAI must be apportioned between the roe (January 1 - April 15) and non-roe (June 1 - December 31) seasons, as indicated in Item D-2(c)(2a-b). At its September meeting, the Council made preliminary specifications of 34% of the pollock TAC (40% of the TAC less the 15% reserve) to be available during the roe season, and 66% during the non-roe season.

In recommending seasonal allowances of the BSAI pollock TAC, the Council will wish to consider the following factors:

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 mammal stocks, and stocks of species taken as bycatch in 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; and,
9. Other biological and socioeconomic information that affects the consistency of seasonal pollock harvests with the goals and objectives of the FMP.

Item D-2(c)(4) provides information regarding these nine factors, including estimated duration of the pollock "A" season and weekly BSAI pollock catch, product mix and wholesale value of the 1991 pollock fishery.

Pollock Allocation to Pelagic Trawl Gear

Amendment 16a provided for the apportionment of pollock to pelagic trawl gear (i.e., limit the amount that can be taken with bottom trawl gear). In approving this amendment for Secretarial Review, the Council adopted the 88%-12% split (midwater-bottom trawl) recommended by the Region. The actual percentages from the 1990 fishery were 89%-11%. Last April the Council noted that additional pollock harvests with non-pelagic trawl gear likely would be constrained by halibut bycatch, and did not recommend a specific apportionment between pelagic and non pelagic gear. The actual percentages for 1991 turned out to be 95%-5% (midwater-bottom trawl). At the September 1991 meeting the Council recommended that pollock TACs should not be separated by gear type.

Regulations require that pollock allocations to non pelagic trawls be based on the following types of information:

1. Bycatch allowances of PSC species;
2. Projected bycatch of prohibited species that might occur with and without constraining amounts of pollock taken with non pelagic trawls; and
3. Costs of a limit in terms of amounts of pollock TAC that may be taken with bottom trawls in the non pelagic trawl fisheries.

Bycatch Allowances and Seasonal Apportionments

Halibut and Crab PSCs. Overall PSC limits adopted by the Council in Amendment 16 are:

Pacific halibut:	4,400 mt catch in BSAI for Zones 1 and 2H (Area 517) closure 5,333 mt catch for BSAI closure
C. bairdi:	1,000,000 crabs in Zone 1 for Zone 1 closure 3,000,000 crabs in Zone 2 for a Zone 2 closure
Red king crab:	200,000 crabs in Zone 1 for a Zone 1 closure

These PSC limits are to be apportioned among four bottom trawl fishery categories:

1. Greenland turbot;
2. rock sole;
3. flatfish (includes yellowfin sole and "other flatfish"); and
4. "Other fishery" (includes P. cod, bottom trawl pollock, Atka mackerel, sablefish, arrowtooth flounder and other).

At the September Council meeting the Council recommended the 1991 PSC apportionments as preliminary 1992 PSC apportionments. Item D-2(c)(5) is a table indicating 1991 PSC apportionments. Item D-2(c)(6) is a worksheet on which initial 1992 PSC apportionments can be filled in as the meeting proceeds.

The Council may also propose seasonal apportionments of the bycatch allowances. In 1991, the Council chose to seasonally apportion only the Pacific halibut bycatch allowance to the DAP "other" fishery category. Regulations require that seasonal apportionments of bycatch allowances be based on the following types of information:

1. Seasonal distribution of prohibited species;
2. Seasonal distribution of target groundfish species relative to prohibited species distribution;
3. Expected prohibited species bycatch needs on a seasonal basis relevant to change in prohibited species biomass and expected catches of target groundfish species;
4. Expected variations in bycatch rates throughout the fishing year;
5. Expected changes in directed groundfish fishing seasons;
6. Expected start of fishing efforts; and
7. Economic effects of establishing seasonal prohibited species apportionments on segments of the target groundfish industry.

Appendix F from the 1992 SAFE Report provides 1990 and 1991 PSC catch information and can be useful when reviewing these seven factors.

Herring PSC. Amendment 16a establishes an overall herring PSC bycatch cap of 1% of the Eastern Bering Sea biomass. The cap is to be apportioned among the four fisheries listed above plus the midwater pollock fishery.

At the September Council meeting the Council established as preliminary specification last year's herring PSC specification. Item D-2(c)(5) lists this apportionment. The Council needs to set final herring PSC apportionments at this meeting.

Included in Item D-2(c)(7) are Alaska Department of Fish & Game reports describing the current status of the Bering Sea herring stocks. The Division of Commercial Fisheries estimates that the 1992 biomass of Bering Sea herring stocks from Port Moller to Norton Sound will be 95,649 mt, a slight increase from the previous year (83,300 mt). The PSC limit therefore would be 956 mt.

Changes in PSC Apportionment Process the Council Will Need to Consider if Amendment 19/24 is Enacted.

Two major components of Amendment 19/24 will affect the Council's apportionment of PSCs in the groundfish fisheries.

The first provision would, if adopted, change the fisheries among which the PSCs will be apportioned. Currently four DAP trawl fisheries receive crab and halibut PSC limit allowances: 1) Greenland turbot, 2) rock sole, 3) flatfish (includes yellowfin sole/other flatfish), and 4) "Other fishery" (includes P. cod, bottom trawl pollock, m-w pollock, rockfish, Atka mackerel, sablefish, arrowtooth flounder and other). The following table provides the differences between the current and proposed 1991 bycatch amendment programs.

Current Fisheries	Proposed fisheries
1. Greenland Turbot	1. Greenland Turbot/arrowtooth flounder
2. Rock sole	2. Yellowfin sole
3. Flatfish (yellowfin sole/other flatfish)	3. Rock sole and other flatfish
4. Other fishery	4. Pacific cod
	5. Other fishery

A second proposed change would be a halibut PSC mortality limit for the fixed gear fisheries in the BSAI. Analysis of both of these proposals is included in the 1991 bycatch amendment. If the Council adopts alternatives that include these changes when it approves Amendment 19/24, it will need to apportion crab and halibut PSCs to these new categories. Supplementary worksheets with new PSC apportionment groups will be made available once the decision is made on Amendment 19/24.

Bycatch Rate Standards for the Vessel Incentive Program

Last November the Council approved a revised vessel incentive program which holds operators of individual trawl vessels accountable for their bycatch of halibut and red king crab. This program currently applies to the following specified groundfish fisheries:

Halibut	BSAI and GOA Pacific cod trawl fisheries BSAI flatfish fisheries (yellowfin sole, rock sole and "other flatfish") GOA bottom rockfish trawl fisheries
Red king crab	BSAI flatfish fisheries in Zone 1

At its December 1991 meeting, the Council must recommend halibut and red king crab bycatch rate standards for the 1992 vessel incentive program. At its September meeting, the Council adopted their 1991 recommendations as preliminary 1992 bycatch rate standards. These standards appear in Item D-2(c)(8). This item also provides the average observed bycatch rates exhibited by vessels in each of the incentive program fisheries during 1990 and 1991.

Effects of Amendment 19/24 on the Incentive Program

One provision of Amendment 19/24 would, if adopted, change the vessel incentive program to include additional fisheries and establish a bycatch rate standard for salmon. The following table provides the differences between the current and proposed 1991 bycatch amendment programs.

Current Program		Proposed Program
1. Pacific Cod (halibut) 2. Flatfish (halibut, king crab)	BSAI	1. Pacific Cod (halibut) 2. Flatfish (halibut, king crab) 3. Pollock when the bottom trawl fishery is closed (halibut) 4. All other trawl fisheries (halibut) 5. All trawl fisheries (salmon)
1. Pacific Cod (halibut) 2. Rockfish (halibut)	GOA	1. Pacific Cod (halibut) 2. Rockfish (halibut) 3. Pollock when the bottom trawl fishery is closed (halibut) 4. All other trawl fisheries (halibut) 5. All trawl fisheries (salmon)

If the Council adopts the proposed changes to the Incentive Program presented in Amendment 19/24, it will have to set bycatch rate standards for the additional fisheries at this meeting. The Council may want to review Section 3.2 of Amendment 19/24 EA/RIR. This analysis provides information about bycatch rate standards for the proposed fisheries and will be helpful for establishing final bycatch rate standards.

SUMMARY

by
The Plan Team for the Groundfish Fisheries
of the Bering Sea and Aleutian Islands

INTRODUCTION

The Guidelines for Fishery Management Plans published by the National Marine Fisheries Service (NMFS) require that a stock assessment and fishery evaluation (SAFE) report be prepared and reviewed annually for each fishery management plan (FMP). The SAFE reports are intended to summarize the best available scientific information concerning the past, present, and possible future condition of the stocks and fisheries under federal management.

The SAFE reports for the groundfish fisheries managed by the North Pacific Fishery Management Council (Council) are compiled by the respective Plan Teams from chapters contributed by scientists at NMFS' Alaska Fisheries Science Center (AFSC) and the Alaska Department of Fish and Game. These SAFE reports include separate stock assessment and fishery evaluation sections. The stock assessment section includes recommended acceptable biological catch (ABC) levels for each stock and stock complex managed under the FMP. The ABC recommendations, together with social and economic factors, are considered by the Council in determining total allowable catches (TACs) and other management strategies for the fisheries.

The FMPs for the groundfish fisheries managed by the Council require that drafts of the SAFE reports be produced each year in time for the September and December meetings of the Council. Unfortunately, critical stock assessment data often do not become available until after the September draft has been completed. Such was the case this year, when results of the 1991 AFSC trawl surveys in the eastern Bering Sea (EBS) and Aleutian Islands remained unavailable at the time the present SAFE report was being compiled. Thus, most chapters of this report are largely unchanged from last year's final SAFE report. To aid the reader, each chapter of this report has been prefaced by a brief description of any substantive changes that have been made to that chapter relative to last year's final report.

Members of the Plan Team who compiled this SAFE report were Loh-Lee Low (chairman), Brent Paine (team coordinator), Rebecca Baldwin, Jeremy Collie, Jay Ginter, Richard Merrick, Grant Thompson, Gregg Williams, and Sam Wright.

BACKGROUND INFORMATION

Management Areas and Species

The Bering Sea/Aleutian Islands (BS/AI) management area lies within the 200-mile U.S. Exclusive Economic Zone (EEZ) of the United States (Figure 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 report describes the status of the stocks in categories (b) and (c) only.

Historical Catch Statistics

Catch statistics since 1954 are shown for the 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 (t) 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 t in 1972. Catches have since varied from 1.2 to 1.9 million t 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. Target species have also been different (Table 3): In the Aleutians, Pacific ocean perch (POP) was the initial target species. During the early years of exploitation, overall catches of Aleutian groundfish reached a peak of 112,000 t in 1965. As POP abundance declined, the fishery diversified to other species. Total catches from the Aleutians in recent years have been about 100,000 t annually.

Recent Total Allowable Catches

Amendment 1 to the BS/AI Groundfish FMP provides the framework to manage the groundfish resources as a complex. Maximum sustainable yield (MSY) for this complex was originally estimated at 1.8 to 2.4 million t. The optimum yield (OY) range was set at 85% of the MSY range, or 1.4 to 2.0 million t.

Total allowable catches established by the Council since implementation of extended jurisdiction under the Magnuson Fishery Conservation and Management Act in 1977 are given in Table 4. The sum of the TACs equals OY for the groundfish complex, which is currently constrained by the 2.0 million t cap. Optimum yield for all species combined increased steadily from 1.4 million t in 1977 to 2.0 million t in 1984-91.

Plan Team Policy on Acceptable Biological Catch

The Plan Team continues to use the following policy regarding ABC, which was initially adopted at a meeting of the Plan Team and its Gulf of Alaska counterpart in September, 1990:

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.

OVERVIEW OF "STOCK ASSESSMENT" SECTION

Plan Team recommendations for 1992 ABCs are summarized in Tables 6-8. The sum of recommended ABCs for 1992 is 3.1 million t, slightly above both the 2.9 million t total recommended for 1991 and the current complex-wide MSY estimate of 2.8 million t. Overall, the status of the stocks continues to appear relatively favorable. Stock status is summarized on a species-by-species basis below.

Walleye Pollock

EBS	1991 ABC = 1,676,000 t	1992 ABC = 1,490,000 t
Aleutians	1991 ABC = 101,460 t	1992 ABC = 51,600 t
Bogoslof	1991 ABC = 138,000 t	1992 ABC = 107,000 t

EBS	Projected 1992 exploitable biomass = 6,190,000 t
Aleutians	Projected 1992 exploitable biomass = 215,000 t
Bogoslof	Projected 1992 exploitable biomass = 444,000 t

Pollock abundance in the EBS was estimated with two age-structured methods, cohort analysis and CAGEAN, using data up to and including the 1990 catches at age and the 1979-1988 triannual combined hydroacoustic and bottom trawl survey. Age 1 indexes from the 1990 and 1991 trawl surveys were used to forecast age 3 recruitment in 1992 and 1993. 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 1990 CAGEAN estimate overlaps the confidence interval from the trawl survey, but it does not overlap the point estimates from either the cohort analysis or the trawl survey. The cohort analysis biomass estimates were preferred by the Plan Team over those from CAGEAN because the cohort analysis tracks the survey better in recent years and because it uses more age-specific information from the surveys than does CAGEAN.

Current abundance is above B_{MSY} (6 million t, section 1.6.1). The strong 1982 and 1984 year-classes now contribute substantially to the fishery. Recruitment of age-three pollock is projected to be below average in 1992 but above average in 1993. The ABC for this stock was computed with an exploitation rate corresponding to $F_{0.1}$=0.31 which is close to the F_{MSY} estimate of 0.335 obtained by Quinn and Collie (1990). Application of this fishing mortality rate gives a 1992 EBS ABC of 1,490,000 t. The ABC is less than in

1991 because the 1992 projected biomass is lower than the value projected for 1991 in last year's assessment. Exploitation at the $F_{0.1}$ rate when abundance is greater than B_{MSY} does not violate the Council's overfishing definition in the case of pollock, since $F_{0.1}$ is less than the available estimates of F_{MSY} (section 1.6.1).

The Aleutian Islands pollock stock was surveyed by bottom trawl in the summer of 1991, and an on-bottom exploitable biomass of 180,000 t was estimated (section 1.3.3). The Plan Team projected 1992 Aleutian exploitable biomass as follows: 1) Assuming that the 1991 on-bottom component in the Aleutians constitutes the same proportion of total exploitable biomass as the on-bottom component in the EBS (79%, section 1.3), the total exploitable biomass in the Aleutians for 1991 is 228,000 t (180,000/0.79). 2) Assuming that the 1991-1992 time trend of exploitable biomass in the Aleutians parallels the corresponding trend in the EBS as indicated by cohort analysis (6.57 million t in 1991 compared to 6.19 million t in 1992, Table 1.8), the 1992 exploitable biomass in the Aleutians should decrease to 215,000 t. Application of a catch-to-biomass ratio of 0.24 (Table 1.10) yields a 1992 ABC of 51,600 t for the Aleutian stock.

Pollock taken near Bogoslof Island have a consistently different age composition and slower growth rates than pollock taken from the EBS. A hydroacoustic survey in the winter of 1991 estimated the abundance of Bogoslof pollock to be 0.6 million t (section 1.3 and Appendix C). Recruitment to this area has been very low in recent years. Assuming that fishery removals during 1991 were matched by growth and recruitment, the 1991 estimate can be projected forward by applying an instantaneous natural mortality rate of 0.3 (section 1.5.1), giving a 1992 exploitable biomass of 444,000 t. Applying a catch-to-biomass ratio of 0.24 (Table 1.8) results in a 1992 ABC of 107,000 t 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, in which case the Bogoslof TAC should be zero. 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 1987, 1988, and 1989 catches from the Aleutian Basin all exceeded the corresponding catches from the U.S. EEZ (Table 1.3 and Appendix C, Table 2). 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 1991 ABC = 229,000 t   1992 ABC = 182,000 t

EBS and
Aleutians Projected 1992 exploitable biomass = 910,000 t

Pacific cod in the 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, and the 1991 survey showed a 25% drop in biomass relative to 1990 (section 2.3.1.1). The chapter author expresses concern over this decline and the poor recruitment observed during the past three years, noting that the stock's dynamics may be entering a new phase defined by different environmental conditions or ecological relationships. However, the 1990 and 1991 surveys also show evidence of stronger-than-average year classes that will recruit at age 3 in 1992 and 1993.

The stock assessment model used to calculate ABC for Pacific cod was retuned for this year's assessment, incorporating survey and catch data from 1991 and an expanded supply of age data. This resulted in new estimates for all parameters estimated by the model, and led the chapter author to conclude that reliable values for MSY, F_{MSY}, and B_{MSY} were no longer available. Because the model is tuned to the survey results, it showed a decline in biomass between 1990 and 1991. However, the decline indicated by the model was smaller than that indicated by the survey (8% vs. 25%, respectively [section 2.3.1.3]).

The EBS cod model calculates ABC by applying the target exploitation rate (in this case the $F_{0.1}$ rate, 0.145) to projected biomass through a complex schedule of age- and time-dependent fishing mortality rates. This procedure produces a 1992 ABC of 162,000 t for the EBS portion of the stock, which can be scaled upward by a factor of 1.124 to give a 1992 ABC of 182,000 t for the EBS and Aleutian Islands combined (section 2.7.2).

Because reliable estimates of F_{MSY} and B_{MSY} are no longer available, overfishing for this stock would occur at the fishing mortality rate that reduces the biomass-per-recruit ratio to 30% of its pristine value. This fishing mortality rate is 0.149, which corresponds to a 1992 catch of 188,000 t for the EBS and Aleutians combined.

Yellowfin Sole

1991 ABC = 250,600 t   1992 ABC = 372,000 t
Projected 1992 exploitable biomass = 2,660,000 t

Exploitable biomass, as calculated from both cohort analysis and stock synthesis (Methot 1990), 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. The results from stock synthesis were preferred over those from cohort analysis because stock synthesis makes more complete use of the available data, facilitates sensitivity testing, and estimates the age selectivity of the trawl survey. Exploitable biomass in 1992 was projected from 1990 exploitable biomass by accounting for mortality and growth, and adding the projected biomass of the 1985 year class recruiting as 7 years olds in 1992. The $F_{0.1}$ fishing mortality rate of 0.14 (estimated from the Beverton-Holt yield-per-recruit model) multiplied by the projected 1992 projected exploitable biomass resulted in the recommended ABC of 372,000 t. The reason for the increase in ABC compared with the 1991 value is that the 1992 exploitable biomass was projected from the current high biomass and continued strong recruitment. The Plan Team believes that current estimates of B_{MSY} are too preliminary to use in a prescriptive fashion. Given this and the fact that the $F_{0.1}$ value is less than the fishing mortality rate that would reduce the biomass-per-recruit ratio to 30% of its pristine level (F=0.17), the recommended ABC does not exceed the overfishing level defined by the Council.

Greenland Turbot

1991 ABC = 7,000 t   1992 ABC = 7,000 t
Projected 1992 exploitable biomass = 307,000 t

Continuous poor recruitment has been observed throughout the 1980s, indicating that biomass of the adult population is likely 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. Although no threshold level has been determined for this species, the Plan Team sees no justification for a major directed fishery on Greenland turbot at this time.

The recommended ABC for 1992 is 7,000 t, which is close to the low catch levels observed for turbot in recent years. This ABC should allow legitimate incidental catches to be retained (thus preventing wastage), while precluding development of any new effort directed at this resource during the current period of decline. An ABC estimated from the $F_{0.1}$ harvest strategy (17,200 t) was considered and rejected because of concern over continued recruitment failure. Projected exploitable biomass for 1992 (307,000 t) is less than B_{MSY} (407,000 t). Consequently, an upper limit on ABC is imposed by the Council's overfishing definition at $F = [(307,000/407,000) \times F_{MSY}] = 0.75 \times 0.07 = 0.05$. The fishing mortality rate corresponding to the recommended 1992 ABC (approximately 0.02) is substantially lower than this limit.

Arrowtooth Flounder

1991 ABC = 116,400 t   1992 ABC = 82,300 t
Projected 1992 exploitable biomass = 457,400 t

The resource is in excellent condition, as a result of steadily increasing biomass during the 1980s. Biomass, as estimated by trawl surveys, declined moderately from 1990 to 1991 but remains at a high level. Observer data from 1991 indicate that 90% of the arrowtooth flounder caught were discarded. In the absence of a stock-recruitment relationship for this species, an $F_{0.1}$ harvest strategy ($F_{0.1}$ = 0.18) was used to recommend a 1992 ABC of 82,300 t. The decrease in ABC from 1991 to 1992 parallels the decline in exploitable biomass. Since B_{MSY} and F_{MSY} estimates are unavailable for this stock, an upper limit on ABC is imposed by the fishing mortality rate that would reduce the biomass-per-recruit ratio to 30% of its pristine value. The $F_{0.1}$ value used to compute ABC is well below this rate (F=0.25).

Historically, catches of Kamchatka flounder (Atheresthes evermanni) have been lumped with arrowtooth catches in the landings statistics, since the two species are difficult to distinguish in the field. For consistency, the same convention has been adopted here in the reporting of trawl survey biomass estimates. The practical effect of this convention is negligible, however, since Kamchatka flounder represents only a minor component of the combined species' biomass.

Rock Sole

1991 ABC = 246,500 t   1992 ABC = 260,800 t
Projected 1992 exploitable biomass = 1,481,900 t

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, 1990 and 1991 survey estimates. Observer data from 1991 indicate that about one half of the rock sole caught were discarded. The MSY exploitation rate (F_{MSY}=0.176) is used to calculate ABC. Because the 1992 projected exploitable biomass is well in excess of B_{MSY} (904,000 t), the F_{MSY} fishing exploitation strategy is consistent with the Council's overfishing definition. To account for the small Aleutian Islands component of the rock sole stock, the exploitable biomass for the EBS component was expanded by a factor of 1.03 based on the ratio of biomass in the two areas in previous surveys.

Other Flatfish Complex

1991 ABC = 219,700 t   1992 ABC = 199,600 t
Projected 1992 exploitable biomass = 1,255,100 t

Exploitable biomass is high and stable. To smooth out the variability in survey biomass estimates, the mean of the 1989, 1990 and 1991 values is used to estimate 1992 exploitable biomass in the EBS. This figure is then adjusted upward on the basis of the 1983 and 1986 EBS and Aleutian surveys to project the 1992 biomass for the entire BS/AI region. As a group, species of "other flatfish" were retained at a rate of 13% in the 1990 fishery.

The Team beleives that estimates of F_{MSY} and B_{MSY} are not possible for this complex, and an $F_{0.1}$ fishing mortality rate should be applied. The $F_{0.1}$ rate for rock sole (0.159) was used as a proxy to obtain the 1992 ABC for other flatfish. Even though the other flatfish stocks are currently very abundant the Team felt it was inappropriate to apply an F_{MSY} mortality rate without knowing whether the stocks are above B_{MSY}. 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 rate recommended for this complex (0.159) is below this limit.

Sablefish

EBS	1991 = 3,100 t	1992 ABC = 1,400 t
Aleutians	1991 = 3,200 t	1992 ABC = 3,000 t

EBS	Projected 1992 exploitable biomass = 11,700 t
Aleutians	Projected 1992 exploitable biomass = 25,700 t

Catches in 1990 were 2,329 t in the EBS and 1,545 t in the Aleutians, well below the average 11,700 t harvested from the EBS alone in the 1960s. Catches in 1991 (through 10/16) are even lower than the 1990 levels. The 1990 longline survey indicated substantial decreases in relative abundance in both the EBS and Aleutians. In 1991, the longline survey indicated an all-time low abundance in the eastern Bering Sea, while abundance in the Aleutians remained at the historic low set in 1990. These decreases are not entirely attributed to mortality; migration may also affect relative abundance indices. The likelihood of such migration resulted in a decision to combine the assessments for the Gulf of Alaska, Aleutians, and EBS stocks. Absolute biomass was calculated by calibrating the relative abundance trends to trawl survey biomass estimates. A single calibration factor was adopted for the EBS, Aleutians, and Gulf of Alaska.

Because the stock-recruitment relationship is poorly defined for sablefish, the Plan Team believes that F_{MSY} and B_{MSY} are inestimable with the current model. Therefore, ABC was calculated by applying the $F_{0.1}$ fishing mortality rate to the 1992 projected biomass for the to the biomass distribution estimated by the 1991 longline survey. The $F_{0.1}$ rate (0.13) is less than the with the Council's overfishing definition, which, in the absence of a reliable B_{MSY} estimate, constrains ABC by the fishing mortality rate that would reduce the biomass-per-recruit ratio to 30% of its pristine value (F=0.18).

Pacific Ocean Perch Complex

EBS

True POP	1991 ABC = 4,570 t	1992 ABC =	4,800 t
Others	1991 ABC = 1,670 t		
NO and SC		1992 ABC =	1,050 t
RE and SR		1992 ABC =	350 t

True POP	Projected 1992 exploitable biomass =	70,800 t
NO and SC	Projected 1992 exploitable biomass =	17,500 t
RE and SR	Projected 1992 exploitable biomass =	12,200 t

Aleutian Islands

True POP	1991 ABC = 10,775 t		
East of 180°		1992 ABC =	4,800 t
West of 180°		1992 ABC =	13,900 t
NO and SC	1991 ABC = 3,440 t	1992 ABC =	5,670 t
RE and SR	1991 ABC = 1,245 t	1992 ABC =	1,220 t

True POP	Projected 1992 exploitable biomass =	234,000 t
NO and SC	Projected 1992 exploitable biomass =	94,500 t
RE and SR	Projected 1992 exploitable biomass =	45,000 t

The POP complex consists of true POP (Sebastes alutus) and four other red Sebastes species (northern rockfish [NO], rougheye rockfish [RE], sharpchin rockfish [SC], and shortraker rockfish [SR]). Prior to 1991, the complex was managed as a unit in each of the two management areas. In 1991, however, the Council began managing S. alutus separately from the other species in both areas, and also split out rougheye and shortraker in the Aleutians. This was done to avoid excessive catches of the less abundant members of the complex, particularly shortraker and rougheye. For 1992, the Plan Team has adopted the Council's 1991 management scheme, with two exceptions: 1) the Plan Team recommends splitting out a rougheye/shortraker subcomplex in the EBS as well as in the Aleutians, and 2) the Plan Team recommends splitting the Aleutians regulatory area into two halves (at 180° longitude) for the purpose of apportioning the S. alutus ABC. In both cases, the Plan Team's recommendation is motivated by a desire to prevent localized depletion.

The stock assessment for this complex is based mainly on S. alutus, which has the most data and is the most abundant species in the complex. Model results indicate that the S. alutus stocks in both areas underwent sharp declines in abundance due to intensive fishing in the 1960s, and remained low in abundance through the early 1980s. For several years, the Council 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.

For S. alutus, F_{MSY} has been estimated at values of 0.07 and 0.08 in the EBS and Aleutians, respectively. Because 1992 biomass in the EBS is projected to be slightly below B_{MSY}, F_{MSY} for that area was adjusted by the ratio of the two biomasses (B_{92}/B_{MSY}), giving a target fishing mortality rate of 0.068. When applied to the projected 1992 biomass of 70,800 t, the resulting 1992 ABC for S. alutus in the EBS is 4,810 t, which also corresponds to the overfishing limit for this portion of the POP complex. For the Aleutian Islands region, applying the F_{MSY} rate of 0.08 to the overall projected biomass of 234,000 t gives an overall 1992 S. alutus ABC of 18,700 t. Partitioning this figure according to the 1991 Aleutian trawl survey biomass distribution (74.3% west of 180° versus 25.7% east of 180°) gives ABCs for the eastern and western subareas of 4,800 t and 13,900 t, respectively. These catch levels also correspond to the Council's overfishing limit.

For the other two subcomplexes (northern/sharpchin and rougheye/shortraker), ABC in both areas was calculated as the product of the natural mortality rate (0.06 for northern and sharpchin, 0.025 for rougheye, and 0.03 for shortraker) and exploitable biomass. The biomass estimates for these species are as follows: northern/sharpchin (EBS) - 17,500 t, (AI) - 94,500 t; rougheye (EBS) - 3,000 t, (AI) - 25,300 t; and shortraker (EBS) - 9,200 t, (AI) - 19,700 t. Since estimates of other biological parameters are unavailable, harvesting at the F=M strategy also corresponds to the Council's overfishing limit.

Other Rockfish Complex

EBS	1991 ABC = 400 t	1992 ABC = 400 t
Aleutians	1991 ABC = 925 t	1992 ABC = 925 t

EBS	Projected 1992 exploitable biomass = 8,000 t
Aleutians	Projected 1992 exploitable biomass = 18,500 t

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 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. The species in this complex are primarily located on the EBS slope and in the Aleutian Islands region. Although both of these areas were surveyed in 1991, biomass estimates for the species in this complex were not available in time to be used in this SAFE report. Therefore, the 1988 slope and 1986 Aleutian biomass estimates are used for the purpose of computing 1992 ABC.

The natural mortality rate for species in this complex has been estimated at 0.05, which was used as the target fishing mortality rate in calculating ABC. Lacking estimates of other biological parameters, the resulting ABC values correspond to the limit specified by the Council's overfishing definition.

Atka Mackerel

1991 ABC = 24,000 t	
East of 180°	1992 ABC = 66,400 t
West of 180°	1992 ABC = 194,000 t
Projected 1992 exploitable biomass = 869,000 t	

In last year's assessment, it was noted that the most recent trawl survey of the stock's central area of distribution (the Aleutian Islands) was conducted in 1986. The length of the elapsed time since that survey, together with the fact that the 1986 survey biomass estimate (545,000 t) was far higher than any previous estimate led to the conclusion in last year's assessment that a reliable estimate of current or projected biomass was unavailable. However, a new biomass estimate (658,000 t) became available for this year's assessment from the 1991 Aleutian trawl survey. The fact that the 1991 estimate is roughly comparable to the 1986 estimate lends credibility to the hypothesis that a large Atka mackerel biomass exists in the Aleutian Islands region.

In this year's assessment, the stock synthesis approach was applied to Atka mackerel for the first time. The model was calibrated using the available catch-at-age data, the relative abundance trend from trawl survey samples taken at depths greater than 100 m, and the absolute survey biomass estimates from 1986 and 1991. Although the model had some difficulty matching the high survey biomass observed in 1986, it was able to match the 1991 survey biomass estimate quite well. The model's success in the latter instance was due largely to its estimation of a particularly strong 1988 year class.

Because the stock-recruitment data generated by stock synthesis do not indicate the presence of a definable stock-recruitment relationship for this stock, a harvest strategy based on the natural mortality rate was used to determine ABC. Multiplying the natural mortality rate of 0.3 by the projected biomass of 869,000 t gives an overall 1992 ABC of 261,000 t. The author notes that this strategy corresponds to a full-recruitment fishing mortality rate of 0.208. An F of 0.208 is below the overfishing level (F=0.50), defined for this stock as the fishing mortality rate that results in the biomass-per-recruit ratio falling to 30% of its pristine value.

Because of the possibility of local depletion, the Plan Team recommends splitting the Aleutian and EBS regulatory areas into two halves (at 180° longitude) for the purpose of apportioning the Atka mackerel ABC. The 1991 Aleutian trawl survey estimated that 74.5% of the Atka mackerel biomass occurs west of 180°, with 25.5% occurring to the east. Applying these proportions to the overall 1992 ABC gives catches for the eastern and western subareas of 66,400 t and 194,000 t, respectively.

Squid and Other Species Complex

Squid	1991 ABC = 3,800 t	1992 ABC = 3,600 t
	Projected 1992 exploitable biomass is unavailable	
Other Species	1991 ABC = 28,700 t	1992 ABC = 27,200 t
	Projected 1992 exploitable biomass = 793,800 t	

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 such as smelts and sharks may be substantially underestimated by demersal trawls. Recent increases in the exploitable biomass of this category is largely attributable to the substantially increased biomass of skates. Projected biomass for 1992 was computed by averaging the biomass estimates from the 1988-91 EBS surveys and adding the 1986 Aleutians survey biomass. Survey abundance estimates for squid are unavailable because squid are mainly pelagic over deep water. The ABCs for squid and other species were detemined by the average catch since 1977 to comply with the Council's overfishing definition for stocks for which total biomass estimates are unavailable.

Because of the scarcity of data regarding these species, the Council's overfishing definition caps the ABC at the average catch levels since 1977, which are 3,600 t for squid and 27,100 t for "other species." The decreases in recommended ABCs from 1991 to 1992 are due to the addition of another year of catch data.

OVERVIEW OF "FISHERY EVALUATION" SECTION

Landings data presented in the fishery evaluation (economic) section were extracted from PacFIN on August 23, 1991. These data may differ from catch data presented elsewhere in the SAFE report due to lags in processing fishtickets and the presence of discards. Caution should be used in judging reductions in harvest during 1991 because of the incomplete data. Total domestic landings of groundfish in the BS/AI region increased in both 1989 and 1990. Domestic landings of pollock showed the largest increase in tonnage, rising by 470,000 t in 1989 and by another 340,000 t in 1990. The 1990 domestic BS/AI landings of Pacific cod, Atka mackerel, and rockfish increased over the 1988 totals by 75,700 t, 20,300 t, and 22,600 t, respectively. Already, the 1991 Atka Mackerel fishery has eclipsed the 1990 harvest by 800 t. However, the greatest increase seen thus far is in the flatfish fishery, where the annual domestic landings of roughly 40,000 t observed between 1988 and 1990 has already risen to more than 90,000 t this year.

Area-wide increases in landings were observed in trawl and longline gear groups. Longline landings were up from 8,700 t in 1988 to nearly 54,000 t in 1990, largely due to increased Pacific cod landings. Trawl operations increased their landings from 651,000 in 1988 to 1,535,000 t in 1990. Although the majority of this increase was derived from pollock, most species other than sablefish also exhibited higher domestic landings. Shoreside and at-sea processors also benefitted from increased domestic landings. The volume of fish processed shoreside increased from 170,000 t (round weight) in 1988 to 285,000 t in 1990. During the same period, at-sea processing rose from 490,000 t to 1,303,000 t.

These increases in domestic landings were obtained through substantial reductions in the joint-venture (JV) harvest of several species. From a high of over 1,300,000 t in 1987, JV harvest in the BS/AI region dropped to less than 135,000 t in 1990, with no JV catch having yet occurred during 1991. Pollock has undergone the largest drop since 1988, when more than 1,000,000 t was taken by joint ventures. JV catch of Pacific cod fell from a high of 110,000 t in 1988 to 8,100 t in 1990. Annual JV harvest of flatfish and Pacific cod had reached all-time highs of 230,000 t and 110,000 respectively during 1988. Atka mackerel also fell by 20,000 over this period.

The ex-vessel value of domestic landings (excluding the value added by at-sea processing) increased by over $100 million dollars in 1989, and by another $110 million in 1990, producing total revenue of $353 million. Over this 2-year period, the value of longline landings increased by $23 million, including a $26 million increase from Pacific cod, while trawl revenue increased by $188 million. Most of the trawl fishery gains occurred in the pollock fishery, which increased in value from $88 million in 1988 to $255 million in 1990. In 1991, trawl revenue from the rapidly expanding flatfish fishery ($33 million) has already surpassed the sum of the earnings from the preceding three years of flatfish landings. Roughly 90% of the increase in ex-vessel revenue between 1988 and 1990 was realized by vessels participating in the at-sea processing sector.

Year-to-date BS/AI trawl prices for rockfish, flatfish, sablefish, and Pacific cod are 54%, 42%, 35%, and 33% higher, respectively, than the average prices in 1990. The year-to-date longline price for sablefish is $1.06/lb, which is 47% higher than the 1990 price. The massive shift of pollock harvest from JV to domestic landings in recent years has contributed substantially to an increase in the value of Alaskan and Northwest exports of groundfish from $358 million in 1988 to $796 million in 1990. During this period, the percentage of total fisheries exports, by value, accounted for by groundfish products rose from 21% to 39%.

OVERVIEW OF APPENDICES

Marine Mammal Considerations

Three marine mammal species are of particular concern in the EBS 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 through 1990 were sufficient to lead to a final listing on 26 November 1990 of the species as threatened throughout its range under the Endangered Species Act (ESA). 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. Marine mammal considerations are detailed in Appendix A.

Pacific Halibut SAFE Report

A separate SAFE report on the Pacific halibut (Hippoglossus stenolepis) stock and fishery has been prepared by the staff of the International Pacific Halibut Commission, and is included with the present SAFE report as Appendix B. Catches of halibut by the 1990 directed fishery totalled 56.4 million pounds in the northeast Pacific Ocean and 5.4 million pounds in the BS/AI region. Exploitable biomass was estimated at 234.7 million pounds in 1990, representing a decline of 8% percent from the 1989 biomass estimate. Although 1990 was the fifth year in which biomass was observed to decline, such a pattern is consistent with the long-term cycles typical of the halibut resource. Constant exploitation yield for the directed setline fishery was estimated to be 82.15 million pounds net weight. This figure was based on an overall exploitation rate of 35%, and was adjusted to allow for other removals. Incidental mortality increased in 1990, reaching 18 million pounds. Over half of the incidental mortality occurred in the EBS.

Status of the Pollock Resource in the Aleutian Basin

The status of the pollock resource in the Aleutian Basin is discussed in Appendix C. Some studies have suggested that the resource is declining or being fished at excessive rates. These findings have been corroborated by declining catches and catch rates in the Basin and declining biomass estimates in the Bogoslof area. However, the size of the overall Basin stock remains in dispute, with estimates ranging from 5 million to 20 million t.

The Basin fishery has apparently been supported by the large 1978 year class and above-average year classes spawned in 1977, 1979, and 1980. Except for the 1982 and 1984 year classes, no strong year classes have been spawned since 1980. The absence of strong recruitment in recent years, coupled with the gradual attrition of the 1977-1980 year classes, would explain the observed decline in catch rates. Since the present Basin pollock biomass is comprised primarily of fish from weaker year classes (1983 and 1985-88), no improvement in stock condition is anticipated in the near future. The decline will be reversed only when strong year classes are produced or management actions are taken to reduce harvest rates.

The decline of the Basin stock has a fairly clear potential to undermine the U.S. pollock roe fishery in the Bogoslof area, since pollock in this area are predominantly of Basin origin during the roe season. However, since the direction and significance of migration patterns between the Basin and EBS shelf are less well-defined, the Basin fishery's impact on the EBS shelf stock is less clear. One possibility is that Basin fish spawn primarily in the Bogoslof area, with the eggs and larvae drifting onto the shelf to reside as juveniles and young adults, then finally returning to the Basin at ages five and older. If adult fish from the EBS shelf do indeed migrate into the Basin (where they are currently subjected to high exploitation rates), potential for an adverse impact exists. However, the magnitude of any such impact cannot yet be estimated. The Basin fishery also has the potential to impact the northern sea lion population, designated as threatened under the ESA. Since sea lions eat pollock, there is concern that reduced pollock abundance, particularly near rookeries along the Aleutian chain, could cause further harm.

Bycatch of Fully U.S.-Utilized Groundfish Species

Amendment 12 to the BS/AI Groundfish FMP authorizes the Council to establish allowable levels of incidental catch of groundfish species that are fully utilized by domestic fishermen. Previous regulations required joint venture operations to discard such species, but without any limit to the amount of discard.

In 1990, joint venture fisheries targeted only on yellowfin sole and "other flatfish." Bycatch allowances of pollock, Pacific cod, arrowtooth flounder, and rock sole were made by the Council. There were no joint venture fisheries in 1991. If the Council wishes to allow joint venture fisheries in 1992, data useful for calculating potential bycatch allowances are presented in Appendix E.

Seasonal Allocation of the Pollock TAC

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

Seasonal Allocation of Crab and Halibut PSC Apportionments

Amendment 16 to the BS/AI Groundfish FMP 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 F.

Stock Synthesis Modeling of Pacific Ocean Perch

Current and previous assessments of POP have relied on stock reduction analysis. However, stock synthesis provides the potential for a more complete assessment of this species. Currently, AFSC scientists are developing a new analysis for POP using the stock synthesis approach. The Plan Team anticipates that the results of this analysis will be available in time for the final edition of the SAFE report. A summary of the method and preliminary results is contained in Appendix G.

Definitions of Common Acronyms

Although a conscientious attempt has been made to see that each acronym used in this SAFE report is defined at the point of its first occurrence, a collection of such definitions has also been included as Appendix H.

LITERATURE CITED

Methot, R. D. 1990. Synthesis model: An adaptable framework for analysis of diverse stock assessment data. Int. N. Pac. Fish. Comm. Bull. 50:259-277.

Quinn, T. J. II, and J. S. Collie. 1990. Alternative population models for eastern Bering Sea pollock. Int. N. Pac. Fish. Comm. Bull. 50:243-257.

Table 6-- Summary of stock abundance and exploitation strategies for the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district (518) in 1992. Biomass figures are in metric tons.

Species	Area	Exploitable Biomass	B_{MSY}	F_{OF}[a]	Harvest Strategy
Pollock	EBS	6,190,000	6,000,000	0.38	$F_{0.1}$=0.31
	AI	215,000		0.38	$F_{0.1}$=0.31
	518	444,000		0.38	$F_{0.1}$=0.31
Pacific cod		910,000		0.15	$F_{0.1}$=0.14
Yellowfin sole		2,660,000		0.17	$F_{0.1}$=0.14
Greenland turbot		307,000	407,000	0.05	F =0.02[b]
Arrowtooth flounder		457,400		0.25	$F_{0.1}$=0.18
Rock sole		1,481,900	904,000[c]	0.18	F_{MSY}=0.18
Other flatfishes		1,255,100		0.23	F =0.16[d]
Sablefish	EBS	11,700		0.18	$F_{0.1}$=0.13
	AI	25,700		0.18	$F_{0.1}$=0.13
POP complex					
True POP	EBS	70,800	72,200	0.07	F_{MSY}=0.07
Sharp/Northern[e]	EBS	17,500		0.06	M =0.06
Short/Rougheye[f]	EBS	12,200		0.03	M =0.03
True POP	AI	234,200	164,000	0.08	F_{MSY}=0.08
Sharp/Northern[e]	AI	94,500		0.06	M =0.06
Short/Rougheye[f]	AI	45,000		0.03	M =0.03
Other rockfish	EBS	8,000		0.05	M =0.05
	AI	18,500		0.05	M =0.05
Atka mackerel		869,000		0.50	M =0.30
Squid		n/a[g]		F_{his}[h]	F_{his}[h]
Other species		793,800		F_{his}[h]	F_{his}[h]

a. Fishing mortality rate corresponding to overfishing.
b. Harvest strategy for Greenland turbot is ad hoc.
c. Eastern Bering Sea only.
d. Rock sole $F_{0.1}$ rate was used as a proxy for this complex.
e. Sharpchin rockfish and northern rockfish.
f. Shortraker rockfish and rougheye rockfish.
g. Not available.
h. Fishing mortality rate corresponding to the historic average catch.

Table 7-- Estimates of maximum sustainable yield (MSY) and acceptable biological catch (ABC) for 1991 and 1992 for groundfish in the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district (518). Where current MSY estimates encompass a range of values, the midpoint has been listed. Figures are in metric tons.

Species	Area	MSY	ABC(1991)	ABC(1992)
Pollock	EBS	1,875,000	1,676,000	1,490,000
	AI	145,000	101,460	51,600
	518	n/a[a]	0	107,000
Pacific cod		n/a[a]	229,000	182,000
Yellowfin sole		268,000	250,600	372,000
Greenland turbot		25,200	7,000	7,000
Arrowtooth flounder		59,000	116,400	82,300
Rock sole		164,000	246,500	260,800
Other flatfish		144,000	219,700	199,600
Sablefish	EBS	5,400	3,100	1,400
	AI	6,800	3,200	3,000
POP complex				
True POP	EBS	4,760	4,570	4,800
Other POP complex	EBS	n/a[a]	1,670	0
Sharp/Northern[b]	EBS	n/a[a]	0	1,050
Short/Rougheye[c]	EBS	n/a[a]	0	350
True POP	AI	12,300	10,775	18,700[d]
Sharp/Northern[b]	AI	n/a[a]	1,245	5,670
Short/Rougheye[c]	AI	n/a[a]	3,440	1,220
Other rockfish	EBS	n/a[a]	400	400
	AI	n/a[a]	925	925
Atka mackerel		n/a[a]	24,000	260,400[e]
Squid		10,000	3,800	3,600
Other species		62,900	28,700	27,200
Groundfish complex		2,782,360	2,932,485	3,081,015

a. Not available.
b. Sharpchin rockfish and northern rockfish.
c. Shortraker rockfish and rougheye rockfish.
d. Plan Team recommends partitioning POP into two areas, east and west of 180°, giving ABCs for the eastern and western subareas of 4,800 t and 13,900 t, respectively.
e. Plan Team recommends partitioning Atka Mackeral into two areas east and west of 180°, giving ABCs for the eastern and western subareas of 66,400 t and 194,000 t, respectively.

Table 8-- Summary of stock abundance and 1992 ABC estimates for groundfish in the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district (518). Biomass and ABC figures are in metric tons.

Species	Area	Biomass[a]	Rate[b]	ABC	Relative abundance, trend
Pollock	EBS	6,190,000	$F_{0.1}$	1,490,000	Moderately high, declining
	AI	215,000	$F_{0.1}$	51,600	Average (?), declining
	518	444,000	$F_{0.1}$	107,000	Average (?), declining
Pacific cod		910,000	$F_{0.1}$	182,000	Moderately high, declining
Yellowfin sole		2,660,000	$F_{0.1}$	372,000	High, stable
Greenland turbot		307,000	$F_{???}$[c]	7,000	Low, declining
Arrowtooth flounder		457,400	$F_{0.1}$	82,300	Very high, increasing
Rock sole		1,481,900	F_{MSY}	260,800	Very high, increasing
Other flatfish		1,255,100	$F_{0.1}$[d]	199,600	Very high, stable
Sablefish	EBS	11,700	$F_{0.1}$	1,400	Low, declining
	AI	25,700	$F_{0.1}$	3,000	Average, declining
POP complex					
True POP	EBS	70,800	F_{MSY}	4,800	Average, slow increase
Sharp/Northern[e]	EBS	17,500	F=M	1,050	Not available
Short/Rougheye[f]	EBS	12,200	F=M	350	Not available
True POP	AI	234,000	F_{MSY}	18,700[i]	Average, slow increase
Sharp/Northern[e]	AI	94,500	F=M	5,670	Not available
Short/Rougheye[f]	AI	45,000	F=M	1,220	Not available
Other rockfish	EBS	8,000	F=M	400	Average, stable
	AI	18,500	F=M	925	Average, stable
Atka mackerel		869,000	F=M	260,400	Average, declining
Squid		n/a[g]	F_{his}[h]	3,600	Not available
Other species		793,800	F_{his}[h]	27,200	High, increasing
Groundfish complex		Σ 16,121,100		3,081,015	High, stable

a. Projected exploitable biomass for 1992.
b. Harvest strategy.
c. Harvest strategy for Greenland turbot is ad hoc.
d. Rock sole $F_{0.1}$ rate was used as a proxy for this complex.
e. Sharpchin rockfish and northern rockfish.
f. Shortraker rockfish and rougheye rockfish.
g. Not available.
h. Fishing mortality rate corresponding to the historic average catch.
i. Plan Team recommends partitioning POP into two areas, east and west of 180°, giving ABCs for the eastern and western subareas of 4,800 t and 13,900 t, respectively.

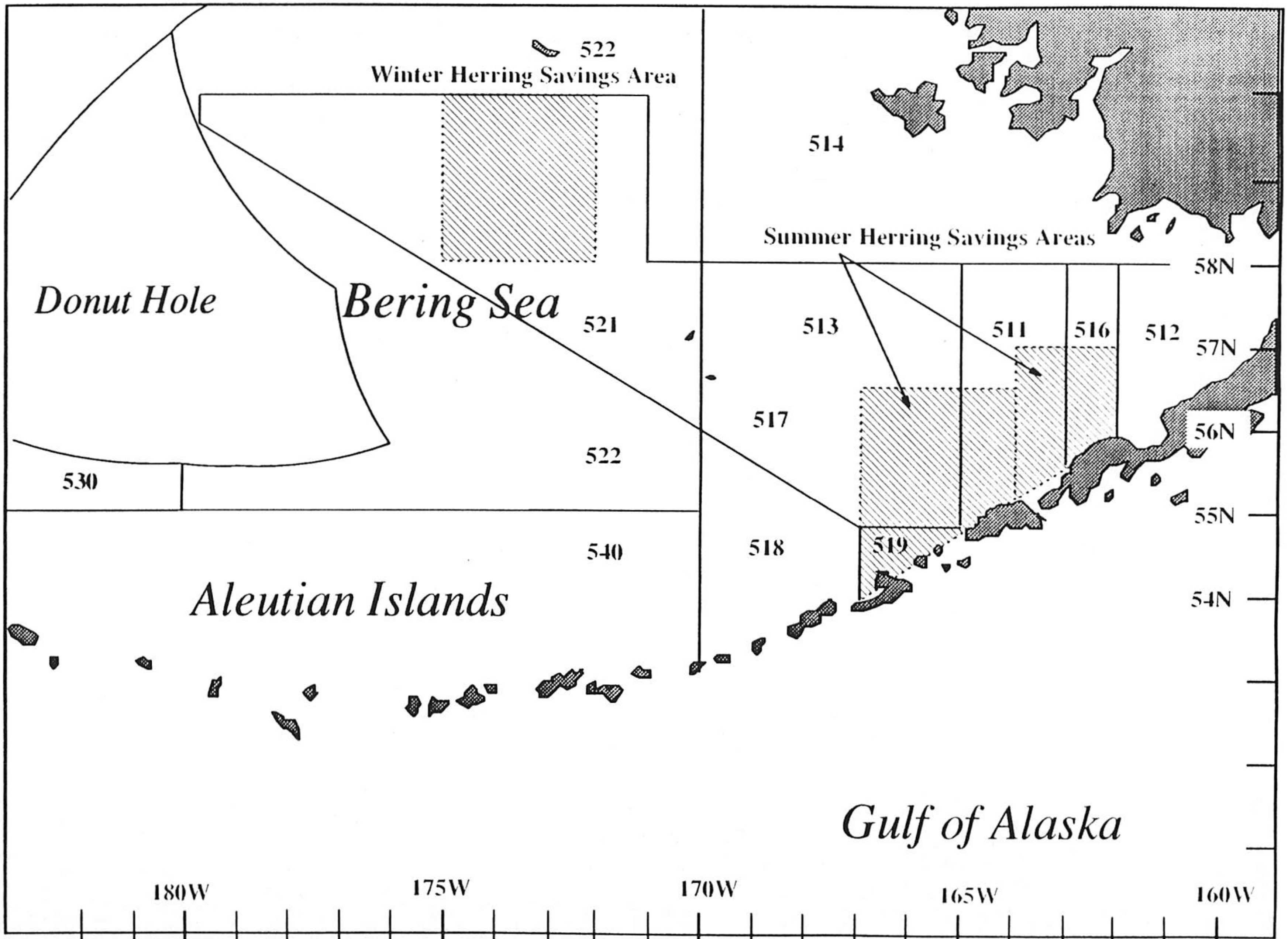

Figure 1 Major regulatory areas of the Bering Sea and Aleutian Islands Groundfish FMP

BERING SEA/ALEUTIAN ISLANDS GROUNDFISH

AGENDA D-2(c)(2a)

1992 Plan Team and SSC recommended ABC, AP recommended TAC and apportionments (mt)

Species	Area	Seasons\1	1991 ABC	1991 TAC	1991 Catch \2	1992 ABC Plan Team	1992 ABC SSC	Advisory Panel TAC	Advisory Panel ITAC\3	Advisory Panel DAP
Pollock	EBS		1,676,000	1,300,000	1,292,442	1,490,000				
		Roe			461,944					
		Non-Roe			830,498					
	AI		101,460	85,000	78,245	51,600				
		Roe								
		Non-Roe								
	518					107,000				
		Roe								
		Non-Roe								
Pacific cod			229,000	229,000	167,380	182,000				
Yellowfin sole			250,600	135,000	97783	372,000				
Greenland turbot			7,000	7,000	7168	7,000				
Arrowtooth flounder			116,400	20,000	13787	82,300				
Rock sole			246,500	90,000	46721	260,800				
Other flatfish			219,700	64,675	30939	199,600				
Sablefish	EBS		3,100	3,100	1148	1,400				
	AI		3,200	3,200	1860	3,000				
POP complex										
True POP	EBS		4,570	4,570	4,369	4,800				
Other POP complex	EBS		1,670	1,670	633	0				
Sharp/Northern	EBS					1,050				
Short/Rougheye	EBS					350				
True POP	AI		10,775	10,775	2184	18,700				
Other POP complex	AI				349					
Sharp/Northern	AI		3,440	3,440		5,670				
Short/Rougheye	AI		1,245	1,245		1,220				
Other rockfish	EBS		400	400	392	400				
	AI		925	925	443	925				
Atka mackerel			24,000	24,000	24,807	260,400				
Squid			3,800	1,000	1,349	3,600				
Other species			28,700	15,000	17,560	27,200				
BS/AI TOTAL			2,932,485	2,000,000	1,789,559	3,081,015				

\1 Only the 1991 EBA pollock fishery was seasonally apportioned

\2 DAP catch data through November 3, 1991.

\3 Recommended TAC less 15% reserve

AGENDA D-2(c)(2a)
DECEMBER 1991

AGENDA D-2(c)(2b)
DECEMBER 1991

BERING SEA/ALEUTIAN ISLANDS GROUNDFISH WORKSHEET
1992 Council Recommendations for ABCs, TACs and Apportionments (metric tons)

Species	Area	Seasons\1	ABC	TAC	ITAC\2	Seasonal Allowances\3	DAP
Pollock	EBS						
		Roe					
		Non-Roe					
	AI						
		Roe					
		Non-Roe					
	518						
		Roe					
		Non-Roe					
Pacific cod							
Yellowfin sole							
Greenland turbot							
Arrowtooth flounder							
Rock sole							
Other flatfish							
Sablefish	EBS						
	AI						
POP complex							
True POP	EBS						
Other POP complex	EBS						
Sharp/Northern	EBS						
Short/Rougheye	EBS						
True POP	AI						
Other POP complex	AI						
Sharp/Northern	AI						
Short/Rougheye	AI						
Other rockfish	EBS						
	AI						
Atka mackerel							
Squid							
Other species							
BS/AI TOTAL							

\1 The Council may seasonally apportion pollock in the EBS, AI and/or 518. \2 Recommended TAC less 15% reserve.
\3 The Council may consider possible seasonal allowances of pollock TAC, including but not limited to 40:60.

BERING SEA/ALEUTIAN ISLANDS GROUNDFISH

Preliminary 1992 Council Recommendations for Groundfish Specifications (metric tons)\1

Species	Area	ABC\1	TAC	Seasons\2	Area	ITAC*	DAP
Pollock	EBS	1,421,000	1,100,000 \3	Roe (1/1-4/15)	EBS	374,000	374,000
				Non-Roe (6/1 -12/31)	EBS	561,000	561,000
	AI	75,900	75,900		AI	64,515	64,515
	518	0 - 102,000	20,000		518	17,000	17,000
Pacific cod		225,000 \4	180,000			153,000	153,000
Yellowfin sole		277,000	130,000			110,500	110,500
Greenland turbot		7,000	7,000			5,950	5,950
Arrowtooth flounder		116,400	20,000			17,000	17,000
Rock sole		246,500	60,000			51,000	51,000
Other flatfish		219,700	40,000			34,000	34,000
Sablefish	EBS	3,100	3,100			2,635	2,635
	AI	3,200	3,200			2,720	2,720
POP complex\5							
True POP	EBS	4,500 - 6,400	4,570 **			3,885	3,885
SR, RE, SC, Nrn	EBS	1,800	1,670 **			1,420	1,420
True POP	AI	10,600 - 16,900	10,775 **			9,159	9,159
SR, RE	AI	1,400	1,245 **			1,058	1,058
SC, Nrn	AI	4,000	3,440 **			2,924	2,924
Other rockfish	EBS	400	400 **			340	340
	AI	900	900 **			765	765
Atka mackerel		24,400	24,000 **			20,400	20,400
Squid		3,600	3,600			3,060	3,060
Other species		27,100	15,000			12,750	12,750
TOTALS		2,768,100 - 2,878,300	1,704,800			1,449,080	1,449,080

\1 Preliminary specifications subject to change upon incorporation of 1991 groundfish survey data.

\2 Seasonal allowances of pollock TAC are made after deduction for reserves.

\3 The Council will consider a range of 0.9 to 1.3 million metric tons for the final specification for pollock in December.

\4 ABC on P. cod may be lowered substantially in December.

\5 True POP: Pacific Ocean Perch; SR: Shortraker; RE: Rougheye; SC: Sharpchin; Nrn: Northern rockfish

* Recommended TAC less 15% reserve.

** Equal to overfishing level

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\	Days	Closure Date (start Jan. 1)	Closure Date (start Jan. 20)
25%	1,000,000	212,500	3.5	27	27-Jan-92	15-Feb-92
	1,100,000	233,750	3.9	29	30-Jan-92	18-Feb-92
	1,200,000	255,000	4.3	32	1-Feb-92	20-Feb-92
	1,400,000	297,500	5.0	37	7-Feb-92	26-Feb-92
40%	1,000,000	340,000	5.7	43	12-Feb-92	2-Mar-92
	1,100,000	374,000	6.2	47	16-Feb-92	6-Mar-92
	1,200,000	408,000	6.8	51	21-Feb-92	11-Mar-92
	1,400,000	476,000	7.9	60	29-Feb-92	19-Mar-92
50%	1,000,000	425,000	7.1	53	23-Feb-92	13-Mar-92
	1,100,000	467,500	7.8	58	28-Feb-92	18-Mar-92
	1,200,000	510,000	8.5	64	4-Mar-92	23-Mar-92
	1,400,000	595,000	9.9	74	15-Mar-92	3-Apr-92
60%	1,000,000	510,000	8.5	64	4-Mar-92	23-Mar-92
	1,100,000	561,000	9.4	70	11-Mar-92	30-Mar-92
	1,200,000	612,000	10.2	77	17-Mar-92	5-Apr-92
	1,400,000	714,000	11.9	89	30-Mar-92	18-Apr-92

1\ FMP provisions require that seasonal allowances be calculated after deduction of 15% non-specific reserve.

2\ Harvest by fleet is assumed to be 60,000 mt/week. (Based on 1991 weekly pollock catch rates as reported by NMFS AKR)

Table 2. Weekly BSAI pollock catch, product mix and wholesale value for the first quarter of the 1991 pollock fishery.

Aleutian Islands

Week Ending	Total Catch (mt)	Roe %	Surimi %	Fillet %	Meal %	Other %	Discard %	Value ($1,000)	Value/mt Tot. Catch
1/ 6/91	8,713.40	3.31	12.92	1.12	5.81	.00	3.59	5,312	609.62
1/13/91	3,049.15	3.50	11.00	4.30	7.30	.65	.75	2,171	712.12
1/20/91	31.75	.00	.00	.00	.00	.00	100.00	0	.00
1/27/91	48.21	.33	.00	.00	.00	4.02	92.82	5	99.01
2/ 3/91	40.26	.00	.00	.00	.00	.00	100.00	0	.00
2/10/91	59.39	.00	.00	.00	.00	.00	100.00	0	.00
2/17/91	79.48	.00	.00	.00	.00	.00	100.00	0	.00
2/24/91	1,041.45	3.85	7.81	4.52	1.19	6.09	5.58	860	825.74
3/ 3/91	17,798.87	1.25	9.00	6.18	4.63	1.51	.61	10,861	610.19
3/10/91	22,386.09	2.38	10.41	5.98	4.38	.73	.93	16,001	714.77
3/17/91	11,980.44	1.82	9.88	6.43	4.19	1.91	.89	8,305	693.22
3/24/91	12,619.46	.52	8.41	8.76	5.09	1.99	1.05	8,138	644.89
3/31/91	131.25	1.11	.00	.00	.00	.00	99.46	12	90.75

Bogoslof Island

Week Ending	Total Catch (mt)	Roe %	Surimi %	Fillet %	Meal %	Other %	Discard %	Value ($1,000)	Value/mt Tot. Catch
1/13/91	25,121.19	4.55	10.87	3.33	4.00	.74	1.06	18,912	752.82
1/20/91	31,897.99	4.44	9.91	3.67	3.23	.87	1.61	23,404	733.70
1/27/91	31,964.26	6.68	9.32	4.80	4.51	1.04	5.00	30,611	957.67
2/ 3/91	32,094.93	6.92	8.68	3.85	3.46	1.15	2.32	33,264	1,036.43
2/10/91	34,636.39	7.88	9.32	4.04	3.47	.91	2.78	39,678	1,145.57
2/17/91	53,167.26	8.72	8.37	3.67	4.52	1.32	3.06	63,866	1,201.23
2/24/91	2,645.86	5.67	10.29	1.37	4.50	.98	2.27	2,309	872.72
3/ 3/91	885.72	1.82	5.95	2.72	6.19	.00	.01	380	429.30

Table 2. Continued.

Other Bering Sea

Week Ending	Total Catch (mt)	Roe %	Surimi %	Fillet %	Meal %	Other %	Discard %	Value ($1,000)	Value/mt Tot. Catch
1/ 6/91	31,105.69	1.68	9.94	5.30	4.68	1.24	4.12	17,712	569.41
1/13/91	32,043.27	1.94	10.45	4.40	3.55	1.01	4.34	18,022	562.44
1/20/91	26,948.49	1.90	10.75	2.04	5.51	1.37	4.58	13,469	499.80
1/27/91	35,064.81	2.18	10.55	1.70	5.41	1.34	4.16	17,760	506.50
2/ 3/91	21,622.94	2.10	10.74	1.91	5.29	2.09	5.67	12,727	588.61
2/10/91	26,753.40	1.76	10.38	3.02	4.60	1.59	6.98	15,361	574.18
2/17/91	26,160.75	1.79	10.10	2.21	5.75	2.01	9.93	14,500	554.27
2/24/91	50,716.94	2.50	9.77	3.15	4.40	1.66	11.14	32,145	633.82
3/ 3/91	5,101.53	.30	1.83	.70	1.13	.73	84.78	585	114.63
3/10/91	3,312.95	.25	.00	.88	.28	.24	93.59	198	59.63
3/17/91	920.75	.48	.00	1.24	.00	.36	95.91	85	92.75
3/24/91	857.94	.95	.00	2.71	.26	.68	88.61	166	193.96
3/31/91	580.92	.50	.00	3.32	.00	1.44	85.40	112	193.21

Total BS/AI

Week Ending	Total Catch (mt)	Roe %	Surimi %	Fillet %	Meal %	Other %	Discard %	Value ($1,000)	Value/mt Tot. Catch
1/ 6/91	39,819.09	2.04	10.59	4.38	4.92	.97	4.00	23,024	578.21
1/13/91	60,213.61	3.11	10.65	3.95	3.93	.88	2.79	39,106	649.45
1/20/91	58,878.23	3.27	10.29	2.92	4.28	1.10	3.02	36,872	626.25
1/27/91	67,077.28	4.32	9.95	3.18	4.98	1.20	4.63	48,376	721.20
2/ 3/91	53,758.13	4.98	9.51	3.07	4.19	1.52	3.74	45,991	855.53
2/10/91	61,449.18	5.21	9.77	3.59	3.96	1.21	4.70	55,040	895.70
2/17/91	79,407.49	6.43	8.93	3.19	4.92	1.55	5.42	78,366	986.89
2/24/91	54,404.25	2.68	9.75	3.09	4.35	1.71	10.61	35,315	649.11
3/ 3/91	23,786.12	1.07	7.35	4.88	3.94	1.29	18.64	11,826	497.17
3/10/91	25,699.24	2.11	9.07	5.32	3.85	.67	12.87	16,202	630.45
3/17/91	12,901.19	1.73	9.18	6.06	3.89	1.80	7.67	8,391	650.44
3/24/91	13,477.40	.55	7.88	8.37	4.78	1.91	6.62	8,306	616.33
3/31/91	712.17	.64	.00	2.71	.00	1.17	87.99	126	176.50

Table 3. Quarterly BSAI pollock catch, product composition and value for the 1991 pollock fishery.

Aleutian Islands

Quarter	Total Catch (mt)	Roe %	Surimi %	Fillet %	Meal %	Other %	Discard %	Value ($1,000)	Value/mt Tot. Catch
1	77,979.20	1.89	9.90	5.89	4.73	1.28	1.71	51,665	662.55
2	262.26	.00	.00	5.03	.00	.27	82.78	55	208.98
3	3.54	.00	.00	.00	.00	18.08	67.80	1	318.92

Bogoslof Island

Quarter	Total Catch (mt)	Roe %	Surimi %	Fillet %	Meal %	Other %	Discard %	Value ($1,000)	Value/mt Tot. Catch
1	212,413.80	6.80	9.25	3.86	3.94	1.04	2.72	212,428	1,000.07
2	2.08	.00	.00	.00	.00	.00	100.00	0	.00
3	.01	.00	.00	.00	.00	.00	100.00	0	.00

Other Bering Sea

Quarter	Total Catch (mt)	Roe %	Surimi %	Fillet %	Meal %	Other %	Discard %	Value ($1,000)	Value/mt Tot. Catch
1	261,190.38	1.96	9.89	2.95	4.66	1.47	10.06	142,844	546.90
2	222,360.58	.12	8.28	6.30	3.72	1.60	12.14	92,006	413.77
3	593,937.48	.00	10.14	5.45	3.78	1.43	4.44	199,145	335.30

Total BS/AI

Quarter	Total Catch (mt)	Roe %	Surimi %	Fillet %	Meal %	Other %	Discard %	Value ($1,000)	Value/mt Tot. Catch
1	551,583.38	3.82	9.65	3.72	4.39	1.28	6.05	406,941	737.77
2	222,624.92	.12	8.27	6.30	3.71	1.60	12.22	92,061	413.52
3	593,941.03	.00	10.14	5.45	3.78	1.43	4.44	199,146	335.30

1991 PSC APPORTIONMENTS

1991 BSAI PSC Apportionments to Trawl Fisheries

Fishery	Halibut Primary (mt)	Halibut Secondary	Herring (mt)	Red King Crab (Zone 1)	C. bairdi (Zone 1)	C. bairdi (Zone 2)
Greenland Turbot	660	800	83	40,000	100,000	825,000
Rock Sole	908	1,100	0	150,000	700,000	300,000
Flatfish\1	165	200	8	0	0	50,000
"Other Fishery"\2	2,667	3,233	158	10,000	200,000	1,825,000
MW Pollock	n/a	n/a	584	n/a	n/a	n/a
TOTAL	**4,400**	**5,333**	**833**	**200,000**	**1,000,000**	**3,000,000**

1\ Flatfish group includes yellowfin sole, and "other flatfish".
2\ "Other fishery" includes P. cod, bt pollock, Atka mackerel, sablefish, arrowtooth flounder and "other".

Quarterly Allowances of Halibut PSC Apportionment to DAP "Other" Fishery

Quarter	Percent	mt
1	45	1,455
2	40	1,293
3	15	485
4		
Total		**3,233**

1992 BERING SEA ALEUTIAN ISLANDS BYCATCH WORKSHEET

HALIBUT

PRIMARY CAP: 4400 MT (ZONE 1, 2H)

1991 Apportionments (mt)	
Greenland turbot	660
Rock Sole	908
Flatfish	165
"Other"	2,667

1992 Council Recommendations

	Greenland turbot	Rock sole	Flatfish	"Other"
Quarter 1				
Quarter 2				
Quarter 3				
Quarter 4				

HALIBUT

SECONDARY CAP: 5333 MT (BSAI-wide)

1991 Apportionments (mt)	
Greenland turbot	800
Rock Sole	1,100
Flatfish	200
"Other"	3,233

1992 Council Recommendations

	Greenland turbot	Rock sole	Flatfish	"Other"
Quarter 1				
Quarter 2				
Quarter 3				
Quarter 4				

C. bairdi
TANNER CRAB

ZONE 1 CAP: 1,000,000 animals

1991 Apportionments	
Greenland turbot	100,000
Rock Sole	700,000
Flatfish	0
"Other"	200,000

1992 Council Recommendations

	Greenland turbot	Rock sole	Flatfish	"Other"
Quarter 1				
Quarter 2				
Quarter 3				
Quarter 4				

C. bairdi
TANNER CRAB

ZONE 2 CAP: 3,000,000 animals

1991 Apportionments	
Greenland turbot	825,000
Rock Sole	300,000
Flatfish	50,000
"Other"	1,825,000

1992 Council Recommendations

	Greenland turbot	Rock sole	Flatfish	"Other"
Quarter 1				
Quarter 2				
Quarter 3				
Quarter 4				

RED KING CRAB

CAP: 200,000 animals (Zone 1 only)

1991 Apportionments	
Greenland turbot	40,000
Rock Sole	150,000
Flatfish	0
"Other"	10,000

1992 Council Recommendations

	Greenland turbot	Rock sole	Flatfish	Other
Quarter 1				
Quarter 2				
Quarter 3				
Quarter 4				

HERRING

CAP: 1 % OF BSAI BIOMASS

1991 Apportionments (mt)	
Greenland turbot	83
Rock Sole	0
Flatfish	165
"Other"	458
MW Pollock	584

1992 Council Recommendations

	Greenland turbot	Rock sole	Flatfish	Other	MW Pollock
Quarter 1					
Quarter 2					
Quarter 3					
Quarter 4					

STATE OF ALASKA

WALTER J. HICKEL, GOVERNOR

DEPARTMENT OF FISH AND GAME

DIVISION OF COMMERCIAL FISHERIES

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

October 31, 1991

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

Dear Dr. Pautzke:

Enclosed are reports describing the current status of Bering Sea herring stocks. The Division of Commercial Fisheries estimates that the 1992 biomass of Bering Sea herring stocks from Port Moller to Norton Sound will be 95,649 tonnes, a slight increase from the previous year. This biomass estimate is provided to the council as the basis for computing the 1992 herring prohibited species catch limit under amendment 16A to the Bering Sea/Aleutians groundfish management plan.

Sincerely,

for Denby S. Lloyd
Director
Division of Commercial Fisheries

Enclosures

OVERVIEW OF BERING SEA HERRING MIGRATION, STOCK STATUS, AND COMMERCIAL FISHERIES

Edited By:

Fritz Funk

REGIONAL INFORMATION REPORT[1] NO. 5J91-13

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

October 1991

[1] The Regional Information Report Series was established in 1987 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 timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries.

TABLE OF CONTENTS

PREFACE

This compilation of reports was prepared as a source of information to be used by the Alaska Board of Fisheries during their October 1991 review of proposed modifications to the management of Bering Sea herring fisheries. This report is a synthesis and summary of detailed information that is available in other publications of the Alaska Department of Fish and Game and from other sources.

This report is divided into two sections. The first section summarizes the currently available information on stock identification and migration patterns of herring in the Bering Sea. The information in this section was first presented to the Board of Fisheries during their March 1991 discussions of the management of the Dutch Harbor food and bait herring fishery. An appendix to this first section contains an updated figure which estimates the potential impact of the 1992 Dutch Harbor food and bait fishery on the Nelson Island herring stock. The second section of this report provides a current summary of Bering Sea herring stock status, commercial fisheries, and trawl bycatch impacts.

SUMMARY OF BERING SEA HERRING STOCK IDENTIFICATION AND MIGRATION STUDIES

By:

Fritz Funk, Kathy Rowell, and Dana Schmidt

EXECUTIVE SUMMARY

The Dutch Harbor food and bait fishery harvests migrating herring stocks enroute from spawning grounds to offshore wintering grounds. The following information summarizes what is known about the origin of herring caught in the Dutch Harbor food and bait fishery.

1. Several stock separation studies have indicated that the origins of the herring caught in this fishery are predominantly from the Togiak stock, averaging 78% Togiak over all studies.

2. The composition of the non-Togiak component of the harvest cannot be identified as to origin. Possible stocks contributing to the non-Togiak component include Norton Sound, Cape Romanzof, Nunivak Island, Nelson Island, Cape Avinof, Goodnews Bay, Security Cove, Port Moller, and possibly other Alaska Peninsula or other stocks. An estimate of the composition of the non-Togiak component is best made by using the relative biomass of the non-Togiak stocks.

3. In 1989, the Alaska Department of Fish and Game conducted a detailed examination of a single sample taken from one trawl haul from the groundfish fishery and of a single sample taken from one purse seine in the Dutch Harbor food and bait fishery. This study indicated that the schools from which the two samples were selected represented a segregated age-size composition, and had a larger component of non-Togiak herring than would be expected if herring from all areas were randomly mixed. However, the overall result of this study showed that Togiak stocks dominated (78%) the Dutch Harbor harvest, agreeing with earlier stock separation studies conducted by the University of Washington. The finding of segregated age-size compositions does not change the overall stock composition estimates, but increases the variability of predicted of stock composition estimates.

4. Herring from Nelson Island likely overwinter with other eastern Bering Sea herring stocks in the area north and west of the Pribilof Islands. Both a clockwise, coastal route around Bristol Bay and a counterclockwise, direct offshore route to the wintering grounds have been hypothesized for the Nelson Island stock. No convincing evidence exists to suggest that the Nelson Island herring stock follows one route or the other. If Nelson Island herring migrate via the counterclockwise, direct offshore route, they would not be taken in the Dutch Harbor food and bait fishery. If Nelson Island herring migrate via the clockwise, coastal route, the relative biomass of eastern Bering Sea herring stocks is the best available predictor of the composition of a late summer Dutch Harbor food and bait fishery.

5. Swimming speed analyses suggest that if Nelson Island herring migrate clockwise, they would not arrive at Dutch Harbor until at least early August, and perhaps as late as mid-September. Togiak herring are known to arrive at Dutch Harbor by mid-July. This suggests that a mid-July fishery at Dutch Harbor could avoid Nelson Island herring. Previous scale pattern analyses were not capable of detecting any meaningful trend in the proportion of non-Togiak stocks over time.

INTRODUCTION

Commercial sac roe fisheries have developed around nine major herring spawning locations in the eastern Bering Sea (Figure 1). After spawning, these herring stocks begin a long migration to offshore wintering areas. During the course of this migration additional herring are taken in the Dutch Harbor food and bait fishery and as bycatch in the pollock and cod trawl fisheries.

This document summarizes the available information on the migration routes of these stocks, with an emphasis on the stock composition of herring harvests taken near Dutch Harbor during mid to late summer. Of particular concern is the magnitude of the catch of the depressed Nelson and Nunivak Island herring stocks in the Dutch Harbor food and bait fishery and trawl fisheries which occur in the Dutch Harbor area. Most of the emphasis is placed on the Nelson Island herring stock because of its former substantial abundance and the importance of subsistence herring harvests to Nelson Island residents. However, much of the material also applies to the nearby Nunivak Island herring stock.

MIGRATION ROUTES

Soviet research vessels located the wintering grounds of eastern Bering Sea herring north and west of the Pribilof Islands (Figure 2) in the early 1960s (Rumyantsev and Darda 1970). Soviet and Japanese trawl fleets developed a massive fishery on the herring wintering grounds during the 1960's. During the early spring, Soviet and Japanese vessels tracked eastward movements of herring schools and established the western Alaskan coast as the spawning location for the herring that were wintering north and west of the Pribilof Islands. During the late 1960's, Japanese gillnet vessels were fishing just offshore of most of the locations of present sac roe herring fisheries (NPFMC 1983). For several months after spawning, the foreign fleets were not able to track herring movements, leading Rumyantsev and Darda (1970) to conclude that post-spawning herring migrations were occurring in nearshore coastal waters. In the central Bering Sea, Rumyantsev and Darda (1970) reported that adult herring reappeared in research catches southwest of Nunivak Island in early August (Figure 3). In the southern Bering Sea, herring also reappeared in Soviet and Japanese catches during August (Wespestad and Barton 1981), in the "horseshoe" area just north of Unimak Pass.

The timing of the clockwise migration of herring around Bristol Bay was further refined by Funk (1990) from records of herring bycatch in foreign and joint venture trawl fisheries in the Bering Sea. Herring bycatch is negligible during May when herring are spawning inshore (Figure 4A). During June, a large aggregation of herring appears in vicinity of Port Moller (Figure 4B). By mid-July, the aggregation has reached the Unimak Pass area (Figure 5A), with substantial offshore movement occurring by August (Figure 5B). Because the Togiak stock comprises the largest biomass of the western Alaskan spawning stocks, these data likely indicate only the movements of the Togiak stock. The movements of smaller stocks would likely be masked by the larger Togiak stock. The Togiak stock has been observed exiting the spawning grounds along the Nushugak Peninsula (Figure 3). This indicates that the Togiak stock migrates clockwise around Bristol Bay in coastal waters and does not proceed in a straight line route to the Port

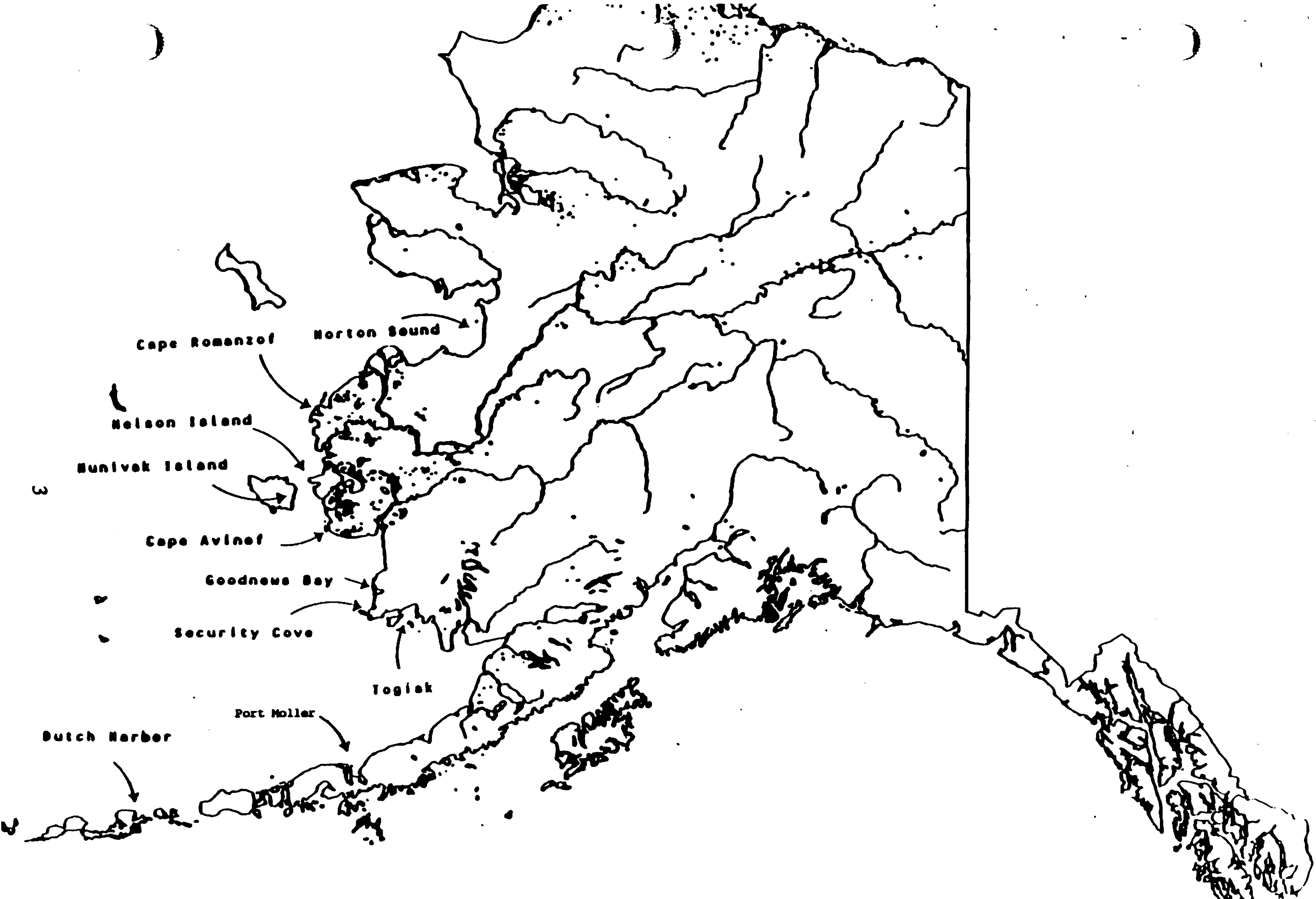

Figure 1. Location of commercial sac roe fisheries at nine eastern Bering Sea herring spawning locations, and location of the Dutch Harbor food and bait herring fishery.

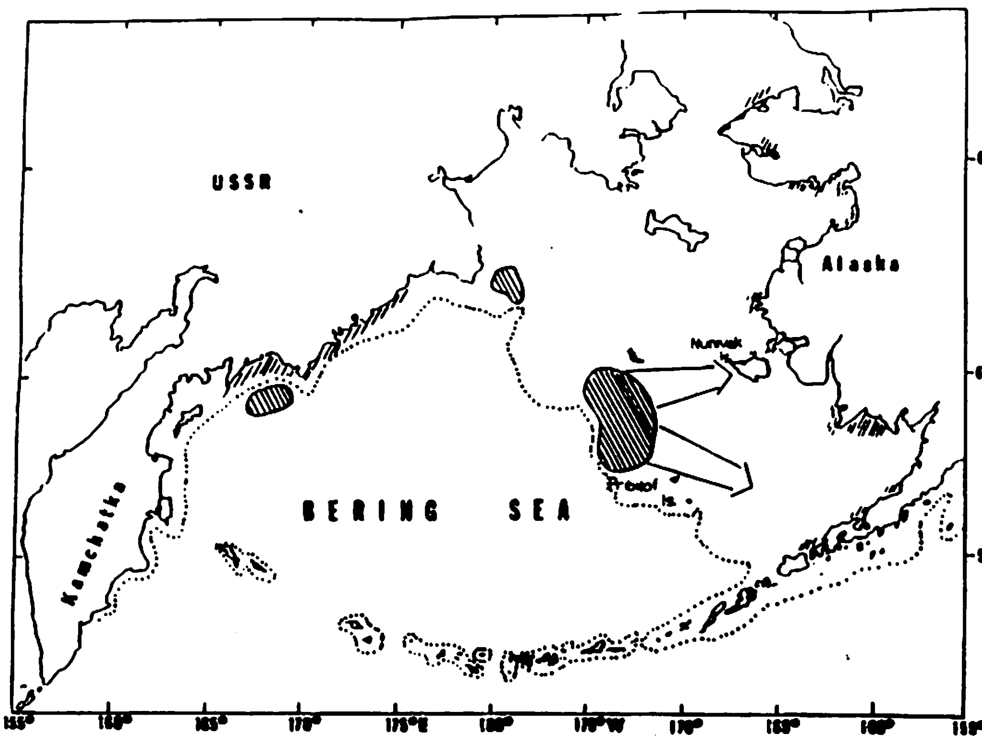

Figure 2. Location of spawning and winter grounds (oval areas) of main eastern and western Bering Sea herring stocks and routes of migration of eastern stocks to spawning areas (from NPFMC 1983).

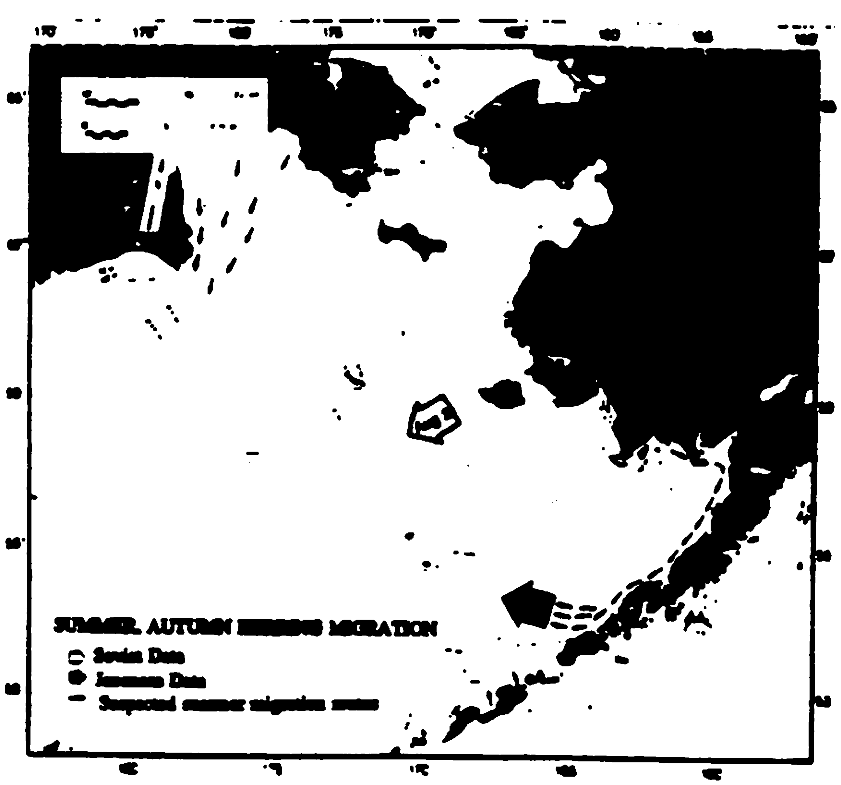

Figure 3. Summer and autumn migration routes to winter grounds, showing area of reappearance in Soviet and Japanese research and commercial catches (after Wespestad and Barton 1981).

Moller area. The trawl bycatch data continue to support the central Bering Sea area north and west of the Pribilofs (Figure 2) as the wintering grounds for herring that spawn in western Alaska.

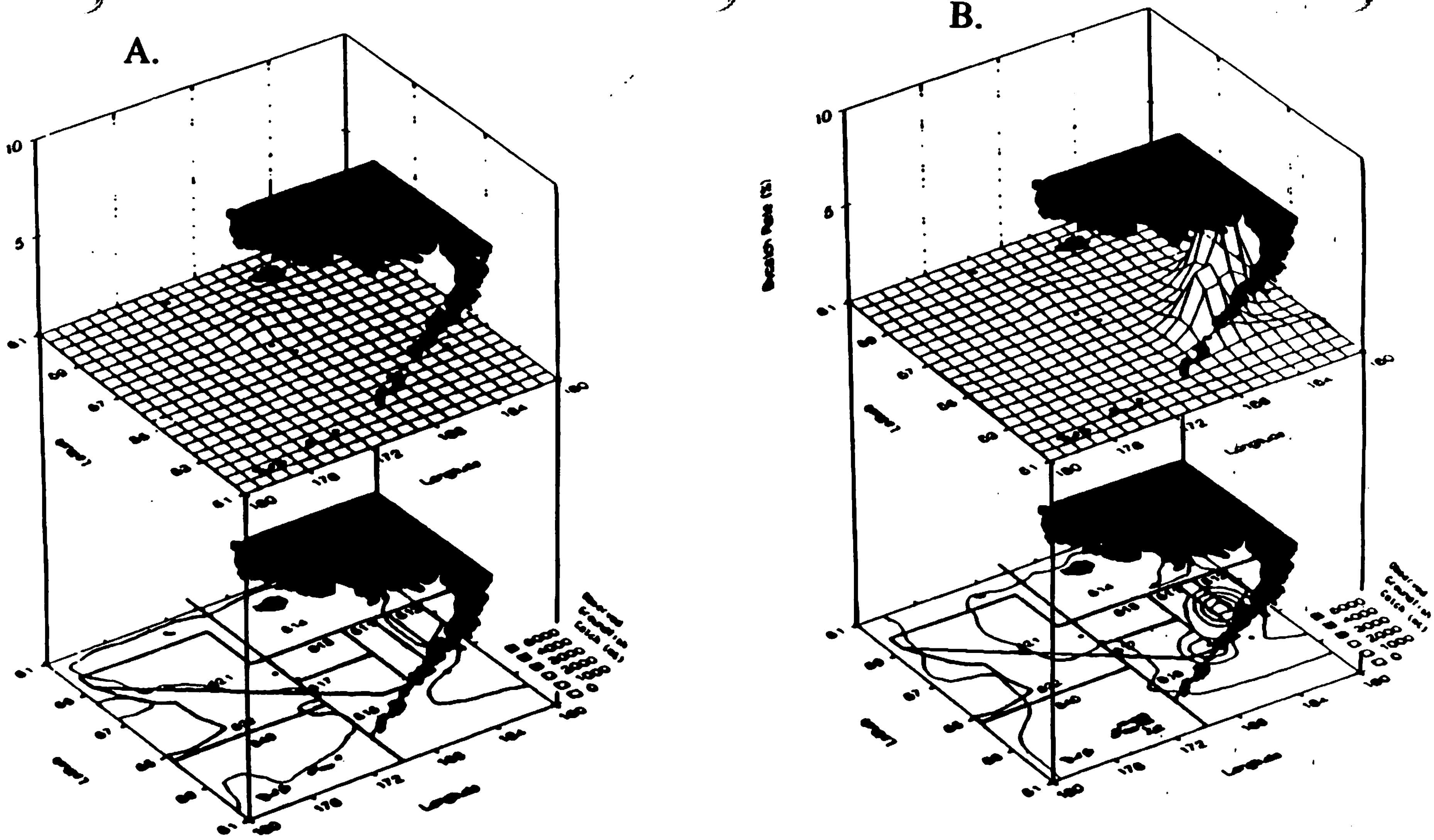

Figure 4. Distribution of herring in May (A), and June (B) reconstructed from 1983-88 foreign and joint venture bycatch data (from Funk 1990). Upper panel: herring bycatch rate by foreign and joint venture pollock bottom trawl and "other" bottom trawl (primarily Pacific cod) gears, averaged from 1983 through 1988, by 1/2° latitude by 1° longitude area, smoothed by distance-weighted least squares. Lower panel: National Marine Fisheries Service regulatory reporting areas (511-540), contour lines of herring bycatch rates from the upper panel, and the distribution of observed foreign and joint venture observed catches for pollock and "other" bottom trawls from 1983-1988 (shaded areas).

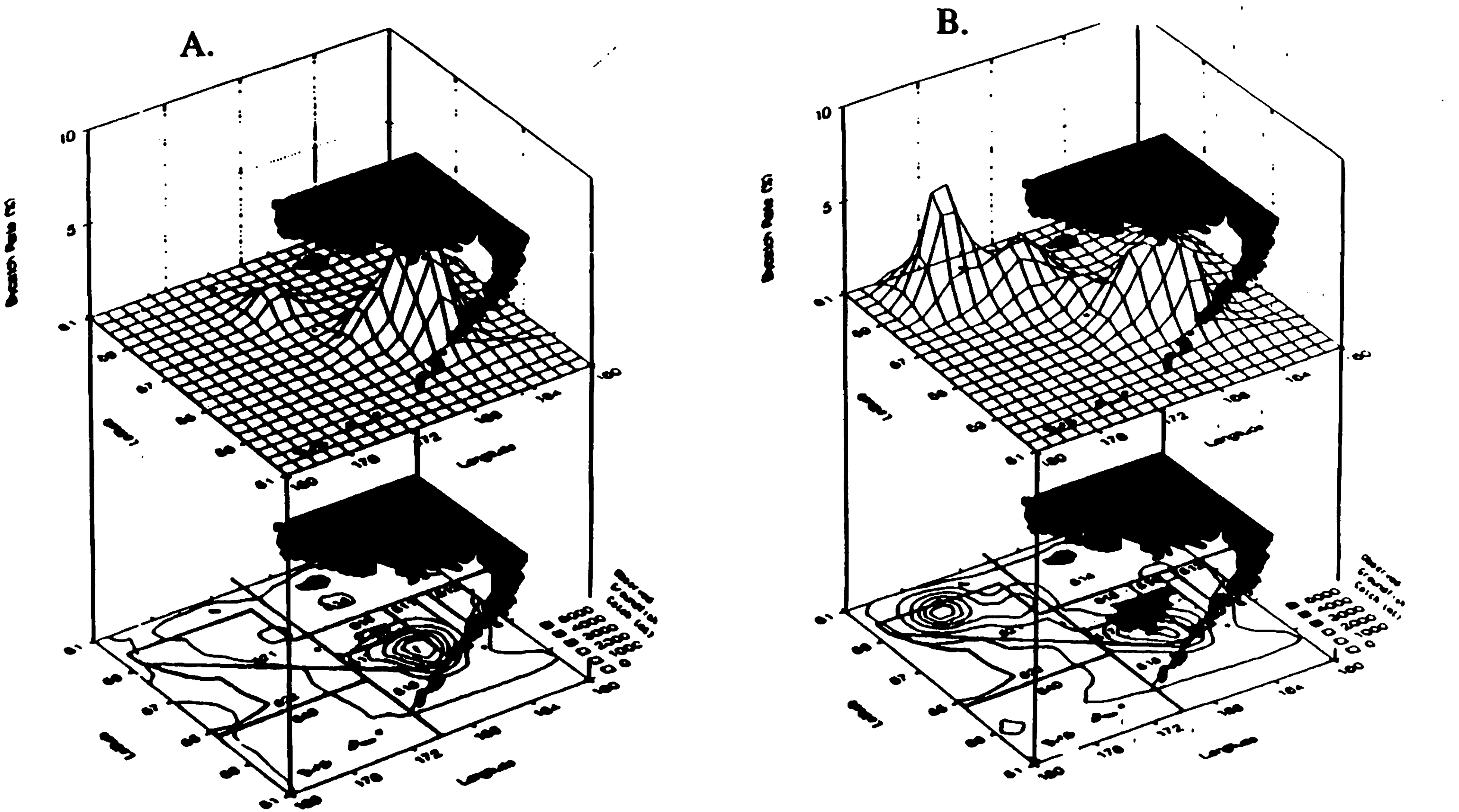

Figure 5. Distribution of herring in July (A), and August (B) reconstructed from 1983-88 foreign and joint venture bycatch data (from Funk 1990). Upper panel: herring bycatch rate by foreign and joint venture pollock bottom trawl and "other" bottom trawl (primarily Pacific cod) gears, averaged from 1983 through 1988, by 1/2° latitude by 1° longitude area, smoothed by distance-weighted least squares. Lower panel: National Marine Fisheries Service regulatory reporting areas (511-540), contour lines of herring bycatch rates from the upper panel, and the distribution of observed foreign and joint venture observed catches for pollock and "other" bottom trawls from 1983-1988 (shaded areas).

The route taken by the Nelson Island herring stock after spawning was not conclusively established by any of these migration studies.

STOCK IDENTIFICATION STUDIES

The scale pattern analysis (SPA) method of stock identification has been used in four studies of the origins of stocks taken in the Dutch Harbor food and bait herring fishery. Three of the SPA studies were conducted by the Fisheries Research Institute (FRI) of the University of Washington (Walker and Schnepf 1982, Rogers et al. 1984, and Rogers and Schnepf 1985). All of these studies suffered from the criticism that a several stocks which could be present in the Dutch Harbor fishery were not considered in the analysis. In general, the Togiak stock dominated the samples collected by these studies, averaging 78% over all three studies (Figure 6). Confidence intervals were extremely wide and in most cases the samples were indistinguishable from samples containing entirely Togiak fish.

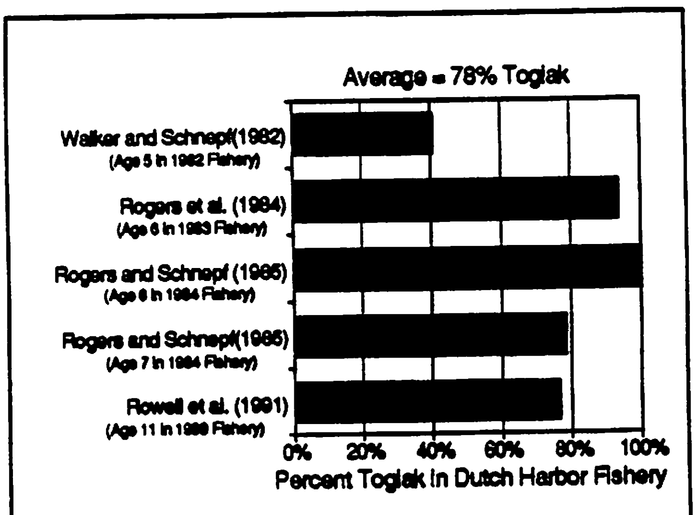

Figure 6. Percentage of herring captured in the Dutch Harbor food and bait fishery classified as the Togiak stock in four scale pattern analysis studies of five different age classes.

Rowell et al. (1990) included almost all possible stocks in the analysis, and similarly concluded that 78% of the Dutch Harbor harvest were Togiak fish. Rowell et al. (1990) were only able to make the SPA techniques work by pooling a number of small stocks together. In the age class examined (age 11 in the 1989 fishery), a number of the small stocks happened to have similar scale patterns, even though they were not geographically adjacent, and these patterns happened to be different from the patterns on the scales of the Togiak stock. This fortuitous circumstance allowed Rowell et al. (1990) to make more definitive statements about the composition of Togiak vs. non-Togiak stocks than was possible in earlier studies. Because pooling was required to make the SPA techniques work, Rowell et al. (1990) stress that it is impossible to conclusively identify any of the individual stocks in the pooled group of small stocks, such as the Nelson and Nunivak Island stocks. The problem of discriminating among smaller stocks afflicted the earlier FRI studies as well, as emphasized by one of the authors of the FRI studies in a recent memorandum to the North Pacific Fisheries Management Council (Appendix).

If all eastern Bering Sea herring stocks were randomly mixed during their migration, the stock composition of migrating stocks would be proportional to the relative biomass of the stocks. For 1991, the Togiak stock is projected to comprise 86% of the herring stocks spawning from Nunivak Island southward (Funk 1991). Given the fluctuations in relative biomass over the last decade and the extremely wide confidence intervals in the SPA studies, this percentage contribution for Togiak is not significantly different from the SPA estimates. For 1991, the Nelson Island herring stock is projected to comprise 3% of the biomass of herring stocks spawning from Nunivak Island southward.

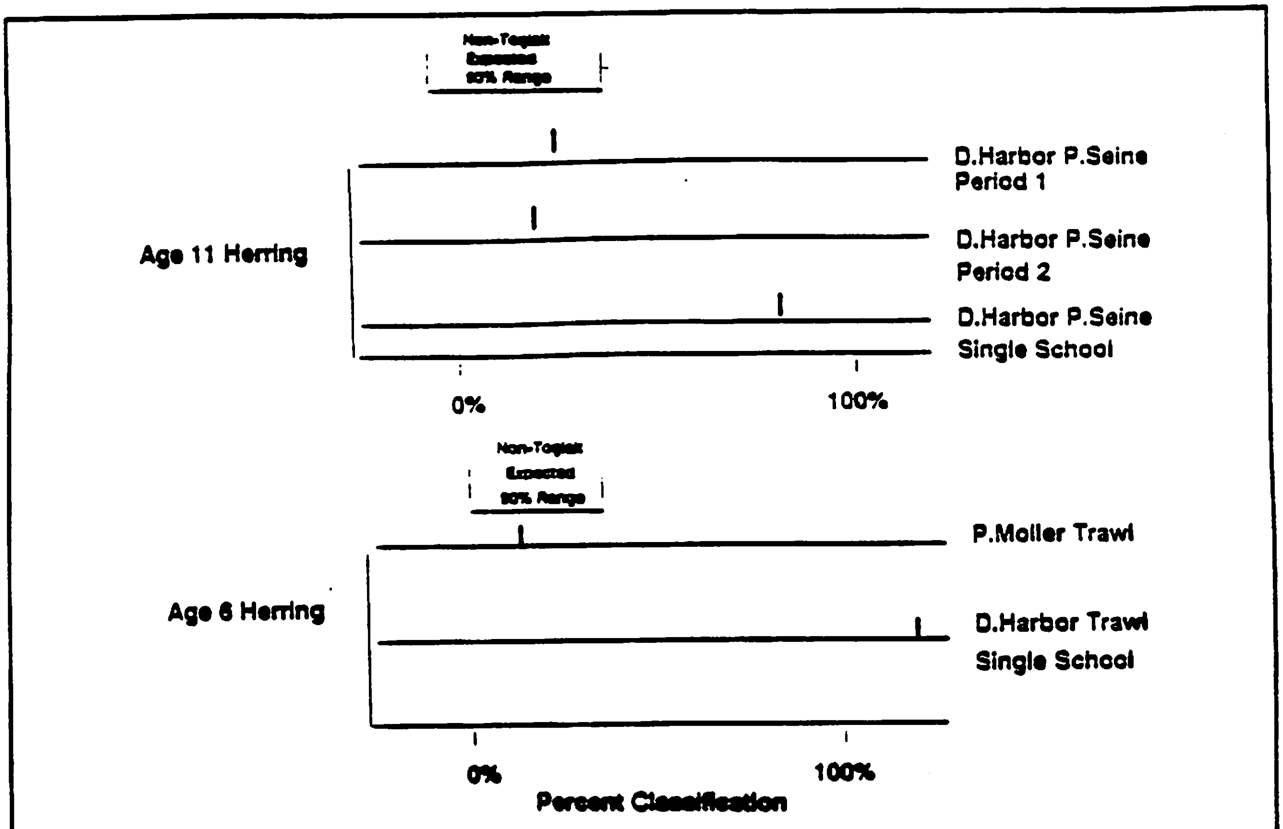

Figure 7. Comparison of fishery mixture classifications from Rowell et al. (1990) for age 6 and 11 herring, showing both single school and overall classifications for the 1989 Dutch Harbor food and bait and trawl fisheries.

In order to make inferences about the mixing of stocks on a school-by school basis, Rowell et al. (1990) classified the stock composition of two very large samples taken from individual fishing gear sets. One sample was from a pollock-targeted trawl haul in the Unimak Pass area, while the second was from a purse seine set during the 1989 Dutch Harbor food and bait fishery. The proportion of non-Togiak stocks greatly exceeded the proportion of the Togiak stock in both the single purse seine set and the single trawl haul (Figure 7). This is the opposite result of what would be expected from the biomass ratios if fish were randomly mixed in the Dutch Harbor area. However, the overall stock composition from all samples in both the trawl fishery and the Dutch Harbor food and bait fishery in both periods was 78% Togiak stock. This is not significantly different from the relative biomass distribution.

Therefore, in all five age classes examined in the four SPA studies, relative stock biomass has provided a reasonable approximation to the stock composition in the Dutch Harbor area. The occurrence of spatial segregation by stock of origin would not alter stock composition expected in the Dutch Harbor area in the future, but increases the variability of predicted stock composition estimates.

None of the scale pattern analysis studies conclusive'y established that Nelson Island herring are present in the Dutch Harbor area during the summe months. It is possible that the Nelson Island herring stock migrates directly offshore to the w .itering grounds. None of the SPA studies has been able to collect samples during the late su.nmer along the direct offshore migration route west of Nunivak Island.

SPAWNING AND MIGRATORY TIMING

If the Nelson Island herring stock migrates clockwise around the eastern Bering Sea, the stock composition in the Dutch Harbor area would vary in time, depending on the timing of the migration of each of the Bering Sea herring stocks. Northern herring stocks spawn later and are further from the Dutch Harbor area than southern stocks and therefore should arrive at Dutch Harbor later. In the SPA studies, sample sizes were too small to detect any significant changes in the percent of the Nelson Island stock over time (Figure 8). As previously mentioned, the ability of any of the SPA studies to properly detect any of the smaller stocks has been seriously questioned. Most of the SPA studies collected samples at Dutch Harbor only during the later part of the summer and did not collect samples during mid July when only earlier-spawning stocks would more likely be present.

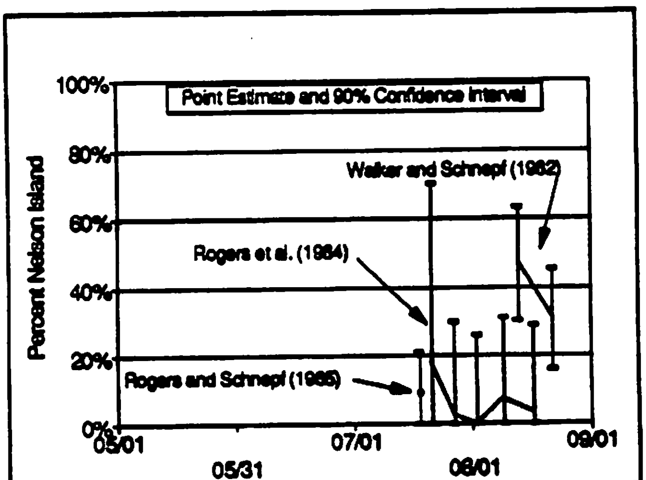

Figure 8. Percent of Dutch Harbor food and bait fishery samples classified to Nelson Island in FRI stock identification studies.

Based on the distance travelled by Togiak herring in Figures 4 and 5 and the mean fishery date at Togiak of May 10, Togiak herring travel approximately 7 to 8 nautical miles per day enroute to Dutch Harbor. These travel speeds agree with the observed increased bycatch of herring at Dutch Harbor in mid July, 1989, and reported abundances of herring off of Port Moller in mid June, 1989. It is not known for certain whether herring migrating from areas north of Cape Newenham would follow the coastline, as does the Togiak stock, or take a more direct route to Dutch Harbor. The earlier Soviet research attempted to follow the post-spawning migration and suspected that stocks followed a coastal route (Rumyantsev and Darda 1970). A direct route to Dutch Harbor would decrease the separation among stocks in the time of arrival at Dutch Harbor.

Assuming that all Bering Sea herring stocks travel at the speed calculated for Togiak stocks, we examined the separation in predicted arrival times of each stock at Dutch Harbor. Because we were interested only in substantial impacts on the stocks, we analyzed the timing only for the major biomass of each stock. The spawning run of the bulk of the biomass for each stock usually occurs over a short period, although lesser amounts of spawning continue for several weeks. To represent the annual variability in the date that the major biomass of each stock

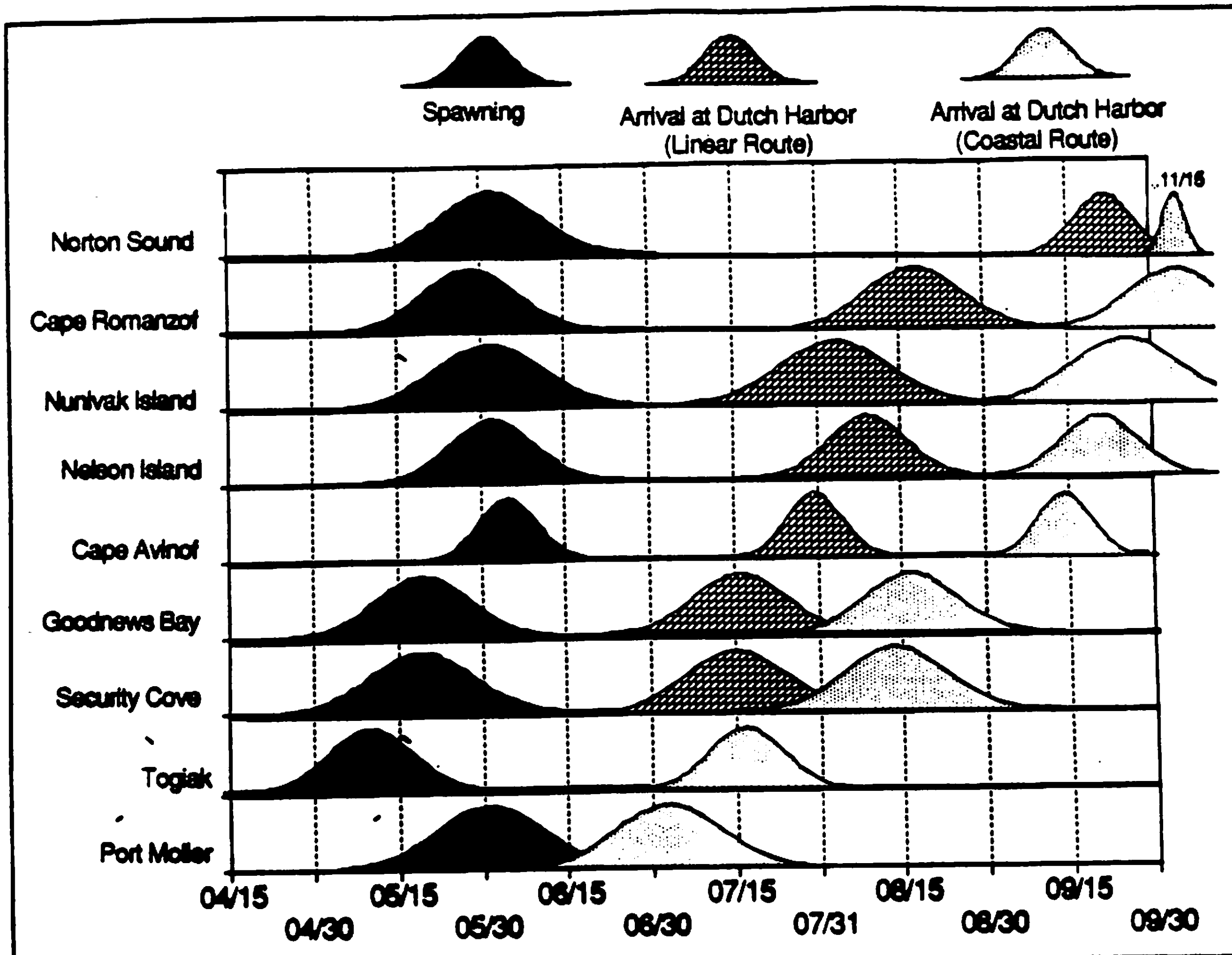

Figure 9. Timing of spawning and arrival at Dutch Harbor for Bering Sea herring stocks, assuming annual variability in spawn timing dates is represented by the variability in the timing of commercial sac roe fishing periods.

would be expected to depart the spawning grounds, we used the observed distribution of days that the commercial sac roe fisher was opened in each area from 1980-1990. We also assumed that departure from the spawning grounds would be expected to follow the average date of fishery openings by 3 days. We assumed that annual variability in arrival times of the major biomass of each stock at Dutch Harbor would be similar to the annual variability in fishery opening dates. Migration route distances to Dutch Harbor for stocks north of Cape Newenham was computed both as a straight line distance and following a coastal migration route. Even if stocks north of Cape Newenham follow a straight line path to Dutch Harbor, a discernable separation in the timing of arrival at Dutch Harbor is evident (Figure 9). If all stocks follow coast line routes, the arrival time of the Nelson Island stock would be clearly distinct from the arrival time of the Togiak stock.

IMPACT OF THE DUTCH HARBOR FISHERY ON THE NELSON ISLAND STOCK

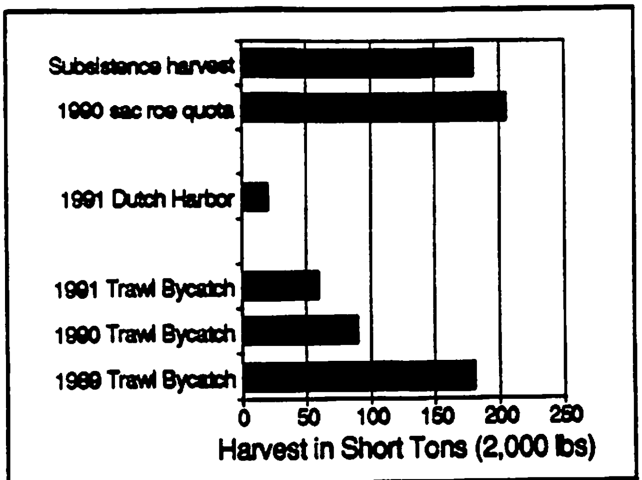

Figure 10. Comparison of the magnitude of Nelson Island herring harvests, assuming that the Dutch Harbor food and bait fishery and trawl fisheries take Nelson Island herring in proportion to their biomass.

Potential impacts of the Dutch Harbor food and bait fishery on the Nelson Island herring stock were computed under several scenarios. First, if the Nelson Island stock migrates directly offshore to the winter grounds, no Nelson Island fish would be caught in the Dutch Harbor fishery. If the Nelson Island stock migrates clockwise around Bristol Bay, as does the Togiak stock, then the relative biomass of the stocks provides the best estimate of stock composition at Dutch Harbor. For 1991, a harvest of 662 short tons is forecast for the Dutch Harbor fishery. In 1991, Nelson Island is projected to comprise 3% of the biomass of herring stocks spawning from Nelson Island south (Funk 1991). The expected harvest of the Nelson Island stock at Dutch Harbor is then 20 short tons. Because there is some segregation of herring schools by stock of origin in the Dutch Harbor area, the observed Nelson Island contribution is more likely to be higher or lower than 20 tons than would be the case if stocks were randomly mixed. SPA studies do not provide guidance for how much this variability would be increased. The magnitude of the expected Dutch Harbor harvest (Figure 10) is considerably smaller than the average subsistence harvest (Pete 1990). The 1991 Dutch Harbor food and bait fishery harvest is also considerably smaller than past and projected trawl bycatch impacts, using the bycatch estimates of NPFMC (1991) and assuming that based on relative biomass composition 3% of the trawl bycatch would be from the Nelson Island herring stock.

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APPENDIX

IMPACT OF THE DUTCH HARBOR FISHERY ON THE NELSON ISLAND STOCK

(Revised for Fall 1991)

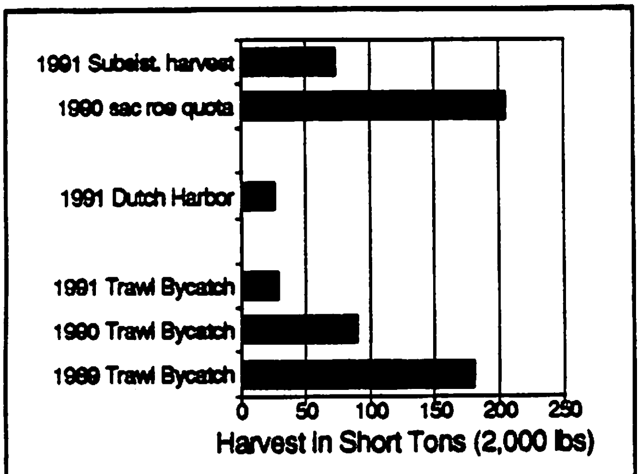

Figure 11. Comparison of the magnitude of Nelson Island herring harvests, assuming that the Dutch Harbor food and bait fishery and trawl fisheries take Nelson Island herring in proportion to their biomass.

The potential impacts of the Dutch Harbor food and bait fishery on the Nelson Island herring stock in Figure 10 were computed using the 1991 forecast projections of harvest and biomass available in March, 1991. These impacts were revised to reflect data available in the fall of 1991 (Figure 11). Actual 1991 subsistence harvests, 1991 Dutch Harbor food and bait fishery harvests, and 1991 trawl bycatches were used in revising the potential impacts. Also, in the 1991 stock assessment data, the Nelson Island stock has declined from 3% to 2% of the biomass of herring stocks spawning south of Nelson Island. The remaining assumptions used to compute Figure 10 were not changed.

SUMMARY OF 1991 HERRING STOCK STATUS AND COMMERCIAL FISHERIES

By:

Fritz Funk

This summary presents the biomass projections for each of the principle Bering Sea herring stocks and reviews trends in biomass, catch and trawl bycatch. Biomass projections in this summary in most cases are based on more detailed publications prepared by area managers and research staff for each herring management area.

Preliminary projections of biomass of Bering Sea herring stocks from Port Moller to Norton Sound indicate that biomass should increase slightly in 1992 (Figure 1). In general, herring stocks in the southern Bering Sea are declining, while the Norton Sound abundance estimates have been increasing. Bering Sea herring biomass forecasts have been substantially less than subsequent inseason biomass estimates for each of the three years for which biomass forecasts are available for all areas, perhaps because of conservative assumptions used in preparing the projections. The projected Bering Sea-wide biomass for 1992 is 95, 649 metric tons (105,456 short tons). During the 1980s, Bering Sea herring stocks were dominated by the very strong 1977 and 1978 year classes. Because the biomass trends of Figure 1 do not indicate a peak in biomass during the mid-1980s when the 1977-78 year classes were abundant, the aerial surveys used to estimate biomass in most areas likely underestimated the peak strength of these year classes. Because aerial surveys have been flown more frequently in many areas in recent years, recent biomass estimates are generally regarded as more accurate than those from earlier years. The Togiak stock is by far the largest in the Bering Sea (Figure 2), followed by Norton Sound and Port Moller. The remaining smaller stocks are each less than 5% of the Togiak biomass.

Herring reduction and bait fisheries developed in the Bering Sea as early as the 1930s, but substantial harvests did not begin until the 1960s (Figure 3). Exploratory fishing by Soviet research vessels in 1957 and 1958 resulted in the direction of large amounts of Soviet fishing effort on Bering Sea herring stocks, beginning in 1959. Japanese trawl and gillnet vessels joined the Soviet fleet in the early 1960s. Catches generally rose through the 1960s, although there are gaps in reported catch records and substantial catch under-reporting probably occurred. Catches peaked in 1968 and declined sharply in the 1970s. These declines are generally regarded to be due to overfishing. Foreign catches continued at lower levels through the 1970s until herring were given prohibited species status under the federal Bering Sea/Aleutians Groundfish Fishery Management Plan. Bering Sea-wide catches have been relatively stable since the mid-1980s at a much lower level than during the foreign herring trawl fishery.

During the offshore migration to over-wintering areas near the continental shelf, Bering Sea herring are vulnerable to incidental catch in groundfish trawls. Although retention of herring is prohibited, trawl bycatch has often amounted to thousands of tons of herring annually. There was no limit on the amount of herring that could be taken as bycatch until 1991. Foreign and joint venture (JV) fisheries took 2,500 to 4,500 tonnes of herring annually as bycatch during 1983-86 (Figure 4). These bycatches amounted to exploitation rates of 1.5% to 3% on Bering

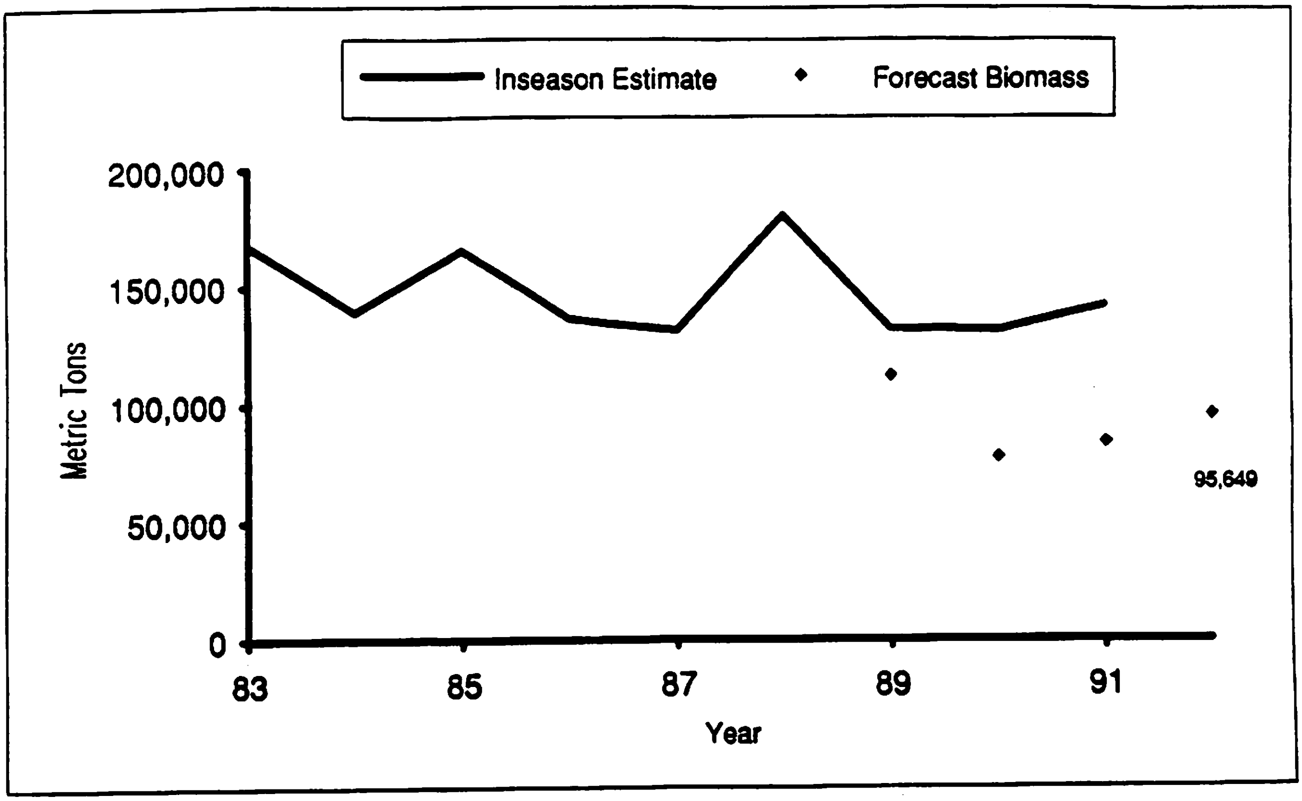

Figure 1. Estimated and forecast biomass for Eastern Bering Sea herring stocks, 1983-1991, with 1992 forecast biomass.

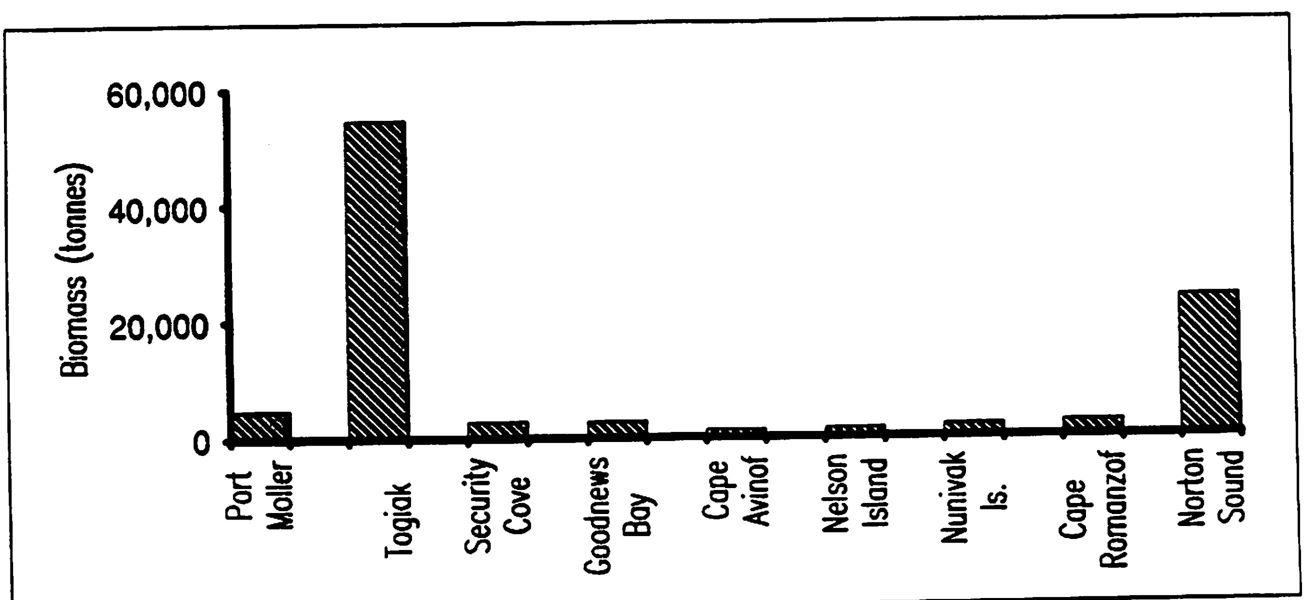

Figure 2. Projected 1992 biomass for principle Bering Sea herring stocks.

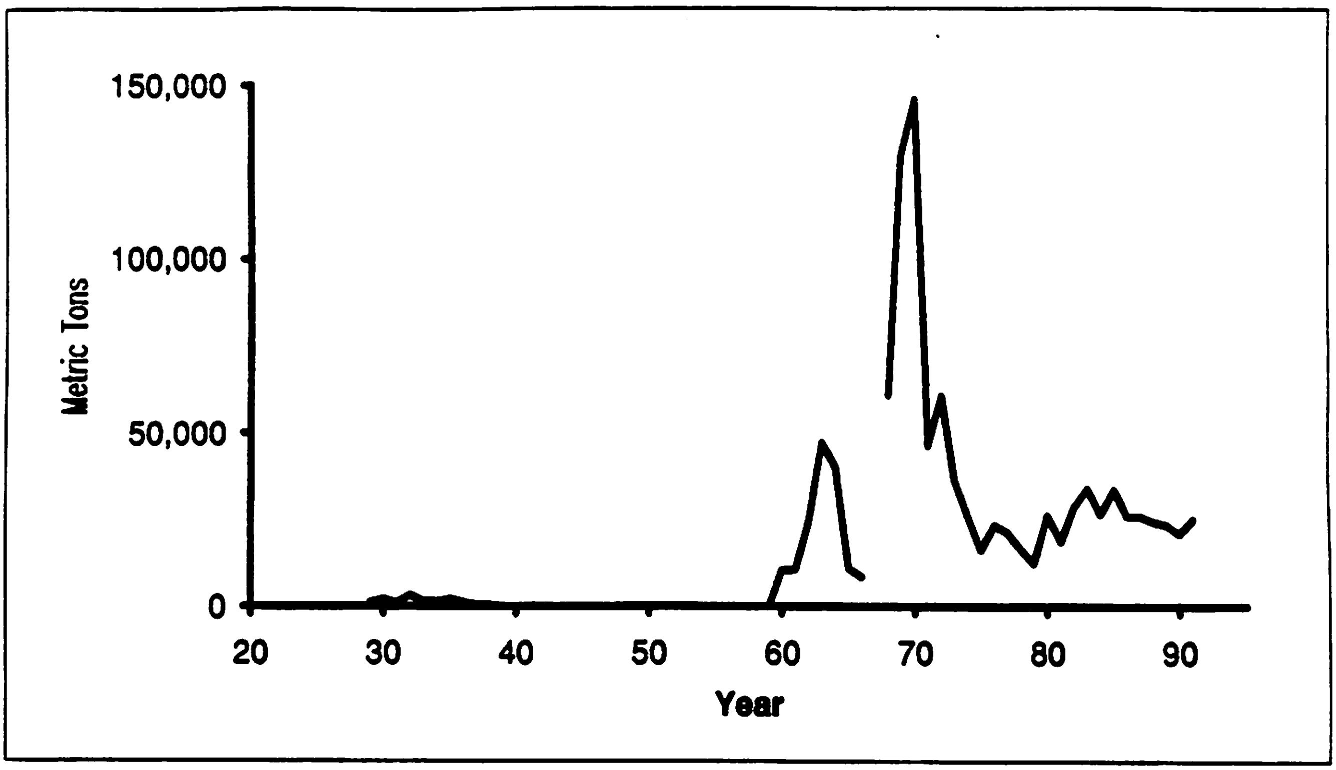

Figure 3. Total harvest of herring in the Bering Sea, 1920-1991.

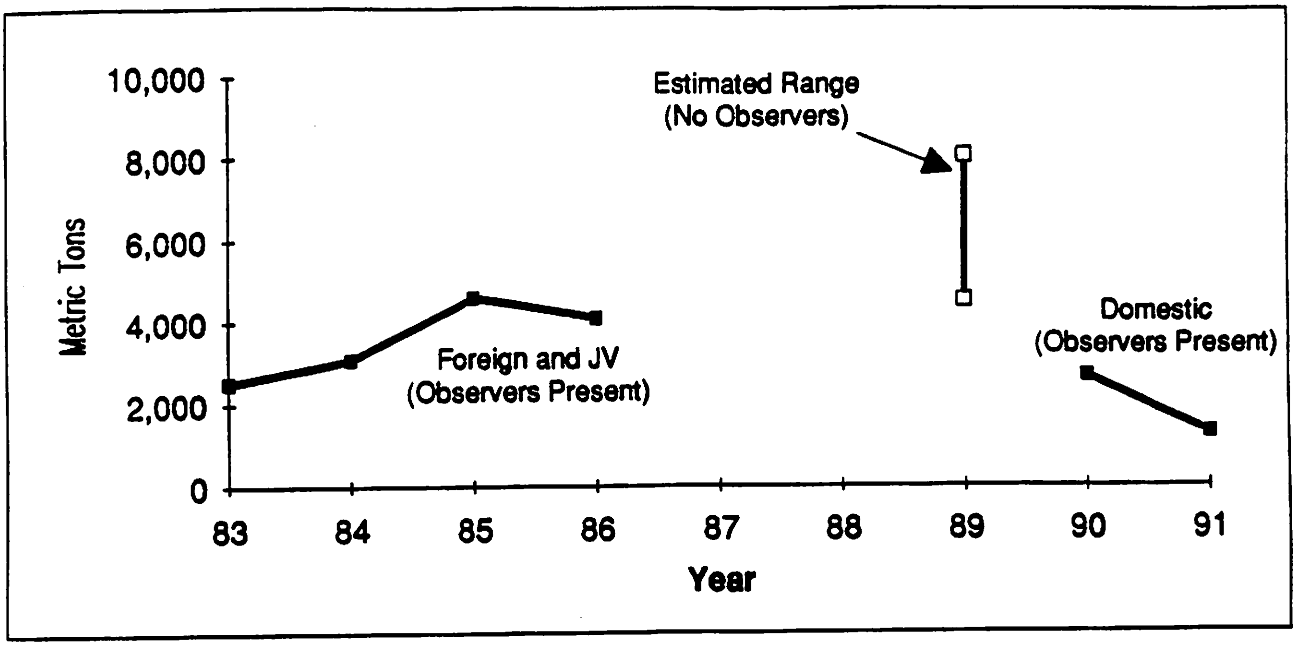

Figure 4. Bering Sea groundfish trawl bycatch of herring, 1983-1991.

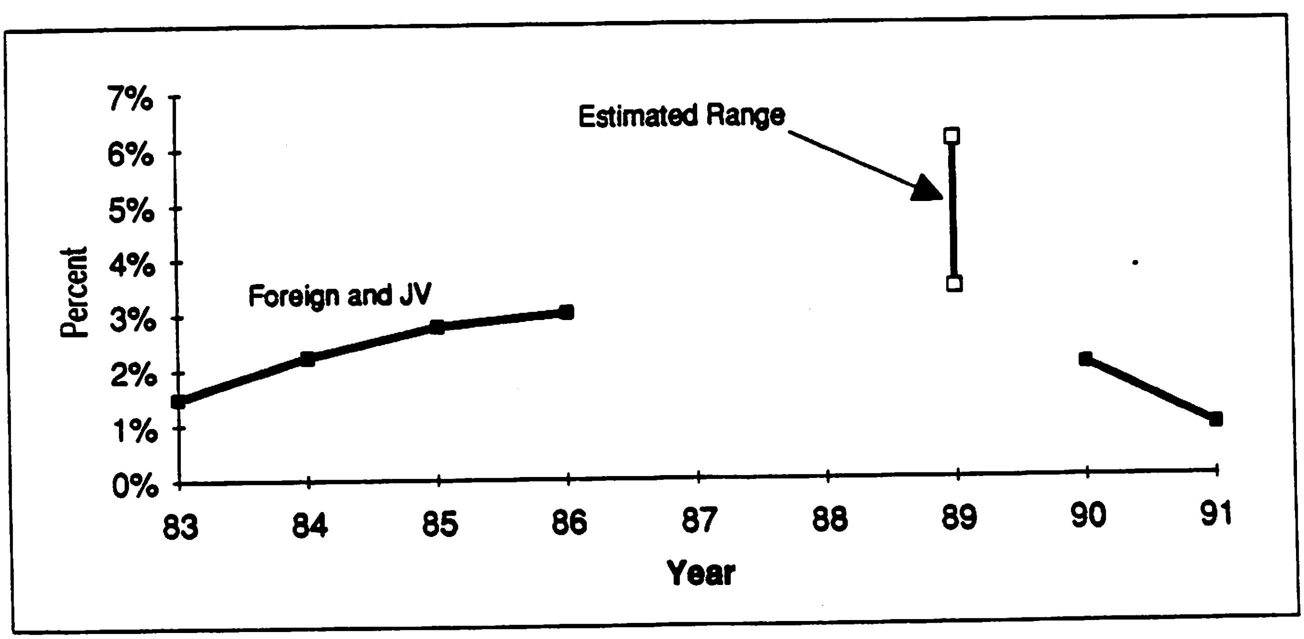

Figure 5. Bycatch exploitation rate of herring by Bering Sea groundfish trawl fisheries, 1983-1991.

Sea herring stocks (Figure 5). After 1986, domestic fisheries began to take an increasing share of the Bering Sea groundfish harvest. However, because observers were not required aboard domestic vessels until 1990, little is known about herring bycatch during this period. Based on limited observer coverage and the time periods and areas fished by domestic groundfish trawlers, trawl bycatch was estimated at a minimum of 4,500 to 8,500 tonnes in 1989. In 1990, the early closure of the pollock fishery helped to reduce herring bycatch by keeping groundfish trawl effort out of the herring wintering grounds late in the fall. The 1990 herring bycatch was estimated to be 2,661 tonnes, corresponding to a bycatch exploitation rate of 2.0%. In 1991, pollock fisheries closed early in September, eliminating the high herring bycatch has been occurring on the herring wintering grounds in late fall. In addition, in 1991 shore-based groundfish trawlers voluntarily agreed to avoid a high herring bycatch area near Unimak pass after encountering very high herring bycatch rates there during the third week of June. The result was that herring bycatch was 1,298 tonnes, corresponding to a bycatch exploitation rate of 0.9%. An estimated 715 tonnes of the 1991 herring bycatch was taken in the midwater trawl fishery, with an additional 593 tonnes taken in the flatfish fishery (Table 1).

In the fall of 1990, the North Pacific Fishery Management Council (NPFMC) voted to adopt measures to limit the bycatch of herring in groundfish trawl fisheries. The Council's actions were approved by the Secretary of Commerce and implemented as amendment 16A to the Bering Sea/Aleutians Groundfish Fishery Management Plan in June 1991. The herring bycatch control measures established three "herring savings areas" (Figure 6), and bycatch caps for each of several groundfish fishery categories. The overall prohibited species catch (PSC) limit was set at 1% of the Bering Sea herring biomass. Each groundfish fishery is allocated a portion of the PSC limit, based on its anticipated needs. When a fishery reaches its PSC limit, vessels participating in that fishery can no longer fish in the herring savings areas during the periods when herring would likely be present. In 1991 the pollock fishery achieved the pollock quota almost at the same time that the herring PSC limit for the pollock fishery was reached. Because of delays in PSC reporting, the bycatch of herring in the pollock fishery ultimately was estimated at 122% of the PSC limit. The only other groundfish fishery to take herring during 1991 was the flatfish trawl fishery, chiefly targeting on yellowfin sole. During the development of the Council's herring bycatch control measures, this fishery was ranked as a "potential" herring bycatch problem, because herring bycatch had been typically 150-400 tonnes annually. The Council designed the herring bycatch control measures to limit the bycatch of fisheries which were taking thousands of tons of herring. Herring savings areas which would specifically constrain the lower-priority flatfish fishery were not considered. In 1991, the flatfish fishery ultimately took 593 tonnes of herring, slightly more than in recent years. Although the flatfish fishery was theoretically excluded from fishing in the herring savings areas, little flatfish fishing effort would have occurred there. The NPFMC is reviewing the performance of the herring savings areas and additional bycatch control measures may be considered in the future.

Table 1. Trawl herring bycatch in 1991 Bering Sea/Aleutian Islands groundfish trawl fisheries.[1]

	TARGET FISHERY							
	FLATFISH		POLLOCK		TURBOT		'OTHER'	
	HERRING METRIC TONS		HERRING METRIC TONS		HERRING METRIC TONS		HERRING METRIC TONS	
WEEK	WK	CUM	WK	CUM	WK	CUM	WK	CUM
01/06	0	0	1	1	0	0	0	0
01/13	0	0	1	2	0	0	0	0
01/20	0	0	1	3	0	0	0	0
01/27	0	0	1	4	0	0	0	0
02/03	0	0	1	6	0	0	0	0
02/10	0	0	0	6	0	0	0	0
02/17	0	0	1	7	0	0	0	0
02/24	0	0	2	9	0	0	0	0
03/03	0	0	0	9	0	0	0	0
03/10	0	0	0	9	0	0	0	0
03/17	0	0	0	9	0	0	0	0
03/24	0	0	0	9	0	0	0	0
03/31	0	0	0	10	0	0	0	0
04/07	0	0	0	10	0	0	0	0
04/14	0	0	0	10	0	0	0	0
04/21	0	0	0	10	0	0	0	0
04/28	0	0	0	10	0	0	0	0
05/05	13	13	0	10	0	0	0	0
05/12	4	17	0	10	0	0	0	0
05/19	74	91	0	10	0	0	0	0
05/26	28	119	0	10	0	0	0	0
06/02	22	142	0	10	0	0	0	0
06/09	96	237	8	18	0	0	0	0
06/16	92	329	101	119	0	0	0	0
06/23	89	419	3	122	0	0	0	0
06/30	28	447	1	123	0	0	0	0
07/07	11	458	13	136	0	0	0	0
07/14	2	460	17	153	0	0	0	0
07/21	4	464	10	163	0	0	0	0
07/28	4	468	10	173	0	0	0	0
08/04	3	471	16	190	0	0	0	0
08/11	3	475	104	294	0	0	0	0
08/18	19	493	87	381	0	0	0	0
08/25	19	512	97	478	0	0	0	0
09/01	11	523	208	685	0	0	0	0
09/08	9	532	30	715	0	0	0	0
09/15	11	543	0	715	0	0	0	0
09/22	43	586	0	715	0	0	0	0
09/29	6	592	0	715	0	0	0	0
10/06	1	593	0	715	0	0	0	0
ALLOWANCES:								
Annual		83		584		8		158
% taken		714.69%		122.45%		0.89%		0.02%

[1] Source: National Marine Fisheries Service bulletin board system, October 11, 1991. Data are based on observer reports, extrapolated to total groundfish harvest.

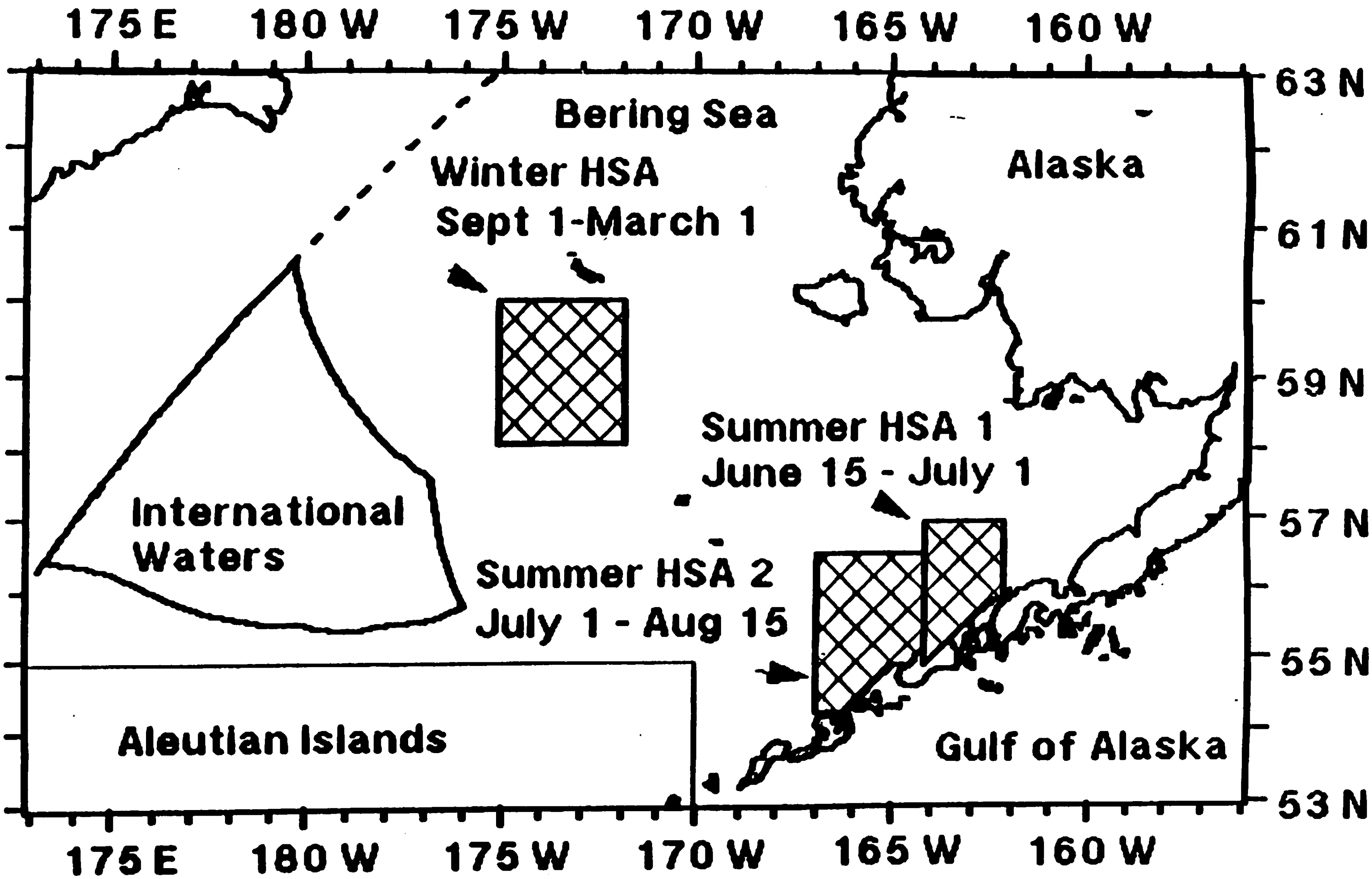

Figure 6. Herring Savings Areas (HSAs) in the Bering Sea and Aleutian Islands implemented under amendment 16A to the Bering Sea/Aleutians Groundfish Fishery Management Plan.

Table 2. Estimated biomass and commercial harvest of Pacific herring in northeastern Bering Sea fishing districts, Alaska, 1985-1991.

Year	District	Estimated Biomass (st)	Harvest (st) Catch	Waste	Total	% Harvest by Gear Gill Net	Purse Seine	Beach Seine	Roe %	Estimated Value ($ x1,000)	Exploitation Rate (%)
1991	Security Cove	4,434	570	0	570	100	0	0	9.3	208	12.9
	Goodnews Bay	4,387	263	0	263	100	0	0	8.9	93	6.0
	Cape Avinof	2,083	267	0	267	100	0	0	9.5	94	12.8
	Nelson Is.	2,385	-	-	-	100	0	0	-	-	-
	Nunivak Is.	3,903	59	0	59	100	0	0	7.4	9	1.5
	Cape Romanzof	4,500	526	0	526	100	0	0	8.8	210	11.7
	Norton Sound	42,854	5,672	125	5,797	91	0	7	9.3	2,414	13.5
	Total	64,546	7,357	125	7,482	93	0	7	9.2	3,028	11.4
1990	Security Cove	2,650	234	0	234	100	0	0	8.7	94	8.8
	Goodnews Bay	2,577	455	0	455	100	0	0	12.2	314	17.7
	Cape Avinof	2,020[a]	50	0	50	100	0	0	12.0	35	2.5
	Nelson Is.	2,705	-	-	-	100	0	0	-	-	-
	Nunivak Is.	422	-	-	-	100	0	0	-	-	-
	Cape Romanzof	4,500	329	0	329	100	0	0	8.4	155	7.3
	Norton Sound	39,384	6,379	60	6,439	95	0	5	8.8	3,606	16.0
	Total	54,258	7,447	60	7,507	95	0	5	9.0	4,204	13.8
1989	Security Cove	2,830	554	0	554	100	0	0	9.4	265	19.6
	Goodnews Bay	4,040	616	0	616	100	0	0	8.4	335	15.2
	Cape Avinof	2,780[a]	129	0	129	100	0	0	8.0	54	18.7
	Nelson Is.	3,320	222	11	233	100	0	0	8.5	57	7.0
	Nunivak Is.	620	116	0	116	100	0	0	9.4	42	18.8
	Cape Romanzof	4,400	926	0	926	100	0	0	9.3	486	21.0
	Norton Sound	25,980	4,741	30	4,771	91	0	8	9.2	2,322	18.3
	Total	43,970	7,304	41	7,345	95	0	5	9.0	3,561	16.7
1988	Security Cove	4,910	324	0	324	100	0	0	9.3	362	6.6
	Goodnews Bay	4,480	483	0	483	100	0	0	8.0	463	10.7
	Cape Avinof	4,110	348	0	348	100	0	0	8.6	264	8.5
	Nelson Is.	7,150	775	0	775	100	0	0	9.2	713	10.8
	Nunivak Is.	2,800[a]	-	-	-	-	-	-	-	-	-
	Cape Romanzof	6,600	1,119	0	1,119	100	0	0	9.1	1,018	17.0
	Norton Sound	33,920	4,672	0	4,672	96	0	4	9.0	3,864	13.8
	Port Clarence	790	80	0	80	30	70	0	8.2	43	10.2
	Total	64,760	7,801	0	7,801	97	<1	2	9.0	6,727	12.0
1987	Security Cove	2,300	313	0	313	100	0	0	9.7	242	13.4
	Goodnews Bay	2,000[a]	321	0	321	100	0	0	7.3	133	16.0
	Nelson Is.	8,100	923	0	923	100	0	0	9.2	661	11.4
	Nunivak Is.	4,400[a]	414	0	414	100	0	0	7.8	231	9.2
	Cape Romanzof	7,200	1,342	0	1,342	100	0	0	8.9	1,000	18.6
	Norton Sound	32,400	4,082	0	4,082	92	0	8	8.6	2,613	12.6
	Port Clarence	900	146	<1	146	<1	100	0	6.6	77	15.6
	Total	57,300	7,541	<1	7,541	94	2	4	8.6	4,957	13.1
1986	Security Cove	3,700[a]	751	0	751	100	0	0	11.2	535	20.3
	Goodnews Bay	3,000[a]	557	0	557	100	0	0	10.4	325	18.1
	Nelson Is.	7,300[a]	886	0	886	100	0	0	10.3	428	12.1
	Nunivak Is.	6,000	511	0	511	100	0	0	10.1	213	8.5
	Cape Romanzof	7,500	1,865	0	1,865	100	0	0	9.2	1,142	24.9
	Norton Sound	28,100	5,194	0	5,194	96	0	4	9.6	2,900	18.5
	Total	55,600	9,764	0	9,764	98	0	2	9.7	5,543	17.6
1985	Security Cove	4,900[a]	703	30	733	100	0	0	10.1	355	15.0
	Goodnews Bay	4,300[a]	724	0	724	100	0	0	8.7	309	16.8
	Nelson Is.	9,500[a]	977	0	977	100	0	0	10.6	527	10.3
	Nunivak Is.	5,700[a]	358	0	358	100	0	0	8.9	146	6.3
	Cape Romanzof	7,000	1,299	0	1,299	100	0	0	8.3	550	18.6
	Norton Sound	20,000	3,548	0	3,548	95	0	5	9.9	1,438	17.7
	Total	51,400	7,609	30	7,639	98	0	2	9.6	3,325	14.8

[a] Inseason biomass estimate from poor aerial survey, therefore projected biomass used.

1991 bycatch rate standards and average bycatch rates in 1990 and 1991, by quarter, of halibut and red king crab in the fisheries included in the 1991 incentive program.

Halibut Bycatch as a Percentage of Allocated Groundfish Catch

Fishery and quarter	1991 Bycatch[1/] Rate Standard	Average Bycatch Rates 1990	1991
BSAI Pacific Cod			
QT 1	1.35	1.35	2.26
QT 2	1.85	1.85	1.43
QT 3	2.25	-	9.08
QT 4	2.25	-	-
BSAI Flatfish			
QT 1	1.31	1.31	1.56
QT 2	0.30	-	0.58
QT 3	0.50	0.17	0.96
QT 4	0.30	0.19	-
GOA Rockfish			
QT 1	4.00	2.91	8.13
QT 2	4.00	3.31	7.44
QT 3	4.00	1.96	1.06
QT 4	4.00	0.54	-
GOA Pacific Cod (Central GOA rates)			
QT 1	3.31	7.55	1.69
QT 2	4.13	11.11	2.56
QT 3	3.29	3.29	0.00
QT 4	5.15	5.15	-

Zone 1 Red King Crab Bycatch Rates
(number of crab/mt of allocated groundfish)

Fishery and quarter	1991 Bycatch Rate Standard	1990	1991
BSAI Flatfish			
QT 1	2.88	2.74	1.09
QT 2	1.50	-	1.45
QT 3	1.50	0.46	0.00
QT 4	1.50	0.01	-

1/ In September 1991, the Council adopted these standards as the preliminary standards for 1992.

AGENDA D-2(c)
DECEMBER 1991
Supplemental

ZENKAMA

ALL JAPAN KAMABOKO MAKERS ASSOCIATION

3-37, KANDA-SAKUMA-CHO TEL. TOKYO(03)3851-1371
CHIYODAKU, TOKYO, JAPAN FAX. TOKYO(03)3861-0555

November 11, 1991

Mr. Clarence Pautzke
Executive Director
North pacific Fishery Management Council
P.O. Box 103136
Anchorage, Alaska 99510

Re: Comments on Preliminary Specifications for Pollack in the Bering Sea and Gulf of Alaska for 1992

Dear Mr. Pautzke:

The All-Japan Kamaboko Makers Association (Zenkama) has a membership of approximately 1800 companies throughout Japan. Many of our member companies utilize surimi produced from pollack harvested in the Gulf of Alaska and Bering Sea. Therefore, we are very much concerned over the management of pollack resources in these areas. We had expresed our concerns in a previous letter to the Councill dated August 18, 1987. The purpose of this letter is to reiterate some of those concerns and comment upon the preliminary pollack specifications for 1992.

(1) Area 518. We have long been concerned over the concentration of fishing effort during spawning. Therefore, we request the Council to adequately regulate the effort on spawning stocks in the Bogoslof area to protect and conserve the pollack resources.

(2) Eastern Bering sea shelf. The preliminary ABC is specified at 1,421,000 mt. The preliminary TAC is specified at 1,100,000 mt which is 200,000 mt less that the TAC for 1991. However, we understand the Council will consider a range of 900,000 to 1,300,000 mt for the final TAC.

We would like to request the Council to set the TAC for the eastern Bering Sea at 1,300,000 mt. This is the same level as 1991 and does not exceed the ABC.

The reason for our request is to maximize the amount of surimi production available for the Japanese market. This year U.S. surimi production was severely decreased thereby resulting in serious problems for our industry. We think the market should be a consideration in setting the TAC.

(3) The "olympic" system. we believe the U.S. "olympic" management system is a major problem contributing to the

ZENKAMA

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decreased supply of surimi this year. The system does not contribute to effective utilization or protection of the resource. For example, we do not believe the recovery rates for surimi are as high as they could be, The Japanese market can utilize all grades of surimi. But we feel the resource is not being efficiently utilized to produse all grades, We strongly believe the efficiency in utilization would be increased if the "orympic" system was replaced with a better management program.

The dramatic reduction in the supply of surimi and the resulting skyrocketing price have caused serious problems for management within our Japanese kamaboko industry. The number of bankruptcies and companies going out of business has increased. Once the market for kamaboko in Japan shrinks, it will have a negative effect upon both the Japanese and U.S. industries for the future. For this reason, we recommend that the TAC and DAP for pollack not be decreased from 1991 as long as the TAC is within the range of the ABC.

Sincerely,

東野義次

Yoshitsugu HIGASHINO
Chairman
All-Japan Kamaboko
Makers Association

August 18, 1987

Mr. James Campbell
Chariman
North Pacific Fisheries Management Council
Spenard Builders Supply Inc,
840 K Street, Suite 200
Anchorage, AK 99501
U.S.A.

Dear Mr. Campbell

We, the All Japan Kamaboko Makers Association Federation (Zenkama) would like to express our views regarding the management and harvesting of the Alaskan pollack resource since we are concerned about the pollack resource in the Bering Sea and the Gulf of Alaska. Zenkama is Japan's federation of associations of member companies engaged in the manufacture of traditional Kamaboko (fish cake) products and shellfish analog products using surimi produced from pollack and other species of fish.

One of the objective of our federation is to seek to assure our members a consistent supply of high quality raw material at reasonable prices.
Our aims are long term, and, hence, we look toward the efficient, scientific management of fishery resources as the gardian of our members' future well being.

Our members rely heavily upon surimi produced from Alaskan pollack harvested in the Bering Sea and in the Gulf of Alaska which we called "Ocean surimi". Until 1986, Ocean surimi has been produced by the direct fishery operation of the Japanese fleet and by the over-the-side-purchase operation of the Japanese factory trawlers.

However, this year no direct allocation of pollack were released to foreign countries. In regard to over-the-side joint venture operations, the total agreed quantity of material fish covered in U.S.-Japan and U.S.-Korea industry-to-industry purchase agreements exceeded the total allowable catch of pollack in the Bering Sea and the Gulf of Alaska. Nevertheless, there was no action taken by the Regional Fisheries Management Council, nor the U.S. Department of Commerce and State, to adjust the quantity of over-the-side-purchases in those industry agreements.

Therefore, under the free competition of the olympic system for 1987, those catching parties which caught fish faster, were granted that catch.
As a result, and as you are fully aware, since January when this over-the-side-purchases-operation began, an intensive catch effort has taken place in the pollack resource in the Bering Sea and in the Gulf of Alaska and what we and other believe was that an excessive catch of pollack took place in the spawning season, January to March.

Concentration of the operations during spawning does not only cause an undesirable effect on pollack resources, it has the ironic result of also producing low quality surimi due to the poor quality of fish flesh immediately prior to, during and immediately after spawning. Accordingly, an relatively large quantity of low quality surimi was produced this year.

Therefore, Zenkama and its members are concerned that this situation may be repeated next year and onward in the future unless remedial steps for pollack resource are taken. We wish to convey our concerns to the relevant members of the United State fishing industry and to the appropriate U.S. Government agencies concerned.

We understand that some of the problems which we have raised here have been the subject of consideration by U.S. authorities and that through discussions among representatives of the U.S. industry and the U.S. Government, a decision has been made whereby allocation for over-the-side-purchase operations for 1988 would be divided into two segments: Forty percent for the first half of 1988, and sixty percent for the second half. While this plan goes a long way in alleviating our concerns, we nonetheless see a problem in the specific timing of the establishment of the two portions of the year. Specifically, we believe that the cut-off date between the first and second half now set as April 15 remains a problem.

While initiating of second half fishing in April may exclude the pre-spawning season, we believe that since the quality of fish flesh after spawning will not recover until the middle of June, fish caught in the early part of the second half of 1988 will still produce low quality surimi and a low yield.

Therefore, if there is a concentration of the catch in the early part of the second half of 1988 we have essentially the same disappointing results as we had in 1987.

We would like to emphasize that in order to utilize the resources in the most efficient and effective manner from the point of view of resource management, and in regard to the quality and yield of the surumi produced, it is most desirable that surimi operations are carried out from the middle of June, when the fish begin to feed, until the Winter season.

The following, then, summarizes the views of Zenkama on this matter:

1. We would urge that the relevant U.S. authorities and the Council take appropriate measures to avoid excessive concentration of catching in the pre-spawning, spawning, and immediate post-spawning seasons. Accordingly, the concentration of fishing should not begin until mid-June.

2. From the point of view of surimi quality, Zenkama would like to see the cutoff date of fishing in the first half of the year as of mid-June.

3. Zenkama would like the appropriate U.S. authorities to reconsider the olympic system itself which, in 1987 has been a cause in the reduction of the quality of surimi and which may very well adversely affect future resource management of the specie.

Thank you for your consideration of this matter. Zenkama stands ready to assist our friends and colleagues and in the United States, whose resource is to a significant degree, the vow material of our livelihood.

Truly yours,

谷川 豊

YUTAKA TANIGAWA
Chairman
All Japan Kamaboko Makers Association (Zenkama)

cc:Mr. Jim Branson, North Pacific Fisheries Management Council
Ambassador Edward Wolfe, Department of State
Dr. William E. Evans, NMFS
Mr. Carmen Blondin, NMFS
Mr. Robert Ford, Department of State

GREENPEACE
U.S.A.

P.O. Box 104432, Anchorage, Alaska 99510, Tel. (907) 277-8234, FAX (907) 272-6519

December 5, 1991

Richard Lauber, Chairman
North Pacific Fishery Management Council
P.O. Box 103136
Anchorage, AK
99510

RE: Groundfish specifications for walleye pollock for the 1992 fishing seasons in the Bering Sea, Aleutian Islands and Bogoslof areas.

INTRODUCTION

On behalf of Greenpeace U.S.A., an international environmental organization with 2 million supporters in the United States, I am submitting the following comments to the above referenced item that is being considered by the North Pacific Fishery Management Council (NPFMC) at its December, 1991 meeting.

Our organization is highly concerned over the current unregulated trawling in the Donut Hole and the impact that these fish removals have on the U.S. Exclusive Economic Zone (EEZ) pollock stocks. The targeting of Bogoslof pollock during the spawning season and the unregulated trawling in the donut hole may account for the reported low biomass estimates of the Aleutian Basin stock. This "double dipping" must be accounted for in the allocation of pollock in the 1992 fishing season.

RECOMMENDATIONS

Greenpeace respectfully requests the Council to set the Bogoslof Region pollock Acceptable Biological Catch (ABC) and the Total Allowable Catch (TAC) at zero. There are no controls set on the amount of Aleutian Basin pollock that are harvested in the donut hole. Until this unregulated catch is controlled, there should not be a targeted fishery for pollock in the Bogoslof Region. Since the biomass of the Aleutian Basin stock is currently declining and has been heavily harvested in both the donut hole and the Bogoslof region, there is no justification for the Bogoslof Region fishery in 1992.

In the Eastern Bering Sea (EBS), we recommend a conservative ABC that reflects the declining biomass of this stock. The catch rates of EBS pollock have increased in recent years, irrespective of the biomass decline of the Eastern Bering Sea shelf stock. There is no justification for increasing the exploitation rate when the biomass of this stock is decreasing.

The Aleutian Islands area fishery also merits a conservative ABC. Little is known about the Aleutian Island pollock stock to warrant an increased ABC. Most importantly, recent trawl survey estimates indicate a decline in the biomass of this stock.

DISCUSSION

Recent scientific information on the Bering Sea pollock stocks indicate that this species is composed of 3 separate stocks, one in the Eastern Bering Sea, one in the Western Bering Sea, and one in the Aleutian Basin. The Aleutian Basin stock has been subject to exploitation in the Bogoslof Area fishery during spawning seasons and in the donut hole, where this stock migrates. It is now documented that the Aleutian Basin pollock stock has declined significantly and is continuing to decline. Catches from the donut hole fisheries have contributed to this decline. There is also information on the EBS shelf stock that indicates some adult fish migrate out to the Aleutian Basin where they would be subject to exploitation. The impact of the donut hole fishery on the EBS shelf stock is still unknown.

In order to effectively manage the Bering Sea pollock stocks, serious considerations of the intermixing of these stocks need to be made. Pollock stocks within the U.S. EEZ are subject to exploitation outside of this regulatory area. There is an urgent need to consider the unregulated impact of the donut hole fishery on the Bogoslof, Eastern Bering Sea and Aleutian Islands fisheries. These catches within the EEZ must weigh on the conservative side if the future sustainability of the fisheries resource is to be ensured.

SIGNS OF OVERHARVESTING BERING SEA POLLOCK

Reported catches of pollock over the entire Bering Sea have increased dramatically over the last 6 years. The catch doubled from 2 million metric tons (mt) in 1984 to 4 million mt in 1988. The explosion of unregulated catches in the donut hole from only 181,000 mt in 1984 to over 1.3 million mt annually in 1987-1989, reduced to under 900,000 mt in 1990. Catches in this region have declined but still continue.

Despite declining catches, the exploitation rate of pollock in the Bering Sea has remained high. Bering Sea-wide, the exploitation rates exceed 35%, which is higher than the recommended rate. Also, current harvest levels do not take in account the discard levels of pollock in the targeted pollock fisheries nor the discards of bycatch pollock in other targeted fisheries.

Catch per unit effort (CPUE), a relative measure of population abundance, has been declining in the donut hole. All nations fishing in the donut hole recorded significant declines in CPUE during the past 3 years.

Biomass of spawning pollock in the Bogoslof area of the Eastern Bering Sea is also declining. Aleutian Basin pollock aggregate for winter/spring spawning in the Bogoslof area. Combined hydroacoustic and trawl surveys indicated pollock spawning biomasses down from 2.1 million mt in 1989 to .6 million mt in 1991.

The average age of the Aleutian Basin population is increasing. There has not been a strong year class since 1978 and no above average year class since pollock fishing dramatically expanded in the donut hole in 1984 and 1985.

In conclusion, the combinations of declining catches, declining indices of CPUE, an apparently declining biomass, together with the lack of good recruitment over many years, are warning signs that pollock in the Aleutian Basin are now being overharvested.

ECOSYSTEM CONSIDERATIONS

There are ecosystem considerations regarding the allocation of pollock fishery quotas in the Bering Sea that have not yet been addressed. For example, the Aleutian Islands fishery is conducted in a region where Steller sea lions have recently experienced a steep decline. The Aleutian Islands pollock catches occur west of 170 degrees West longitude, in the central and western Aleutian Islands. Adult and juvenile Steller sea lions in both regions combined declined by 15% from 1990 to 1991 and by 82% since the mid-1970s. Meanwhile, the pollock catch of 1991 was at its second highest level since 1977 (in 1991, the total as of Nov. 17 was 79,000mt).

CONCLUSION

The poor status of pollock stocks warrants conservative settings of the ABC in all regions of the Bering Sea. The lack of accountability for the pollock removals in the donut hole require that the harvested catches in the U.S. EEZ be reduced.

Recent data on the pollock fishery in the Bering Sea indicate that the status of stocks has further deteriorated and there is even greater need for remedial action to prevent the collapse of the pollock stocks. The poor condition of pollock stocks warrants adoption of precautionary conservative quota levels so that the threats posed to the viability of the Bering Sea marine ecosystem and future fisheries can be brought under control.

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Sincerely,

Penny Pagels
Northwest Fisheries Campaigner