MEMORANDUM

TO: Council, SSC and AP Members

FROM: Clarence G. Pautzke
Executive Director

DATE: December 1, 1999

SUBJECT: Final BSAI Groundfish Specifications for 2000

ESTIMATED TIME
8 HOURS
(for all D-1 items)

ACTION REQUIRED

(a) Review 2000 BSAI EA and Final Stock Assessment and Fishery Evaluation (SAFE) report.

(b) Approve final BSAI groundfish specifications for 2000:
   1. Acceptable Biological Catch (ABC), and annual Total Allowable Catch (TAC);
   2. Seasonal apportionment of the fixed gear Pacific cod TAC; and
   3. Bycatch allowances, and seasonal apportionments of Pacific halibut, red king crab, Tanner crab, opilio crab, and herring to target fishery (PSC) categories.

BACKGROUND

At this meeting, the Council makes final recommendations on groundfish and bycatch specifications as listed above. These final specifications will be used for management of the 2000 groundfish fisheries.

(a) BSAI SAFE Document

The groundfish Plan Teams met in Seattle during the week of November 15-19, to prepare the final SAFE documents provided at this meeting. This SAFE forms the basis for groundfish specifications for the 2000 fishing year. Note that there are three sections to the SAFE report: a stock assessment section, a fishery evaluation section ("economic SAFE"), and an ecosystems considerations section. These three sections, together with the GOA SAFE, are incorporated into the Environmental Assessment for the 2000 groundfish total allowable catch specifications.

(b) ABCs, TACs, and Apportionments

At this meeting, the Council will establish final catch specifications for the 2000 fisheries. During the week of this Council meeting the SSC and AP recommendations will be provided to the Council. Attached as Item D-1(b)(1) are Tables 4 - 6 from the SAFE summary chapter indicating ABCs and biomass levels. The Plan Team's sum of recommended ABCs for 2000 is 2,265,553 mt. Overall, the status of the stocks continues to appear relatively favorable, although in some cases biomass has declined due to below average recruitment.

Other final specifications include making the seasonal apportionment of the fixed gear Pacific cod TAC, and establishing bycatch allowances and seasonal apportionments of Pacific halibut, red king crab, Tanner crab, opilio crab, and herring to target fishery (PSC) categories.

Adopt Seasonal Apportionments of the Pacific Cod TAC Allocated to Fixed Gear

Amendment 24 regulations allow seasonal apportionment of the Pacific cod TAC allocated to vessels using hook-and-line or pot gear. Seasonal apportionments will be divided among trimesters and established through the annual specifications process. In recommending seasonal apportionments, regulations require the Council to base its decision on factors listed in the adjacent box.

Seasonal apportionments can be based on the following information:

1. Seasonal distribution of Pacific cod relative to PSC distribution;
2. Expected variations in PSC bycatch rates in the Pacific cod fishery throughout the fishing year; and
3. Economic effects of any seasonal apportionment of Pacific cod on the hook-and-line and pot gear fisheries.

Under Amendment 46, two percent of the TAC is reserved for jig gear, 51 percent for fixed gear, and 47 percent for trawl gear. The trawl apportionment will be split between catcher vessels and catcher processors 50/50. Any unused TAC from the jig gear quota will become available to fixed gear on September 15.

For the 1999 fisheries, the Council recommended that 60,000 mt of the fixed gear's allocation be released during the first trimester (January 1 - April 30), 8,500 mt be released for the second trimester (May 1 - September 14), and 15,000 mt for the third trimester.

Adopt bycatch allowances of Pacific halibut, crab, and herring

Halibut

For the Trawl Fisheries: Amendment 21 established a 3,775 mt limit on halibut mortality for trawl gear. This limit can be apportioned to the trawl fishery categories as shown in the adjacent box. Note that the recently adopted ban on bottom trawl gear for BSAI pollock fisheries will reduce PSC limits by 100 mt of halibut mortality. Also note that under Amendment 46, the trawl halibut PSC mortality cap for Pacific cod will be no greater than 1,600 mt.

Categories used for prohibited species catch (PSC) apportionment in trawl fisheries.

1. Greenland turbot, arrowtooth flounder and sablefish;
2. rock sole and "other flatfish;"
3. yellowfin sole;
4. rockfish;
5. Pacific cod; and,
6. pollock, Atka mackerel and "other species."

For Fixed Gear Fisheries: A 900 mt non-trawl gear halibut mortality can be apportioned to the fishery categories listed in the adjacent box. Note that under Amendment 46, the hook-and-line halibut PSC mortality cap for Pacific cod will be no greater than 900 mt. Item D-1(b)(2) is a table indicating this past year's PSC allocations and seasonal apportionments for the trawl and non-trawl fisheries. Item D-1(b)(3) is a current summary of PSC bycatch accounting for BSAI fisheries.

Categories used for PSC apportionment in non-trawl fisheries.

1. Pacific cod;
2. Other non-trawl (longline sablefish and rockfish, and jig gear)
3. Groundfish pot (exempt in recent years)

Crab

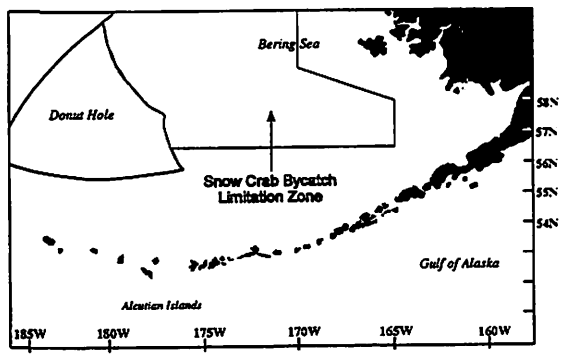
Prescribed bottom trawl fisheries in specific areas are closed when prohibited species catch (PSC) limits of C. bairdi Tanner crab, C. opilio crab, and red king crab are taken. Amendment 37 established a stairstep procedure for determining PSC limits for red king crab taken in Zone 1 trawl fisheries. PSC limits are based on abundance of Bristol Bay red king crab as shown in the adjacent table. Given NMFS and ADF&G's 1999 abundance estimate for Bristol Bay red king crab, a Zone 1 PSC limit will be established at 100,000 red king crabs for 2000. This will be further reduced by 3,000 crabs with adoption of Amendment 57, so the total red king crab PSC limit in 2000 will be 97,000 crabs. The regulations also specify that up to 30% of the PSC apportioned to the rock sole fishery can be used in the 56° - 56°10' strip of the Red King Crab Savings Area..

PSC limits for red king crab and C. bairdi Tanner crab.

Species	Zone	Crab Abundance	PSC Limit
Red King Crab	Zone 1	Below threshold or 14.5 million lbs of effective spawning biomass (ESB)	35,000
		Above threshold, but below 55 million lbs of ESB	100,000
		Above 55 million lbs of ESB	200,000
Tanner Crab	Zone 1	0-150 million crabs	0.5% of abundance
		150-270 million crabs	750,000
		270-400 million crabs	850,000
		over 400 million crabs	1,000,000
Tanner Crab	Zone 2	0-175 million crabs	1.2% of abundance
		175-290 million crabs	2,100,000
		290-400 million crabs	2,550,000
		over 400 million crabs	3,000,000

Amendment 41 established stairstep PSC limits for Tanner crab. Given 1999 survey abundance of 349 million Tanner crab, and the 50,000 crab reduction as part of Amendment 57, the 2000 C. bairdi PSC limits will be established at 830,000 Tanner crabs in Zone 1 and 2,520,000 Tanner crabs in Zone 2.

Under Amendment 40, PSC limits for snow crab (C. opilio) are based on total abundance of opilio crab as indicated by the NMFS standard trawl survey. The snow crab PSC cap is set at 0.1133% of the Bering Sea snow crab abundance index, with a minimum PSC of 4.5 million snow crab and a maximum of 13 million snow crab. Amendment 57 included a provision to reduce the PSC limit for snow crab by an additional 150,000 crabs. Snow crab taken within the "C. Opilio Bycatch Limitation Zone"accrue towards the PSC limits established for individual trawl fisheries. The 1999 survey indicated a total population of 1.4 billion crabs. Therefore, the 2000 snow crab PSC limit will be established at 4,350,000 crabs.



Location of the C. opilio bycatch limitation zone.

Herring

Amendment 16a established an overall herring PSC bycatch cap of 1 percent of the EBS biomass of herring. This cap is to be apportioned to the same six PSC fishery categories listed above, plus a seventh group, mid-water pollock. Last year, the Alaska Department of Fish and Game forecasted the 1999 herring biomass at 168,512 mt. The 1999 PSC limit was set at 1 percent of the biomass in metric tons, or 1,685 mt. Item D-1(b)(4) is ADF&G's summary report on the 1999 fisheries and assessments.

Seasonal Apportionment of bycatch limits

The Council may also seasonally apportion the bycatch allowances. Regulations require that seasonal apportionments of bycatch allowances be based on the following types of information listed in the adjacent box. Additional information on PSC limits and apportionments is presented in a BSAI SAFE Appendix.

Staff will present a worksheet with SSC and AP recommendations for ABCs, TACs, PSC and seasonal apportionments when the Council addresses this action item.

Factors to be considered for seasonal apportionment of bycatch allowances.

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.

DRAFT ENVIRONMENTAL ASSESSMENT FOR THE YEAR 2000 GROUNDFISH TOTAL ALLOWABLE CATCH SPECIFICATIONS

IMPLEMENTED UNDER THE AUTHORITY OF THE
FISHERY MANAGEMENT PLANS
FOR THE
GROUNDFISH FISHERY OF THE BERING SEA AND ALEUTIAN ISLANDS AREA
AND
GROUNDFISH OF THE GULF OF ALASKA

December 1999

Lead Agency: National Marine Fisheries Service
Alaska Fisheries Science Center
Seattle, Washington
and the
Alaska Regional Office
National Marine Fisheries Service
Juneau, Alaska

Responsible Official: Steven Pennoyer
Regional Administrator
Alaska Regional Office

For Further Information Contact:
Tamra Faris, Alaska Regional Office
National Marine Fisheries Service
P.O. Box 21668
Juneau, AK 99802
(907) 586-7228

Abstract: The Environmental Assessment documents the analysis of the groundfish target species stock status, higher and lower trophic level species, and the physical and socioeconomic environment. The federal action consists of setting the year 2000 total allowable catch specifications for the Bering Sea and Aleutian Islands management area and the Gulf of Alaska management area. The specified total allowable catch will, if approved, become the upper limit of groundfish harvested in the fisheries during calendar year 2000.

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EXECUTIVE SUMMARY

In 1998 a Final Supplemental Environmental Impact Statement (SEIS) was prepared that supplements the original Environmental Impact Statements (EIS) for the Fishery Management Plans for the Gulf of Alaska (GOA) and Bering Sea and Aleutian Islands (BSAI) (NMFS 1998a). The SEIS analyzes the impacts of fishing over a range of total allowable catch (TAC) specifications and compares them to impacts of status quo fishing. NEPA guidelines for an EIS require consideration of several, or a range of, alternatives, in addition to the proposed action. This action falls within the range of alternatives analyzed in the SEIS, however, new information has arisen since then that must be addressed under NEPA, therefore, this environmental assessment (EA) is being prepared.

This EA updates the information available and pertinent to changing the TAC amounts from those set in 1999 to those proposed for fishing year 2000 for the federally managed Groundfish Fisheries in the BSAI and GOA. Potential impacts of the recommended 2000 TAC specifications compared to the 1999 TAC specifications on target groundfish species categories, higher trophic level species, Endangered Species Act listed species, habitat, other predators and prey which together constitute the ecosystem, and socioeconomic impacts are addressed in this EA.

Species listed under the Endangered Species Act (ESA) are present in the action area and some are negatively affected by the fishing action. NMFS is the expert agency for ESA listed marine mammals. The US Fish and Wildlife Service is the expert agency for ESA listed seabirds. The proposed action, continuation of the federal groundfish fisheries at these proposed harvest levels in the EEZ off Alaska, must be in compliance with the ESA. Consultations for marine mammals were performed on the final 1999 TAC specifications (NMFS 1998b), for ESA listed Pacific salmon (NMFS 1998d), and for the endangered short-tailed albatross (USFWS 1999). NMFS has reinitiated section 7 consultations for Steller sea lion and twelve stocks of ESA listed Pacific salmon, but has not yet concluded that process. Those consultations must be completed and incorporated into the final EA prepared for the 2000 harvest specifications prior to making a finding of no significant impact decision on the NEPA document.

Updated information on the status of groundfish stocks was reviewed by the Plan Teams for the groundfish fisheries of the BSAI and GOA at their September and November 1999 meetings, and is presented in the preliminary Stock Assessment and Fishery Evaluation (SAFE) Reports for the Groundfish Resources of the BSAI and GOA as Projected for 2000 (Appendix A and B).

The sums of the recommended 2000 ABC and OFL specifications from the SAFE reports, and the 1999 TAC specifications follow. The OY levels were established in the Fishery Management Plans for the Groundfish Fishery of the BSAI (NPFMC, 1999) and the GOA (NPFMC, 1999).

Parameters	BSAI (metric tons)	GOA (metric tons)
OY	2,000,000	800,000
ABC	2,247,846	532,590
TAC	2,000,000	306,535
OFL	3,961,911	712,578

NMFS acknowledges that certain mitigation measures must be in place before the start of the 2000 BSAI and GOA groundfish fisheries so that a finding of no significant impact can be reached. These measures include a final rule implementing changes to the pollock fishery in the BSAI and GOA to avoid jeopardizing the continued existence of the western population of endangered Steller sea lions or adversely modifying its critical habitat. A separate EA will analyze the effects of that action on the human environment. If these mitigation measures cannot be implemented before the start of the fishery, NMFS, by emergency rule under the authority of the Magnuson-Stevens Act, will prohibit fishing until such time that mitigation measures can be fully implemented.

1.0 PURPOSE AND NEED FOR ACTION

1.1 Introduction

Under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) of 1996, the United States has exclusive fishery management authority over all living marine resources, except for marine mammals and birds, found within the exclusive economic zone between 3 and 200 nautical miles from the baseline used to measure the territorial sea The management of these marine resources is vested in the Secretary of Commerce (Secretary) and in Regional Fishery Management Councils. In the Alaska region, the Council has the responsibility to prepare fishery management plans (FMPs) for the marine resources it finds require conservation and management. NMFS is charged with carrying out the federal mandates of the Department of Commerce with regard to marine fish. NMFS Alaska Regional Office and Alaska Fisheries Science Center research, draft, and support the management actions requested by the Council.

The Magnuson-Stevens Act established that the FMPs must specify the optimum yield from each fishery, which would provide the greatest benefit to the Nation, and must state how much of that optimum yield can be expected to be harvested in U.S. waters. The FMPs must also specify the level of fishing that would constitute overfishing. Using the framework of the FMPs and current information about the marine ecosystem (stock status, natural mortality rates, and oceanographic conditions), the Council recommends TAC specifications and prohibited species catch (PSC) limits based on biological and economic determinations made by NMFS to the Secretary of Commerce. Intermediate determinations of ABC and OFL amounts for each of the FMP established target species or species groups precedes recommendations of TAC specifications and PSC limits.

Using stock assessments prepared annually by NMFS and the Alaska Department of Fish and Game (ADF&G), Plan Teams calculate biomass, ABC, and OFL for each species or species group, as appropriate, for each of the various geographic areas of the Alaska EEZ that are open to harvest. The Plan Teams' rationale, models, and resulting ABC and OFL calculations are documented in the preliminary SAFE reports. SAFE reports are reviewed by the Council's Advisory Panel and Scientific and Statistical Committee (SSC), the public, and the Council members and are part of the permanent record on the fisheries.

Total allowable catch specifications and prohibited species catch limits are determined by the Council and recommended to the Secretary annually. NMFS and ADF&G collect data for stock assessments annually. The Plan Teams meet in September and November. Preliminary SAFE reports are produced by the end of September and final ones by the end of November. Since 1990, specification of interim harvest levels are made. With few exceptions, the Secretary implements one-fourth of the proposed TAC specifications and one-fourth of each proposed PSC allowance and apportionments thereof toward fisheries occurring in the first quarter of the calendar year. Following completion of analysis of any new stock status, the Council at its December meeting determines what TAC specifications and PSC limits to recommend to the Secretary. The final specifications are generally implemented in February. The final TAC specifications and PSC limits replace the interim specifications upon becoming effective. A separate analysis will be completed to support the interim TAC specifications.

1.2 Regulatory Changes

Regulatory changes in the Groundfish Fisheries in 1999 that have an effect on the TAC-setting process for 2000 are listed below.

NMFS is preparing a proposed rule to implement BSAI FMP Amendment 61. Amendment 61 implements major provisions of the American Fisheries Act (AFA). Proposed regulatory changes include a new formula to allocate the BSAI pollock TAC between the CDQ program and inshore, catcher/processor, and motherships industry sectors. The pollock TAC in the BSAI, after subtraction of the 10 percent CDQ reserve and establishing an incidental catch allowance to account for pollock taken in other directed groundfish fisheries, will be allocated as 50 percent to vessels harvesting pollock for processing by AFA inshore processors, 40 percent to vessels harvesting pollock for processing by AFA catcher processors, and 10 percent to vessels harvesting pollock for processing by AFA motherships. Allocations of squid were removed from the CDQ program in 1999 by emergency rule (64 FR 3877, January 26, 1999 and 64 FR 34743, June 29, 1999). BSAI FMP Amendment 66 would permanently remove squid from the CDQ program.

In 1999 the pollock fisheries in the GOA and BSAI were subject to additional management under emergency rules (64 FR 3437, January 22, 1999 and 64 FR 39087, July 21, 1999) implemented to avoid jeopardizing the continued existence of the western population of endangered Steller sea lions and avoid adverse modification of its critical habitat. NMFS is preparing a rule to make permanent the revised final reasonable and prudent actions necessary to prevent the pollock fishery from jeopardizing the Steller sea lion and adversely modifying its critical habitat. These actions in the year 2000 will change the seasonal apportionments of pollock TAC, the opening dates for the pollock season, and place limits on the amount of pollock that can be harvested from Steller sea lion critical habitat.

NMFS is preparing a rule to implement BSAI FMP Amendment 58 Chinook Salmon Bycatch Control. When implemented this action will adjust the prohibited species catch limits of chinook salmon in the BSAI. This action will modify slightly the boundaries of the Chinook Salmon Savings Area (CHSSA) in the BSAI, set new CHSSA closure dates, and reduce the Chinook Salmon bycatch limit in the CHSSA to 41,000 fish in 2000.

The groundfish harvest quotas are also affected by the annual guideline harvest levels (GHL) of groundfish fisheries managed by the Alaska Department of Game that occur in state waters. In the past the GHL for pollock in Prince William Sound has been deducted from the federal GOA ABC and the GHLs for Pacific cod in the GOA have been deducted from the federal harvest quota in the GOA.

1.3 Purpose

This Environmental Assessment tiers off the SEIS (NMFS 1998a) which analyzed the effects of groundfish fisheries being promulgated in the EEZ and displayed fishery induced impacts on all aspects of the ecosystem. NMFS notes that in a July 8, 1999, order, amended on July 13, 1999, the court in Greenpeace, et al., v. NMFS. et al., Civ No. 98-0492 (W.D. Wash.) held that the SEIS did not adequately address aspects of the GOA and BSAI groundfish fishery management plans other than TAC setting, and therefore was insufficient in scope under NEPA. In response to the Court's order, NMFS is currently preparing a programmatic SEIS for the GOA and BSAI groundfish fishery management plans. Notwithstanding the less expansive scope of the 1998 SEIS, NMFS believes that the discussion of

impacts and alternatives in the SEIS is directly applicable to the proposed action to be analyzed in this EA. Therefore, this EA adopts the discussion and analysis in the SEIS (NMFS 1998a).

The 2000 SAFE reports (Appendix A and B) incorporate biological survey work completed during the summer of 1999, any new methodologies applied to obtaining these data, and ABC and OFL determinations that are based on the most recent stock assessments. At its September and this upcoming December 1999 meetings, the Council, its Advisory Panel, the SSC,, and its Ecosystem Committee reviewed the SAFE reports and made recommendations based on that information about the condition of groundfish stocks in the respective fishing areas. The ABC specifications proposed by the Council for the 2000 fishing year, therefore, are based on the best available scientific information, including projected biomass trends, information on assumed distribution of stock biomass, and revised technical methods used to calculate stock biomass. The proposed 2000 TAC specifications (Tables 1 and 2), if approved, would define upper harvest limits, or fishery removals, during the 2000 fishing year. Absent approval within the first quarter of calendar year 2000, directed fishing in excess of the interim TAC specification is unauthorized.

2.0 PROPOSED ACTION and ALTERNATIVES TO THE PROPOSED ACTION

Five alternatives designed to provide a range of harvest alternatives that are likely to bracket the final TAC for the year 2000 were examined ("$maxF_{ABC}$" refers to the maximum permissible value of F_{ABC} under Amendment 56). Each F is specified on a species or species group basis.

Alternative 1: In all future years, F is set equal to $maxF_{ABC}$.

Alternative 2: In all future years, F is set equal to a constant fraction of $maxF_{ABC}$, where this fraction is equal to the ratio of the F_{ABC} value for 2000 recommended in the assessment to the $maxF_{ABC}$ for 2000. NMFS preferred alternative.

Alternative 3: In all future years, F is set equal to 50% of $maxF_{ABC}$.

Alternative 4: In all future years, F is set equal to the 1994-1998 average F.

Alternative 5: In all future years, F is set to zero.

3.0 ENVIRONMENTAL AND ECONOMIC CONSEQUENCES

An EA is required by NEPA to determine whether a proposed action will result in significant effects on the human environment. If the environmental effects of the action are determined not to be significant based on an analysis of relevant considerations, the EA and resulting finding of no significant impact would be the final environmental documents required by NEPA. If this analysis concludes that the proposal is a major Federal action significantly affecting the human environment, an environmental impact statement must be prepared.

An EA must include a discussion of the need for the proposal, the environmental impacts of the proposed action, and a list of agencies and persons consulted. The purpose and need are discussed in Section 1.

The proposed action is presented in Section 2 and tables 1 and 2. Section 6 contains the list of agencies and persons consulted. This section contains the discussion of the environmental impacts including impacts on threatened and endangered species and marine mammals.

The environmental impacts generally associated with fishery management actions are effects resulting from: 1) harvest of fish stocks that may result in changes in food availability to predators, changes in population structure of target fish stocks, and changes in community structure; 2) changes in the physical and biological structure of the benthic environment as a result of fishing practices (e.g., gear effects and fish processing discards); 3) entanglement/entrapment of non-target organisms in active or inactive fishing gear; and 4) major shifts in the abundance and composition of the marine community as a result of disproportionate fishing pressure on a small set of species (also known as "cascading effects," National Research Council, 1996). The SEIS comprehensively analyzes these effects at a variety of TAC levels. Only information that is new since preparation of the SEIS is presented in this EA.

3.1 Overview of Status

The status of each target species category, biomass estimates, and ABC specification are presented both in summary and in detail in the GOA and BSAI 2000 SAFE reports (Appendices A and B). This EA addresses changes between the 1999 TAC specifications and the recommended 2000 TAC specifications and provides relevant socioeconomic information. This EA tiers off information presented in the SEIS; therefore, only new information regarding the status of stocks, evaluation methods, impacts on ESA listed species are provided.

Four categories of species are likely to be taken in the GOA and BSAI groundfish fisheries: 1) Prohibited species--those species and species groups the catch of which must be returned to the sea with a minimum of injury except when their retention is authorized by other applicable law; 2) target species--those commercially important species for which sufficient data exists to allow each to be managed on its own biological merits; 3) other species--those species and species groups currently of slight economic value and not generally targeted for harvest; and 4) nonspecified species--those species and species groups generally of no current economic value taken by the groundfish fishery in Federal waters only as incidental catch.

Amendments 56/56 to the BSAI and GOA Groundfish FMPs, approved by the Secretary in January 1999, define ABC and OFL for the BSAI and GOA fisheries. These Amendments define overfishing as any amount of fishing in excess of a prescribed maximum allowable rate. This maximum allowable rate is prescribed through a set of six tiers which are defined in sections 4.3 and 2.2 of the BSAI and GOA FMPs respectively. Each target species assessment is analyzed under one of the six tiers. The Council's SSC has final authority for determining whether a given item of information is "reliable" for the purpose of this definition, and may use either objective or subjective criteria in making such determinations. A stock is determined to be "overfished" whenever it has fallen below its minimum stock size threshold (MSST), defined as whichever of the following is greater: one-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock were exploited at the maximum allowable harvest rate.

3.1.1 Status of Groundfish Target Species in the BSAI

Designated target species and species groups in the BSAI are walleye pollock, Pacific cod, yellowfin sole, Greenland turbot, arrowtooth flounder, rock sole, other flatfish, flathead sole, sablefish, Pacific

ocean perch, other rockfish, Atka mackerel, squid, and other species. The most current information on ABCs is found in the 2000 SAFE reports (Appendix A and B). Differences between 1999 and the proposed 2000 specifications for the BSAI area are presented in Table 1 and discussed below. Catch history for 1999 (current through October 30,1999) is also provided in Table 1. For detailed life history, ecology, and fishery management information regarding groundfish stocks in the BSAI see Section 3.3.3 of the SEIS.

Walleye pollock in the Eastern Bering Sea (EBS) is currently managed under Tier 1a. This year's pollock assessment features new data from the 1999 fishery and bottom trawl and echo-integration trawl surveys. The 1999 bottom trawl survey estimated a biomass of 3,570,000 mt, an increase of 61% relative to the 1998 estimate. The 1999 echo-integration trawl survey estimated a biomass of 3,290,000 t, an increase of 27% from the 1997 estimate, the last year an echo-integration trawl survey was conducted in this region. Of the eight models presented, the Plan Team based its recommendations for 2000 on Model 2, which assumes a Ricker stock-recruitment relationship and uses the average commercial fishery selectivity pattern from the most recent three years to make projections of future catch and stock size. This is the same model used by the Plan Team last year to recommend the 1999 ABC, except that the recruitment distribution used for harvest projections was estimated from year classes spawned after 1976 only. Projections of age 3+ biomass beyond 2000 are not available, but spawning biomass is projected to remain constant from 2000 to 2001, then decrease in 2002. The OFL fishing mortality rate under Tier 1a is 0.80, the arithmetic mean value of F_{MSY}. A fishing mortality rate of 0.80 translates into a 2000 OFL of 1,680,000 t. Model projections indicate that the EBS walleye pollock stock is not overfished.

The updated estimates of B_{MSY} and the harmonic and arithmetic means for F_{MSY} from the present assessment are 1,790,000 t, 0.50, and 0.80, respectively. Projected spawning biomass for 2000 is 2,160,000 t, placing EBS walleye pollock in sub-tier "a" of Tier 1. The maximum permissible value of F_{MSY} under Tier 1a is 0.50, the harmonic mean of the probability density function for F_{MSY}. A fishing mortality rate of 0.50 translates into a 2000 catch of 1,200,000 t, which would be the maximum permissible ABC under Tier 1a. However, the senior assessment author recommends setting ABC at a lower value, specifically, the maximum permissible level that would be allowed under Tier 3. The Tier 3 reference points $B_{40\%}$ and $F_{40\%}$ are estimated at values of 2,340,000 mt and 0.48, respectively. Because projected spawning biomass for 2000 is below $B_{40\%}$, the maximum permissible value of F_{ABC} that would be allowed under Tier 3 is the adjusted $F_{40\%}$ rate of 0.46. The 2000 catch associated with a fishing mortality rate of 0.46 is 1,100,000 t, an 8% reduction from the maximum permissible level under Tier 1. The Plan Team concurs with the senior assessment author that a 2000 ABC of 1,100,000 mt is appropriate.

The 1997 bottom trawl survey of the Aleutian Islands region resulted in a biomass estimate of 106,000 t, an increase of 23% relative to the 1994 estimate. The 1997 stock assessment concluded that the model which had been used to recommend ABC for 1997 was no longer reliable due to the confounding effect of immigration from other areas, and the SSC determined that Aleutian pollock qualified for management under Tier 5. The recommended 1998 and 1999 ABC was 23,800 t, computed as the product of the 1997 survey biomass estimate and 75% of the natural mortality rate (0.3). The recommended 1998 and 1999 OFL was 31,700 t, computed as the product of the 1997 survey biomass estimate and the natural mortality rate. Anticipating that the SSC will continue to find that Aleutian pollock qualify for management under Tier 5, the Plan Team recommends retaining the 1997 survey biomass estimate as the best available estimate of biomass in 1999 (by assuming that growth and recruitment balance mortality), and keeping 2000 ABC and OFL at their respective 1999 levels. As a Tier 5 stock, it is not possible to determine whether Aleutian pollock is overfished or whether it is approaching an overfished condition.

However, because of endangered Steller sea lion concerns, pollock is available for bycatch only in the Aleutian Islands to prohibit any directed fishing for pollock during the 1999 fishery. Therefore, only incidental catch amounts of pollock in the Aleutian Islands area can be harvested in 2000.

The 1999 hydroacoustic survey of the Bogoslof region resulted in a biomass estimate of 475,000 t. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, with values of 2,000,000 t, 0.27, and 0.37 respectively, and that Bogoslof pollock therefore qualified for management under Tier 3 (the $B_{40\%}$ estimate of 2,000,000 mt presumably includes both males and females). This year's assessment includes an age-structured model for Bogoslof pollock that calls the $B_{40\%}$ estimate of 2,000,000 mt into question. The new age-structured model gives a females-only $B_{40\%}$ estimate of 96,800 t, which is a full order of magnitude lower than the previous estimate, even after correcting for the combined-sexes nature of the old estimate. The senior assessment author has not been able to reproduce the calculations that led to the original acceptance of the old estimate several years ago. The Plan Team thus recommends that Bogoslof pollock be moved from Tier 3 down to Tier 5, based on the following rationale: 1) Until questions surrounding computation of $B_{40\%}$ for this stock are resolved, it is not clear that a reliable estimate of this quantity exists, which implies that Bogoslof pollock should move down to at least Tier 4. 2) Given that there has been no fishery on this stock for so long and that selectivity patterns estimated for the shelf stock are probably not applicable to the deep-water Bogoslof stock, it is not clear that a reliable estimate of fishery selectivity--and thus $F_{40\%}$--exists, which implies that Bogoslof pollock should move down to at least Tier 5. 3) It appears that a reliable estimate of natural mortality (0.20) does exist, which places Bogoslof pollock in Tier 5. The Plan Team also notes that placement of Bogoslof pollock in Tier 5 would classify it similarly with Aleutian pollock, a stock which generally has about the same quality of assessment information.

Atka mackerel are found from the Kamchatka Peninsula through the Bering Sea and GOA to southeast Alaska. Atka mackerel is a schooling, semi-demersal species most abundant in the Aleutian Islands, and is harvested primarily with trawl gear. In 1994, the Atka mackerel ABC in the Aleutian Islands subarea was divided between the Western, Central, and Eastern Aleutian districts. The present assessment is a straightforward update of last year's assessment, incorporating new catch data only. In 1999, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 154,000 t, 0.35, and 0.42, respectively. Projected spawning biomass for 2000 is 163,000 t, placing Atka mackerel in sub-tier "a" of Tier 3. The maximum F_{ABC} value allowable under Tier 3a is $F_{40\%}$ (0.35). Projected harvesting at a fishing mortality rate of 0.35 gives a 2000 catch of 103,000 t, which is the maximum permissible value of ABC under Tier 3a. The current F_{ABC} rate of 0.23 would give a 2000 catch of 70,800 t, about 31% below the maximum permissible value. The Plan Team recommends setting F_{ABC} at a value of 0.26, slightly higher than the current F_{ABC} rate but still substantially below the maximum permissible rate. They derive their F_{ABC} value as follows: First, compute the lower limit of the 50% confidence interval for each survey biomass estimate since 1986. Second, compute the ratio of this lower limit to the survey biomass point estimate for each survey since 1986. Third, compute the average value of this ratio (0.74). Finally, multiply this average by $F_{40\%}$ ($0.74 \times 0.35 = 0.26$). A fishing mortality rate of 0.26 would give a 2000 catch of 78,500 t.

Pacific cod is managed as a single BSAI stock and is the second largest Alaskan groundfish fishery. A length-based synthesis model is used to assess Pacific cod biomass estimates. Annual trawl surveys in the eastern Bering Sea and triennial trawl surveys in the Aleutian Islands are the primary fishery independent sources of data. The present assessment incorporates new catch and survey information.

This year's EBS bottom trawl survey resulted in a biomass estimate of 583,000 t, a 9% increase relative to last year's estimate. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 379,000 t, 0.30, and 0.35, respectively. Fishing at a rate of 0.28 is projected to result in a 2000 spawning biomass of 357,000 t, and solves the equation for the maximum permissible value of F_{ABC} under tier 3. Because projected biomass for 2000 is less than $B_{40\%}$, Pacific cod qualify for management under sub-tier "b" of tier 3. Fishing at an instantaneous rate of 0.28 is projected to result in a 2000 catch of 206,000 t, which is the maximum permissible ABC under Amendment 56. The Plan Team concurs with the chapter authors' recommendation to set 2000 ABC at 193,000 t, about 6% below the maximum permissible level. This recommendation is based on a risk-averse optimization procedure which considers uncertainty in the estimates of the survey catchability coefficient and the natural mortality rate in the computation of an $F_{40\%}$ harvest level. The Plan Team feels that a 6% reduction from the maximum permissible ABC is justified not only on the basis of these decision-theoretic concerns, but also because estimated spawning biomass from the model has declined continuously since 1985 and because three of the last four year classes (assessed at age 3) appear to have been well below average. A 2000 catch of 193,000 mt would represent an increase of 9% over the 1999 ABC of 177,000 t, matching the 9% increase in the trawl survey biomass estimate. However, the Plan Team notes that the assessment model projects a 2001 ABC (using the same relative harvest rate) of 171,000 mt with a continuing decline through 2003 (expected ABC = 138,000 t), meaning that the increase for 2000 is expected to be short-lived. A 2000 catch of 193,000 mt corresponds to a fishing mortality rate of 0.26, below the value of 0.28 which constitutes the upper limit on F_{ABC} under tier 3b.

The Plan Team's recommended OFL was determined from the tier 3b formula, where fishing at a rate of 0.33 gives a 2000 catch of 240,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Sablefish

The BSAI sablefish biomass can be described as below target stock size but stable. Relative to the 1999 SAFE, new sources of information include: 1) relative abundance and length data from the 1999 longline survey; 2) historical catch data from 1960-1978; 3) catch rate and length data from the Japanese longline fishery from 1964-1981; 4) length data from the Japanese trawl fishery from 1964-1971; 5) catch rate date from the U.S. longline fishery from 1990-1999; 6) length data from the U.S. trawl fishery from 1990-1996; 7) age composition data from the 1998 sablefish longline survey; and 8) length data from the 1999 longline fishery.

Revisions to the sablefish assessment from last year primarily include: the addition of about 20 years of historical data, adding recent fishery catch rate data, the use of ageing imprecision, and a Bayesian decision analyses. Recruitment variability was significantly different compared to last year's assessment. This was due to the addition of true ageing error estimates.

The Team selected the *F40% adjusted rate* that used the split gears for setting the maximum permissible ABC level (Tier 3b). This gave the adjusted EBS value for the year 2000 ABC of 1,410 mt as the maximum permissible ABC (F_{ABC}=0.11) and in the AI, and ABC of 2,490 mt (F_{ABC}=0.11) . The Plan Teams also discussed the three different methods for computing area apportionments for sablefish. There are significant differences in the area apportionments depending on the method. The questions are what biological effects area apportionments may have on the sablefish stock. Based on the earlier work of Heifetz *et al.* (1997), area-specific harvest rates begin to have significant impacts at levels (e.g.,

>30%) significantly higher than what is currently estimated. The Teams suggested that Council should continue to apportion based on the 5-year weighted average as in the past. There are concerns that biases may be introduced by adding the fishery data. While the Team did not have any compelling evidence that suggested biological issues are of concern, they felt that a good strategy continues to be one of area apportionment based on the best estimate of the biomass distribution.

Yellowfin sole is the most abundant flatfish species in the eastern Bering Sea and is the target of the largest flatfish fishery in the United States. They inhabit the Bering Sea shelf and are considered to be one stock. The present assessment includes significant changes from the 1999 assessment, including use of a new modeling platform and incorporation of new catch and survey information. The 1999 EBS bottom trawl survey resulted in a biomass estimate of 1,310,000 t, a 44% decrease relative to last year's estimate. The sharp decrease appears due to an effect of cold water to decrease availability; water temperatures were the coldest on record in 1999 and previous trawl survey results appear affected by shelf bottom temperatures. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 577,000 t, 0.11, and 0.13, respectively. Given that the projected 2000 spawning biomass of 789,000 mt exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2000 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.11) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2000 ABC of 191,000 t.

The Plan Team's OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.13 gives a 2000 OFL of 226,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Rock sole is abundant on the eastern Bering Sea shelf and to a lesser extent in the Aleutian Islands. The present assessment includes significant changes from the 1999 assessment, including use of a new modeling platform, incorporation of new catch and survey information, and use of year-specific weight-at-age schedules. This year's EBS bottom trawl survey resulted in a biomass estimate of 1,690,000 t, a 22% decrease relative to last year's estimate. The biomass estimate from the 1998 survey constituted a 20% decrease relative to 1997. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 285,000 t, 0.15, and 0.19, respectively. Given that the projected 2000 spawning biomass of 676,000 mt exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2000 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.15) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2000 ABC of 230,000 t.

The Plan Team's OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.19 gives a 2000 OFL of 273,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Greenland turbot is distributed from Baja California northward throughout Alaska, primarily found in the BSAI region. The 1999 EBS bottom trawl survey resulted in a biomass estimate of 19,797 t, a 30% decrease relative to last year's estimate. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3

of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 81,300 t, 0.26, and 0.32, respectively. Projected spawning biomass for 2000 is 165,000 t, placing Greenland turbot in sub-tier "a" of Tier 3. The Plan Team notes that the ratio of 1999 spawning biomass to $B_{40\%}$ has changed dramatically since last year's assessment: In last year's assessment, the ratio was 79%, whereas in the present assessment, the ratio is 203%. The main reason for this change is that the recruitments used to estimate $B_{40\%}$ in last year's assessment included year classes spawned prior to the regime shift of 1977, whereas the recruitments used to estimate $B_{40\%}$ in the present assessment include only year classes spawned during the current environmental regime. The maximum permissible value of F_{ABC} under Tier 3a is 0.26. A fishing mortality rate of 0.26 translates into a 2000 catch of 34,700 t, which would be the maximum permissible ABC under Amendment 56. The Plan Team recommends a 2000 ABC value substantially less than the maximum permissible, using $F_{ABC} = 0.25 \times max\ F_{ABC}$, which results in a 2000 ABC of 9,300 t. The Plan Team believes that a 2000 ABC well below the maximum permissible value is warranted for the following reasons: 1) estimated age 1+ biomass has trended downward continually since 1972; 2) the 7 most recent age 1 recruitments constitute 7 of the lowest 8 values in the entire time series; and 3) if the maximum permissible ABC of 34,700 mt were actually caught, this would constitute the highest catch since 1983, even though spawning biomass in 2000 is projected to be less than half of what it was in 1983.

The OFL fishing mortality rate is computed under Tier 3a, $F_{OFL} = F_{35\%} = 0.32$, and translates into a 2000 OFL of 42,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Arrowtooth flounder (*Atheresthes stomias*) is common from Oregon through the eastern Bering Sea. The very similar Kamchatka flounder (*Atheresthes evermanni*) also occurs in the Bering Sea. Because it is not usually distinguished from arrowtooth flounder in commercial catches, both species are managed as a group. The stock assessment uses a method of weighting sex-specific size composition data that had been used prior to last year's assessment and incorporates new catch and survey information. This year's EBS bottom trawl survey resulted in a biomass estimate of 244,000 t, a 29% decrease relative to last year's estimate. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 195,000 t, 0.22 and 0.27, respectively. Given that the projected 2000 spawning biomass of 496,000 mt exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2000 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.22) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2000 ABC of 131,000 t.

The OFL fishing mortality rate is computed under Tier 3a, $F_{OFL} = F_{35\%} = 0.27$, and translates into a 2000 OFL of 160,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Flathead sole (*Hippoglossoides elassodon*) is distributed from northern California northward throughout Alaska (Wolotira et al. 1993). In the northern part of its range, it overlaps with the related and very similar Bering flounder (*Hippoglossoides robustus*) (Hart 1973). Because it is difficult to separate these two species at sea, they are currently managed as a single stock (Walters and Wilderbuer 1997). The 1999 EBS bottom trawl survey resulted in a biomass estimate of 395,000 t, a 43% decrease relative to last year's estimate. It should be noted that 1998 estimate was a 14% decrease relative to that of 1997,

which in turn was a 31% increase relative to the 1996 estimate. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 134,000 t, 0.28, and 0.35, respectively. Given that the projected 2000 spawning biomass of 261,000 mt exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2000 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.28) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2000 ABC of 73,500 t.

The Plan Team's OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.35 gives a 2000 OFL of 90,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Other flatfish compose eight species in the Bering Sea (Alaska plaice, rex sole, Dover sole, starry flounder, English sole, butter sole, sand sole, and deep sea sole). In the Bering Sea, Alaska plaice is the most abundant (comprising 92 percent of the group biomass) and commercially important of the other flatfish species. In general, other flatfish are taken as incidental catch in other directed groundfish fisheries. The present assessment includes significant changes from last year's assessment, including use of AD Model Builder as a modeling platform for the first time (Alaska plaice only) and incorporation of new catch and survey information. This year's EBS bottom trawl survey resulted in biomass estimates of 547,000 mt for Alaska plaice and 69,700 mt for the remaining species in the "other flatfish" complex, representing an increase of 21% and a decrease of 6% relative to last year's estimates, respectively. The Plan Team notes that Alaska plaice was the only major flatfish species that showed increased abundance in the 1999 bottom trawl survey. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock complex, and that this stock complex therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 100,000 mt (Alaska plaice only), 0.28, and 0.35, respectively. Given that the projected 2000 spawning biomass (Alaska plaice only) of 187,000 mt exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2000 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ level (=0.28 for all species), which is the maximum allowable under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2000 ABC of 117,000 mt for the complex.

The Plan Team's OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value (=0.35 for all species) gives a 2000 OFL of 141,000 mt for the complex. Model projections indicate that this stock complex is neither overfished nor approaching an overfished condition.

Pacific ocean perch (POP) is primarily a demersal species which inhabits the North Pacific and Bering Sea. Pacific ocean perch is the most commercially important rockfish in Alaska's fisheries and is taken almost exclusively with bottom trawls.

EBS Pacific Ocean Perch: The present assessment is a straightforward update of last year's assessment, incorporating new catch information. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 26,200 t, 0.057, and 0.069, respectively. Projected spawning biomass for 2000 is 24,900 t, placing true POP in the EBS in sub-tier "b" of Tier 3. The maximum F_{ABC} value allowed under Tier 3b is 0.054. Projected harvesting at a fishing mortality rate of

0.054 gives a 2000 catch of 2,600 t, which is the Plan Team's recommended ABC (last year's ABC was set using a lower fishing mortality rate, 0.040, in part because last year's $B_{40\%}$ estimate of 34,400 mt was higher than this year's estimate of 26,200 t).

The OFL fishing mortality rate under Tier 3b is 0.065. Projected harvesting at a fishing mortality rate of 0.065 gives a 2000 catch of 3,100 t, which is the Plan Team's recommended OFL. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

AI Pacific Ocean Perch: The present assessment is a straightforward update of last year's assessment, incorporating new catch information and age composition data. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 100,000 t, 0.072, and 0.085, respectively. Projected spawning biomass for 2000 is 97,800 t, placing true POP in the Aleutians in sub-tier "b" of Tier 3. The maximum F_{ABC} value allowed under Tier 3b is 0.070. Projected harvesting at a fishing mortality rate of 0.070 gives a 2000 catch of 12,300 t, which is the Plan Team's recommended ABC (last year's ABC was set based on Tier 3a, so no adjustment of the $F_{40\%}$ rate was required). The ABC is apportioned among AI subareas based on survey distribution as follows: Western AI = 46.1%, Central AI = 28.5% , and Eastern = 25.4%.

The OFL fishing mortality rate under Tier 3b is 0.083. Projected harvesting at a fishing mortality rate of 0.083 gives a 2000 catch of 14,400 t, which is the Plan Team's recommended OFL. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Other red rockfish complex is composed of sharpchin, northern, shortraker, and rougheye rockfish in the EBS. In the current assessment, biomass was estimated from domestic trawl surveys only (1988-1997). This modification addresses concerns about biomass estimates for northern rockfish that included results from two exceptionally large tows of northern rockfish from the 1986 Aleutian trawl survey (in the small part of the EBS covered by that survey). These tows were responsible for approximately 94% of the northern rockfish biomass estimate in that year. Last year, the Plan Team and the SSC concluded that biomass estimates produced by eliminating the 1986 survey estimate represented the best estimate of northern rockfish biomass in the EBS. The change provided in this assessment addresses these concerns, and the Plan Team agrees that the 1988-1997 surveys provide better estimates of current biomass.

Last year, the SSC determined that reliable estimates of the natural mortality rate (M) existed for the species in this complex, and that non-*alutus* members of the POP complex in the EBS therefore qualified for management under Tier 5 of the BSAI Groundfish FMP. The accepted estimates of M for these species in the EBS are as follows: rougheye rockfish--0.025, shortraker rockfish--0.030, and northern rockfish--0.060. The Plan Team recommends setting F_{ABC} at the maximum value allowable under Tier 5, which is 75% of M. On a species-specific basis, this translates into the following F_{ABC} values: rougheye rockfish--0.019, shortraker rockfish--0.023, and northern rockfish--0.045. Multiplying these rates by the best estimates of species-specific biomass and summing across species gives a 2000 ABC of 194 mt.

Sharpchin and northern rockfish are broken out of the other red rockfish complex for management purposes in the Aleutian Islands area. Because sharpchin rockfish are found only rarely in the Aleutians, northern rockfish are for all practical purposes the only species in this complex. Traditionally, the biomass estimates from all Aleutian bottom trawl surveys have been averaged over all years to obtain the best estimate of northern rockfish biomass. In the current assessment, however, biomass was estimated

from the domestic trawl surveys only (1988-1997). Last year, the SSC determined that a reliable estimate of the natural mortality rate (M) existed for this stock, and that northern rockfish in the Aleutians therefore qualified for management under Tier 5 of the BSAI Groundfish FMP. The accepted estimate of M for northern rockfish in the Aleutians is 0.06. The Plan Team recommends setting F_{ABC} at the maximum value allowable under Tier 5, which is 75% of M, or 0.045. Multiplying this rate by the best estimate of biomass gives a 2000 ABC of 5,150 t.

The Plan Team's OFL was determined from the Tier 5 formula, where setting $F_{OFL}=M$ gives a 2000 OFL of 6,870 t. As a Tier 5 stock complex, it is not possible to determine whether the AI sharpchin/northern complex is overfished or whether it is approaching an overfished condition.

Shortraker and rougheye rockfish are broken out of the other red rockfish complex for management purposes in the Aleutian Islands area. Traditionally, the biomass estimates from all Aleutian bottom trawl surveys have been averaged over all years to obtain the best estimate of shortraker and rougheye rockfish biomass. In the current assessment, however, biomass was estimated from the domestic trawl surveys only (1988-1997). Last year, the SSC determined that reliable estimates of the natural mortality rate (M) existed for the species in this complex, and that shortraker and rougheye rockfish in the Aleutians therefore qualified for management under Tier 5 of the BSAI Groundfish FMP. The accepted estimates of M for these species in the Aleutians are as follows: rougheye rockfish--0.025 and shortraker rockfish--0.030. The Plan Team recommends setting F_{ABC} at the maximum value allowable under Tier 5, which is 75% of M. On a species-specific basis, this translates into the following F_{ABC} values: rougheye rockfish--0.019 and shortraker rockfish--0.023. Multiplying these rates by the best estimates of species-specific biomass and summing across species gives a 2000 ABC of 885 mt.

The Plan Team's OFL was determined from the Tier 5 formula, where setting $F_{OFL}=M$ for each species gives a combined 2000 OFL of 1,180 t. As a Tier 5 stock complex, it is not possible to determine whether the AI shortraker/rougheye complex is overfished or whether it is approaching an overfished condition.

Other rockfish. Most of the species in the other rockfish complex have been reported to be demersal or semi-demersal, with different species occupying different depth strata. Most other rockfish are long lived with low natural mortality rates.

Traditionally, the biomass estimates (split according to management area) from all bottom trawl surveys (EBS shelf/slope and Aleutians) are averaged over all years to obtain the best estimates of biomass for the species in this complex. Summed over the species in the complex, this procedure produces a biomass estimate of 7,030 mt in the EBS and a biomass estimate of 13,000 mt in the Aleutians. The great majority of this biomass is comprised of thornyhead rockfish. Last year, the SSC determined that a reliable estimate of the natural mortality rate (M) existed for the species in this subcomplex, and that "other rockfish" in the EBS and Aleutians therefore qualified for management under Tier 5 of the BSAI Groundfish FMP. The accepted estimate of M for these species in both areas is 0.07. The Plan Team recommends setting F_{ABC} at the maximum value allowable under Tier 5, which is 75% of M, or 0.053. Multiplying this rate by the best estimate of complex-wide biomass gives a 2000 ABC of 369 mt in the EBS and 685 mt in the Aleutians.

The Plan Team's OFLs were determined from the Tier 5 formula, where setting $F_{OFL}=M$ gives a 2000 OFL of 492 mt in the EBS and 913 mt in the Aleutians. As a Tier 5 stock complex, it is not possible to

determine whether the "other rockfish" complex is overfished or whether it is approaching an overfished condition.

Squid are found throughout the Pacific Ocean and are not currently the target of groundfish fisheries in the BSAI region. They are primarily caught as incidental catch in trawl fisheries for pollock and rockfish. The present squid assessment incorporates new catch information. Last year, the SSC determined that a reliable catch history existed for this stock complex, and that squid therefore qualified for management under Tier 6 of the BSAI Groundfish FMP. Under Tier 6, OFL is set equal to the average catch from 1978 through 1995 (unless an alternative value is established by the SSC on the basis of the best available scientific information), and ABC is constrained to be no greater than 75% of OFL. The average catch from 1978 through 1995 was 2,620 mt. Given a 2000 OFL of 2,620 mt, the maximum permissible value of ABC for 2000 would be 1,970 mt, which is the Plan Team's recommended value. As a Tier 6 stock complex, it is not possible to determine whether the squid complex is overfished or whether it is approaching an overfished condition.

Other species The "other species" assessment is a straightforward update of last year's assessment, incorporating new catch and survey biomass information. It should be noted that assessments prior to 1999 included smelts in the "other species" category, but that smelts have now been moved into the "forage fish" category. This year's EBS bottom trawl survey resulted in a biomass estimate (exclusive of smelts) of 520,000 t, a 7% decrease from last year's estimate of 556,000 t. Last year, the SSC determined that a reliable estimate of the natural mortality rate (M) existed for the species in this complex, and that the "other species" complex therefore qualified for management under Tier 5 of the BSAI Groundfish FMP. The accepted value of M was 0.20. Under Tier 5, the maximum permissible value for F_{ABC} is $0.75 \times M$.

The Plan Team has noted that sculpins and skates, which tend to have M values substantially below 0.20, make up the majority of the survey biomass of the "other species" complex, meaning that an M of 0.20 might not be appropriate on average. As an alternative, M for the complex could be computed as the biomass-weighted estimates of the main component species. Using this method, the maximum permissible ABC for 2000 would be 53,600 mt. However, a catch of this magnitude would be twice the average catch since 1977. Given the large number of species in this complex, it would be unwise to increase harvests until more information is available regarding the status of the complex's individual components. Therefore, the Plan Team recommends a 2000 ABC equal to the average catch, which is 26,800 mt.

Under Tier 5, the 2000 OFL computed by the above method is 71,500 t. As a Tier 5 stock complex, it is not possible to determine whether the "other species" complex is overfished or whether it is approaching an overfished condition.

Table 1. Council recommended specifications for the Bering Sea and Aleutian Islands management area including 1999 ABC, TAC, and actual catch through September 13, 1999; and 2000 OFL (revised), ABC, and TAC amounts as recommended by the BSAI Plan Team (values are in mt).

		1999 Specifications				Plan Team Reccomended 2000 Specifications	
Species	Area	OFL	ABC	TAC	Actual Catch	OFL	ABC
Pollock	Bering Sea (BS)	2,210,000	992,000	992,000	978,301	1,680,000	1,100,000
	Aleutian Is. (AI)	31,700	23,800	2,000	1,019	31,700	23,800
	Bogoslof District	115,000	15,300	1,000	21	95,000	71,300
Pacific cod	BSAI	215,000	177,000	177,000	160,084	240,000	193,000
Sablefish	BS	1,600	1,340	1,340	628	1,750	1,410
	AI	2,200	1,860	1,380	629	3,090	2,490
Atka mackerel	Total	126,000	73,300	66,400	52,962	119,000	70,800
	Western AI	.....	30,700	27,000			29,700
	Central AI	.....	25,600	22,400			24,700
	Eastern AI/BS	.....	17,000	17,000			16,400
Yellowfin sole	BSAI	251,000	212,000	207,980	67,885	226,000	191,000
Rock sole	BSAI	367,000	309,000	120,000	40,362	273,000	230,000
Greenland turbot	Total	21,000	14,200	9,000	5,937	42,000	9,300
	BS	.....	9,515	6,030			
	AI	.....	4,685	2,970			
Arrowtooth flounder	BSAI	170,000	140,000	134,354	10,679	160,000	131,000
Flathead sole	BSAI	95,600	77,300	77,300	17,777	90,000	73,500
Other flatfish	BSAI	197,000	154,000	154,000	15,184	141,000	117,000
Pacific ocean perch	BS	2,300	1,900	1,400	376	3,100	2,600
	AI Total	16,200	13,500	13,500	11,776	14,400	12,300
	Western AI	.....	6,220	6,220			5,670
	Central AI	.....	3,850	3,850			3,500
	Eastern AI	.....	3,430	3,430			3,130
Other red rockfish	BS	356	267	267	217	259	194
Sharpchin/Nrthrn.	AI	5,640	4,230	4,230	5,181	6,870	5,150
Shortrkr./rougheye	AI	1,290	965	965	474	1,180	885
Oher rockfish	BS	492	369	369	137	492	369
	AI	913	685	685	632	913	685
Squid	BSAI	2,620	1,970	1,970	413	2,620	1,970
Other species	BSAI	129,000	32,860	32,860	18,396	71,500	26,800
	TOTAL	3,961,911	2,247,846	2,000,000	1,389,070	3,203,874	2,265,553

3.1.2 Status of Groundfish Target Species in the GOA

Designated target species and species groups in the GOA are walleye pollock, Pacific cod, deep water flatfish, rex sole, shallow water flatfish, flathead sole, arrowtooth flounder, sablefish, other slope rockfish, northern rockfish, Pacific Ocean Perch, shortraker and rougheye rockfish, pelagic shelf rockfish, demersal shelf rockfish, Atka mackerel, thornyhead rockfish, and other species. Differences between 1999 and 2000 for the GOA are presented in Table 2. and discussed throughout section 3.1.2. For detailed life history, ecology, and fishery management information regarding groundfish stocks in the GOA see Section 3.3 of the FSEIS.

Walleye pollock The GOA pollock biomass can be described as below target stock size and increasing. Relative to the 1999 SAFE, new sources of information include: 1) 1997 and 1998 echo integration trawl

(EIT) survey age composition; 2) an evaluation of 1989-98 ADF&G coastal trawl survey biomass and length composition data for inclusion in the model; 3) age composition from the 1998 fishery; (4) catch data from the 1999 fisheries; and 5) the 1999 ADF&G summer biomass estimate for Prince William Sound (PWS). The Shelikof EIT survey was not conducted in 1999. In addition, the stock assessment was extended eastward to 140° W to coincide with the area open for trawling in the Gulf of Alaska; this assessment previously extended only to 147° W long. Annual catches and the AFSC bottom trawl survey biomass time series were revised to correspond to the larger area. Biomass estimates in the trawl survey time series were also increased to account for biomass in PWS.

Projected spawning biomass in 2000 for the Western, Central and West Yakutat areas is 214,900 mt, which is below the $B_{40\%}$ value of 247,000 mt and places Gulf pollock in Tier 3b. Following substantial discussion, the Plan Team recommended the 1999 ABC of 94,400 mt be applied as the 2000 ABC for the Western/Central area. This harvest rate, while less than the maximum permissable of $F_{40\%\ adjusted}$=0.34, was recommended to address some of the following concerns: 1) the stock continues to decline; 2) the stock biomass is now at an all time low; and 3) the large variability around the biomass estimate from the 1999 trawl survey. Given the low biomass and continued decline, the Team felt it inappropriate to increase the ABC relative to 1999. Total recommended ABC for Western, Central, and West Yakutat areas is 96,560 mt, which represents a fishing mortality rate of F = 0.29. The Plan Team recommends the 2000 ABC be apportioned according to mean distribution of the exploitable population biomass in the four most recent bottom trawl surveys. ABC apportionment by mean distribution among surveys is a departure from previous pollock assessments and was used because of the high variability observed in the 1999 trawl survey distributions. This resulted in an apportionment of 41.0% (39,590 mt) to the Shumagin area, 24.4% (23,560 mt) to the Chirikof area, 32.1% (31,000 mt) to the Kodiak area, and 2.5% (2,410 mt) to the West Yakutat area. OFL for gulf pollock in 2000 is defined as $F_{35\%adjusted}$ = 0.40.
The 1999 ADF&G survey estimated a PWS biomass of 1.05% of the AFSC survey estimate of Gulf pollock. As an interim approach, pollock biomass estimates from the triennial survey time series were increased by 1.05% prior to Gulf assessment model runs. This allows the PWS ABC to be deducted from the ABC for the combined Western, Central, and West Yakutat areas, consistent with the assessment approach. The PWS ABC is estimated to be approximately 1,420 mt.

Pollock in the Southeast Outside and East Yakutat areas fall into a Tier 5 assessment. Under this approach, 2000 ABC is 6,460 mt, based on 1999 trawl survey biomass estimate of 28,710 mt and a natural mortality estimate of 0.30. OFL is 8,610 mt. The assessment authors noted that pollock catch in the pooled Southeast Outside and East Yakutat areas never exceeded 100 mt during 1991-98.

The total recommended 2000 ABC for pollock in the GOA is 103,020 mt, up from 100,920 mt in 1999. The Plan Team recommendations for pollock ABCs and OFLs by management area are presented in Table 2. Harvest alternatives for GOA pollock ABC levels are presented in Table x. Two other harvest alternatives were evaluated for comparative purposes to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). Spawning biomass is projected to be 212,700 mt in 2000 under an FOFL harvest policy, less than B35% (216,000 mt), but greater than ½ of B35%. At FOFL, the projected mean spawning biomass in 2010 is 239,100 mt, 111% of B35%. Therefore, GOA pollock stocks are not currently overfished. The projected mean spawning biomass in 2002 is 166,600 mt, less than B35%, but greater than ½ of B35%. Projected mean spawning biomass in 2012 is 236,300 mt, 109% of B35%. Therefore, GOA pollock stocks are not approaching an overfished

condition. The OFL determinations for pollock falls under tier 3(b) in the combined Western, Central, and West Yakutat areas and under tier 5 in the SEO District and are 130,760 and 8,610 mt respectively.

Pacific cod The GOA Pacific cod biomass can be described as above target stock size but declining. Relative to 1999 SAFE, new sources of information include: 1) size composition data from the 1998 and January-August 1999 commercial fisheries; 2) size composition data from the 1999 GOA bottom trawl survey; 3) the biomass estimate from the 1999 GOA bottom trawl survey; and 4) weight-at-length data from recent GOA bottom trawl surveys have been incorporated.

The 1999 bottom trawl survey biomass estimate of 305,823 mt was down about 43% from the 1996 survey estimate. Maximum permissible values of ABC and OFL under Tier 3a are the F40% (=0.38) and F35% (=0.46) yields 86,000 and 102,000 mt, respectively. The projected age 3+ biomass for the year 2000 is 567,000 mt. The author noted that the historic trend of catch and age 3+ biomass shows a pattern in exploitation rate over time where the rate has met or exceeded the average for every year after 1989, while the estimated values fall below average for every year prior to 1990.

The author's ABC recommendation of 76,400 mt is the geometric mean of the posterior distribution of 2000 catch obtained under an F40% harvest strategy and is equivalent to an F=0.33. In past years the author's similarly obtained ABC recommendation represented an increase in ABC, while the assessment indicated a decreasing stock trend. The Team chose in those years to not increase ABC, but to forward the previous year's ABC. This year, the assessment still estimates the stock to be decreasing, however, 76,400 mt does not represent an increase over the past year's ABC, and is accepted as the Plan Team's recommended ABC for the year 2000.

The author notes in his report that if the ABC is to be distributed between regulatory areas in proportion to the biomass estimates from the most recent trawl survey, the proportions are: Western-36% , Central-57%, and Eastern-7%, which would result in 27,500 mt, 43,550 mt, and 5,350 mt, respectively, for a 76,400 mt Gulfwide ABC.

The total recommended 2000 ABC for Pacific cod in the GOA is 76,400 mt , down from 84,400 mt in 1999. The Plan Team recommendations for Pacific cod ABCs and OFLs by management area are presented in Table 2. Harvest alternatives for GOA Pacific cod ABC levels are presented in Table x. Two other harvest alternatives were evaluated for comparative purposes to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). Spawning biomass is projected to be 109,400 mt in 2000 under an FOFL harvest policy, greater than B35% (86,400 mt). Therefore, GOA Pacific cod stocks are above MSST and are not currently overfished. The projected mean spawning biomass in 2002 is 89,800 mt, greater than B35%. Therefore, GOA Pacific cod stocks are not approaching an overfished condition. The OFL determination for Pacific cod falls under tier 3(a) and is 102,000 mt.

Deep water flatfish include Greenland turbot, Dover sole and deep sea sole. Deep water flatfish inhabit the continental shelf and slope across the northern Pacific Ocean from northern Baja California to Japan to depths as great as 1100 meters. These fish were separated from other flatfish in the GOA based on seasonal differences in the bycatch of Pacific halibut. The relative abundance and trend of the deep water flatfish biomass is unknown. Relative to 1999 SAFE, new sources of information include: 1)

updated catch information; and 2) biomass and size composition from the 1999 bottom trawl survey, which included additional survey efforts in deep water habitat.

The 2000 exploitable biomass for each category is based on abundance estimated from the 1999 triennial trawl survey biomass distributions in the 1999 trawl survey. The Plan Team recommends that ABCs for deep water flatfish be apportioned among the regulatory areas in proportion to the 1999 triennial trawl survey biomass distributions in the 1999 trawl survey. The Team further recommends splitting the eastern GOA ABC of 2,310 mt between the WYK and SEO subareas. The resulting 2000 ABC's are 280, 2,710, 1,240, and 1,070 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

The total recommended 2000 ABC for deep water flatfish in the GOA is 5,300 mt, down from 6,050 mt in 1999. The Plan Team recommendations for deep water flatfish ABCs and OFLs by management area are presented in Table 3. Harvest alternatives for GOA deep water flatfish are not included in Table 4. Additional harvest alternatives could not be evaluated to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). The overfishing level for deep water flatfish is determined by the fishing mortality rates from the tier structure to the exploitable biomass estimates. The OFL determinations for deep water flatfish fall under tiers 5 and 6 and is 6,980 mt.

Rex sole inhabit the continental shelf and slope at depths from the surface to 800 meters but are most abundant below 200 meters. Rex sole was separated from the deep water flatfish group in 1993 due to high incidental catch rates of Pacific ocean perch while targeting Rex sole. The relative abundance of the rex sole flatfish biomass is unknown but stable. Relative to 1999 SAFE, new sources of information include: 1) updated catch information; and 2) biomass and size composition from the 1999 bottom trawl survey, which included additional survey efforts in deep water habitat.

The 2000 exploitable biomass for rex sole is based on abundance estimated from the 1999 triennial trawl survey biomass distributions in the 1999 trawl survey. The Plan Team recommends that ABCs for rex sole be apportioned among the regulatory areas in proportion to the 1999 triennial trawl survey biomass distributions in the 1999 trawl survey. The Team further recommends splitting the eastern GOA ABC of 2,550 mt between the WYK and SEO subareas. The resulting 2000 ABC's are 1,230, 5,660, 1,540, and 1,010 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

The total recommended 2000 ABC for rex sole in the GOA is 9,440 mt, up from 9,150 mt in 1999. The Plan Team recommendations for rex sole ABCs and OFLs by management area are presented in Table 2. Harvest alternatives for GOA rex sole are not included in Table x. Additional harvest alternatives could not be evaluated to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). The overfishing level for rex sole is determined by the fishing mortality rates from the tier structure to the exploitable biomass estimate. The OFL determination for rex sole falls under tier 5 and is 12,300 mt.

Shallow water flatfish comprise all flatfish species in the GOA, except those species for which a separate ABC is calculated (deep water flatfish, rex sole, flathead sole, arrowtooth flounder, and Pacific halibut). The relative abundance of the shallow water flatfish biomass is unknown but stable. Relative to 1999 SAFE, new sources of information include: 1) updated catch information; and 2) biomass and

size composition from the 1999 bottom trawl survey, which included additional survey efforts in deep water habitat.

The 2000 exploitable biomass for shallow water flatfish is based on abundance estimated from the 1999 triennial trawl survey biomass distributions in the 1999 trawl survey. The Plan Team recommends that ABCs for shallow water flatfish be apportioned among the regulatory areas in proportion to the 1999 triennial trawl survey biomass distributions in the 1999 trawl survey. The Team further recommends splitting the eastern GOA ABC of 1,950 mt between the WYK and SEO subareas. The resulting 2000 ABC's are 19,510, 16,400, 790, and 1,160 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

The total recommended 2000 ABC for shallow water flatfish in the GOA is 37,860 mt , down from 43,150 mt in 1999. The Plan Team recommendations for shallow water flatfish ABCs and OFLs by management area are presented in Table2. Harvest alternatives for GOA shallow water flatfish are not included in Table x. Additional harvest alternatives could not be evaluated to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). The overfishing level for shallow water flatfish is determined by the fishing mortality rates from the tier structure to the exploitable biomass estimates. The OFL determination for shallow water flatfish fall under tiers 4 and 5 and is 45,320 mt

Flathead sole occurs widely over the continental shelf and slope from northern California through the North Pacific and Bering Sea to Japan. They are widely found from near the surface to depths of 800 meters. A separate ABC was assigned for flathead sole because they overlap the depth distributions of the deep and shallow water flatfish groups. The relative abundance of the flathead sole biomass is unknown but stable. Relative to 1999 SAFE, new sources of information include: 1) updated catch information; and 2) biomass and size composition from the 1999 bottom trawl survey, which included additional survey efforts in deep water habitat.

The 2000 exploitable biomass for flathead sole is based on abundance estimated from the 1999 triennial trawl survey biomass distributions in the 1999 trawl survey. The Plan Team recommends that ABCs for rex sole be apportioned among the regulatory areas in proportion to the 1999 triennial trawl survey biomass distributions in the 1999 trawl survey. The Team further recommends splitting the eastern GOA ABC of 2,060 mt between the WYK and SEO subareas. The resulting 2000 ABC's are 8,490, 15,270, 1,440, and 620 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

The total recommended 2000 ABC for rex sole in the GOA is 25,830 mt , down from 26,110 mt in 1999. The Plan Team recommendations for rex sole ABCs and OFLs by management area are presented in Table 2. Harvest alternatives for GOA rex sole are not included in Table x. Additional harvest alternatives could not be evaluated to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). The overfishing level for flathead sole is determined by the fishing mortality rates from the tier structure to the exploitable biomass estimate. The OFL determination for rex sole falls under tier 4 and is 45,320 mt.

Arrowtooth flounder occurs over the continental shelf and slope from depths near the surface to 900 meters from California to the eastern Bering Sea. Arrowtooth flounder were separated from the other

flatfish complex in 1990, due to their disproportionally high abundance. The GOA arrowtooth flounder biomass can be described as above target stock size and declining. Relative to 1999 SAFE, new sources of information include: 1) biomass and size composition from the 1999 bottom trawl survey; 2) a projection of biomass based on an ADModel Builder model which is now being used as the main assessment model; and 3) differential mortality values for males and females.

The 2000 exploitable biomass is based on abundance estimates derived from an ADModel Builder stock assessment model. There was a change in the way the model accounted for higher proportions of females in the larger size intervals. In the previous model, the changing sex ratio was fit by having different selectivity for males and females as size increased. In the present model, the sex ratio pattern is fit by giving males a higher mortality rate than females. The Plan Team agreed with the assessment authors that this was a more appropriate way to model the pattern in sex ratio, as this pattern (fewer males at larger sizes) is observed in both the Bering Sea and the Gulf of Alaska, and in both survey and commercial catches. This change is largely responsible for the drop in exploitable biomass estimated in 2000, although there was also a less-dramatic decrease in the trawl survey biomass in the 1999 survey. The Plan Team recommends that ABCs for arrowtooth flounder be apportioned among the regulatory areas in proportion to the 1999 triennial trawl survey biomass distributions in the 1999 trawl survey. The Team further recommends splitting the eastern GOA ABC of 31,490 mt between the WYK and SEO Districts. The resulting 2000 ABC's are 16,160, 97,710, 23,770, and 7,720 mt for the Western, Central, West Yakutat, and Southeast Outside Districts respectively.

The total recommended 2000 ABC for arrowtooth flounder in the GOA is 145,360 mt , down from 217,110 mt in 1999. The Plan Team recommendations for arrowtooth flounder ABCs and OFLs by management area are presented in Table 2. Harvest alternatives for GOA arrowtooth flounder ABC levels are presented in Table x. Two other harvest alternatives were evaluated for comparative purposes to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). Spawning biomass is projected to be 1,075,900 mt in 2000 under an FOFL harvest policy, greater than B35% (394,219 mt). Therefore, GOA arrowtooth flounder stocks are above MSST and are not currently overfished. The projected mean spawning biomass in 2002 is 826,786 mt, greater than B35%. Therefore, GOA arrowtooth flounder stocks are not approaching an overfished condition. Using Tier 3a criteria, the overfishing level based on $F_{35\%} = 0.159$ is 173,910 mt.

Sablefish The GOA sablefish biomass can be described as below target stock size but stable. Relative to 1999 SAFE, new sources of information include: 1) relative abundance and length data from the 1999 longline survey; 2) historical catch data from 1960-1978; 3) catch rate and length data from the Japanese longline fishery from 1964-1981; 4) length data from the Japanese trawl fishery from 1964-1971; 5) catch rate date from the U.S. longline fishery from 1990-1999; 6) length data from the U.S. trawl fishery from 1990-1996; 7) age composition data from the 1998 sablefish longline survey; and 8) length data from the 1999 longline fishery.

Revisions to the sablefish assessment from last year primarily include: the addition of about 20 years of historical data, adding recent fishery catch rate data, the use of ageing imprecision, and a Bayesian decision analyses. Recruitment variability was significantly different compared to last year's assessment. This was due to the addition of true ageing error estimates.

The Team selected the *F40% adjusted rate* that used the split gears for setting the maximum permissible ABC level (Tier 3b). This gave the adjusted GOA value for the year 2000 harvest level of 13,400 mt as the maximum permissible ABC (F_{ABC}=0.109). The Team recommended that this value should also be used for setting the ABC level. The PlanTeams also discussed the three different methods for computing area apportionments for sablefish. There are significant differences in the area apportionments depending on the method. The questions are what biological effects area apportionments may have on the sablefish stock. Based on the earlier work of Heifetz *et al.* (1997), area-specific harvest rates begin to have significant impacts at levels (e.g., >30%) significantly higher than what is currently estimated. The Teams suggested that Council should continue to apportion based on the 5-year weighted average as in the past. There are concerns that biases may be introduced by adding the fishery data. While the Team did not have any compelling evidence that suggested biological issues are of concern, they felt that a good strategy continues to be one of area apportionment based on the best estimate of the biomass distribution.

As in 1999, the Plan Team recommended that 5 percent of the East Yakutat/Southeast Outside (SEO) area ABC has been subtracted, and added to the West Yakutat area TAC. This adjustment of TAC allows up to 5 percent of the total Eastern GOA TAC to be available to trawl gear as incidental catch in other directed fisheries following the prohibition of trawl gear east of 140 degrees west longitude. This adjustment does not change the allocation of TAC to fixed gear in any management area of the Eastern GOA. The Team further recommends splitting the eastern GOA ABC of 31,490 mt between the WYK and SEO subareas. The resulting 2000 ABC's (which do not include the recommended adjustments in the Eastern GOA described above) are 1,960, 6,030, 1,920, and 3,490 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

The total recommended 2000 ABC for sablefish in the GOA is 13,400 mt , up from 12,700 mt in 1999. The Plan Team recommendations for sablefish ABCs and OFLs in the GOA by management area are presented in Table 2. Harvest alternatives for GOA sablefish ABC levels are presented in Table x. Two other harvest alternatives were evaluated for comparative purposes to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). Spawning biomass is projected to be 176,000 mt in 2000 (in the combined BSAI/GOA) under an FOFL harvest policy, less than B35% (190,000 mt), but greater than ½ of B35%. At FOFL, the projected mean spawning biomass in 2010 is 218,000 mt, 115% of B35%. Therefore, BSAI/GOA sablefish stocks are not currently overfished. The projected mean spawning biomass in 2002 is 176,600 mt, less than B35%, but greater than ½ of B35%. Projected mean spawning biomass in 2012 is 221,000 mt, 116% of B35%. Therefore, BSAI/GOA sablefish stocks are not approaching an overfished condition.. Using Tier 3b criteria, the overfishing level based on $F_{35\%}$adjusted = 0.136 is 16,700 mt.

Other slope rockfish include all species in the genus *Sebastes* excluding Pacific Ocean perch, northern rockfish, shortraker rockfish, rougheye rockfish, pelagic shelf rockfish, and demersal shelf rockfish in the Southeast Outside District. The relative abundance and trend of the other slope rockfish biomass is unknown. Relative to 1999 SAFE, new sources of information include: 1) updated catch information; and 2) biomass and size composition from the 1999 bottom trawl survey.

As in the past, the recommended ABC for other slope rockfish is based on F = M or F = 0.75M applied to exploitable biomass. Exploitable biomass is determined from the average of the three most recent trawl surveys. Applying the definitions for ABC and OFL places sharpchin rockfish in Tier 4 where F_{ABC} $F_{40\%}$, and the other species of other slope rockfish in Tier 5 where F_{ABC} 0.75M. For sharpchin

rockfish, F_{ABC} = M = 0.05 is less than $F_{40\%}$ = 0.055. This results in a recommended combined ABC for other slope of 4,900 mt (including 5 mt of northern rockfish in the West Yakatat area). Distributing this ABC based on the same method used for Pacific ocean perch results in ABCs of 20 mt in the Western area, 740 mt in the Central area, and 4,140 mt in the Eastern area.

The Team recommends that a separate ABC be set for other slope rockfish in the West Yakutat area. Using the same weighted average method as used for Pacific ocean perch results in a point estimate of 0.06 for the proportion of the exploitable biomass in the Eastern area that occurs in West Yakutat. Because a small portion of the Eastern ABC of other slope rockfish has been taken recently and some other slope rockfish are caught with longline gear, the Team recommended that this point estimate be used to apportion the ABC. This corresponds to an ABC of 250 mt (including 5 mt of northern rockfish) in WYK and 3,890 mt in the SEO areas.

The total recommended 2000 ABC for other slope rockfish in the GOA is 4,900 mt , down from 5,270 mt in 1999. The Plan Team recommendations for other slope rockfish ABCs and OFLs by management area are presented in Table 2. Harvest alternatives for GOA other slope rockfish are presented in Table x. Additional harvest alternatives could not be evaluated to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). The overfishing level for other slope slope rockfish is determined by the fishing mortality rates from the tier structure to the exploitable biomass estimate. Overfishing is defined as $F_{35\%}$ = 0.064 for sharpchin rockfish (tier 4) and F=M (tier 5) for the other species. The OFL determination for other slope rockfish is 6,390 mt.

Northern rockfish are found from the GOA through the Bering Sea at depths generally greater than 100 meters. A separate ABC has been recommended since 1993 to prevent overfishing of the highly valued northern rockfish. The relative abundance and trend of northern rockfish biomass is unknown. Relative to 1999 SAFE, new sources of information include: 1) updated catch information; and 2) biomass and size composition from the 1999 bottom trawl survey.

In the past, the unweighted average of the exploitable biomasses in the three most recent surveys (1993, 1996, and 1999) was used to determine current exploitable biomass. This results in exploitable biomass of 125,545 mt. However, variance of the 1999 survey was exceptionally large, approximately 30 and 15 times larger than the 1996 and 1993 survey variances, repectively. This large variance is due to one very large haul in one strata. The biomass estimate for this strata makes up 78% of the 1999 survey estimate of exploitable biomass for northern rockfish. The Team concurred with the author that to account for the increased level of uncertainty in the 1999 survey estimate, exploitable biomass this year should be estimated using a weighted average. Weights for each survey estimate are in proportion to the inverse of their respective variances. This weighted average results in an estimate of 85,360 mt of exploitable biomass for northern rockfish.

Applying the definitions for ABC and OFL places northern rockfish in Tier 4 where F_{ABC} $F_{40\%}$. As in the past, an F=M harvest strategy is used to determine ABC. This results an F_{ABC}=M= 0.06 which is less than $F_{40\%}$=0.075. Applying the F=0.06 harvest rate to the estimated exploitable biomass of 85,360 mt results in an ABC of 5,120 mt for northern rockfish. Distributing this ABC based on the same method used for Pacific ocean perch results in ABCs of 630 mt in the Western area and 4,485 mt in the Central area. The small ABC of 5 mt apportioned to the Eastern is combined with the WYK ABC for other slope

rockfish. The Eastern area is the edge of the geographical range of northern rockfish and such a small ABC is extremely difficult to manage..

The total recommended 2000 ABC for northern rockfish in the GOA is 5,120 mt , up from 4,990 mt in 1999. The Plan Team recommendations for other slope rockfish ABCs and OFLs by management area are presented in Table 2. Harvest alternatives for GOA northern rockfish are presented in Table x. Additional harvest alternatives could not be evaluated to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). The overfishing level for other slope slope rockfish is determined by the fishing mortality rates from the tier structure to the exploitable biomass estimate. Overfishing is defined as $F_{35\%} = 0.088$ for northern rockfish (tier 4). The OFL determination for northern rockfish is 7,510 mt.

Pacific ocean perch (POP) inhabit the outer continental shelf and slope regions of the North Pacific and Bering Sea at depths of 100 to 450 meters. The GOA POP biomass can be described as below target stock size but incresing. Relative to 1999 SAFE, new sources of information include: 1) updated catch information; 2) biomass and size composition from the 1999 bottom trawl survey; and 3) a projection of biomass based on the stock synthesis model for POP.

As in the past, the Team and the authors concurred that a model that treats survey biomass as an index of abundance rather than absolute abundance should be used as the basis for ABC and overfishing levels. Thus, survey catchability q was estimated in the current stock assessment. Survey catchability q was estimated at 2.99, compared with an estimate of $q = 2.78$ for last year's assessment. Justification for an estimate of $q > 1.0$ is based on expansion of the trawl survey estimates to untrawlable areas and on possible herding of fish into the trawl by the bridles and trawl doors. Submersible studies indicate adult Pacific ocean perch often concentrate over trawlable substrates. The Team had a difficult time reconciling the high estimated value for q. However, other factors independent of surveys, such as parameter confounding contribute to the estimate of q. The model chosen for ABC and OFL recommendations fit the data best ($q = 2.99$) and is in keeping with the desire to remain conservative.

The current female spawning biomass (B_{2000} = 92,920 mt) is less than $B_{40\%}$ (110,120), where $B_{40\%}$ is determined from the average recruitment of the 1977-92 year classes. Since B_{2000} is less than $B_{40\%}$, the computation in Tier 3b is used to determine the maximum value of F_{ABC}. The current estimate of $F_{40\%}$ is 0.078. Applying Tier 3b results in F_{ABC} 0.065 and an ABC 13,020 mt. The Team recommends that the ABC for Pacific ocean perch for the 2000 fishery in the Gulf of Alaska be set at 13,020 mt.

The Team and the authors concurred with the method of apportionment used for the past three years. The method weights prior surveys based on the relative proportion of variability attributed to survey error. Survey error is assumed to contribute 2/3 of the total variability in predicting the distribution of biomass. Thus, the weight of a prior survey should be 2/3 the weight of the preceding survey. This results in weightings of 4:6:9 for the 1993, 96, and 99 surveys, respectively and area apportionments of 9.5% for the Western area, 71.0% for the Central area, and 19.4% for the Eastern area. This results in recommended ABCs of 1,240 mt for the Western area, 9,240 mt for the Central area, and 2,540 mt for the Eastern area. For Pacific ocean perch the overfishing level is apportioned by area. Using the same apportionment as used for ABC, results in overfishing levels by area of 1,460 mt in the Western area, 10,930 mt in the Central area, and 3,000 mt in the Eastern area. The authors pointed out that an alternative apportionment scheme may be warranted because variance of the 1999 survey estimate is

considerably higher than previous surveys. Thus an alternative weighting scheme that considers year specific estimates of measurement error (i.e. survey variance) may be warranted.

The Team recommends that a separate ABCs be set for Pacific ocean perch in the Eastern Gulf between the WYK and SEO Districts. Using the same weighted average method as described above results in a point estimate of 0.22 for the proportion of the exploitable biomass in the Eastern area that occurs in WYK. However, there is considerable uncertainty in this estimate. In an effort to balance this uncertainty with associated costs to the industry, the Team recommends apportionments to West Yakutat, be based on proportions from the upper 95% confidence limit of 0.33. This corresponds to an ABC of 840 mt for WYK. Under this apportionment strategy, very little of the 1,700 mt assigned to the remaining SEO District is expected to be harvested. Note that the combined ABC for the WYK and SEO Disitricts should not exceed 2,540 mt.

The total recommended 2000 ABC for POP in the GOA is 13,020 mt , down from 13,120 mt in 1999. The Plan Team recommendations for POP ABCs and OFLs in the GOA by management area are presented in Table 2. Harvest alternatives for GOA POP ABC levels are presented in Table x. Two other harvest alternatives were evaluated for comparative purposes to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). Spawning biomass is projected to be 90,116 mt in 2000 under an FOFL harvest policy, less than B35% (96,102 mt), but greater than ½ B35%. At FOFL, the projected mean spawning biomass in 2010 is 102,440 mt, 101% of B35%. Therefore, GOA POP stocks stocks are not currently overfished. The projected mean spawning biomass in 2002 is 98,478 mt, greater than B35%.Therfore, GOA POP stocks are not approaching an overfished condition.. Using Tier 3b criteria, the overfishing level based on $F_{30\%}$ = 0.115 is estimated at 17,750 mt gulfwide; 1,690, 12,620, 3,440 mt in the Western, Central, and Eastern GOA respectively.

Shortraker and rougheye rockfish are found from California to the Bering Sea, at depths from 100 to 800 meters. In 1991, shortraker and rougheye rockfish were separated from the other slope rockfish complex to prevent overfishing of shortraker and rougheye rockfish. The relative abundance and trend of shortraker and rougheye rockfish biomass is unknown. Relative to 1999 SAFE, new sources of information include: 1) updated catch information; and 2) biomass and size composition from the 1999 bottom trawl survey.

As in the past, the average of the exploitable biomasses in the three most recent surveys (1993, 1996, and 1999) is used to determine current exploitable biomass. The current estimates of exploitable biomass are 22,480 mt for shortraker rockfish and 48,400 mt for rougheye rockfish. Applying the definitions for ABC and OFL places shortraker rockfish in Tier 5 where F_{ABC} 0.75M. Thus, the recommended F_{ABC} for shortraker rockfish is 0.023 (i.e., 0.75 X 0.03). Applying Tier 4 to rougheye rockfish (i.e., F_{ABC} $F_{40\%}$) allows an F_{ABC}=M= 0.025 which is less than $F_{40\%}$=.032. Applying these F_{ABC} rates to the estimates of exploitable biomass results in ABCs of 520 mt for shortraker rockfish and 1,210 mt for rougheye rockfish and a total ABC for the subgroup of 1,730 mt.

As in last year's assessment, to apportion ABC among areas, the Team recommends that the same methodology used for Pacific ocean perch be applied to shortraker and rougheye rockfish. This method results in apportionments of 210 mt for the Western area, 930 mt for the Central area and 590 mt for the Eastern area.

The total recommended 2000 ABC for other shortraker and rougheye rockfish in the GOA is 1,730 mt, up from 1,590 mt in 1999. The Plan Team recommendations for shortraker and rougheye rockfish ABCs and OFLs by management area are presented in Table 2. Harvest alternatives for GOA shortraker and rougheye rockfish are presented in Table x. Additional harvest alternatives could not be evaluated to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). Overfishing is defined as $F_{35\%} = 0.088$ for northern rockfish (tier 4). The OFL determination for northern rockfish is calculated to be 7,510 mt. Overfishing is defined to occur at the harvest rate set equal to $F_{35\%}$ of 0.038 for rougheye rockfish and at the F=M rate of 0.03 for shortraker rockfish because data are not available to determine $F_{35\%}$ for shortraker rockfish. These harvest rates are applied to estimates of current exploitable biomass to yield an overfishing catch limit of 2,510 mt for the shortraker/rougheye assemblage.

Pelagic shelf rockfish inhabit the continental shelf of the GOA and typically exhibit midwater schooling behavior. The pelagic shelf rockfish (PSR) assemblage is comprised of dusky, yellowtail, and widow rockfishes. The assemblage was separated from the other slope rockfish complex in 1988. Pelagic shelf rockfish are taken primarily by trawl and jig gear in the GOA. In 1998, two species, black rockfish and blue rockfish, were removed from the pelagic shelf rockfish complex so that the State of Alaska could manage these near shore species. The relative abundance and trend of pelagic shelf rockfish biomass is unknown. Relative to 1999 SAFE, new sources of information include: 1) biomass and size compositions from the 1999 bottom trawl survey; 2) revised von Bertalanffy growth parameters for dusky rockfish; 3) age at 50% maturity for female dusky rockfish (11.3) years); and 4) revised estimates of age at 50% recruitment for dusky rockfish (10 years).

Biomass estimates for PSR indicate that dusky rockfish comprise nearly all the biomass. Based on mean trawl survey data in 1993, 1996, and 1999, the 1999 exploitable biomass was calculated to be 66,443 mt. An F=M strategy equal to 0.09 for dusky rockfish resulted in an ABC of 5,980 mt for the assemblage. This strategy is more conservative than the Tier 4 maximum $F_{40\%}$ of 0.11 and the Team feels a reduction is justified due to concern over the reliability of biomass estimates and the estimates of $B_{40\%}$ for this assemblage. The Team concurs with the authors that sufficient data may now exist to conduct an age-structured assessment for dusky rockfish and recommends that this work proceed. Given the rational described above for Pacific ocean perch, a respective weighting of 4:6:9 applied to PSR geographical distributions from the 1993, 1996, and 1999 surveys results in ABC apportionments of 550 mt to the Western, 4,080 mt to the Central, and 1,350 mt to the Eastern areas.

The Team recommends that the Eastern area ABC be apportioned to West Yakutat according to the upper 95% confidence limit estimate of proportion in West Yakutat from the three most recent survey years with total Eastern area ABC not to exceed 1,350 mt, resulting in 580 mt and 770 mt for the WYK and SEO Districts repectively. Point estimates for West Yakutat and SEO are 420 and 930 respectively.

The total recommended 2000 ABC for pelagic shelf rockfish in the GOA is 5,980 mt, up from 4,880 mt in 1999. The Plan Team recommendations for pelagic shelf rockfish ABCs and OFLs by management area are presented in Table 2. Harvest alternatives for GOA pelagic shelf rockfish are presented in Table x. Additional harvest alternatives could not be evaluated to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). Overfishing is defined as $F_{35\%} = 0.136$ for pelagic shelf rockfish (tier 4). The OFL determination for pelagic shelf rockfish is 9,036 mt

Demersal shelf rockfish (DSR) is a subgroup of seven species from the other slope rockfish complex which is managed by the State of Alaska in the Southeast Outside area of the GOA. DSR was separated from other slope rockfish in 1987. These rockfish are bottom dwelling in shallow near shore waters, and are primarily harvested with longline gear. The relative abundance and trend of demersal shelf rockfish biomass is unknown. Relative to 1999 SAFE, new sources of information include: 1) updated catch information; 2) density estimates fro the SSEO and EYAK areas from the 1999 line transect survey; and 3) revised estimates of rocky habitat areas.

Estimates of rock habitat were revised using a combination of information available from submersible dives, sidescan data, NOS data, and commercial logbook data. Areas were digitized into a GIS. Changes from previous estimates were significant and varied by area with some areas showing an increase and some a decrease in estimated area of rock habitat. The overall change was down 34%, with 3,095 km^2 compared to 5,758 km^2 used in previous assessments. Area estimates will most likely change in the future as more information on habitat is collected.

The exploitable biomass estimate for yelloweye rockfish, based on the sum of the lower 90% confidence limit of biomass is 15,100 mt. This is a decrease of 40% over the 1999 estimate. This decrease is largely due to the change in estimate of rock habitat as well as the lower density for EYKT.

Because of the continued uncertainty in estimation of yelloweye biomass due to difficulties in estimation of total area of rock habitat, and our inability to include the uncertainty of this estimate in our assessment, we continue to advocate using the lower 90% confidence limits of biomass, as the reference number for setting ABC. Consistent with past years, the exploitable biomass estimate is based on the sum of the lower 90% confidence limits for each management area. This is appropriate as there are significant differences in density between management areas and the directed fishery quota is set by management area.

The SEO exploitable biomass estimate for 1999 is 15,100 mt. Using tier 4 and adjusting for the 10% of other species landed in the assemblage, the F_{ABC} was set at F=M=0.02, more conservative than the $F_{40\%}$ rate and yields an ABC of 340.

The total recommended 2000 ABC for demersal shelf rockfish in the SEO District of the GOA is 340 mt, down from 560 mt in 1999. The Plan Team recommendations for demersal shelf rockfish ABC in the SEO Districrt and OFL are presented in Table 2. Harvest alternatives for GOA demersal shelf rockfish are not included in Table x. Additional harvest alternatives could not be evaluated to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). Overfishing is defined as $F_{35\%}$ = 0.0279 for demersal shelf rockfish (tier 4). The OFL for demersal shelf rockfish is 420 mt in the SEO District.

Atka mackerel is a schooling, semi-demersal species, most abundant in the Aleutian Islands. Atka mackerel is harvested primarily with trawl gear. In 1994, Atka mackerel was separated from the other species group in the GOA to prevent overfishing Atka mackerel. The relative abundance and trend of Atka mackerel biomass is unknown. Relative to 1999 SAFE, new sources of information include updated catch information.

Prior to 1997, exploitable biomass and ABC for GOA Atka mackerel were based on triennial bottom trawl survey estimates. However, schooling behavior, patchy distribution, and habitat preference makes

this species difficult to sample with standard trawl survey gear. Atka mackerel are also poor targets for hydroacoustic surveys because they lack swim bladders. Re-evaluation of historical survey data indicated abundance estimates prior to 1997 were also compromised by high variability. Thus, existing GOA bottom trawl survey data has limited utility for either absolute abundance estimates or indices for Atka mackerel.

The Plan Team supports a bycatch only fishery as a conservative harvest policy for Atka mackerel because: 1) there is no reliable biomass estimate; 2) localized depletion may occur; and 3) this species has previously exhibited a particular vulnerability to fishing pressure in the GOA. The Team recommends an ABC of 600 mt in 2000 to satisfy bycatch needs in other fisheries.

The total recommended 2000 ABC for Atka mackerel in the GOA is 600 mt, unchanged from 1999. The Plan Team recommendations for Atka mackerel ABC and OFL are presented in Table 2. Harvest alternatives for GOA Atka mackerel are presented in Table x. Additional harvest alternatives could not be evaluated to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). Under Tier 6 criteria, the overfishing level is equal to 6,200 mt, the average catch for 1978-1995.

Thornyhead rockfish inhabit the outer continental shelf and slope throughout the northeastern Pacific and Bering Sea at depths of 90 to 1,460 meters. Thornyheads have been managed as a single stock in the GOA since 1980. Beginning in 1998, the gulfwide thornyhead ABC was divided between the Western, Central, and Eastern areas of the GOA. The GOA thornyhead biomass can be described as above target stock size and stable. Relative to 1999 SAFE, new sources of information include: 1) updated estimated catch information and 2) biomass and size composition from the 1999 bottom trawl survey.

Shortspine thornyheads were assessed using the same model as in the preceding year. The 1999 NMFS survey extended into deeper water thereby covering more of the shortspine thornyhead habitat. The authors treated the 1999 estimate the same as the earlier surveys where deeper areas had been surveyed. The Team concurred with the author's recommendation for a year 2000 ABC of 2,360 mt (based on Tier 3a; $F_{ABC} = 0.077$). The area specific apportionments give 430, 990, and 940 tons to the Western, Central and Eastern areas, respectively.

The total recommended 2000 ABC for thornyhead rockfish in the GOA is 2,360 mt , up from 1,990 mt in 1999. The Plan Team recommendations for thornyhead rockfish ABCs and OFLs in the GOA by management area are presented in Table 2. Harvest alternatives for GOA thornyhead rockfish ABC levels are presented in Table x. Two other harvest alternatives were evaluated for comparative purposes to determine if under Amendment 56 to the FMP the status of the stock is overfished (any stock below its MSST) or approaching an overfished condition (any stock that is expected to fall below its MSST in the next two years). Spawning biomass is projected to be 23,084 mt in 2000 under an FOFL harvest policy, greater than B35% (15,032 mt). Therefore, GOA thornyhehad stocks stocks are not currently overfished. The projected mean spawning biomass in 2002 is 21,223 mt, greater than B35%.Therfore, GOA thornyhead stocks are not approaching an overfished condition.. Using Tier 3a criteria, the overfishing level based on $F_{35\%} = 0.093$ is 2,830 mt.

Other species in the GOA includes sharks, skates, sculpins, squid, and octopus. At present, these species are not targeted in the GOA and are taken incidentally in trawl and longline fisheries. The relative abundance and trend of these stocks are unknown. The Plan Team reviewed the stock assessment for the

"other species" assemblage in the Gulf of Alaska presented in Appendices D and E to the final SAFE report. The Plan Team believes that following the removal of the forage species, eulachon and smelts, and the proposed removal of sharks and skates, several alternatives considered by Amendment 63 would result in an "other species" assemblage that could not support full harvest of the 5 % TAC without damaging the sustainability of the remaining species groups. In reviewing the status of the "other species" assemblage in the Gulf of Alaska the Plan Team agrees with the assessment authors that cephalopod biomass is substantially underestimated by the bottom trawl survey. Amendment 63 to the Gulf of Alaska FMP analyzes the separation of sharks and skates from the "other species" assemblage in the GOA. The Plan Team recommends that additional alternatives be analyzed in the proposed Amendment 63 to the Gulf of Alaska FMP. The Plan Team recommends that Amendment 63, in addition to evaluating sharks and skates, also undertake a more comprehensive reconstruction of the "other species" assemblage including the following: 1) Remove the FMP provision that establishes the "other species" TAC at 5% of the sum of all other assessed target species in the GOA and 2) Establish ABCs, OFLs, and TACs for the five major species groups in the "other species" assemblage; sharks, skates, sculpins, octopi, and squid. 3) Include the species group grenadiers, and possibly additional utilized species (prowfish for example), in the FMP and establish ABCs, OFLs, and TACs for these species groups.

In the interim, the Plan Team recommends that NMFS place the "other species" assemblage on bycatch status from January 1, 2000 to December 31, 2000. Under current regulations, this action would still allow 20% retention in other directed groundfish fisheries. The vast majority of "other species" catch in previous years has been taken incidentally in other directed groundfish fisheries. This action, if adopted, would approximate the status quo of the groundfish fisheries as they are presently conducted while precluding the development of large-scale directed fisheries on species groups within the "other species" assemblage. For example, 20% octopus could be retained in the Pacific cod pot gear fishery or 20% skates could be retained in either the hook-and-line or trawl gear fisheries. The Plan Team believes that relatively few fish that would otherwise be utilized, would be required by regulation to be discarded.

Table 2. Council recommended total allowable catch specifications for the Gulf of Alaska management area. 1999 OFL, ABC, TAC specifications, and actual catch through September 13, 1999; and recommended 2000 ABC, OFL (revised), and TAC specifications (values are in mt).

		1999				Plan Team Recommendations		
Species	Area	OFL	ABC	TAC	Catch	Area	OFL	ABC
Pollock	W (610)		23,120	23,120	23,385	W (610)		39,590
	C (620)		38,840	38,840	38,129	C (620)		23,560
	C (630)		30,520	30,520	30,093	C (630)		31,000
	subtotal	134,100	92,480	92,480	91,607	WYK (640)		2,410
	WYK (640)			2,110	1,759	subtotal	130,760	96,560
	SEO(6500			6,330	4	SEO(650)	8,610	6,460
	subtotal	12,300	8,440	8,440	1,763			
	Total	146,400	100,920	100,920	93,370	Total	139,370	103,020
Pacific Cod	W		29,540	23,630	23,154	W		27,500
	C		53,170	42,935	44,722	C		43,550
	E		1,690	1,270	874	E		5,350
	Total	134,000	84,400	67,835	68,750	Total	102,000	76,400
Flatfish, Deep Water	W		240	240	22	W		280
	C		2,740	2,740	1,865	C		2,710
	WYK		1,720	1,720	389	WYK		1,240
	SEO		1,350	1,350	9	SEO		1,070
	Total	8,070	6,050	6,050	2,285	Total	6,980	5,300
Rex Sole	W		1,190	1,190	603	W		1,230
	C		5,490	5,490	2,391	C		5,660
	WYK		850	850	41	WYK		1,540
	SEO		1,620	1,620	22	SEO		1,010
	Total	11,920	9,150	9,150	3,057	Total	12,300	9,440
Flatfish, Shallow Water	W		22,570	4,500	252	W		19,510
	C		19,260	12,950	2,282	C		16,400
	WYK		250	250	6	WYK		790
	SEO		1,070	1,070	5	SEO		1,160
	Total	59,540	43,150	18,770	2,545	Total	45,330	37,860
Flathead Sole	W		8,440	2,000	184	W		8,490
	C		15,630	5,000	680	C		15,720
	WYK		1,270	1,270	16	WYK		1,440
	SEO		770	770	11	SEO		620
	Total	34,010	26,110	9,040	891	Total	34,210	26,270
Arrowtooth	W		34,400	5,000	3,656	W		16,160
	C		155,930	25,000	11,787	C		97,710
	WYK		13,260	2,500	382	WYK		23,770
	SEO		13,520	2,500	241	SEO		7,720
	Total	295,970	217,110	35,000	16,066	Total	173,910	145,360
Sablefish[3]	W		1,820	1,820	1,487	W		1,960
	C		5,590	5,590	5,896	C		6,030
	WYK			2,090	1,709	WYK		1,920
	SEO			3,200	3,158	SEO		3,490
	E subtotal		5,290	5,290				
	Total	19,720	12,700	12,700	12,250	Total	16,660	13,400
Rockfish, Other Slope	W		20	20	40	W		20
	C		650	650	615	C		740
	WYK		470	470	122	WYK		250
	SEO		4,130	4,130	12	SEO		3,890
	Total	7,560	5,270	5,270	789	Total	6,390	4,900

Table 2 - continued. Council recommended total allowable catch specifications for the Gulf of Alaska management area. 1999 ABC, TAC specifications, and actual catch through September 13, 1999; and recommended 2000 ABC, OFL (revised), and TAC specifications (values are in mt).

		1999				Plan Team Recommendations		
Species	Area	OFL	ABC	TAC	Catch	Area	OFL	ABC
Rockfish, Northern	W		840	840	573	W		630
	C		4,150	4,150	4,826	C		4,490
	E		na	na	na	E		na
	Total	9,420	4,990	4,990	5,399	Total	7,510	5,120
Pacific Ocean Perch	W	2,610	1,850	1,850	850	W	1,460	1,240
	C	9,520	6,760	6,760	7,501	C	10,930	9,240
	WYK		1,350	820	610	WYK		840
	SEO		3,160	3,160		SEO		1,700
	E subtotal	6,360				E subtotal	3,000	
	Total	18,490	13,120	12,590	8,961	Total	15,390	13,020
Shortraker/Rougheye	W		160	160	194	W		210
	C		970	970	579	C		930
	E		460	460	536	E		590
	Total	2,740	1,590	1,590	1,309	Total	2,510	1,730
Rockfish, Pelagic Shelf	W		530	530	130	W		550
	C		3,370	3,370	3,835	C		4,080
	WYK		740	740	672	WYK		580
	SEO		240	240	21	SEO		770
	Total	8,040	4,880	4,880	4,658	Total	9,040	5,980
Rockfish, Demersal Shelf	SEO	950	560	560	243	SEO	420	340
Atka Mackerel	Gulfwide	6,200	600	600	262	Gulfwide	6,200	600
Thornyhead	W		260	260	282	W		430
	C		700	700	582	C		990
	E		1,030	1,030	416	E		940
	Total	2,840	1,990	1,990	1,280	Total	2,820	2,360
Other Species	Gulfwide		NA	15,570	3,698	Gulfwide		NA
GULF OF ALASKA	TOTAL	778,890	532,590	327,046	227,454	TOTAL	581,040	451,100

3.2 Prohibited Species Stock Status

Prohibited species taken incidentally in groundfish fisheries include: Pacific salmon (chinook, coho, sockeye, chum, and pink salmon), steelhead trout, Pacific halibut, Pacific herring, and Alaska king, Tanner and snow crab. The Council recommends prohibited species catch (PSC) limits to control its bycatch of prohibited species in the groundfish fisheries. During haul sorting, these species or species groups are to be returned to the sea with a minimum of injury except when their retention is required by other applicable law. The status of the different prohibited species are summarized as follows:

Pacific salmon are managed by the State of Alaska. A detailed description of its management, production history, and life history are contained in Section 3.7.2 of the SEIS. Salmon run sizes off Alaska have exhibited wide variations throughout its known history and have generally been strongly correlated to environmental factors.

In 1999 salmon harvests in Alaska are estimated at nearly 208 million fish, making it the second largest commercial catch in the State's history. Following two years (1997 and 1998) of low red salmon returns to Bristol Bay, preseason forecasts of the run strength were greatly exceeded. Returns of over 39 million fish met all escapement goals for Bristol Bay. Commercial harvests in Bristol Bay exceeded 26 million fish which approximates the most recent 20 year average harvest for the Bay. The statewide pink salmon

harvest of 140 million fish set a new record high for that species. Southeast Alaska's harvest of nearly 75 million pinks far exceeds the region's previous record of 64 million in 1966. Prince William Sound's harvest of over 40 million pinks is close to the region's record harvest of 44 million achieved in 1990. The overall harvests of nearly 20 million chum salmon also ranks among the three historical largest, however poor returns of chum salmon to the Yukon, Kuskokwin, and Norton Sound region remain a concern. Harvests of coho salmon were down in all areas expect Southeast Alaska. Of particular concern are poor returns to the Kuskokwim area which reached only 10 percent of expectations. The statewide harvest of 350,000 king salmon is down by nearly a third from 1998.

In the Bering Sea, a PSC limit of 48,000 chinook salmon exists between January 1 and April 15, for trawl gear in the Chinook Salmon Savings Area (CHSSA) (Figure 3-9 of the NMFS 1998 SEIS (§ 679.21 (e)(1)(v)). A PSC limit of 42,000 non-chinook salmon between August 15 and October 15 in the Catcher Vessel Operational Area (§ 679.21 (e)(1)(vi)) was also established. Pacific salmon bycatch data are routinely tabulated by species only for chinook salmon. All other salmon species and steelhead trout are merged as "other salmon". NMFS is preparing a proposed rule to implement BSAI FMP Amendment 58. When implemented this action would: 1) reduce the chinook salmon bycatch limit from 48,000 to 29,000 chinook salmon over a 4-year period, beginning with 41,000 in the year 2000, 2) implement year-round accounting of chinook salmon bycatch for the pollock fishery, beginning on January 1 of each year, 3) revise the boundaries of the chinook salmon savings area (CHSSA) , and 4) set new CHSSA closure dates.

In the GOA, while PSC limits have not been established for salmon, in previous years the timing of seasonal openings for pollock in the Central and Western GOA have been adjusted to avoid periods of high chinook and chum salmon bycatch. In 1999, the groundfish fisheries of the GOA had a bycatch of 31,232 chinook and 7,225 "other" salmon through October 30, 1999. In the BSAI in 1999, neither the chinook or non-chinook PSC limits were exceeded to trigger closure of the CHSSA or CVOA. Incidental takes of salmon through October 30, 1999, in the BSAI are reported in Table 3.

Table 3--Incidental Take of Salmon in BSAI Trawl Fisheries in 1999 (values are in numbers of fish), through October 30, 1999.

BSAI Trawl Fishery Group	Chinook	Other Salmon	Total
Midwater Pollock	14,888	62,777	77,665
Bottom Pollock	0	0	0
Pacific Cod	2,249	57	2,307
Yellowfin Sole	0	412	412
Rock Sole/Other Flatfish	288	717	1,005
Rockfish	1	0	1
Other	51	812	863
Total	17,477	64,775	82,252

Pacific halibut fisheries are managed by a Treaty between the United States and Canada through recommendations of the International Pacific Halibut Commission (IPHC). Pacific halibut is considered to be one large interrelated stock, but is regulated by subareas through catch quotas. The commercial and recreational fishery has a long tradition dating back to the late 1800s . Further details on the

management, production history, and life history of Pacific halibut are described in section 3.7.2 of the SEIS.

The halibut resource is considered to be healthy, with total catch near record levels. The current estimate of exploitable halibut biomass for 1999 is estimated to be 227,366 mt. The exploitable biomass of the Pacific halibut stock apparently peaked at 326,520 mt in 1988 (Sullivan, 1998). The long-term average reproductive biomass for the Pacific halibut resource was estimated at 118,000 mt (Parma, 1998). Long-term average yield was estimated at 26,980 mt, round weight (Parma, 1998). The species is fully utilized. Recent average catches (1994-96) were 33,580 mt for the U.S. and 6,410 mt for Canada, for a combined total of 39,990 mt for the entire Pacific halibut resource. This catch was 48 percent higher than long-term potential yield, which reflects the good condition of the Pacific halibut resource. At its January 1999 annual meeting, the IPHC recommended commercial catch limits totaling 35,314 mt (round weight equivalents) for Alaska in 1999, up from 32,580 mt in 1998. Though November 10, 1999 commercial hook-and line harvests of halibut in Alaska total 33,377 mt (round weight equivalents).

Fixed PSC mortality limits have been set for the Alaska groundfish fisheries. Each year the IPHC evaluates the performance of the groundfish fisheries and recommends mortality rates for halibut bycatch in each groundfish fishery. PSC amounts for Pacific halibut mortality are actually deducted from the available fishery yields for the directed Pacific Halibut fishery by the IPHC. Therefore, the allowable commercial catch of halibut is reduced on account of halibut bycatch mortality in the groundfish fisheries. The Council uses the best estimate of halibut bycatch mortality rates each year and the groundfish TAC apportionments to project halibut bycatch mortality allowances for each gear and target fishery group. NMFS monitors halibut bycatch performance throughout the fishing season, including the extrapolation of data to unobserved vessels, and closes fishing by gear group before bycatch mortality limits are reached.

In the GOA, the PSC mortality limit for halibut is 2,300 mt (allocated as 2,000 mt for the trawl fisheries and 300 mt to the hook & line fisheries). Since 1996 pot gear and jig gear targeting groundfish, and hook-and-line gear targeting sablefish have been exempted from PSC caps due to relatively low bycatch by these gear types and since the sablefish and halibut IFQ program requires quota share holders to retain halibut. The 2,000 mt of halibut mortality allocated to trawl gear is further apportioned by season throughout the fishing year and to two target fishery complexes; the shallow water complex (consisting of pollock, pacific cod, shallow-water flatfish, flathead sole, Atka mackerel, and "other species") and the deep-water complex (consisting of sablefish, rockfish, deep-water flatfish, rex sole, and arrowtooth flounder) In 1999, the 2000 mt mortality limit for the trawl fisheries was exceeded by 6 % (2,124 mt). The 300 mt of halibut mortality allocated to the hook-and-line fisheries is apportioned 10 mt to the demersal shelf rockfish fishery and 290 to other hook-and-line fisheries. The 290 mt PSC cap for other hook-and-line fisheries is further apportioned seasonally throughout the fishing year. In 1999, 290 mt mortality limit for the other hook-and-line fisheries in the GOA was exceeded by 19% (344 mt).

The BSAI halibut PSC mortality limit is 4,675 mt (3,492 mt for trawl and 832 mt for non-trawl gear, and 352 mt for the multispecies CDQ program). The trawl mortality component (3,492 mt) is sub-allocated to target groundfish fisheries (Pacific cod, yellowfin sole, rock sole, pollock/Atka mackerel/other species, and rockfish). The 1999 bycatch amounts of Pacific halibut in the BSAI through October 30, 1999, by the trawl groundfish fisheries are given in Table 4. Although some target fisheries exceeded their bycatch allocations, the overall halibut PSC limit has not been exceeded.

Table 4—Halibut Bycatch in BSAI Trawl Fisheries in 1999 through October 30, 1999.

BSAI Trawl Fishery Group	Bycatch (mt)	Cap (mt)	Percent
Pacific cod	1,314	1,473	89%
Yellowfin sole	869	955	91%
Rock sole/Flathead sole/Other Flats	848	755	112%
Pollock/Atka mackerel/Other Spp.	284	238	119%
Rockfish	53	71	75%
Turbot/Arrowtooth flounder/Sablefish	75	0	
Total	3,443	3,492	96%

The bycatch amounts of Pacific halibut through October 30, 1999 by the fixed-gear groundfish fisheries are given in Table 5. None of the target fisheries have exceeded their bycatch allocations.

Table 5—Halibut Bycatch in BSAI Fixed Gear Fisheries in 1999 through October 30, 1999.

BSAI Fixed Gear Fishery Groups	Bycatch (mt)	Cap (mt)	Percent
Pacific cod, Hook & Line	489	598	82%
Other species, Hook & Line, Jig	98	234	42%
Total	587	832	71%

Pacific Herring fisheries are managed by the State of Alaska. A detailed description of its management, production history, and life history are contained in Section 3.7.4 of the Final Groundfish SEIS. The fisheries occur in specific areas in the Gulf of Alaska and the Bering Sea when the stocks come inshore to spawn. In the Gulf of Alaska, spawning concentrations occur mainly off southeastern Alaska, in Prince William Sound, and around the Kodiak Island-Cook Inlet area. In the Bering Sea, the centers of abundance are in northern Bristol Bay and Norton Sound. Although most herring are harvested near-shore in the sac-roe season in spring, fall seasons are also designated for food and bait fisheries. From catch records, it is evident that herring biomass fluctuates widely due to influences of strong and weak year-classes. The Bering Sea and Gulf of Alaska stocks are currently at moderate to high levels and in relatively stable condition, with the exception of Prince William Sound and Cook inlet. Stock assessments indicated that the herring biomass in Prince William Sound and Cook Inlet were below the minimum threshold needed to conduct a harvest so these fisheries were closed for 1999. Statewide harvests of herring in 1999 were estimated at 34,066 mt, recent statewide harvests have averaged 46,300 mt.

Pacific herring PSC limitations in the groundfish fisheries apply to trawl gear in the Bering Sea. The PSC limit for trawl gear is determined each year during the ABC and TAC setting process, and is set at 1 percent of the estimated EBS herring biomass, which is further apportioned by target fishery (§ 679.21 (e)(1)(iv)). Should the herring PSC limit for a particular groundfish target fishery be reached during the fishing year, the trawl fishery for that species is closed in the Herring Savings Areas (Figure 3-10 of the NMFS 1998 SEIS) (§ 679.21 (e)(7)(v)). In 1999, the bycatch amounts of Pacific herring through October 30, 1999, in the trawl groundfish fisheries are given in Table 6. None of the bycatch allocations have been exceeded.

Table 6—Herring Bycatch in the BSAI Area in 1999 through October 30, 1999.

BSAI Trawl Fishery Group	Bycatch (mt)	Cap (mt)	Percent
Midwater pollock	973	1,217	80%
Pacific cod	0	22	0%
Yellowfin sole	89	254	35%
Rockfish	0	8	0%
Other	18	152	12%
Rock sole/Other flatfish	2	22	8%
Turbot/A. flounder/Sablefish	1	10	10%
Total	1,084	1,685	64%

Alaska king, Tanner and snow crab fisheries are managed by the State of Alaska, with federal oversight established in the FMP for the BSAI crab fisheries. The commercially important crab species are: red king crab (*Paralithodes camtschaticus*), blue king crab (*Paralithodes platypus*), golden or brown king crab (*Lithodes aequispinus*), Tanner crab (*Chionoecetes bairdi*), and snow crab (*Chionoecetes opilio*). A detailed description of their management, production history, and life history are contained in Section 3.7.1 of the SEIS.

Annual trawl surveys for crab stock assessments are conducted by NMFS in the BSAI. A length-based analysis, developed by ADF&G, incorporates survey, commercial catch, and observer data to estimate stock abundance (Zheng 1995; Zheng 1998). Abundance estimates generated by this model are used to set guideline harvest levels for the crab fisheries. Catches are restricted by guideline harvest levels, seasons, permits, pot limits, and size and sex limits that restrict landings to legal sized male crabs. Fishing seasons are set at times of the year which avoid molting, mating, and softshell periods, both to protect crab resources and to maintain product quality.

Based on analysis of the 1999 NMFS survey results, the latest status of red king crabs are as follows. In Bristol Bay the number of mature male red king crab increased in 1999. Numbers of mature female red king crabs (>90mm carapace width), however, decreased. The effective spawning biomass is estimated at 47 million pounds (21,319 mt). A 10 percent exploitation rate of mature male crabs has, therefore, been established for the 1999 fishery, down from the 15 percent exploitation rate in 1998. The guideline harvest level (GHL) for 1999 is 10.66 million pounds (4,835 mt), which includes 0.533 million pounds (242 MT) for the CDQ fisheries. This is a reduction from the 16.4 million pound (7,439 mt) GHL in 1998. The Bristol Bay stock remains depressed compared to past abundance levels. In 1999 259 vessels participated in the fishery, harvesting 11 million pounds (4,990 mt) in five days. Estimates of red king crabs in the Pribilof Islands area increased significantly from 1998. However, most red king crabs were captured in a single tow, making the reliability of that estimate extremely low. Given significant declines of blue king crab in that area, the high degree of uncertainty surrounding the estimate of red king crab abundance, and the poor fishery performance of recent years, the red and blue king crab fishery in the Pribilof District will remain closed in 1999. In 1999, the bycatch amounts of red king crab by the various trawl target fisheries in Zone 1 of the BSAI through October 30, 1999 are listed in Table 7. None of the PSC caps for targeted fisheries has been exceeded.

Table 7—Bycatch of Red King Crab in Zone 1 BSAI Fisheries in 1999 through October 30, 1999.

BSAI Trawl Fishery Group	Number of Crab	PSC Cap (number of crab)	Percent
Rock sole/Other flatfish	62,490	103,950	60 %
Pacific cod	7,506	14,850	51 %
Yellowfin sole	12,613	19,800	64 %
Pollock/Atka mackerel/Other Spp.	91	1,850	5 %
Total	82,699	140,050	59 %

The blue king crab population in the Pribilof District is low and population trends are not easily detectable
(NPFMC 1998b). For reason outline above, the Pribilof district will remain closed in 1999. Survey results for blue king crabs in the St. Matthews Island area indicate dramatic declines of both male and female crabs in all size categories, with mature males at the lowest level since 1986. Results of the 1999 ADF&G near-shore pot survey of St. Matthew Island are also consistent with a dramatic decline in mature female abundance. The current estimate of spawning biomass , 2177 mt, is well below the minimum stock size threshold (MSST) of 4990 mt . This stock is overfished as defined in the federal BSAI King and Tanner Crab Fishery Management Plan. As a result, and coupled with the poor fishery performance in 1998, this area will remain closed for the 1999 season. The Council is currently developing a rebuilding plan.

ADF&G and NMFS do not make annual abundance estimates for Bering Sea golden king crabs and commercial harvest is controlled by ADF&G permit (Morrison 1998). Catches have declined from the early years of the fishery as the virgin stock was exploited and recruitment was unable to sustain the fishery at its initial harvest levels (Morrison 1998). In 1995 the State of Alaska mandated observer coverage for all vessels targeting golden king crab in the Aleutian Islands.

The Tanner crab fishery was closed in 1997 and 1998 due to low abundance. Based on 1999 survey results, the abundance of legal sized *C. bairdi* Tanner crabs continues to be extremely low and showed little change from 1998. In contrast, the abundance of mature female and small crabs of both sexes increased by 80 percent and 64 percent respectively. However, due to the extremely low abundance of legal male crabs, the entire Bering Sea will remain closed to the harvest of *C. bairdi* Tanner crabs for the 1999/2000 fishing season. The stock was declared overfished on March 3, 1999, because survey data indicated that spawning biomass was below the MSST established for this stock. At its October 1999 meeting the Council adopted a rebuilding plan for this stock. The plan consists of a conservative and precautionary harvest strategy, reduced crab bycatch in crab fisheries through the Board of Fisheries, increased habitat protection through consultations, and allowances for future actions to be taken to stay within the projected rebuilding time period. The 1999 bycatch amounts of Tanner crab through October 30,1999 by the various trawl target fisheries in Zones 1 and 2 of the BSAI are given in Table 8. The trawl target fisheries have not exceed any Tanner crab PSC allocations, except for the Greenland turbot/Arrowtooth/Sablefish target species.

Table 8—Bycatch of Tanner crab in the BSAI by Area in 1999 through October 30, 1999.

BSAI Trawl Fishery Group	Zone 1			Zone 2		
	Crabs #	Cap #	%	Crabs #	Cap #	%
Rock sole/Other Flatfish	132,148	279,528	47%	170,977	376,274	45%
Pacific cod	77,765	139,950	56%	42,884	205,528	21%
Yellowfin sole	148,843	260,894	57%	301,418	1,128,824	27%
Pollock/Atka/ Other .	655	13,378	5%	5,092	19,146	27%
Rockfish	0	0	0%	0	7,378	0%
Turbot/A.Flounder/ Sablefish	0	0	0%	1,381	0	
Total	359,421	693,750	52%	521,752	1,737,150	30%

From a low in 1985, snow crab rebounded sharply, producing high catches in 1991 which have since declined. The biomass of both male and female snow crab in the Bering Sea declined significantly from levels observed during the 1998 survey. This year's estimate of male crabs 4 inches and larger dropped 63 percent from last year. In addition, 41 percent of legal males observed were old shell crabs. The number of small crabs observed during the 1999 survey declined 50 percent and female crabs declined 60 percent. Survey results indicate that the Bering Sea snow crab stock is below the MSST of one half the long term average mature biomass as defined in the FMP for BSAI king and Tanner crab. The Magnuson-Stevens Act directs NMFS to develop a rebuilding plan within one year to bring the stock back to the average mature biomass. The snow crab stock is expected to further decline and thus remain below the minimum stock size threshold next year given the current size and age distribution even if there were no fishery this season. ADF&G has established a GHL of 28.5 million pounds (12,928 mt) for the 2000 fishing season, which includes 2.137 million pounds (970 mt) for the CDQ fishery. This amount is an 85 % reduction from the 1999 GHL of 196 million pounds (89,000 mt). The outlook for a fishery in 2001 appears doubtful at this time. In 1999, *C. opilio* bycatch was apportioned by fishery for the first time. No PSC allocation has been exceeded. Bycatch of snow crab in the BSAI fisheries through October 30, 1999 is reported in Table 9.

Table 9—Bycatch of *C. opilio* Crab by Trawl Fisheries in the BSAI in 1999 through October 30, 1999.

BSAI Trawl Fishery Group	Crab #s	Cap #s	Percent
Rock sole/Other flatfish	242,035	766,552	32%
Pacific cod	20,957	127,758	16%
Yellowfin sole	342,109	3,108,786	11%
Pollock/Atka mackerel/Other Spp.	1,210	74,234	2%
Rockfish	0	42,585	0%
Turbot/Arrowtooth flounder/Sablefish	0	42,585	0%
Total	606,311	4,162,500	15%

3.3 Forage Species

Forage fish species are abundant fishes that are preyed upon by marine mammals, seabirds and other commercially important groundfish species. Forage fish perform a critical role in the complex ecosystem

functions of the Bering Sea and Aleutian Islands management area and the Gulf of Alaska by providing the transfer of energy from the primary or secondary producers to higher trophic levels. Because of their importance to so many ecosystem components, a new management assemblage for forage fish was established in 1998 in Amendments 36 and 39 to the BSAI and GOA FMPs, respectively (63 FR 13009, March 17, 1998). Although ABC and TAC amounts are not specified for species in the forage fish category, the amendments provide protection for forage fish by preventing the development of commercial fisheries for these species. Directed fishing for forage fish species is restricted year-round with a maximum retainable bycatch of 2 percent. These Amendments also established mandatory reporting categories for forage fish species that took effect during 1998.

The following forage species are included in the new forage fish category established in 1998: Osmeridae (which includes capelin and eulachon), Myctophidae, Bathylagidae, Ammodytidae, Trichodontidae, Pholidae, Stichaeidae, Gonostomatidae, and the Order Euphausiacea. For further detailed discussion of forage fish species, see section 3.3.3.13 of the SEIS.

3.4 Status of Marine Habitat

Inclusively all the marine waters and benthic substrates in the management areas comprise the habitat of the target species. Additionally the adjacent marine waters outside the EEZ, adjacent State waters inside the EEZ, shoreline, freshwater inflows, and atmosphere above the waters, constitutes habitat for prey species, other life stages, and species that move in and out of, or interact with, the target species in the management areas. Distinctive aspects of the habitat include water depth, substrate composition, substrate infauna, light penetration, water chemistry (salinity, temperature, nutrients, sediment load, color, etc.), currents, tidal action, plankton and zooplankton production, associated species, natural disturbance regimes, and the seasonal variability of each aspect. Substrate types include bedrock, cobbles, sand, shale, mud, silt, and various combinations of organic material and invertebrates which may be termed biological substrate. Biological substrates present in these management areas include corals, tunicates, mussel beds, tube worms. Biological substrate has the aspect of ecological state (from pioneer to climax) in addition to the organic and inorganic components. Ecological state is heavily dependant on natural and anthropogenic disturbance regimes. The fishery management plans (NPFMC 1999a; b) contain some descriptions of habitat preferences of the target species and projects are underway to systematically present biological requirements for each life history stage that are known (NMFS-Council in progress). Much remains to be learned about habitat requirements for most of the target species.

Appendix E of this EA contains an assessment of impacts to essential fish habitat as required by amendments to the Magnuson-Stevens Fishery Conservation and Management Act of 1996. EFH consultation must be concluded before a Finding of No Significant Impact NEPA determination can be reached for the proposed 2000 TAC specifications.

For further information about the habitat and ongoing habitat studies in the fisheries management area, see Section 3.1 and 3.6 of the NMFS 1998 SEIS, and Appendix D (Ecosystems Considerations for 2000).

3.5 Status of Marine Mammal Pinniped Species

The SEIS (NMFS 1998) contains a detailed analysis on the ecology, population trends, and the impacts of an array of alternative TAC specifications on marine mammals. For further information see Section 3.4 and 4.3.2 of the SEIS (NMFS 1998), and the section on marine mammals in Appendix. New

information on population status and current management concerns for selected marine mammals is summarized below.

Steller Sea Lions

Recent reviews of Steller sea lion population status in Alaska are contained in the Section 7 Biological Opinions on ESA listed species (NMFS 1998b, 1998c, and 1999.) Recent survey data used to monitor population status are summarized below:

NMFS and ADF&G conducted surveys of Steller sea lion pups and non-pups during June and July of 1998 from southeast Alaska to the western Aleutian Islands. Numbers of sea lions counted during a "winter" or "non-breeding season" survey conducted in March 1999 are still being analyzed. In general, numbers of non-pups in the western stock (west of 144°W) continued to decline in 1998 (Table 10). In the Kenai to Kiska area, non-pup numbers at trend sites declined by 12.8 percent from 1994 to 1998 (18,713 to 16,315) and 8.9 percent (17,900 to 16,315) from 1996 to 1998. This compares to a Kenai to Kiska decline of 4.6 percent from 1994 to 1996. The Aleutian Islands as a whole declined by 7.3 percent from 1996 to 1998, as compared to a marginal increase (1.1 percent) from 1994 to 1996. Combined, the western and central Gulf of Alaska declined 12.4 percent from 1996 to 1998, and 4.0 percent from 1997 to 1998. The central Aleutian Islands (Islands of Four Mountains to Kiska) was the one area that did show a marginal increase (4.2 percent) from 1996 to 1998.

Although the numbers for southeast Alaska show a decline, only 18 sites were surveyed in 1998, and other indications, particularly pup count results (below) suggest that the population in this area is stable. Survey coverage in the eastern Gulf of Alaska was too incomplete to provide a reliable trend for non-pups.

NMFS and ADF&G conducted counts of Steller sea lion pups at all rookeries in Alaska, from the Forrester Complex in southeast Alaska to Attu Island in the western Aleutian Islands during 19 June to 5 July 1998. Since 1994, the last range-wide pup counts, pup numbers decreased by 10.8 percent (from 14,198 pups to 12,670) at all rookeries (Table 11). For the western stock (reflected by the counts from Kenai to Kiska) the decline was 19.1 percent over 4 years. In general, pup numbers were up slightly in parts of the central Aleutian Islands (8 rookeries from Seguam Island to the Delarof Islands), but down elsewhere. Rookeries in the western Aleutian Islands (particularly those in the Near Islands: 3 rookeries at Attu and Agattu Islands) were counted completely for the first time in 1997. Pup numbers at these three rookeries declined by 18.0 percent in one year (979 pups to 803 pups). The 2 rookeries in the eastern Gulf of Alaska declined 23.7 percent from 1994 to 1998, but increased 13 percent from 1997 (610 pups to 689). Pup numbers in southeast Alaska have increased 12.3 percent from 1994, but showed little change from 1997 to 1998.

Table 10--Counts of Non-pup Steller Sea Lions at Trend Sites (Rookeries and Haulouts) During Aerial Surveys in Alaska, 1994 to 1998.

Region	Non-pup counts at Trend Sites 1994	1996	1998	Percent change 1994-98	1996-98
Western Aleutian Islands	2,037	2,190	1,913	6.1	12.6
Central Aleutian Islands	5,790	5,528	5,761	< 1	4.2
Eastern Aleutian Islands	4,421	4,716	3,847	13.0	18.4
Western Gulf of Alaska	3,982	3,741	3,361	15.6	10.2
Central Gulf of Alaska	4,520	3,915	3,346	26.0	14.5
Kenai to Kiska subtotal (Central Gulf of Alaska through central Aleutian Islands)	18,713	17,900	16,315	12.8	8.9

Table 11--Counts of Steller Sea Lion Pups in Alaska, 1994 to 1998.

Region	Number of rookeries	1994	1997	1998	Percent change 94-98	97-98
Western Aleutian Islands	4		979	803		-18.0
Central Aleutian Islands	16	3,162		2,862	-9.5	
Eastern Aleutian Islands	6	1,870		1,516	-18.9	
Western Gulf of Alaska	4	1,662		1,493	-10.2	
Central Gulf of Alaska	5	2,831		1,876	-33.7	
Eastern Gulf of Alaska	2	903	610	689	-23.7	13
Western Stock subtotal (Kiska to Seal Rocks)	33	10,428		8,436	-19.1	
Southeast Alaska	3	3,770	4,160	4,234	12.3	1.8

Northern fur seals

Northern fur seals were listed as depleted in 1988 under the Marine Mammal Protection Act. Much of the research effort for fur seals takes place on the Pribilof Islands (St. Paul and St. George). The NMML conducts counts of adult males (bulls) annually, and counts of pups biennially. Analysis of the 1998 bull and pup counts indicate a continued slight decrease in fur seal numbers on both of the Pribilof Islands. From 1997 to 1998 the total number of adult males on the Pribilof Islands decreased by 1.6 percent. Because of the high variability in these counts, however, several more years of data are needed to determine if a trend exists. The estimate of the total number of pups born on St. Paul Island in 1998 was 179,149 (SE = 6,193); the standard error accounts for variance in the estimation of both live and dead pups. The total estimated number of pups born in 1998 was not significantly different ($P = 0.82$) from 1996, but was significantly less than the estimate in 1994 ($P < 0.01$). The total number of pups born on St. George Island and the approximate 95 percent confidence interval was 21,547 - 22,633. The 1998 estimate of pups born on St. George Island is significantly less ($P < 0.01$) than the number of pups born in 1996, but the estimate is not significantly different ($P = 0.22$) from the estimate of the number of pups born in 1994..

Harbor seals

The NMFS National Marine Mammal Laboratory (NMML) conducted aerial assessment surveys for harbor seals in the southern portion of southeast Alaska, from Frederick Sound to the US/Canadian border in 1998. The northern portion of southeast Alaska was surveyed in 1997. Two observers worked out of Petersburg and five observers used Ketchikan as their base of operations. From 18 to 28 August, the entire coastline was surveyed from small, single-engine aircraft equipped with floats, at an altitude of 200-250 m (700-800 ft.). Observers estimated the number of seals hauled out and took photographs of all seal haulouts. Results from the two surveys will be combined to produce an overall estimate for southeast Alaska.

When seals are censused from the air, an unknown number of seals are in the water and not present at the haulout sites. A companion project to the assessment surveys is development of a correction factor for each haulout type (rocky, sandy, and ice) to account for seals not present at the time of the census surveys. This is accomplished by capturing 20-40 seals and attaching a small VHF radio transmitter to the left rear flipper. The proportion of radio-tagged seals hauled during subsequent surveys should be representative of all seals at the haulout. The resulting correction factor is then applied to the population estimates derived in the assessment analysis. The estimates are then adjusted upwards to account for those seals not present during the aerial census surveys.

Correction factors have been developed previously for seals hauling out on rocky and sandy substrates. Little is known about the seals hauling out on glacial ice since no one has been able to successfully capture one. The NMML developed new capture techniques using a variety of net materials and types and net deployment methods. In early August, the NMML successfully captured and radio-tagged 19 seals at Aialik and Peterson Glaciers in the Kenai Fiords National Park near Seward, Alaska. Their movements were tracked from aircraft (22 August to 2 September) and remote data collection computers (19 August to about 8 October). Results from the assessment and correction factor surveys are currently being analyzed and will be used to estimate the number of harbor seals in Alaska and determine key components used in the NMFS annual stock assessment report.

Beluga whales

The NMML flew aerial surveys of the isolated stock of beluga whales in Cook Inlet, Alaska, during June and July of 1993 through 1998. This included nearly 100% of the coastal areas each year, and with the addition of offshore transects, systematic searches encompassed 13 to 29 percent of the entire inlet. Beluga whales were concentrated in a few dense groups in shallow areas near river mouths in the northern portion of upper Cook Inlet. Very few belugas occurred elsewhere. Over the past three decades, there have been decreases in sightings of beluga whales both in offshore areas and in lower Cook Inlet. Since 1995, there have been no sightings in our surveys south of the upper inlet. Results of these surveys and status of beluga whales will be reported in a stock assessment report in December 1999.

Harbor porpoise and Dall's porpoise

Researchers from the NMML conducted line transect aerial surveys for harbor porpoise and Dall's porpoise from 27 May to 28 July 1998 in the Gulf of Alaska (offshore waters from Cape Suckling to Unimak Pass), Prince William Sound, and Shelikof Strait. The survey aircraft was a Twin Otter flown at an altitude of 500 ft and an airspeed of 100 knots. Sawtooth lines covered the offshore waters from Cape Suckling to Unimak Pass (offshore of Kodiak Island) from about 15 nm seaward to the 1,000 fathom line. A series of zigzag lines covered Shelikof Strait, between the Alaska Peninsula and Kodiak Island. Larger inlets and bays were also included in the survey. The survey in Prince William Sound consisted

of two lines: one covering the central waters and one along the coast with extensions into selected inlets. Two primary observers surveyed from bubble windows on each side of the aircraft. A third observer, viewing directly beneath the aircraft from a belly window, recorded porpoises missed on the trackline by the primary observers.

Poor weather restricted the completion of the entire planned survey. Survey lines were completed in Prince William Sound and an adequate number of survey miles were completed offshore from Cape Suckling west along the Kenai Peninsula, offshore of Kodiak Island, west to Sutwik Island (Alaska Peninsula), and in Shelikof Strait. A total of 5,722 nm were flown, with sightings of 83 harbor porpoise, 69 Dall's porpoise, 13 killer whales, 47 humpback whales, 24 fin whales, 1 Cuvier's beaked whale, 1 northern right whale, 25 harbor seals, 20 Steller sea lions, and 1 northern fur seal. These data are used to estimate annual abundance of harbor porpoise and Dall's porpoise, one of the key pieces of information needed to manage marine mammal-fishery interactions. A report will be available by December 1999.

3.6 Seabird Species Population Status

Seabirds spend the majority of their life at sea rather than on land. Alaska's extensive estuaries and offshore waters provide breeding, feeding, and migrating habitat for approximately 100 million seabirds. Thirty-four species breed in the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) regions and number 36 million and 12 million individuals, respectively. Another 6 species breed at other locations in Alaska. In addition, up to 50 million shearwaters and 3 albatross species feed in Alaskan waters during the summer months but breed farther south. Detailed seabird information on species population status, life history, ecology, and bycatch is contained in section 3.5 of the SEIS (NMFS 1998a). The only new information on seabirds since publication of the SEIS concerns the taking of short-tailed albatross and subsequent Section 7 consultations on that species. It is summarized below:

On 22 October 1998, NMFS reported the incidental take of 2 endangered short-tailed albatrosses in the hook-and-line groundfish fishery of the BSAI. The first bird was taken on 21 September 1998, at 57 30'N, 173 57'W. The bird had identifying leg bands from its natal breeding colony in Japan. It was 8 years old. In a separate incident, one short-tailed albatross was observed taken on 28 September 1998, at 58 27'N, 175 16'W, but the specimen was not retained for further analysis. Identification of the bird was confirmed by USFWS seabird experts. The confirmation was based upon the observer's description of key characteristics that matched that of a subadult short-tailed albatross to the exclusion of all other species. A second albatross was also taken on 28 September 1998, but the species could not be confirmed (3 species of albatross occur in the North Pacific). Both vessels were using seabird avoidance measures when the birds were hooked.

The current world population of short-tailed albatross is approximately 1200 individuals. Because it is listed as endangered under the ESA, actions such as these fisheries which may effect the species are subject to section 7 consultations. Under terms of the 1999 biological opinion, incidental take statement, a take of up to 4 birds is allowed during the 2-year period of 1999 and 2000 for the BSAI and GOA hook-and-line groundfish fisheries (USFWS 1999). If the anticipated level of incidental take is exceeded, NMFS must immediately reinitiate formal consultation with the USFWS to review the need for possible modification of the reasonable and prudent measures established to minimize the impacts of the incidental take.

NMFS Regional Office, NMFS Groundfish Observer Program, and the USFWS Offices of Ecological Services and Migratory Bird Management are actively coordinating efforts and communicating with each

other in response to the 1998 take incidents and are complying to the fullest extent with ESA requirements to protect this species. Regulations at 50 CFR Parts 679.24(e) and 679.42(b)(2) contain specifics regarding seabird avoidance measures. In February 1999, NMFS presented an analysis on seabird mitigation measures to the Council that investigated possible revisions to the currently required seabird avoidance methods that could be employed by the long-line fleet to further reduce the take of seabirds.

The Council took final action at its April 1999 meeting to revise the existing requirements for seabird avoidance measures. The Council's preferred alternative would: 1) Explicitly specify that weights must be added to the groundline. (Currently, the requirement is that baited hooks must sink as soon as they enter the water. It is assumed that fishermen are weighting the groundlines to achieve this performance standard.); 2) The offal discharge regulation would be amended by requiring that prior to any offal discharge, embedded hooks must be removed; 3) Streamer lines, towed buoy bags and float devices could both qualify as bird scaring lines. (Specific instructions are provided for proper placement and deployment of bird scaring lines.); 4) Towed boards and sticks would no longer qualify as seabird avoidance measures; 5) The use of bird scaring lines would be required in conjunction to using a lining tube; and 5) Night-setting would continue to be an option and would not require the concurrent use of a bird scaring line.

These revised seabird avoidance measures are expected to be effective early in 2000. The avoidance measures affect the method of harvest in the hook and line fisheries, but are not intended to affect the amount of harvest.

3.7 Impacts on Endangered or Threatened Species

The Endangered Species Act of 1973 as amended (16 U.S.C. 1531 *et seq*; ESA), provides for the conservation of endangered and threatened species of fish, wildlife, and plants. The program is administered jointly by the NMFS for most marine mammal species, marine and anadromous fish species, and marine plants species, and by the USFWS for bird species, and terrestrial and freshwater wildlife and plant species.

The designation of an ESA listed species is based on the biological health of that species. The status determination is either threatened or endangered. Threatened species are those likely to become endangered in the foreseeable future [16 U.S.C. § 1532(20)]. Endangered species are those in danger of becoming extinct throughout all or a significant portion of their range [16 U.S.C. § 1532(20)]. Species can be listed as endangered without first being listed as threatened. The Secretary of Commerce, acting through NMFS, is authorized to list marine fish, plants, and mammals (except for walrus and sea otter) and anadromous fish species. The Secretary of the Interior, acting through the USFWS, is authorized to list walrus and sea otter, seabirds, terrestrial plants and wildlife, and freshwater fish and plant species.

In addition to listing species under the ESA, the critical habitat of a newly listed species must be designated concurrent with its listing to the "maximum extent prudent and determinable" [16 U.S.C. § 1533(b)(1)(A)]. The ESA defines critical habitat as those specific areas that are essential to the conservation of a listed species and that may be in need of special consideration. Federal agencies are prohibited from undertaking actions that destroy or adversely modify designated critical habitat. Some species, primarily the cetaceans, which were listed in 1969 under the Endangered Species Conservation Act and carried forward as endangered under the ESA, have not received critical habitat designations.

Federal agencies have an affirmative mandate to conserve listed species (Rohlf 1989). One assurance of this is Federal actions, activities or authorizations (hereafter referred to as Federal action) must be in compliance with the provisions of the ESA. Section 7 of the Act provides a mechanism for consultation by the Federal action agency with the appropriate expert agency (NMFS or USFWS). Informal consultations, resulting in letters of concurrence, are conducted for Federal actions that have no adverse affects on the listed species. Formal consultations, resulting in biological opinions, are conducted for Federal actions that may have an adverse affect on the listed species. Through the biological opinion, a determination is made as to whether the proposed action poses "jeopardy" or "no jeopardy" of extinction to the listed species. If the determination is that the action proposed (or ongoing) will cause jeopardy, reasonable and prudent alternatives may be suggested which, if implemented, would modify the action to no longer pose the jeopardy of extinction to the listed species. These reasonable and prudent alternatives must be incorporated into the Federal action if it is to proceed. A biological opinion with the conclusion of no jeopardy may contain a series of management measures intended to further reduce the negative impacts to the listed species. These management alternatives are advisory to the action agency [50 CFR. 402.24(j)]. If a likelihood exists of any taking[1] occurring during promulgation of the action, an incidental take statement may be appended to a biological opinion to provide for the amount of take that is expected to occur from normal promulgation of the action. An incidental take statement is not the equivalent of a permit to take.

Twenty-three species occurring in the GOA and/or BSAI groundfish management areas are currently listed as endangered or threatened under the ESA (Table 12). The group includes great whales, pinnipeds, Pacific salmon and steelhead, and seabirds.

[1] The term "take" under the ESA means "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct" [16 U.S.C. § 1538(a)(1)(B)].

Table 12 ESA Listed Species. The following species are currently listed as endangered or threatened under the ESA and occur in the GOA and/or BSAI groundfish management areas.

Common Name	Scientific Name	ESA Status
Northern Right Whale	*Balaena glacialis*	Endangered
Bowhead Whale [1]	*Balaena mysticetus*	Endangered
Sei Whale	*Balaenoptera borealis*	Endangered
Blue Whale	*Balaenoptera musculus*	Endangered
Fin Whale	*Balaenoptera physalus*	Endangered
Humpback Whale	*Megaptera novaeangliae*	Endangered
Sperm Whale	*Physeter macrocephalus*	Endangered
Snake River Sockeye Salmon	*Onchorynchus nerka*	Endangered
Short-tailed Albatross	*Phoebaotria albatrus*	Endangered
Steller Sea Lion	*Eumetopias jubatus*	Endangered and Threatened [2]
Snake River Fall Chinook Salmon	*Onchorynchus tshawytscha*	Threatened
Snake River Spring/Summer Chinook Salmon	*Onchorynchus tshawytscha*	Threatened
Puget Sound Chinook Salmon	*Onchorynchus tshawytscha*	Threatened
Lower Columbia River Chinook Salmon	*Onchorynchus tshawytscha*	Threatened
Upper Willamette River Chinook Salmon	*Onchorynchus tshawytscha*	Threatened
Upper Columbia River Spring Chinook Salmon	*Onchorynchus tshawytscha*	Endangered
Upper Columbia River Steelhead	*Onchorynchus mykiss*	Endangered
Snake River Basin Steelhead	*Onchorynchus mykiss*	Threatened
Lower Columbia River Steelhead	*Onchorynchus mykiss*	Threatened
Upper Willamette River Steelhead	*Onchorynchus mykiss*	Threatened
Middle Columbia River Steelhead	*Onchorynchus mykiss*	Threatened
Spectacled Eider	*Somateria fishcheri*	Threatened
Steller Eider	*Polysticta stelleri*	Threatened

[1] The bowhead whale is present in the Bering Sea area only.
[2] Steller sea lion are listed as endangered west of Cape Suckling and threatened east of Cape Suckling.

Of the species listed under the ESA and present in the action area (Table 12), some may be negatively affected by groundfish fishing. NMFS is the expert agency for ESA listed marine mammals. The USFWS is the expert agency for ESA listed seabirds. The proposed 2000 TAC specifications rule must be in compliance with the ESA.

Section 7 consultations with respect to actions of the federal groundfish fisheries have been done for all the species listed in Table 12, either individually or in groups. See section 3.8 of the SEIS (NMFS 1998a), for summaries of section 7 consultations done prior to December 1998. Consultations completed since publication of the SEIS are summarized below. Also each species has been considered for re-initiated consultation with respect to this proposed action (establishment of year 2000 specifications) and reinitiated consultations are underway for Steller sea lion and the 12 evolutionarily significant units of Pacific salmon and steelhead .

Steller sea lions and other ESA listed marine mammals.
One consultation (summarized below) was completed concurrently with completion of the SEIS, and a second one immediately thereafter (also summarized below.)

The first Biological Opinion (BiOp) was for the action authorizing the pollock and Atka mackerel fisheries for the years 1999 through 2002. It was issued December 3, 1998, by the Office of Protected Resources of NMFS. The scope of the consultation was the Atka mackerel fishery of the BSAI, and the

pollock fisheries in the BSAI and the GOA. The BiOp concluded that the Atka mackerel fishery was not likely to jeopardize the continued existence of the western population of Steller sea lions or adversely modify its critical habitat. However, the BiOp also concluded that both of the pollock fisheries, as they had been proposed in 1998, were likely to cause jeopardy to Steller sea lions and adverse modification of designated Steller sea lion critical habitat. This determination was based primarily on the premise that the two pollock fisheries would compete with Steller sea lions by removing prey items from important foraging areas at crucial times of the year.

To avoid the likelihood of causing jeopardy and adverse modification, NMFS developed a framework of reasonable and prudent alternatives (RPAs) based on three objectives: (1) temporally disperse fishing effort, (2) spatially disperse fishing effort, and (3) provide full protection from fisheries competition in waters adjacent to rookeries and important haulouts. The RPAs contained guidelines for management measures which would achieve these principles. The Council initially provided recommendations for management measures at its December 1998 meeting. NMFS evaluated those recommendations and incorporated them into the RPAs on December 16, 1998. The RPAs were implemented by emergency interim rule for the first half of 1999, published on January 22, 1999 (64 FR 3437), amended on February 17, 1999 (64 FR 7814) and February 25, 1999 (64 FR 9375). The Council met again in February, April, and June 1999, to consider recommendations for extending the emergency rule for the second half of 1999, and at its June meeting, voted to extend the emergency rule (with modifications to the Bering Sea B and C seasons) until December 31, 1999 (July 21, 1999, 64 FR 39087; technical amendment August 10, 1999, 64 FR 43297).

The December 3, 1998, BiOp was challenged in the United States District Court for the Western District of Washington by Greenpeace, the American Oceans Campaign, and the Sierra Club. On July 9, 1999, (amended July 13, 1999), the Court upheld the no-jeopardy conclusion for the Atka mackerel fishery and the jeopardy conclusion for the pollock fisheries. However, the Court also found that "the Reasonable and Prudent Alternatives . . . were arbitrary and capricious . . . because they were not justified under the prevailing legal standards and because the record does not support a finding that they were reasonably likely to avoid jeopardy." On August 6, 1999, the Court remanded the BiOp back to NMFS for further analysis and explanation.

To comply with the Court's Order, NMFS conducted additional analyses and considered recommendations from the Council to develop Revised Final Reasonable and Prudent Alternatives (RFRPAs) (October 1999). NMFS intends to initiate rulemaking to implement these conservation measures for the year 2000 and beyond.

A second BiOp, on the action of authorization of the BSAI and GOA groundfish fisheries (other than pollock and Atka mackerel) TAC specifications was issued December 24, 1998, by the Office of Protected Resources of NMFS. That BiOp examined the 1999 proposed TAC specifications for the BSAI and GOA and the effect of that action on ESA listed marine mammal species and critical habitat. The BiOp concluded that mitigation measures recommended by the Council and modified by NMFS, for the BSAI and GOA pollock fisheries and the BSAI Atka mackerel fisheries, were sufficient to avoid jeopardizing the continued existence of the western population of Steller sea lions and avoid adverse modification to its critical habitat. This conclusion required that NMFS, implement the recommended revised reasonable and prudent alternatives before the scheduled regulatory start of the 1999 BSAI and GOA trawl fisheries (see discussion above regarding Atka mackerel and pollock mitigation measures).

NMFS is currently consulting on the TAC specifications for the year 2000 groundfish fisheries (except Walleye pollock and Atka mackerel), but has not concluded that consultation. It must be concluded, and with a determination of no jeopardy, before a Finding of No Significant Impact NEPA determination can be reached for the proposed 2000 TAC specifications.

ESA Listed Pacific Salmon

NMFS reinitiated section 7 consultation for ESA listed Pacific salmon affected by the Alaska groundfish fisheries primarily because several additional evolutionarily significant units of Pacific salmon were listed under ESA (Table 12) since preparation of the 1995 BiOp for those species (NMFS 1995). It must be concluded, and with a determination of no jeopardy, before a Finding of No Significant Impact NEPA determination can be reached for the proposed 2000 TAC specifications.

Short-tailed Albatross

A BiOp on the BSAI hook-and-line groundfish fishery and the BSAI trawl groundfish fishery for the ESA listed short-tailed albatross was issued March 19, 1999, by the USFWS for the years 1999 through 2000 (USFWS 1999). The conclusion continued the no jeopardy determination and the incidental take statement expressing the requirement to immediately reinitiate consultations if incidental takes exceed four short-tailed albatross over two years' time. No consultations on short-tailed albatross are pending for the year 2000 TAC specifications.

3.8 Socioeconomic Summary

The most recent description of the groundfish fishery is contained in the *Economic Status of the Groundfish Fisheries Off Alaska, 1997* (Greig et al. 1998) (hereinafter 1998 Economic Safe) and Appendix C to this EA, the draft Economic Status of the Groundfish Fisheries Off Alaska, 1998, dated September, 1999 (hereinafter draft 1999 Economic Safe). These reports, incorporated herein by reference, presents the economic status of groundfish fisheries off Alaska in terms of economic activity and outputs using estimates of catch, bycatch, ex-vessel prices and value, the size and level of activity of the groundfish fleet, the weight and value of processed products, wholesale prices, exports, and cold storage holdings. The catch, ex-vessel, ex-processor, and fleet size and activity data are for the fishing industry activities that are reflected in Weekly Production Reports, Observer Reports, fish tickets from processors who file Weekly Production Reports, and the annual survey of groundfish processors. All catch data for 1991 through 1997 are based on the blend estimates of total catch which are used by NMFS to monitor groundfish and PSC quotas during each fishing year. External factors, in part, determine the economic status of the fisheries are foreign exchange rates, the prices and price indexes of products that compete with products from these fisheries, and fishery imports.

3.8.1 Summary of 1997 Ex-vessel Values

The commercial groundfish catch off Alaska totaled 2.06 million mt in 1997, 1 percent over 1996. The increase in catch was accompanied by a 1 percent increase in the average ex-vessel price of groundfish and the estimated ex-vessel value of the catch, excluding the value added by at-sea processing, from $542 million in 1996 to $583 million in 1997. The value of the 1996 catch after primary processing was estimated at $1.18 billion. The groundfish fisheries accounted for the largest share of the ex-vessel value of all commercial fisheries off Alaska in 1997, while the Pacific salmon fishery was second with $248 million or 22 percent of the total Alaska ex-vessel value. The value of the shellfish catch amounted to $172 million or 15.3 percent of the total for Alaska (Greig et al. 1998). Due to data acquisition

difficulties, the draft 1999 Economic SAFE does not contain estimates of the 1998 ex-vessel or processed product values.

During the last ten years, the total catch in the commercial groundfish fisheries off Alaska (including foreign and joint venture fisheries as well as the domestic fishery) varied between 1.85 and 2.38 million mt. The peak catch occurred in 1991, in part because blend estimates of catch and bycatch were not yet used to monitor most quotas. If they had been, several fisheries would have been closed earlier in the year (Greig et al. 1998).

The ex-vessel value of domestic landings, excluding the value added by at-sea processing, increased from $425 million in 1993 to $570 million in 1997. In 1997, catcher vessels accounted for 43.8 percent of the ex-vessel value of the groundfish landings compared to 40.7 percent of the total catch, because catcher vessels take a higher percentage of valuable species such as sablefish which was $2.25 per pound in 1997. Similarly, trawl gear accounted for only 67.2 percent of the total ex-vessel value compared to 91.6 percent of the catch because much of the trawl catch is of low priced species such as pollock which was about $0.10 per pound in 1997 (Greig et al. 1998)

Average ex-vessel prices, including the value added by at-sea processing, in 1994 were up slightly from $0.102 per pound in 1993 to $0.107 per pound, round weight in 1994. The average price of pollock increased from $0.073 per pound in 1994 to $0.089 in 1996. Average prices of sablefish rose from $0.969 in 1993 to $1.924 in 1996. Pacific cod prices went from $0.220 in 1993 to $0.212 in 1996. Flatfish prices were $0.158 in 1993, rose to $0.181 in 1995, and fell to $0.155 in 1996. Rockfish prices declined from $0.216 in 1992 to $0.181 in 1996. Atka mackerel in 1996 were $0.145 (Greig et al. 1998).

Walleye pollock has been the dominant species in the commercial groundfish catch off Alaska. The pollock catch in 1997 totaled 1.24 million mt and accounted for 60 percent of the total groundfish catch of 2.06 million mt. The pollock catch was down 2.6 percent from 1996. The next major species, Pacific cod, accounted for 326,200 mt or 15.8 percent of the total 1997 groundfish catch. The Pacific cod catch was up 5.5 percent from a year earlier. The 1997 catch of flatfish, which includes yellowfin sole, rock sole, and arrowtooth flounder was 345,600 mt in 1997, up 24.9 percent from 1996. Pollock, Pacific cod, and flatfish comprised 92.6 percent of the total 1997 catch. Other important species are sablefish, rockfish, and Atka mackerel (Greig et al. 1998).

3.8.2 Economic Considerations of the 2000 TACs

The actual value realized from the groundfish harvest is dependent on factors unquantifiable at present, including market demand, costs of harvesting and processing, proportion of catch processed at sea (value added), and the degree to which the harvests are constrained by PSC limits. See Tables 1 and 2, for TAC, ABC, and OFL specifications for 2000.

A component of the 1996 Sustainable Fisheries Act amendments to the Magnuson-Stevens Act is the requirement to evaluate effects of changes in TAC on economic value of the harvest. Analysis to predict the 2000 product prices by regulatory area for target species management groups, utilizing the catch specification, bycatch and discard rates is not, however, available.

4.0 CONCLUSIONS

Section 4.0 of the NMFS 1998 SEIS analyzes the possible impacts of different TAC specification levels on future catches, marine mammals, seabirds, forage species, and prohibited species, as well as other components of the physical and chemical environment. New information that has arisen since that analysis is summarized in this EA. This EA tiers off the analysis presented in the SEIS. The proposed 2000 TAC specifications are also within the range of alternatives analyzed for TAC amounts in the GOA and BSAI.

4.1 Impacts on Groundfish Species

The proposed TAC specifications for each target groundfish category are equal to or less than respective ABC and OFL specifications. The sum of the BSAI and GOA TAC specifications would be 2,000,000 mt and 306,535 mt, respectively. The BSAI would operate at the maximum OY level, while the GOA would operate at a level between the maximum and minimum OY level. Updated information on the status of groundfish stocks was reviewed by the Plan Teams for the groundfish fisheries of the BSAI and GOA at their November 1999 meeting, and is presented in the SAFE Reports for the Groundfish Resources of the BSAI and GOA as Projected for 2000 (Appendix A and B). A summary of the Year 2000 harvest alternatives for the BSAI is presented in Table 13 and the GOA in Table 14.

Table 13. Bering Sea Aleutian Islands Area Year 2000 Harvest Alternatives (values are in mt)
Plan Team recommendations are highlighted in bold text

Species/Area	Alternative 1 *F*=max*F*abc	Alternative 2 *F*=(%)max*F*abc	Alternative 3 *F*=50%max*F*abc	Alternative 4 *F*='94-'98ave*F*	Alternative 5 *F*=0	Tier
Pollock	1,200,000	1,100,000	604,000	843,000	0	1a
EBS	23,800	**23,800**	11,900	37,356	0	5
AI	71,300	**71,300**	35,650	276	0	5
Pacific cod	206,000	**193,000**	108,000	152,000	0	3b
Yellowfin sole	191,000	**191,000**	97,000	135,000	0	3a
Greenland turbot	34,700	**9,300**	18,185	7,891	0	3a
Arrowtooth	131,000	**131,000**	66,314	10,927	0	3a
Rock sole	230,000	**230,000**	116,933	32,530	0	3a
Flathead sole	73,500	**73,500**	38,647	15,262	0	3a
Other flatfish	117,000	**117,000**	62,231	15,847	1	3a
Sablefish						
EBS	**1,410**	1,384	725	1,360	0	3b
AI	**2,490**	2,446	1,280	2,403	0	3b
POP						
EBS	2,600	**2,600**	1,316	1,665	0	3b
AI	12,300	**12,300**	6,240	10,09	0	3b
Other red rockfish	194	**194**	97	204	0	5

Species/Area	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Tier
Sharpchin/Northr	5,150	**5,150**	2,575	4,173	0	5
Shortraker/Roughe	885	**885**	442	779	0	5
Other rockfish						
EBS	369	**369**	184	191	0	5
AI	685	**685**	342	296	0	5
Atka mackerel	103,000	**70,800**	54,754	47,007	0	3a
Squid	1,970	**1,970**	985	925	0	6
Other species	91,600	**26,800**	45,800	23,780	0	5
Total	2,500,953	2,265,483	1,273,600	1,342,971	0	

Table14. Gulf of Alaska Year 2000 Harvest Alternatives (values are in mt)
Plan Team recommendations are highlighted in bold text

Species/Area	Alternative 1 *F*=max*F*abc	Alternative 2 *F*=(%)max*F*abc	Alternative 3 *F*=50%max*F*abc	Alternative 4 *F*='94-'98ave*F*	Alternative 5 *F*=0	Tier
Pollock						
W/C/WYK	111,310	**96,560**	58,980	55,550	0	3b
E	6,460	**6,460**	3,230	4,630	0	5
Pacific cod	86,600	**76,400**	45,500	41,300	0	3a
Flatfish(deep)	5,300	**5,300**	2,650	2,700	0	5,6
Rex sole	9,440	**9,440**	4,720	6,020	0	5
Flathead sole	26,270	**26,270**	13,140	2,400	0	5
Flatfish(shal)	37,860	**37,860**	18,930	3,920	0	4,5
Arrowtooth	145,360	**145,360**	76,400	11,640	0	3a
Sablefish	**13,400**	13,170	6,900	12,940	0	3b
POP	13,020	**13,020**	6,600	11,280	0	3b
SR/RE	2,070	**1,730**	1,850	1,030	0	4.5
Other rockfish	5,010	**4,900**	1,070	2,500	0	4.5
Northern rockfish	6,400	**5,120**	4,010	3,240	0	4
Pelagic rockfish	7,310	**5,980**	3,650	3,090	0	4
Thornyhead	**2,360**	2,120	1,190	1,370	0	3a
Demersal rockfish	380	**340**	290	300	0	4
Atka mackerel	4,700	**600**	2,350	1,300	0	6
Total	483,250	450,630	251,460	165,210	0	

The Plan Teams determined that the OFLs and ABCs implemented for the 2000 fisheries is based on the most current information available. After reviewing the current information, the Council will recommended 2000 TAC specifications to the Secretary of Commerce. Absent new information, the harvest specifications promulgated for 1999 are proposed for 2000.

4.2 Effects on Marine Mammals and Species Listed as Threatened or Endangered Under the ESA

The effects of groundfish harvest at various TAC levels on marine mammals is discussed in section 4.3.2 of the NMFS 1998 SEIS. Assessment of potential impacts is somewhat simpler for direct interactions than for indirect considerations. Estimates of marine mammal incidental takes in the federally managed groundfish fisheries are based on observer data whereby mortalities are tallied and observed takes are extrapolated to fishery-wide totals. In all cases in the groundfish fisheries, levels of direct incidental take are low relative to each marine mammal stock's Potential Biological Removal. As noted previously, two short-tailed albatross were taken in 1998 in the long-line fishery, however, this was within incidental take guidelines and did not prompt the USFWS to re-initiate consultation. The Council adopted additional seabird avoidance measures for implementation in the year 2000.

Indirect interactions between marine mammals and commercial fisheries are much more difficult to detect and document. They include, competition for similar prey resources which may result in local scarcity of prey, and disturbance by fishing activities. Additional impacts have been suggested, including alteration of the age structure of fish stocks targeted by a fishery, resulting in a shift in biomass from older to younger age groups, and alteration of the actual and relative abundance of fish stocks in the ecosystem and increase in the dominance of less desirable forage species. Whereas the first two indirect effects are based on observed overlaps in marine mammal diets and harvested species and on spatial and temporal overlaps in fisheries and marine mammal distributions, the latter two suggest specific outcomes of ecosystem processes even though the processes themselves are poorly understood. As such, these concerns are speculative and can not be objectively evaluated with regard to their impacts on marine mammals.

Causal relationships between commercial harvesting of groundfish in the EEZ off Alaska and the population status and trends of marine mammal have not been established. The complexity of potential interactions at multiple temporal and spatial scales that might affect foraging behavior, coupled with the paucity of data available to characterize those relationships, inherently limit detection of fisheries effects. Thus, the mechanisms by which fish biomass removals might translate to marine mammal fitness or mortality are largely unknown at this time.

Interactions, either direct or indirect, between commercial fisheries and the 26 species of marine mammals inhabiting federal waters off Alaska vary widely, given those mammals diverse life histories and spatial distribution patterns. In general, the impacts resulting from the fisheries are likely to be constrained to those marine mammal species with the greatest potential dependence on prey species that are harvested commercially. Likewise, those marine mammals which feed more extensively in the commercial fishing grounds may be proportionally more affected. Of the 26 marine mammal species described in section 3.4 of the NMFS 1998 SEIS, only a subset have been shown to consume groundfish species as a large part of their diet, and to potentially do so in areas coincident with groundfish harvest operations. Thus, the greatest emphasis is placed on those species: Steller sea lion, northern fur seal and harbor seal. Among the cetacean species, a few include groundfish in their diets, but most exploit a larger prey base, with extensive consumption of invertebrates and small schooling fishes.

The new information on marine mammals presented in section 3.5 does not contain any impacts that would be considered significant or that were not already analyzed in the SEIS.

The section 7 consultations on Steller sea lion (NMFS 1998b, c) considered the impacts of the BSAI and GOA pollock and Atka mackerel fisheries and the TAC amounts being recommended for 1999 through 2001, and concluded that certain mitigation measures must be implemented for the BSAI and GOA. Fishery removals equal to or less than the ABC amounts were considered satisfactory (as under status quo TAC setting), but that these removals should be redistributed spatially and temporally according to the pollock stock biomass. Emergency rulemaking by NMFS redistributed the 1999 pollock fisheries both temporally and spatially, thereby reducing competition for prey between the fishery and Steller sea lions. NMFS is currently promulgating permanent rulemaking which will implement spatial and temporal dispersion of the pollock fishery for 2000 and beyond.

4.3 Effects on Species Prohibited in Groundfish Fisheries Harvest

Fishing at the 1999 TAC levels in fishing year 2000 is not expected to adversely affect stocks of fish or invertebrates prohibited in groundfish fisheries harvest. Catches of Pacific halibut, crabs, salmon, and herring are controlled by PSC limits that are established based in proportion to the biomass estimates of those species. Section 4.3.5 of the NMFS 1998 SEIS describes the possible impacts of a range of total harvest alternatives on prohibited species. New information presented in section 3.2 does not demonstrate any impacts that NMFS considers to be significant or that were not already analyzed in the SEIS.

4.4 Socioeconomic Impacts

Socioeconomic impacts from a range of TAC levels are discussed in section 4.4 of the NMFS 1998 SEIS. All harvest levels are anticipated to have different net economic benefits. The actual value realized is dependent on factors unquantifiable at present, including market demand, costs of harvesting and processing, proportion of catch processed at sea, and the degree to which the TAC specifications are constrained by PSC limits.

A variety of at least partially external factors affect the economic performance of the BSAI and GOA groundfish fisheries. They include landing market prices in Japan, wholesale prices in Japan, U.S. imports of groundfish products, U.S. per capita consumption of seafood, Foreign exchange rates, and U.S. cold storage holdings of groundfish. More information on these factors are included in Tables 39-49 of the 1998 Economic SAFE and in Appendix C (the preliminary 1999 economic SAFE).

Management actions that will decrease groundfish catches or increase operating costs may result from continued concerns with: 1) the bycatch of prohibited species, 2) the discard and utilization of groundfish catch, and 3) the effects of the groundfish fisheries on marine mammals and sea birds. The implementation of the American Fisheries Act and Steller sea lion conservation measures are expected to result in changes in the economic performance of the BSAI and GOA groundfish fisheries.

5.0 LIST OF PREPARERS

Tamra Faris, Shane Capron, Tom Pearson, Nina Mollett
Sustainable Fisheries Division
National Marine Fisheries Service
Alaska Regional Office
P.O. Box 21668
Juneau, AK 99802

Elizabeth Sinclair, Loh-lee Low, Lowell Fritz, Jeff Fujioka, Jim Hastie, Jon Heifetz, Anne Hollowed, Jim Ianelli, Pat Livingston, Sandra A. Lowe, Mike Sigler, Joe Terry, Grant Thompson.
Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, BIN C15700
Seattle, WA 98115-0070

Jane DiCosimo, David Witherell
North Pacific Fishery Management Council
605 West 4th Avenue, Suite 306
Anchorage, AK 99501-2252

Bill Bechtol, Tory O'Connell, Dave Jackson, Ivan Vining
Alaska Department of Fish and Game
(Juneau, Homer, Sitka, Kodiak Offices)

Lew Haldorsen
University of Alaska

Farron Wallace
Washington Department of Fisheries

Gregg Williams
International Pacific Halibut Commission

6.0 LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THE STATEMENT ARE SENT

Alaska Fisheries Science Center
National Marine Fisheries Service
7600 Sand Point Way NE, BIN C15700
Seattle, WA 98115-0070

Alaska Department of Fish and Game
P.O. Box 25526
Juneau, AK 99802-5526

Alaska Groundfish Databank
P.O. Box 2298
Kodiak, AK 99615

American Oceans Campaign
201 Massachusetts Avenue NE, Suite C-3
Washington, DC 20002

Center for Marine Conservation
1725 DeSales Street, NW, Suite 600
Washington, DC 20036

Earth Justice Legal Defense Fund
325 4th Street
Juneau, AK 99801

Greenpeace
4649 Sunnyside Avenue N.
Seattle, WA 98103

International Pacific Halibut Commission
P.O. Box 95009
Seattle, WA 98145-2009

North Pacific Fishery Management Council (and current Council members)
605 West 4th Avenue, Suite 306
Anchorage, AK 99501-2252

Pacific Fishery Management Council
2130 SW 5th, Suite 224
Portland, OR 97201

Trustees for Alaska
725 Christensen Drive, Suite 4
Anchorage, AK 99501

University of Alaska
School of Fisheries and Ocean Science
P.O. Box 757220
Fairbanks, AK 99775

U.S. Department of the Interior
Fish and Wildlife Service
1011 E. Tudor Road
Anchorage, AK 99503-6199

Washington Department of Fisheries
600 Capitol Way N
Olympia, WA 98501-1091

7.0 LITERATURE CITED

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ALASKA SABLEFISH, INC.
P. O. BOX 319
HOMER, ALASKA 99603

F/V JUDI B
PHONE: (907) 235-5581 (206) 774-8624
FAX: (907) 235-2928 (206) 774-8528

Nov. 29, 1999

North Pacific Fisheries Management Council
P.O. Box 103136
Anchorage, Ak. 99510

Dear Mr. Chairman and Council Members,

We support the proposed 31% increase of the Aleutian Island sablefish quota for 2000. This increase was recommended for the 1999 season, as well, but was not adopted by the NPFMC. The following reasons have been sighted: 1) Some council members have taken the stance that sablefish can be managed as an entire stock, 2) the logbook information released for the Aleutian Island sablefish fishery showed a lower CPUE than the survey boat experienced and 3) there seems to be a misconception that since only 50% of the AI quota is taken each year, the stocks must be down. We have arguments against each of these points.

1) Managing the sablefish fishery as a entire stock- This approach may be tolerable between Gulf areas that have similar habitat and vague physical boundaries but the stock way out west in the Aleutians is far removed from the Gulf. However, the crux of the issue with this approach is that it turns what should be a scientific endeavor into a political one of allocation. It sets a dangerous trend allowing managers the flexibility to grab from one area to favor another. And, of course, this approach only seems to work one way. No one stepped forward in '95 or '96 when the AI quota was sharply reduced by 60%, and proposed to have the reduction apportioned between the Gulf areas.

2) Logbook information showed a lower CPUE in the AI - Unlike the logbook data generated in the Gulf of Alaska by hundreds of boats covering nearly every mile of the edge, the data from the AI is limited. At most, a few dozen boats participate and most of those favor 3 - 4 spots that are known to have milder tides, a gentler edge and fewer killer whales. This is not a broad based data bank that should be used as a scientific overlook of the entire Aleutian chain. As well, the Aleutians present challenging fishing conditions. Weather, tides, coral reefs, lost brown crab pots, spotty fishing grounds, inexperienced fishermen and unfortunately, whales, all contribute to the CPUE reported by vessels- not just the condition of the stock.

Our vessel, the F/V Judi B, has a long history of fishing for sablefish in the AI. Over the years, our production has generally followed the decreasing trend of the quota. Although we thought the sharp 60% reduction over two years, '95 and '96, was a bit

extreme, there was no doubt fishing had dropped off. Two years ago, we started to see a turn around. Our average production increased and we have seen an abundance of juveniles. We were not surprised when the 1998 survey reported a healthy increase in the stocks. However, we were very surprised when the NPFMC did not adopt the recommended increase in the quota.

3) Misconception that since only 50% of quota is taken, stocks are down - We have consistently caught our Aleutian quota every year. The uncaught portion of the quota mostly represents smaller blocks that cannot be compiled on a boat large enough to effectively fish in the Aleutians or IFQ's owned by vessels that predominately fish in the Gulf that have not bothered to go out west and catch their fish. The vessels with experience fishing for sablefish in the Aleutians and that are serious about catching their fish, have found the stocks to fish on.

In conclusion, we believe that the proposed 31% increase in the Aleutian Island sablefish fishery is absolutely warranted. The survey and scientific models support the increase. Let's not change our management approach mid-stream turning what should be a scientific decision into a political based allocation.

Best Regards,

Mary Stanhurst, Barbara McBride,

Owners of the F/V Judi B

Pat McBride,

The following individuals and organizations support the increase in the proposed Aleutian Island sablefish quota for the 2000 fishing season.

Duane Torgerson - F/V REPUBLIC

F/V Evening Star

Karl Vedo Owner of the F/V Ocean Harvester

Donald C. Fenn, JUBILEE FISHERIES

Pacific Herring Stocks and Fisheries in the Arctic-Yukon-Kuskokwim Region of the Bering Sea, Alaska, 1999

A Report to the Alaska Board of Fisheries

Compiled by

Larry DuBois
and
Helen H. Hamner

Regional Information Report[1] No. 3A99-39

Alaska Department of Fish and Game
Commercial Fisheries Division
AYK Region
333 Raspberry Road
Anchorage, Alaska 99518
November 1999

[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.

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

Division of Commercial Fisheries

TONY KNOWLES, GOVERNOR

P.O. Box 230
545 Kenny Wren Road
Dillingham, Alaska 99576-0230
PHONE: (907) 842-5227
FAX: (907) 842-5937

TO: Robert D. Mecum
Director – Division of Commercial Fisheries
Juneau

DATE: August 9, 1999

TELEPHONE: 842-5227

THRU: James Browning
Area Management Biologist
Division of Commercial Fisheries
Dillingham

FROM: William Glick and Cindy Anderson
Assist. Area Management Biologists
Dillingham

SUBJECT: 1999 Togiak Herring
Season Summary

Following is a summary of the 1999 herring sac roe and spawn-on-kelp fisheries in Togiak District, Bristol Bay. Herring are harvested for sac roe using gillnets and purse seines while herring spawn on wild kelp (Fucus spp.) is harvested by hand. A later food and bait fishery occurs near Dutch Harbor in July on herring that receive a harvest allocation based on the forecasted biomass of Togiak herring. The Dutch Harbor fishery is summarized separately. All data are preliminary.

STOCK ASSESSMENT

Biomass Estimation

Aerial surveys of the Togiak District began April 19, 1999. Surveys from April 19 to April 28 indicated that significant ice pack still remained in Togiak Bay. The department first observed herring May 15, when 5,000 tons were documented between Picnic Beach and Summit Island. Biomass increased to an estimated 21,500 tons May 16, and the peak biomass of 156,200 tons was observed May 17 under excellent conditions. Biomass declined rapidly after May 21, and by May 23 only 32,000 tons were estimated in the district. Throughout May substantial biomass was observed moving northwest along the Nushagak Peninsula, apparently entering the district from the east. Good aerial survey conditions occurred for most of the biomass surveys.

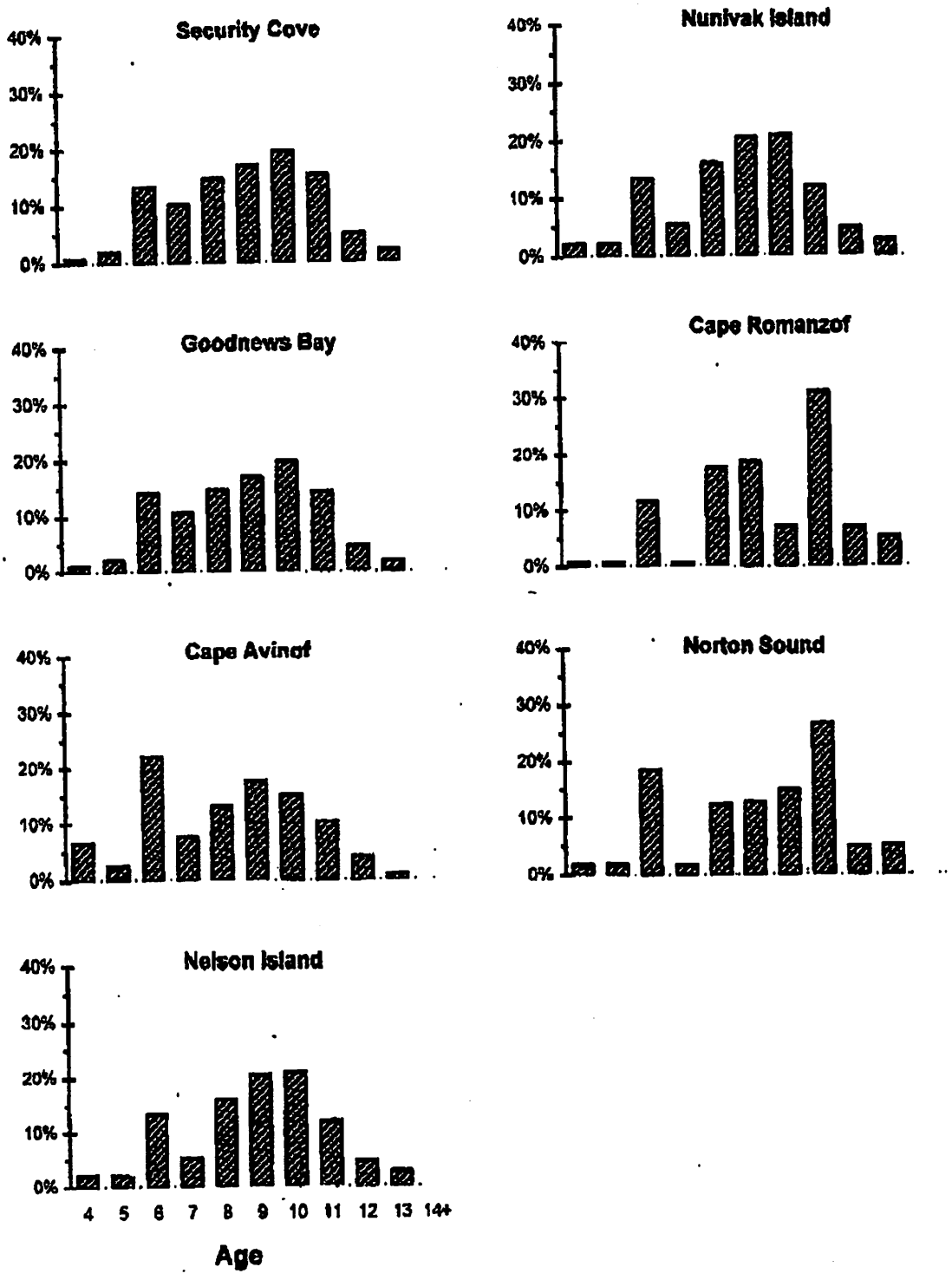

Figure 1. Observed run age composition by weight in 1999 at major herring spawning locations in the eastern Bering Sea.

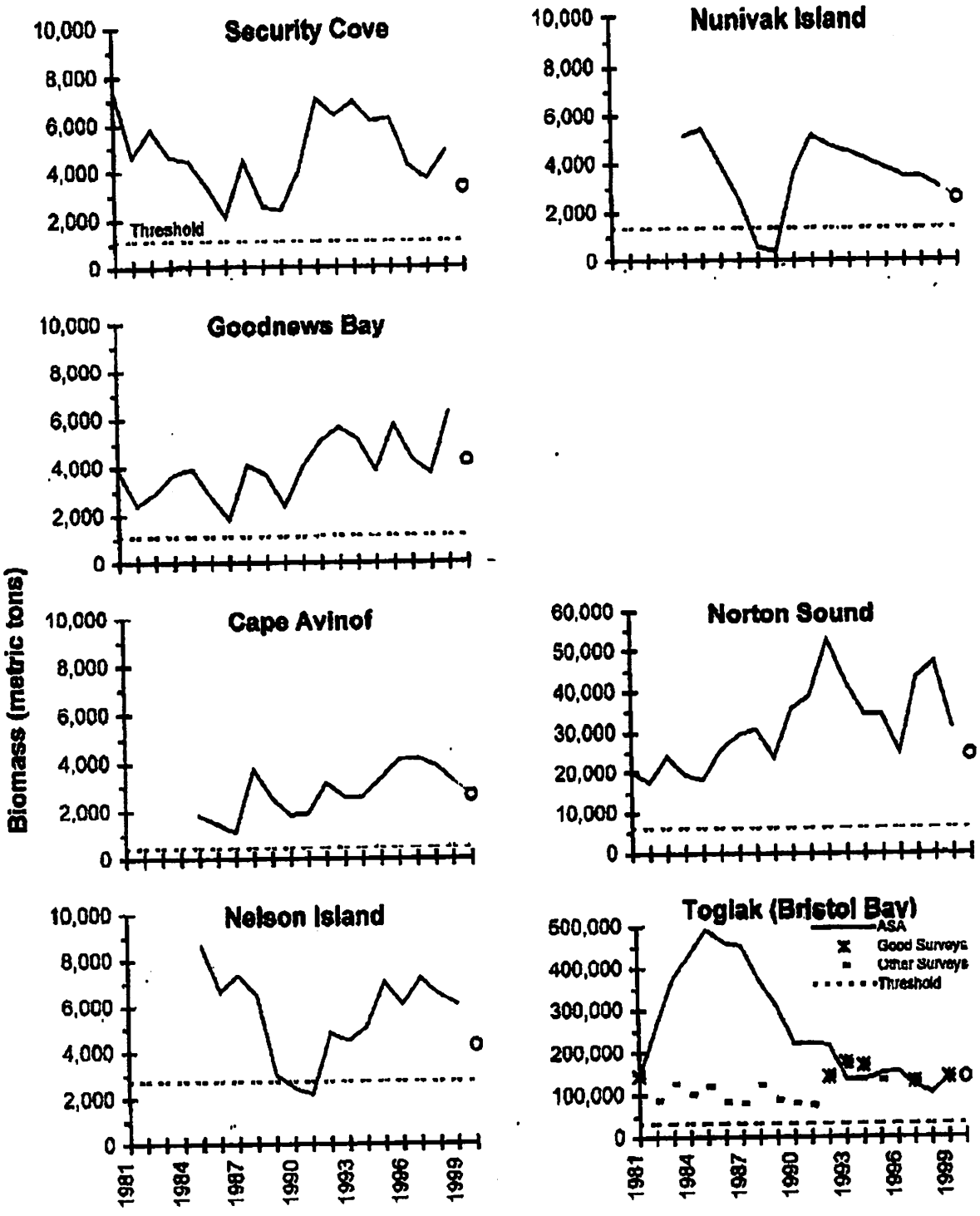

Figure 2. Estimated run biomass at major herring spawning locations in the eastern Bering Sea, 1981-99, with preliminary 2000 forecast biomass (open circles).

AGENDA D-1(b)(4)
DECEMBER 1999

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

DIVISION OF COMMERCIAL FISHERIES

TONY KNOWLES, GOVERNOR

P.O. BOX 25526
JUNEAU, ALASKA 99802-5526
PHONE: (907) 465-4210

December 1, 1999

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

Dear Dr. Pautzke:

The Alaska Department of Fish and Game estimates that the biomass of eastern Bering Sea herring returning to spawn in the spring of 2000 between Port Moller and Norton Sound will be approximately 185,330 metric tons (Table 1). This is a modest increase from last year's estimate of 168,512 metric tons, primarily resulting from a higher biomass estimate for herring spawning at Togiak. Under Amendment 16A to the Bering Sea/Aleutian Islands groundfish fishery management plan, a herring prohibited species catch limit would be set at 1 percent of the estimated biomass, or 1,853 metric tons.

All major Bering Sea herring stocks are considered to be healthy and are expected to be above their thresholds for 2000. The 1993 year class (aged 6 in 1999) appears to be moderately strong in most areas (Figure 1) and is expected to sustain healthy spawning populations for several years. The attached reports describe the 1999 fisheries and assessments in Bristol Bay, Kuskokwim Bay, and Norton Sound for more detail on these herring populations.

Sincerely,

Doug Mecum
Director

Enclosure

cc: Dave Witherell

Table 1. Summary of preliminary 2000 forecast run biomass, and threshold levels for eastern Bering Sea herring.

	Forecast Run Biomass		Threshold
Fishery	(metric tons)	(short tons - 2,000 lbs)	
Port Moller	136	150	1,000
Bristol Bay (Togiak)	141,521	156,000	35,000
Kuskokwim Area			
Security Cove	3,286	3,622	1,200
Goodnews Bay	4,232	4,665	1,200
Cape Avinof	2,602	2,868	500
Nelson Island	4,238	4,672	3,000
Nunivak Island	2,561	2,823	1,500
Cape Romanzof	2,329	2,567	1,500
Norton Sound	24,425	26,924	7,000
Total:	**185,330**	**204,291**	
PSC Limit (at 1% of run biomass):	**1,863**		

Table 3. 1999 BERING SEA / ALEUTIAN ISLANDS FISHERIES
10/28/99 FIXED GEAR HALIBUT BYCATCH MORTALITY (METRIC TONS)

	PACIFIC COD HOOK & LINE		OTHER SPECIES HOOK & LINE, JIG		ALL GROUNDFISH POT GEAR	
WED	WEEKLY	TOTAL	WEEKLY	TOTAL	WEEKLY	TOTAL
01/02/99	6	6	0	0	0	0
01/09/99	32	38	0	0	0	0
01/16/99	29	66	0	0	0	0
01/23/99	15	82	0	0	0	0
01/30/99	17	99	0	0	0	0
02/06/99	14	113	0	0	0	0
02/13/99	17	130	0	0	0	0
02/20/99	17	147	0	0	0	0
02/27/99	13	159	0	0	0	0
03/06/99	18	177	0	0	0	0
03/13/99	15	192	0	0	0	0
03/20/99	11	203	0	0	0	0
03/27/99	15	218	0	0	0	0
04/03/99	16	233	0	0	0	0
04/10/99	15	249	0	0	0	0
04/17/99	19	267	- 0	0	0	0
04/24/99	0	267	0	0	0	0
05/01/99	0	267	11	11	0	0
05/08/99	0	267	61	72	0	1
05/15/99	0	267	5	77	0	1
05/22/99	0	268	1	78	0	1
05/29/99	1	268	8	86	0	1
06/05/99	0	268	0	86	0	2
06/12/99	0	268	0	86	0	2
06/19/99	0	268	0	86	0	2
06/26/99	0	268	1	86	0	2
07/03/99	2	271	0	86	0	2
07/10/99	1	271	0	86	0	2
07/17/99	0	272	0	86	0	2
07/24/99	0	272	0	87	0	2
07/31/99	0	272	0	87	0	2
08/07/99	0	272	0	87	0	2
08/14/99	0	272	0	87	0	2
08/21/99	0	272	0	87	0	2
08/28/99	0	272	0	87	0	2
09/04/99	3	274	3	89	0	2
09/11/99	0	274	7	97	0	2
09/18/99	26	300	1	98	0	2
09/25/99	47	347	0	98	0	2
10/02/99	38	385	0	98	0	3
10/09/99	36	421	0	98	0	3
10/16/99	53	474	0	98	0	3
10/23/99	15	489	0	98	0	3

PCOD SEASONAL CAP: 598 OTHER SEASONAL CAP: 234 Pot gear is exempt
% OF SEASONAL CAP: 82% % OF SEASONAL CAP: 42% from bycatch allowances
REMAINING PCOD: 109 REMAINING OTHER: 136

1999 BSAI NON-TRAWL PACIFIC COD FISHERY HALIBUT BYCATCH ALLOWANCES

(Jan 01 - Apr 30)	457 MT
(May 01 - Sep 14)	0 MT
(Sep 15 - Dec 31)	141 MT
Annual Total	598 MT

Table 4.
10/28/99
15:50:55

1999 BERING SEA / ALEUTIAN ISLANDS FISHERIES
TRAWL HALIBUT BYCATCH MORTALITY (METRIC TONS)

WED	PACIFIC COD	YELLOWFIN SOLE	ROCK SOLE/ FLATHEAD SOLE/ OTHER FLATFISH	PLCK/AMCK/ OTHER	ROCKFISH	ARROWTOOTH/ SABLEFISH/ TURBOT
01/23/99	31	0	25	5	0	0
01/30/99	124	4	17	9	0	0
02/06/99	51	0	37	17	0	0
02/13/99	56	0	89	18	0	0
02/20/99	69	0	77	7	0	0
02/27/99	110	0	150	8	0	0
03/06/99	210	23	8	12	0	0
03/13/99	111	21	5	2	1	0
03/20/99	87	20	6	1	0	0
03/27/99	40	19	17	0	0	0
04/03/99	83	34	39	0	0	0
04/10/99	60	24	40	0	1	0
04/17/99	58	34	67	0	0	0
04/24/99	75	20	56	1	0	4
05/01/99	125	5	7	1	0	0
05/08/99	16	19	0	40	0	3
05/15/99	0	64	0	21	0	2
05/22/99	2	15	0	0	0	31
05/29/99	0	37	0	2	0	3
06/05/99	0	10	0	0	0	4
06/12/99	0	17	0	0	0	0
06/19/99	0	13	0	0	0	0
06/26/99	0	23	0	0	0	0
07/03/99	0	4	0	0	0	0
07/10/99	0	0	21	0	14	3
07/17/99	0	0	27	0	3	7
07/24/99	0	1	28	0	5	4
07/31/99	0	0	50	2	29	2
08/07/99	0	0	20	3	0	5
08/14/99	0	3	18	4	0	0
08/21/99	0	78	15	3	0	3
08/28/99	0	90	21	4	0	6
09/04/99	0	5	4	53	0	0
09/11/99	1	22	0	22	0	0
09/18/99	0	29	0	8	0	0
09/25/99	0	15	0	17	0	0
10/02/99	0	55	2	7	0	0
10/09/99	2	92	0	2	0	0
10/16/99	1	75	2	14	0	0
10/23/99	2	0	0	1	0	0
	1,314	870	848	283	53	75
SEASONAL CAP:	1,473	955	755	238	71	0
% OF CAP:	89%	91%	112%	119%	75%	0%
REMAINING:	159	85	-93	-45	18	-75
ANNUAL CAP:	1,473	955	755	238	71	0
% OF CAP:	89%	91%	112%	119%	75%	0%

TOTAL HALIBUT MORTALITY : 3,443
TOTAL FINAL HALIBUT CAP : 3,492

TABLE 2. 1999 BERING SEA/ALEUTIAN ISLANDS FISHERIES
10/28/99 PROHIBITED SPECIES BYCATCH
15:50:35 Week Ending: 10/23/99

TRAWL HERRING, BSAI

Fishery group	Herring (mt)	Cap (mt)	%
Midwater pollock	975	1,217	80%
Pacific cod	0	22	1%
Yellowfin sole	89	254	35%
Rockfish	0	8	0%
Other	17	152	11%
Rock sole/Other flatfish	2	22	8%
GTRB/ARTH/SABL	1	10	6%
Total:	1,084	1,685	64%

TRAWL SALMON, BSAI

Fishery group	Chinook (#'s)	Other (#'s)	Total (#'s)
Midwater pollock	14,696	62,648	77,343
Bottom pollock	0	0	0
Pacific cod	2,249	57	2,307
Yellowfin sole	0	412	412
Rock sole/Other flatfish	288	717	1,005
Rockfish	1	0	1
Other	51	803	854
Seasonal Total:	17,285	64,637	81,921

TRAWL BAIRDI TANNER CRAB

	ZONE 1			ZONE 2		
Fishery group	Crabs (#'s)	Cap (#'s)	%	Crabs (#'s)	Cap (#'s)	%
Rock sole/Other flatfish	132,148	279,528	47%	170,971	376,274	45%
Pacific cod	77,765	139,950	56%	42,884	205,528	21%
Yellowfin sole	146,730	260,894	56%	301,130	1,128,824	27%
Pollock/AMCK/Other species	665	13,378	5%	5,092	19,146	27%
Rockfish	0	0	0%	0	7,378	0%
GTRB/ARTH/SABL	0	0	0%	1,381	0	0%
Total:	357,308	693,750	52%	521,457	1,737,150	30%

TRAWL C. OPILIO TANNER CRAB in the COBLZ AREA

Fishery group	Crabs (#'s)	Cap (#'s)	%
Rock sole/Other flatfish	241,987	766,552	32%
Pacific cod	20,957	127,758	16%
Yellowfin sole	342,501	3,108,786	11%
Pollock/AMCK/Other species	1,210	74,234	2%
Rockfish	0	42,585	0%
GTRB/ARTH/SABL	0	42,585	0%
Total:	606,656	4,162,500	15%

TRAWL RED KING CRAB ZONE 1

Fishery group	Crabs (#'s)	Cap (#'s)	%
Rock sole/Other flatfish	62,490	103,950	60%
Pacific cod	7,506	14,850	51%
Yellowfin sole	12,630	19,800	64%
Pollock/AMCK/Other species	91	1,850	5%
Total:	82,717	140,450	59%

Table 3. 1999 BSAI Trawl Fisheries PSC Apportionments and Seasonal Allowances

Fishery Group	Halibut Mortality Cap (mt)	Herring (mt)	Red King Crab (animals) Zone1	C. bairdi Zone1	C. bairdi Zone2	C. opilio COBLZ
Yellowfin sole	1,005	254	21,084	274,526	1,198,906	3,248,821
January 20 - March 31	285					
April 1 - May 10	210					
May 11 - July 10	100					
July 11 - Dec 31	410					
Rocksole/other flatfish	795	22	158,133	294,134	399,635	801,080
January 20 - March 29	485					
March 30 - July 10	130					
July 11 - December 31	180					
Turbot/sablefish/ Arrowtooth		10				44,504
Rockfish	75	8			7,836	44,504
July 11 - Dec 31	75					
Pacific cod	1,550	22	15,813	147,263	218,288	133,513
Pollock/mackerel/o.species	250	152	1,970	14,077	20,335	77,578
Pelagic Trawl Pollock		1,217				
TOTAL	**3,675**	**1,685**	**197,000**	**730,000**	**1,845,000**	**4,350,000**

Note: Includes 7.5% CDQ allocation.

Unused PSC allowances may be rolled into the following seasonal apportionment.

30% of the red king crab PSC for the rock sole fishery is apportioned to the 56 - 56o10' RKCSA strip.

Accounts for the reductions in halibut and crab PSCs due to ban on pollock bottom trawling (halibut: -100 mt; RKC: -3,000; Z1 bairdi: -20,000; Z2 bairdi: -30,000; opilio: -150,000 crab)

Accounts for adjustments due to changes in biomass for herring, red king crab, Z2 bairdi, and opilio.

Table 4. 1999 BSAI Non-Trawl Fisheries PSC Bycatch Allowances and fixed gear Pacific cod seasonal apportionements

Fishery Group	Halibut Mortality (mt)	Seasonal Apportion of cod TAC (mt)
Pacific Cod	810	
Jan 1 - April 30	495	60,000 first tr.
May 1 - September 14	0	8,500 second tr.
Sept. 15 - Dec. 31	315	15,000 third tr.
Other Non-Trawl*	90	
May 1 - September 14	45	
Sept. 15 - Dec. 31	45	
Groundfish Pot	Exempt	
TOTAL	**900 mt**	**83,500**

Note: unused halibut PSC or P. cod TAC from first trimester will be rolled into the third trimester.

Any halibut PSC removed from the CDQ fisheries will be replaced from PSC apportioned from the third trimester.

* Includes hook & line fisheries for rockfish and Greenland turbot.

Sablefish hook & line fisheries will be exempted from the halibut mortality cap.

Jig gear will also be exempted from the halibut mortality cap.

Table 6-- Summary of stock abundance (biomass), harvest strategy (rate), 2000 recommended acceptable biological catch (ABC), and stock condition for groundfish in the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district. "Biomass" corresponds to projected January 2000 abundance for the age+ range reported in the summary section. Biomass and ABC are in metric tons, reported to three significant digits. Fishing mortality rates are reported to two significant digits. "Relative biomass" is based on the long-term average, and "trend" is based on the short-term projection.

Species or Species Complex	Area	Biomass	Rate	ABC	Relative biomass, trend
Walleye pollock	EBS	7,700,000	$F_{40\%}$ [a]	1,100,000	Average, increasing
Walleye pollock	AI	106,000	$0.75M$	23,800	Low, stable
Walleye pollock	Bogoslof	475,000	$0.75M$	71,300	Low, stable
Pacific cod	BSAI	1,300,000	F_{cod} [b]	193,000	Average, declining
Yellowfin sole	BSAI	2,820,000	$F_{40\%}$	191,000	High, stable
Greenland turbot	BSAI	233,000	$0.25F_{40\%}$	9,300	Low, declining
Arrowtooth flounder	BSAI	785,000	$F_{40\%}$	131,000	High, declining
Rock sole	BSAI	2,070,000	$F_{40\%}$	230,000	High, declining
Flathead sole	BSAI	611,000	$F_{40\%}$	73,500	High, declining
Other flatfish	BSAI	829,000	$F_{40\%}$ [c]	117,000	High, declining
Sablefish	EBS	18,000	$F_{40\%}$ [a]	1,410	Low, stable
Sablefish	AI	33,000	$F_{40\%}$ [a]	2,490	Low, stable
Pacific ocean perch	EBS	47,700	$F_{40\%}$ [a]	2,600	Low, stable
Pacific ocean perch	AI	192,000	$F_{40\%}$ [a]	12,300	Average, declining
Other red rockfish	EBS	8,200	$0.75M$	194	Not available
Sharpchin/northern	AI	115,000	$0.75M$	5,150	Not available
Shortraker/rougheye	AI	41,500	$0.75M$	885	Not available
Other rockfish	EBS	7,030	$0.75M$ [c]	369	Not available
Other rockfish	AI	13,000	$0.75M$ [c]	685	Not available
Atka mackerel	BSAI	565,000	F_{max} [d]	70,800	Average, declining
Squid	BSAI	n/a	$0.75F_{his}$ [e]	1,970	Not available
Other species	BSAI	611,000	F_{his} [e]	26,800	Not available
Total	BSAI	18,580,430		2,265,553	

a/ Adjusted on the basis of the relationship between projected spawning biomass and $B_{40\%}$.
b/ Species-specific harvest strategy used only for Pacific cod
c/ Proxy values used for some species.
d/ Species-specific harvest strategy used only for Atka mackerel.
e/ Fishing mortality rate implied by setting ABC equal to historic average catch.

Table 4-- Summary of stock abundance (biomass), overfishing level (OFL), acceptable biological catch (ABC), the fishing mortality rate corresponding to ABC (F_{OFL}), and the fishing mortality rate corresponding to OFL (F_{ABC}) for the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district as projected for 2000. "Biomass" corresponds to projected January 2000 abundance for the age+ range reported in the summary section. Biomass, OFL, and ABC are in metric tons, reported to three significant digits. *F*s are reported to two significant digits.

Species or Species Complex	Area	Biomass	OFL	ABC	F_{OFL}	F_{ABC}
Walleye pollock	EBS	7,700,000	1,680,000	1,100,000	0.80	0.46
Walleye pollock	AI	106,000	31,700	23,800	0.30	0.23
Walleye pollock	Bogoslof	475,000	95,000	71,300	0.20	0.15
Pacific cod	BSAI	1,300,000	240,000	193,000	0.33	0.26
Yellowfin sole	BSAI	2,820,000	226,000	191,000	0.13	0.11
Greenland turbot	BSAI	233,000	42,000	9,300	0.32	0.064
Arrowtooth flounder	BSAI	785,000	160,000	131,000	0.27	0.22
Rock sole	BSAI	2,070,000	273,000	230,000	0.19	0.15
Flathead sole	BSAI	611,000	90,000	73,500	0.35	0.28
Other flatfish	BSAI	829,000	141,000	117,000	0.35 [a]	0.28 [a]
Sablefish	EBS	18,000	1,750	1,410	0.14	0.11
Sablefish	AI	33,000	3,090	2,490	0.14	0.11
Pacific ocean perch	EBS	47,700	3,100	2,600	0.065	0.054
Pacific ocean perch	AI	192,000	14,400	12,300	0.083	0.070
Other red rockfish [b]	EBS	8,200	259	194	0.032 [c]	0.024 [c]
Sharpchin/northern [d]	AI	115,000	6,870	5,150	0.060 [c]	0.045 [c]
Shortraker/rougheye [e]	AI	41,500	1,180	885	0.028 [f]	0.021 [f]
Other rockfish	EBS	7,030	492	369	0.070 [f]	0.053 [f]
Other rockfish	AI	13,000	913	685	0.070	0.053
Atka mackerel	BSAI	565,000	119,000	70,800	0.42	0.23
Squid	BSAI	n/a	2,620	1,970	n/a	n/a
Other species	BSAI	611,000	71,500	26,800	0.12	0.044

a/ Alaska plaice rate shown as an example.
b/ Sharpchin, northern, shortraker, and rougheye rockfish.
c/ Weighted average of species-specific rates.
d/ Sharpchin and northern rockfish.
e/ Shortraker and rougheye rockfish.
f/ Shortspine thornyhead rate shown as an example.

Table 5-- Total allowable catch (TAC) and acceptable biological catch (ABC) for 1999 (as established by the Council) and 2000 (as recommended by the Plan Team) for groundfish in the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district. Figures are in metric tons.

Species or Species Complex	Area	1999 TAC (Council)	1999 ABC (Council)	2000 ABC (Plan Team)
Walleye pollock	EBS	992,000	992,000	1,100,000
Walleye pollock	AI	2,000	23,800	23,800
Walleye pollock	Bogoslof	1,000	15,300	71,300
Pacific cod	BSAI	177,000	177,000	193,000
Yellowfin sole	BSAI	207,980	212,000	191,000
Greenland turbot	BSAI	9,000	14,200	9,300
Arrowtooth flounder	BSAI	134,354	140,000	131,000
Rock sole	BSAI	120,000	309,000	230,000
Flathead sole	BSAI	77,300	77,300	73,500
Other flatfish	BSAI	154,000	154,000	117,000
Sablefish	EBS	1,340	1,340	1,410
Sablefish	AI	1,380	1,860	2,490
Pacific ocean perch	EBS	1,400	1,900	2,600
Pacific ocean perch	AI	13,500	13,500	12,300
Other red rockfish	EBS	267	267	194
Sharpchin/northern	AI	4,230	4,230	5,150
Shortraker/rougheye	AI	965	965	885
Other rockfish	EBS	369	369	369
Other rockfish	AI	685	685	685
Atka mackerel	BSAI	66,400	73,300	70,800
Squid	BSAI	1,970	1,970	1,970
Other species	BSAI	32,860	32,860	26,800
Total	BSAI	2,000,000	2,247,846	2,265,553

(D-1) Final Groundfish Specifications for Year 2000

Staff Presentation

Cooperative Project Between:

- Both Groundfish Plan Teams
- Alaska Regional Office, Sustainable Fisheries' staff
- Alaska Fisheries Science Center REFM, RACE, NMML staff
- Pat Livingston and contributors to Ecosystem Considerations Chapter
- Terry Hiatt and Joe Terry on Socioeconomic Assessments

WHY Incorporate SAFE reports into Environmental Analysis (EA) documents ?

↑ Improves NEPA compliance in TAC-setting process

↑ Provides full disclosure of all information into the public record

↑ Tier off NMFS 1998 SEIS

↑ Use EA as template for other groundfish FMP actions throughout year

Downsides of this method.

↓ Earlier Deadlines

Proposed/Interim Specs - 28 Sept 1999

Final Specs - 23 Nov 1999

↓ Ecosystem harvest impacts more obviously absent

Iterative process:

More scrutiny → more ecosystem considerations of harvest effects

→ future EAs more robust

EA Outline

1.0 Purpose and Need
2.0 Proposed Action and Harvest Level Alternatives
3.0 Environmental Consequences
- target species
- prohibited species
- forage species
- marine habitat
- marine mammals
- seabirds
- threatened & endanger species
- socioeconomic

4.0 Conclusions
- ESA Sec 7 Consultations
- FONSI statement

Appendices

Final Groundfish TAC Specifications for Year 2000

Environmental Assessment Appendices

- A: BSAI SAFE
- B: GOA SAFE
- C: Economic SAFE
- D: Ecosystem Considerations
- E: EFH Assessment

Year 2000 Final Specification Alternatives

On a species or species group basis:

1) Fishing mortality rate (F) equal to the maximum permissible ABC fishing mortality rate under the ABC/OFL definitions in Amendment 56

2) Fishing mortality rate equal to the stock assessment author's recommended ABC fishing mortality rate

3) Fishing mortality rate equal to 50% of the maximum permissible ABC fishing mortality rate under Amendment 56

4) Fishing mortality rate equal the 5-year average F from 1994 to 1998

5) Fishing mortality rate of $F = 0$

Table 13. Bering Sea Aleutian Islands Area Year 2000 Harvest Alternatives (values are in mt)
Plan Team recommendations are highlighted in bold text

Species/Area	Alternative 1 *F*=max*F*abc	Alternative 2 *F*=(%)max*F*abc	Alternative 3 *F*=50%max*F*abc	Alternative 4 *F*='94-'98ave*F*	Alternative 5 *F*=0	Tier
Pollock	1,200,000	1,100,000	604,000	843,000	0	1a
EBS	23,800	23,800	11,900	37,356	0	5
AI	71,300	71,300	35,650	276	0	5
Pacific cod	206,000	193,000	108,000	152,000	0	3b
Yellowfin sole	191,000	191,000	97,000	135,000	0	3a
Greenland turbot	34,700	9,300	18,185	7,891	0	3a
Arrowtooth	131,000	131,000	66,314	10,927	0	3a
Rock sole	230,000	230,000	116,933	32,530	0	3a
Flathead sole	73,500	73,500	38,647	15,262	0	3a
Other flatfish	117,000	117,000	62,231	15,847	1	3a
Sablefish	1,410	1,384	725	1,360	0	3b
EBS						
AI	2,490	2,446	1,280	2,403	0	3b
POP	2,600	2,600	1,316	1,665	0	3b
EBS						
AI	12,300	12,300	6,240	10,09	0	3b
Ot red rockfsh	194	194	97	204	0	5
Sharpch/North	5,150	5,150	2,575	4,173	0	5
Shortrak/Roug	885	885	442	779	0	5
Ot rockfish EBS	369	369	184	191	0	5
AI	685	685	342	296	0	5
Atka mackerel	103,000	70,800	54,754	47,007	0	3a
Squid	1,970	1,970	985	925	0	6
Other species	91,600	26,800	45,800	23,780	0	5
Total	2,500,953	2,265,483	1,273,600	1,342,971	0	

Table14. Gulf of Alaska Year 2000 Harvest Alternatives (values are in mt)
Plan Team recommendations are highlighted in bold text

Species/Area	Alternative 1 *F*=max*F*abc	Alternative 2 *F*=(%)max*F*abc	Alternative 3 *F*=50%max*F*abc	Alternative 4 *F*='94-'98ave*F*	Alternative 5 *F*=0	Tier
Pollock						
W/C/WYK	111,310	96,560	58,980	55,550	0	3b
E	6,460	6,460	3,230	4,630	0	5
Pacific cod	88,600	76,400	45,500	41,300	0	3a
Flatfish (deep)	5,300	5,300	2,650	2,700	0	5,6
Rex sole	9,440	9,440	4,720	8,020	0	5
Flathead sole	26,270	26,270	13,140	2,400	0	5
Flatfish (shal)	37,860	37,860	18,930	3,920	0	4,5
Arrowtooth	145,360	145,360	76,400	11,640	0	3a
Sablefish	13,400	13,170	6,900	12,940	0	3b
POP	13,020	13,020	6,600	11,280	0	3b
SR/RE	2,070	1,730	1,850	1,030	0	4,5
Other rockfish	5,010	4,900	1,070	2,500	0	4,5
Northrn rockfish	6,400	5,120	4,010	3,240	0	4
Pelag rockfish	7,310	5,980	3,650	3,090	0	4
Thornyhead	2,360	2,120	1,190	1,370	0	3a
Demr rockfish	380	340	290	300	0	4
Atka mackerel	4,700	600	2,350	1,300	0	6
Total	483,250	450,630	251,460	165,210	0	

Pacific Herring Stocks and Fisheries in the Arctic-Yukon-Kuskokwim Region of the Bering Sea, Alaska, 1999

A Report to the Alaska Board of Fisheries

Compiled by

Larry DuBois
and
Helen H. Hamner

Regional Information Report[1] No. 3A99-39

Alaska Department of Fish and Game
Commercial Fisheries Division
AYK Region
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Anchorage, Alaska 99518
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[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.

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Cape Romanzof District
Dan Bergstrom, Area Manager and Vince Golembeski, Asst. Area Manager. Commercial Fisheries Division, 333 Raspberry Rd., Anchorage, Alaska. 99518-1599. 344-0541.

Norton Sound and Port Clarence Districts
Charles Lean, Area Manager and Fred Bue and Tom Kohler, Asst. Area Managers. Commercial Fisheries Division, P.O. Box 1148, Nome, Alaska. 99762-1148. 443-5167.

AYK Region
Rich Cannon, Regional Management Biologist and Helen Hamner, Assistant Regional Biometrician. Commercial Fisheries Division, 333 Raspberry Rd., Anchorage, Alaska. 99518-1599. 344-0541.

OEO/ADA STATEMENT

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INTRODUCTION

The objectives of this report are to summarize the results of the 1999 Pacific herring stock assessment programs for the Arctic-Yukon-Kuskokwim (AYK) Region, review 1999 management strategies and harvests in all AYK commercial and subsistence herring fisheries, and present harvest projections and general management strategies for the 2000 fishing season. Commercial fishing districts included in this report consist of the Security Cove, Goodnews Bay, Cape Avinof, Nelson Island, Nunivak Island, Cape Romanzof, Norton Sound, and Port Clarence Districts (Figures 1 and 2).

The Alaska Board of Fisheries established threshold biomass levels, below which commercial harvests are not allowed under the Bering Sea Herring Fishery Management Plan (5 AAC 27.060, ADF&G 1998), for all districts with the exception of the Port Clarence District. Exploitation rates are limited to a maximum of 20% in all areas. In some areas, the Board of Fisheries has further restricted exploitation rates to protect subsistence harvests. All AYK herring districts open and close by emergency order authority. The Nelson Island, Nunivak Island, Cape Romanzof, and Norton Sound herring fisheries were designated limited entry status in 1987. A moratorium to new entry was placed on the Goodnews Bay herring fishery starting in 1998. In addition, all AYK Region commercial herring districts, except Security Cove and Port Clarence, are designated as superexclusive use areas.

The Alaska Board of Fisheries approved two new regulations regarding the Norton Sound herring fisheries in November 1998. The open pound spawn on kelp fishery which had been a one year only provisional fishery was made an annual fishery. Similarly, the spawn on wild *Fucus* kelp fishery that was allowed by Emergency Regulation in 1998 was put into regulation. Both these fisheries require participants to own a Norton Sound sac roe permit. The intent is to allow fishers to diversify their use of the herring resource by electing to participate in only one of the fisheries. This would allow permit holders to maximize their earnings by selling their product to the highest paying market.

A total biomass of 63,800 tons of herring was estimated to have been present in the surveyed portion of the AYK Region herring districts in 1999 (Tables 2 and 5). The 1999 return was 11% below the 5-year average (1994-1998) of 71,848 tons. Young herring (ages 5 or less) averaged approximately 4% of the biomass in the region. Middle-aged herring (ages 6-8) comprised approximately one-third of the biomass in all herring districts combined. Older herring (ages 9 and older) constituted almost two-thirds of the biomass in the region. Ages 9 and 10 were the dominant age groups in nearly all the Kuskokwim herring districts (Security Cove, Goodnews Bay, Nelson Island and Nunivak Island). Ages 6 and 9 dominated the herring biomass in the Cape Avinof District. Ages 9 and 11 were the dominant age groups in the Cape Romanzof District. Ages 6 and 11 dominated the herring biomass in the Norton Sound District. The average age among all herring districts was 8.4 years. Cape Avinof had the youngest average age (7.4 years) while Cape Romanzof had the oldest average age (9.2 years). Overall, the recruitment

percentage in number of fish was 8.7%, a record low for the region. DuBois (*in press*) presents information on sampling effort and age composition in 1999.

In recent years, some processors in western Alaska herring fisheries have adjusted delivery weights of the landed catch to reflect water weight. There is considerable variation throughout the fleet in equipment and technique used to handle fish delivered to tenders. Newly implemented dewatering equipment used by some tenders has resulted in lower harvest weights on fish tickets compared to recent years. For the 1999 season, the Alaska Department of Fish and Game, Division of Commercial Fisheries issued a newly designed fish ticket that includes a check box where tender boat operators can record the type of weight used. However, the older fish tickets were widely used in 1999. Norton Sound management staff interviewed processors postseason to determine which tenders or processors used dewatering equipment and which weight-type was recorded on fish tickets. The 'dry' weights recorded on some fish tickets in 1999 were then converted to a 'wet' weight to maintain consistency in harvest reporting and estimated exploitation rate. The converted wet weight is used in the text with the fish ticket weight in parentheses, for the Norton Sound District. Only the fish ticket weight is reported for the other districts.

The 1999 herring harvest for the AYK Region was approximately 7,630 tons, a slight increase from the 1998 harvest of 7,310 tons (Table 1). The 1999 harvest is 10% below the 5-year average (1994-1998) of 8,450 tons. Food and bait sales during the sac roe fishery totaled 412 tons and 8 tons of waste were reported, with the remaining harvest sold as sac roe product (Table 2). Harvest identified as food and bait primarily occurs during the sac roe fisheries when fish are sold with a roe content that is below buyer's acceptable minimums. An additional eight tons of bait were harvested in the directed-bait fishery in the Norton Sound District. In some years, wastage occurs when fishermen abandon gillnets or cannot sell their catch. This amount is added to the total harvest and is included in calculations of exploitation rates. The 1999 total exploitation rate for the AYK Region was 12.0%. Exploitation rates ranged from 8.0% in the Norton Sound District to 20.5% in the Nelson Island District (Table 2).

An awareness among processors, managers and fishermen of poor market conditions and the need for a high-quality product has helped produce high roe percentages in recent years. Roe recoveries in the sac roe harvest ranged from 10.2% in the Cape Romanzof District to 11.3% in the Goodnews Bay District, with a combined regional roe recovery of 10.9% (Table 2).

The 1999 estimated ex-vessel value for the AYK Region of $1,996,000 was an increase compared to the 1998 value of $1,158,000 (Table 2). The 1999 value is 50% of the 5-year average (1994- 1998) of $4,021,000, and approximately one-fifth the record value of $8,730,000 in 1996. The primary reason for the increase in value from 1998 was the improving market for herring in 1999. The price paid to fishermen for herring with 10% roe content in the Kuskokwim Area and Cape Romanzof District ranged from $200 to $500 per ton. These prices are approximately 50% greater than the prices paid in 1998. The largest fishery in AYK is the Norton Sound District, which has the last sac roe herring fishery to occur along the west coast each year. Low abundance and harvests of herring in some other areas of the state brought the price up as the fisheries progressed to the Bering Sea. The price paid to fishermen in the Norton Sound

District ranged from $200 to $250 per ton. This price was three times the price they received in 1998. Still, fewer processors than usual chose to participate in the Norton Sound sac roe herring fishery. This limited the number of participants in the sac roe fishery, only one-third of the permits were fished, and contributed to a decreased harvest rate. A directed-bait herring fishery was allowed in the Nome Subdistrict, Norton Sound District. The price paid during the directed-bait fishery was $1,500 per ton ($0.75 per pound).

A total of 571 permit holders participated in AYK sac roe herring fisheries during the 1999 season (Table 3). Most districts showed slight increases in participation compared to 1998. The exception was the Norton Sound District, where the number of permit holders fishing increased 300% from 1998. However, participation in the 1999 Norton Sound fishery is only one-half the 1993-1997 average of 234 fishers. Beach seine fishers did not harvest any herring in the Norton Sound District during the 1999 season. Two fishers participated in the Norton Sound kelp fisheries and one permit holder harvested herring in the directed-bait fishery.

Surveyed subsistence fishermen from selected Yukon River coastal villages harvested approximately 12.5 tons of herring in 1999 (Table 4). No surveys were conducted in the Nelson Island and Nunivak Island villages. These villages have historically harvested approximately 110 tons of herring annually (Pete 1992).

Biomass projections are made for each district using postseason escapement estimates, historical mean rates of survival, current mean weights for each age class and assumed recruitment rates for each age class (Wespestad 1982). The projected 2000 spawning biomass of the northeastern Bering Sea herring stocks (Security Cove to Norton Sound) is 48,141 tons, with an allowable commercial harvest of 9,450 tons (Table 7). This is a decline from the 1999 biomass of 63,800 tons. All districts have projected declines, partly due to natural mortality as the predominant year class ages. These projections do not include age classes, generally age 3, not yet seen in the fishery. Hamner and Bromaghin (1999) discuss projection methods and details of the projections for year 2000.

Variability in survival rates and in aerial survey assessments of biomass and deviations from the assumed survival or recruitment rates may result in the observed biomass being either above or below these projections. Observed biomass estimates may be greater than expected if a large numbers of recruit herring arrive in year 2000. Harvest levels may be adjusted inseason according to observed herring spawning biomass. In addition, in accordance with the AYK Region harvest strategy, the commercial fishery will not target newly recruited age classes. If it is not possible to determine herring abundance using aerial survey methods, stock abundance will be assessed using information from the projected biomass, test and commercial catches, and spawn deposition observations.

STOCK STATUS

Assessment Methods

The timing of the spawning migration of herring in the northeastern Bering Sea is greatly influenced by climate and oceanic conditions, particularly the extent and distribution of the Bering Sea ice pack. Most herring appear soon after ice breakup, which generally occurs between late-April and mid-June. Spawning usually begins in the Security Cove District and progresses in a northerly direction. In some areas, spawning may continue as late as July. The run timing during the 1999 season was approximately two weeks later than average due to a late breakup and extensive sea ice.

Aerial survey techniques have been used since 1978 in Bering Sea herring fisheries to estimate herring spawning biomass (Lebida and Whitmore 1985). However, it is often difficult to obtain biomass estimates from aerial surveys in the AYK Region because of poor survey conditions caused by unfavorable weather, ice conditions or turbid water. Herring school surface areas are recorded in 538 ft^2 relative abundance index (RAI) units. In the AYK Region, RAI units are converted to biomass based on water depth. Because purse seine gear is needed to estimate the conversion factors and purse seine gear is not usually fished in the AYK Region, conversion factors developed in the Togiak District were used. Ground surveys are conducted in some districts to obtain information on the distribution and density of kelp beds and herring spawn deposition.

During 1999, 72 aerial surveys totaling 84.1 hours of flight time were flown in the AYK Region: 11 (5.5 hours) in Security Cove, 13 (6.9 hours) in Goodnews Bay, 2 (1.3 hours) in Cape Avinof, 9 (3.5 hours) in Nelson Island, 4 (4.1 hours) in Nunivak Island, 9 (0.6 hours) in Jacksmith Bay, 5 (3.9 hours) in Cape Romanzof, and 19 (58.3 hours) in Norton Sound and Port Clarence combined. Survey conditions were rated as fair or better in 40% of these surveys.

Gillnets are the only legal gear in the AYK Region, with the exception of Norton Sound where a portion of the harvest is generally taken using beach seine gear. However, the beach seine fishery did not take place during the 1999 season. An attempt was made to sample at least 420 herring from each commercial gear type, district or subdistrict per week. The sampling goal for test fish catches was to sample a minimum of 60 herring per day or 420 per week from each district or subdistrict. Herring from test fish and commercial catches were sampled to estimate age, sex, size, and sexual maturity of herring, and to note the occurrence of other schooling fishes, in all but the Security Cove, Nunivak Island and Port Clarence Districts. Security Cove and Nunivak Island age composition summaries were compiled using samples from Goodnews Bay and Nelson Island, respectively. A total of 8,187 herring from commercial gillnet, subsistence beach seine and test catches were sampled during the 1999 fishing season.

In most districts, fishermen, in cooperation with the Department, provided catch samples for roe quality evaluation by industry representatives. Participation by fishermen in collecting samples,

processor evaluation of samples, and the flexibility of fishermen to fish on short notice helped to increase roe recoveries.

Spawning Populations

Security Cove District

Since 1981, biomass estimates in the Security Cove District have ranged from 2,300 tons in 1987 to 8,267 tons in 1981 (Table 5). The herring biomass projected to return to this district in 1999 was 3,060 tons. Between May 8 and May 31, eleven aerial surveys were flown in the district to estimate herring biomass and observe spawning activity. Three of these surveys were flown under acceptable conditions. The largest biomass, 5,261 tons, was observed on May 22. The peak biomass estimate observed on May 22 was used as the biomass estimate for 1999. A total of 14.5 miles of spawn was observed in the district, with peak spawning activity (3.5 miles) observed on May 25.

Due to budget cuts, herring were not sampled from the Security Cove District. Age composition of the Security Cove District biomass was estimated using samples from the Goodnews Bay District. Ages 10 and 9 herring dominated the biomass (19.9% and 17.1%, respectively, Figure 5) Ages 6 and 10 dominated the return in numbers of fish (18.3% and 17.1%, respectively). Age 9 and older herring comprised 57.7% of the biomass. Recruit herring, ages 2-5, represented 5.0% of the returning population (Figure 7).

Goodnews Bay District

Since 1981, biomass estimates in the Goodnews Bay District have ranged from 2,000 tons in 1987 to 6,896 tons in 1999 (Table 5). The herring biomass projected to return to this district in 1999 was 3,009 tons. During the 1999 season, thirteen aerial surveys were flown in the district between May 8 and May 31 to estimate herring biomass and observe spawning activity. Two of these surveys were flown under acceptable conditions. A record high biomass, 6,896 tons, was observed on May 23 and used as the biomass estimate for 1999. Approximately three miles of spawn was observed in the district with the greatest amount (2 miles) observed on May 23.

The Department's test fish crew sampled 790 herring caught with variable-mesh gillnets from May 20 to May 28 for biological data. Ages 10 and 9 herring dominated the biomass (19.8% and 16.9%, respectively, Figure 5). Ages 6 and 10 dominated the return in numbers of fish (18.2% and 17.2%, respectively). Age 9 and older herring comprised 57.4% of the biomass. Recruit herring, ages 2-5, represented 5.0% of the returning population (Figure 7).

Cape Avinof District

Since 1985, biomass estimates in the Cape Avinof District have ranged from 1,225 tons in 1987 to 4,600 tons in 1997 (Table 5). The herring biomass projected to return to this district in 1999 was 3,555 tons. During the 1999 season, two aerial surveys were flown in the district. Neither of these surveys were flown under acceptable conditions. Eleven tons of herring were observed during the second aerial survey flown on June 8. No spawn was observed in either survey. Aerial survey estimates of herring biomass in the Cape Avinof District have been obtained in only three of the past ten years. The area consists of shallow mud flats where turbidity, caused by wind and wave action, often limits visibility. The last year in which the herring biomass was estimated by survey was 1992, when 3,446 tons were observed. In other years, the preseason projection or commercial catch rates have been used to estimate herring biomass. Due to poor aerial survey conditions in 1999, the total biomass present in the district was assessed to be the projected biomass of 3,555 tons.

The Cape Avinof test fish crew sampled 404 herring caught with variable-mesh gillnets from June 5 to June 10 for biological data. Age 6 herring dominated both the biomass (22.0%, Figure 5) and the return in numbers of fish (26.5%). Age 9 and older herring comprised 48.1% of the biomass. Recruit herring represented 17.6% of the returning population (Figure 7).

Nelson Island District

Since 1985, biomass estimates in the Nelson Island District have ranged from 2,385 tons in 1991 to 9,500 tons in 1985 (Table 5). The herring biomass projected to return to this district in 1999 was 5,826 tons. During the 1999 season, nine aerial surveys were flown between May 30 and June 9 to estimate herring biomass and observe spawning activity. Four of these surveys were flown under acceptable conditions. During an aerial survey on June 3, 3,189 tons of herring were observed in the district. The largest biomass, 3,466 tons, was observed on June 9. It is believed these two biomass estimates were separated enough in space and time to represent different groups of fish and were summed to estimate the total biomass present in the district, 6,655 tons. The only spawn observed in the district was on June 8 (2 miles).

Test fishing with variable-mesh gillnets occurred from May 24 through June 10. The crew sampled 1,261 herring caught in variable-mesh gillnets for biological data. Ages 10 and 9 herring dominated the biomass (20.9% and 20.5%, respectively, Figure 5) and the return in numbers of fish (17.7% and 18.6%, respectively). Age 9 and older herring comprised 60.7% of the biomass. Recruit herring represented 9.5% of the spawning population (Figure 7).

Nunivak Island District

Since 1985, biomass estimates in the Nunivak Island District have ranged from 422 tons in 1990 to 6,000 tons in 1986 (Table 5). The herring biomass projected to return to this district in 1999 was 3,319 tons. During the 1999 season, four aerial surveys were flown between May 30 and June 9 to estimate herring biomass and observe spawning activity. Weather hindered the ability to conduct surveys early in the season, but three surveys between June 7 and June 9 were flown under acceptable conditions. The largest biomass, 1,418 tons, was observed on June 8 under fair conditions. The preseason biomass projection of 3,319 tons was used as the biomass estimate for 1999. A total of 14.0 miles of spawn was observed in the district, with peak spawning activity observed on June 9 (5.0 miles).

Due to budget cuts, herring were not sampled from the Nunivak Island District. Age composition of the Nunivak Island herring biomass was estimated using samples from the Nelson Island District. Ages 10 and 9 herring dominated the biomass (20.9% and 20.5%, respectively, Figure 5) and the return in numbers of fish (17.7% and 18.6%, respectively). Age 9 and older herring comprised 60.7% of the biomass. Recruit herring represented 9.5% of the spawning population (Figure 7).

Central Kuskokwim Bay

The Central Kuskokwim Bay area extends from Jacksmith Bay, south of Quinhagak, to the Ishkowik River. No commercial herring fishing districts are located in this area. Nine aerial surveys were flown in this area from May 8 to May 31. All of these surveys were flown under unsatisfactory conditions. The largest biomass, 226 tons, was observed on May 28 under poor conditions.

Cape Romanzof District

Due to excessive water turbidity in the Cape Romanzof area, it is not generally possible to estimate herring biomass using aerial survey techniques. Based on information from limited aerial surveys, test and commercial catches, and spawn deposition, the estimated herring biomass in the Cape Romanzof District has ranged from approximately 3,800 to 7,500 tons since 1981 (Table 5). Five aerial surveys were flown during the 1999 season from May 30 through June 24. The largest biomass, 2,095 tons, was observed on June 8 under fair conditions. The only spawn observed in the district was 2.5 miles on June 8. Based on spawn deposition study results, commercial and test fishery catch rates, herring age composition and the preseason projection, the 1999 biomass of herring in the Cape Romanzof District was estimated to be between 3,300 and 4,300 tons. This is a decrease from the 1998 biomass estimate of between 4,000 and 5,000 tons.

Artificial spawning substrates were located in the same general spawning locations as in 1992 through 1998. Forty platforms were placed just north of the Department's field camp on June 2. Spawn deposited on the substrate was removed and weighed daily at low tide. Daily removal of spawn allowed measurements of new spawn deposition and decreased the problem of spawn loss due to wave action and desiccation. The largest spawn deposition within the study area occurred on June 8 and June 10. The spawn deposition season total index of 3,694 g documented this year was the fourth lowest since the project began in 1992 and was 14% below the five-year average (1993-1996 and 1998) of 4,296 g. However, it is uncertain whether the study area results are indicative of the total spawning biomass within the entire district.

The Department's test fish crew sampled 889 herring caught with variable-mesh gillnets from June 1 to June 15 for biological data. Age 11 herring dominated the return in both biomass (31.0%; Figure 6) and numbers of fish (27.1%). Age 9 and older herring comprised 68.8% of the biomass. Recruit herring represented just 2.8% of the spawning population (Figure 7). The Cape Romanzof District had the oldest average-age herring (9.2 years) of any district in the region.

Norton Sound District

Historically, the primary spawning areas within Norton Sound have been from Stuart Island to Tolstoi Point. Additional spawning areas have been documented along Cape Denbigh and several bedrock outcroppings along the northern shore of Norton Sound between Bald Head and Topkok, especially in years when sea ice has remained in the nearshore areas into June.

In 1999 a late spring and the associated ice floes affected aerial survey biomass estimates. In mid-June the pack ice was concentrated at the entrance to Norton Sound. The herring migration seemed to be more extended than usual. The pack ice gradually dissipated towards the north and west leaving southern Norton Sound ice choked through the end of the fishery. This ice distribution caused a redistribution of spawning locations and herring biomass.

Since 1978, herring biomass estimates in the Norton Sound District have ranged from 5,291 tons in 1978 to 57,974 tons in 1992 (Table 5). During 1999, 19 surveys were flown between May 27 and June 25. Survey conditions were generally fair. Herring were first sighted during an aerial survey on June 9. The peak aerial survey estimate was made on June 19, when 18,067 tons was observed. On June 24, 14,235 tons were observed in Subdistrict 1. Because of the ice distribution, the staff believes a significant portion of the biomass was holding in deep water. The biomass did not migrate to the *Fucus* beds of southern Norton Sound until June 24 as the sea ice finally dissipated. To account for the unusual herring migration, the peak aerial survey of Subdistrict 1 on June 24 was combined with the peak aerial survey observations of the other subdistricts from June 19. These observations combined with the harvests up to June 19 provide a biomass estimate of 34,314 tons. The preseason biomass estimate was 41,169 tons.

Two Department test fish projects were operational during the 1999 season. One crew operated in the northern portion of Norton Sound at Cape Denbigh, and the second crew was stationed in the

southern end of the district at Klikitarik. Test fishing was conducted in the Unalakleet area by staff as time allowed. Test fish crews sampled 2,525 herring caught with variable-mesh gillnets from May 31 through June 24 for biological data. Age 11 herring dominated the return in biomass (26.4%, Figure 6). Age 6 was the largest component in numbers of fish (24.1%). The biomass consisted of 64.1% age 9 and older herring. Recruit herring represented 9.3% of the return in numbers of fish (Figure 7).

Port Clarence District

Generally, it is not possible to survey this district due to the presence of ice, water stain, or poor weather. In addition, it is difficult to identify herring due to the large numbers of saffron cod, whitefish, and other pelagic species typically present in the area. A record biomass for this district of 1,652 tons was sighted during an aerial survey in 1992. No surveys were flown in the Port Clarence district during 1999.

SUBSISTENCE FISHERY

Pacific herring are an important component of the diet of residents of many Yukon-Kuskokwim Delta villages. Surveys of subsistence harvests have been conducted annually in Yukon Delta villages and sporadically in Kuskokwim Delta villages since 1975. In the Nelson and Nunivak Island Districts subsistence surveys have been conducted during several years since 1990 by Subsistence Division (Pete 1990, 1991, 1992, 1993). However, no herring subsistence surveys have been conducted in those districts since 1996 (Table 4). Available data suggest that Nelson Island villages harvest approximately 110 tons of herring annually (Pete 1992).

A total of 48 herring were sampled for biological data from a single beach seine subsistence catch in the Nelson Island District. Age 5 herring dominated the subsistence catch (39.0%). The catch consisted of 12.1% age 9 and older herring and 39.0% recruit-aged herring.

A combination of mail-out questionnaires and personal interviews were used to collect subsistence harvest information from Yukon Delta villages of Hooper Bay, Chevak, and Scammon Bay in 1999. Fifty-nine households responded out of a total of 211 households that were mailed questionnaires. Sixty-seven of the households which did not return mail questionnaires were interviewed as well as six others. A total of 132 households were contacted. A subsistence harvest of 12.5 tons was reported to have been taken by 67 fishing families from Yukon Delta villages (Table 4). In addition, 42 families harvested 1,125 pounds of spawn on *Fucus* kelp for subsistence use. The reported harvest is a minimum estimate since not all fishing families were contacted.

COMMERCIAL FISHERY

Security Cove District

The total harvest of 1,072 tons had an average roe content of 11.0% (Tables 1 and 2). There were 56 tons of bait-quality herring delivered and 1 ton of wasted herring. Eight processors purchased herring from 87 permit holders who made 242 deliveries in three periods with nine hours of total fishing time (Tables 3 and 6). The estimated ex-vessel value was $338,000. The Guideline Harvest Level (GHL) was raised to 1,052 tons based on the May 22 aerial survey estimate of 5,261 tons. The exploitation rate was 20.4%.

On May 25, the first period opened for two hours starting at 3:00 PM. Seventy-six permit holders delivered 293 tons of sac roe quality herring with an average roe content of 10.7%, 39 tons of bait quality herring and 1 ton of wasted herring with unacceptable roe content, primarily due to spawned out fish. The second and third periods both occurred on May 26 with a combined harvest of 739 tons. During the first two periods fishers were allowed to use 100 fathoms of net. Due to high catch rates the allowable gear was restricted to 50 fathoms during the last period.

Due to budget cuts, herring were not sampled from the Security Cove commercial harvest. Samples from the Goodnews Bay commercial catch are used to estimate the age composition of the Security Cove harvest biomass. The largest age class in the harvest biomass was age 10 (22.9%, Figure 5). Age 9 and older herring made up 69.1% of the catch. Recruit-age herring comprised less than 1% of the harvest.

Goodnews Bay District

The total herring harvest was 1,366 tons with an average roe content of 11.3% (Tables 1 and 2). Bait-quality herring accounted for 33 tons of the harvest. Five processors bought herring from 94 permit holders who made 679 deliveries in eight periods with 49 hours total fishing time (Tables 3 and 6). The estimated ex-vessel value was $301,000. The GHL was raised to 1,379 tons based on the May 23 aerial survey estimate of 6,896 tons. The exploitation rate was 19.8% of the available biomass.

On May 29, the first period began at 5:00 AM for 6 hours. Forty-six permit holders delivered 44 tons of sac roe herring with an average roe content of 10.0% and 5 tons of bait-quality herring. Between 5:00 PM on May 29 and 9:00 PM June 1, the district was reopened seven times for a total of 43 hours of fishing time. Harvests ranged from 5 tons on May 30 when bad weather resulted in low fisher participation, to 496 tons on May 31.

A sample of 427 herring was taken from the commercial catch. The largest age class in the harvest biomass was age 10 (22.9%, Figure 5). Age 9 and older herring made up 69.1% of the catch. Recruit-age herring comprised less than 1% of the harvest.

Cape Avinof District

The total herring harvest was 533 tons with an average roe content of 11.0% (Tables 1 and 2). Bait-quality herring accounted for 18 tons of the harvest. Three processors bought herring from 117 permit holders who made 656 deliveries in nine periods with a total fishing time of 51 hours (Tables 3 and 6). The estimated ex-vessel value was $185,000. The exploitation rate was 15.0% based on the preseason biomass projection of 3,555 tons.

On June 11 the first period opened for three hours starting at 7:00 AM. Forty-nine permit holders landed 16 tons of herring with an average roe content of 10.3% and 1 ton of bait-quality herring. Between June 11 and June 15 the district was reopened eight times for a total of 48 hours of fishing time. Catches ranged from 17 tons on June 11 to 123 tons on June 12-13. Average roe contents ranged from 10.0% to 11.5%.

A total of 396 herring were sampled from the commercial catch. Age 9 herring dominated the harvest (23.8%, Figure 5). Age 9 and older herring made up 71.6% of the catch. Recruit-age herring comprised less than 1% of the harvest.

Nelson Island District

The total harvest was 1,366 tons of herring with an average roe content of 11.2% (Tables 1 and 2). There were 97 tons of bait-quality herring delivered and 2 tons of wasted herring. Four processors purchased herring from 94 permit holders who made 483 deliveries in three periods with a total fishing time of 22 hours (Tables 3 and 6). The estimated ex-vessel value was $430,000. The exploitation rate was 20.5% of the available biomass.

On June 4 the first period opened for nine hours starting at 12:00 PM. The harvest consisted of 357 tons of sac roe quality herring with an average roe content of 10.0%, 48 tons of bait-quality herring and 2 tons of wasted herring. Processor concern over high male content postponed the second period until June 7, when six hours of fishing resulted in a harvest of 422 tons with an average roe content of 11.6%. On June 8 the GHL was raised to 1,200 tons based on a June 7 aerial survey estimate of 2,938 tons and high catch rates during the June 7 fishing period. On June 8 the last commercial period produced 538 tons of herring in seven hours. Gear was restricted to 50 fathoms per boat during the final period.

A total of 423 herring were sampled from the commercial catch. Age 9 was the largest age class, comprising 28.3% of the harvest (Figure 5). Age 9 and older herring made up 71.0% of the catch. Recruit-age herring made up less than 1% of the commercial sample.

Nunivak Island District

There was no commercial herring fishing in the Nunivak Island District in 1999. This was due primarily to the late spring, persistent ice conditions, lack of processor interest and low aerial survey estimates of abundance.

The Nunivak Island Herring Fishermen's Association is requesting that the Alaska Board of Fisheries consider a management plan for the Nunivak Island District that would allow permit holders to form a cooperative for the purpose of chartering a purse seine vessel to harvest herring.

Cape Romanzof District

A total of 533 tons of herring were harvested by 57 fishers in 1999 (Tables 1, 2 and 3). The commercial harvest was 21% below the recent five-year average (1994-1998) of 671 tons. Sac roe comprised 71%, or 378 tons of the harvest. The average sac roe recovery was 10.2%. A total of 155 tons of herring were purchased as bait. Bait herring consisted of deliveries with roe content below 8%, primarily due to high numbers of partially spawned out females during the last four commercial fishing periods. The commercial harvest did not reach the preseason harvest projection of 560 to 740 tons. The commercial fishery consisted of seven fishing periods, between June 5 and June 14 (Table 6). Fishing periods ranged from 1.5 hours to 3.0 hours in duration for a total fishing time of 13.5 hours. Fishing gear was restricted to one 50-fathom gillnet per vessel throughout the commercial season.

This season there was a problem with the presence of partially spawned out herring in commercial harvests. Partially spawned out herring accounted for 20% to 51% of the test commercial samples taken from June 8 to June 12. During the last few years early test fishing samples have been good and it will be important to be ready to fish closer to the beginning of the herring migration.

The estimated value of the harvest to fishers was $127,000 (Table 2). Average price for herring sac roe was $300 per ton at 10% roe recovery, plus $30 per percent. The bait herring averaged $71 per ton to fishers. One company purchased herring, represented by one processing vessel and five tenders during the fishery (Table 3).

Fishing effort was slightly above the five-year average (1994-1998) of 55 fishers. Fishing effort increased 40% compared to 1998 levels. Local Alaskan residents (defined as residents of Chevak,

Hooper Bay, and Scammon Bay) accounted for 98% (56 permits) of the effort and 99% (525 tons) of the harvest (Table 2). Fishermen harvested an estimated 14.0% of the available biomass (Table 2).

A total of 576 herring were sampled from the commercial harvest. Age 11 herring dominated the harvest biomass (39.6%, Figure 6). Age 9 and older herring made up 81.8% of the catch. Recruit-age herring comprised less than 1% of the harvest.

Norton Sound District

Because of an anticipated poor market for herring, two herring spawn on kelp fisheries operated during the 1999 season, a herring spawn on imported *Macrocystis* kelp fishery and a herring spawn on wild *Fucus* kelp fishery. In addition, a directed-bait herring fishery was allowed in the Nome Subdistrict.

Sac Roe Fishery

The total harvest during the sac roe fishery was 2,752 tons (fish ticket weight 2,664 tons) of herring with an average roe recovery of 10.5% (Tables 3 and 6). There were 45 tons (fish ticket weight 42 tons) of bait-quality herring. Five tons of wasted herring were observed in abandoned nets after the fishery closed. Since 1981, catches, including waste, have averaged 4,176 tons. Fishers harvested an estimated 8.0% of the available biomass. Only 119 gillnet fishers out of a possible 320 permit holders participated in the fishery (Table 3).

The gillnet fishery was first opened in the eastern Subdistricts 1, 2 and 3 on June 14. Eight additional periods were allowed on a daily basis until June 22 for a total of 101 hours of fishing time (Table 6). Because pack ice was slow to disperse from the southern districts the majority of the harvest occurred in Subdistrict 3 (Table 8). Due to the ice distribution, active fishing only occurred in the southernmost subdistrict on the last three days of fishing, June 20 to June 22.

None of the sac roe was harvested by beach seine (Table 3). Two beach seine openings were allowed on June 18 and June 21 for a total of eight hours of fishing time (Table 6). One beach seine fisher was prepared to fish, but found it difficult to attract a market until the opportunity to harvest high quality herring had past. Six fishers typically participate in the beach seine fishery. Table 8 presents the historical beach seine and gillnet commercial catches in the Norton Sound District.

Four companies were present on the grounds during the season to purchase herring. These four companies registered five processors and 13 tenders to operate in Norton Sound (Table 3). Sea ice delayed the arrival of two of the processors and approximately one-half of the tenders. The

total value of the herring harvest to Norton Sound fishers was $615,000, approximately 31% of the five-year (1994-1998) average of $1,972,000.

A total of 448 herring were sampled from the commercial harvest. Age 11 herring dominated the harvest, comprising 35.6% of the catch by weight (Figure 6). Age 9 and older herring represented 88.0% of the catch. Recruit-age herring comprised less than 1% of the harvest.

Spawn on Kelp Fisheries

Permit holders wishing to participate in the *Macrocystis* spawn on kelp open pound fishery were required to register with the Nome Fish and Game office by April 16. The improved market for sac roe herring caused a decline in interest in the *Macrocystis* spawn on kelp fishery. Eight permit holders registered as participants in the second year of the *Macrocystis* fishery. One permit was revoked just prior to the season and another permit holder eventually chose not to deploy kelp. Of the six participants, only two actually harvested product (Table 3). A late spring and the associated ice floes severely complicated the fishery. At least one kelp frame was damaged by ice, and several participants found their access to spawning herring blocked by ice for several days.

The portion of Subdistrict 1 west of Five-Mile Point was closed to spawn on kelp harvest to minimize gear conflicts. The imported kelp was deployed as it arrived beginning May 22. The two permittees harvesting kelp in the open pound fishery harvested a total of 7,482 pounds of imported *Macrocystis* kelp. Although the spawn on kelp product has been processed, the final sales of the spawn on kelp have not been completed and no value figures are available at this time. A single wild kelp four-hour opening was allowed on June 28. The single participant reported the eggs were already eyed and hatched, and no marketable product was found.

Directed-Bait Fishery

A permit holder from Nome requested that a bait fishery be allowed in the Nome Subdistrict. This permit holder was allowed to harvest bait herring since he was fishing in a distant subdistrict (from the sac roe fishery) and there was a harvestable surplus of hering. To date, 8.3 tons of herring have been landed as bait. The bait harvest has been taken for use in the local halibut and crab fisheries. Approximately 16,500 pounds of bait were sold at $0.75 per pound. The value of the harvest is approximately $12,000.

Port Clarence District

There has not been a commercial sac roe fishery in the Port Clarence District since 1988 because buyers have not been present in the district. A small bait fishery with a harvest of less than 10 tons occurs in most years. However, there was no bait fishery in Port Clarence in 1999.

ENFORCEMENT

The Division of Fish and Wildlife Protection (FWP) was present in Security Cove, Goodnews Bay, and Norton Sound Districts this year. Officers were not present in the Cape Avinof, Nelson Island and Cape Romanzof Districts during 1999. Most fishers followed fishery period opening and closing times very well and buyers were timely and accurate with verbal reporting of purchases. However, several fishers in the Cape Romanzof District had their nets in the water after fishing period closures. In year 2000, fishers will be advised to use methods to avoid fishing after a closure. Two FWP officers were involved in Kuskokwim Bay herring fisheries. Enforcement officers utilized one Supercub aircraft and a small helicopter. Details on the number and type of violations observed are not available from FWP at this time. Protection efforts in Norton Sound consisted of two single engine aircraft (two Supercubs on wheels), and a small boat. Personnel consisted of two permanent, full-time FWP officers. Three citations were issued all relating to fishing after the close of the fishing period.

OUTLOOK AND MANAGEMENT STRATEGY FOR 2000

Projections from postseason escapement estimates suggest that the year 2000 spawning biomass for northeastern Bering Sea herring stocks (Security Cove to Norton Sound) will be 48,141 tons, with an anticipated allowable harvest of 9,450 tons (Table 7). Hamner and Bromaghin (1999) discuss methods and details of the year 2000 projections. If the return is as expected, a small to moderate reduction in biomass will be observed in all districts. This decline is primarily due to natural mortality as the dominant year classes age.

Variability in the quality of aerial survey assessments of biomass and deviations from the assumed survival or recruitment rates may result in the observed biomass being either above or below these projections. Therefore, harvest levels may be adjusted during the season according to observed herring spawning biomass. In addition, in accordance with the AYK Region harvest strategy, newly recruited age classes (age 2 through age 5 herring) will not be targeted by the commercial fishery. If it is not possible to determine herring abundance using aerial survey methods, stock

abundance will be assessed using information from the projected biomass, test and commercial catches and spawn deposition observations. In all districts, the Department will cooperatively work with fishermen and buyers to optimize roe recovery during the 2000 season.

Security Cove District

The year 2000 projected return to the Security Cove District is 3,622 tons. A 20% exploitation rate would result in a harvest of 724 tons (Table 7). Actual catch will depend on inseason abundance assessments. Commercial fishing will not be allowed until the observed biomass reaches 1,200 tons, or significant spawning activity is observed. The occurrence and length of fishing periods will depend on stock strength, fishing effort, and spawning activity.

Due to budget cuts, data was not collected from the Security Cove District in 1999. The estimated year 2000 herring age composition was calculated using data from the Goodnews Bay District. Ages 7, 11 and 10 are expected to comprise over one-half the returning biomass (19.1%, 16.9% and 16.4%, respectively). Age 9 and older herring are expected to comprise almost two-thirds of the biomass.

Goodnews Bay District

The management strategy for this district will be similar to that planned for Security Cove. The season will open and close by emergency order when a biomass of 1,200 tons is observed, or significant spawning activity is observed. The year 2000 projected return of herring to the Goodnews Bay District is 4,665 tons. A 20% exploitation rate would result in a harvest of 933 tons (Table 7). Actual catch will depend on inseason abundance assessments.

Ages 7, 11, and 10 herring are expected to dominate the biomass, contributing 19.5%, 16.7%, and 16.3%, respectively. Age 9 and older herring are expected to comprise almost two-thirds of the biomass.

Cape Avinof District

Either significant spawning activity or a biomass of 500 tons must be observed before the commercial herring season can be opened. The projected year 2000 biomass for the Cape Avinof District is 2,868 tons (Table 7). The exploitation rate will be no greater than 15% because of the limited database for this area and the priority of subsistence fishing. Assuming a 15% commercial

exploitation rate, the projected harvest will be 430 tons of herring. Actual catch will depend on inseason abundance assessments.

Ages 7, 10 and 9 are expected to comprise over one-half the returning biomass (28.5%, 14.8% and 12.3%, respectively). Age 9 and older herring are expected to comprise almost one-half of the biomass.

Nelson Island District

In the Bering Sea Herring Fishery Management Plan, the Alaska Board of Fisheries set a minimum biomass threshold of 3,000 tons for the Nelson Island District. The inseason estimate of herring biomass must exceed the threshold level before a commercial fishery can be allowed.

The spawning biomass projected to return to the Nelson Island District in year 2000 is 4,672 tons (Table 7). At an exploitation rate of 20% minus 200 tons for subsistence harvest, the commercial harvest will be 734 tons of herring. Actual catch will depend on inseason abundance assessments.

To provide additional protection for the subsistence harvest of herring, the following guidelines will be followed:

1. Two hundred tons of the exploitable biomass will be set aside for subsistence.
2. Periodic closures of the commercial fishery will be scheduled, during which only subsistence fishing will be allowed.
3. Several important subsistence use areas occur throughout the district, including the waters around Cape Vancouver. Specific areas may be closed to commercial fishing to insure the adequacy of subsistence harvests.
4. The Department will by all available means, including acting on input from local residents, insure the adequacy of subsistence herring harvests during the commercial fishing season.

Similar to Goodnews Bay, ages 7, 10 and 11 are expected to dominate the returning population, contributing 19.5%, 18.5%, and 18.2%, respectively. Age 9 and older herring are expected to comprise almost two-thirds of the biomass.

Nunivak Island District

The biomass of herring projected to return to the Nunivak Island District in year 2000 is 2,823 tons. A 20% exploitation rate would result in a 565-ton harvest (Table 7). Actual catch will depend on inseason abundance assessments.A larger catch may occur if the 2000 biomass is assessed to be

greater than projected. The commercial season will open when the biomass reaches 1,500 tons, or when significant spawning is observed.

Due to budget cuts, data was not collected from the Nunivak Island District in 1999. Estimates for year 2000 age composition were calculated using data from the Nelson Island District. Ages 10, 11 and 9 are expected to comprise well over one-half the returning biomass (20.4%, 18.9% and 17.3%, respectively). Age 9 and older herring are expected to contribute over two-thirds of the return.

Cape Romanzof District

The projected return for year 2000, based on limited data, is expected to be between 2,067 and 3,067 tons based on an assessed biomass of between 3,300 and 4,300 tons in 1999. The midpoint of this range for 1999 was 3,800 tons, which results in a projected biomass of 2,567 tons. At a 20% exploitation rate, the harvest based on this projection would be 513 tons (Table 7). The allowable harvest is expected to range from approximately 463 to 563 tons and will be based on inseason indicators of abundance. It is probable that fishing gear will be restricted to no more than 50 fathoms and one gillnet per vessel by emergency order. Since water turbidity in the Cape Romanzof area generally prevents aerial observations of herring, spawn deposition and test and commercial catch rates will be used to determine the timing and duration of commercial fishing periods.

Ages 12, 9, and 10 herring are expected to dominate the biomass, contributing 24.6%, 21.0%, and 20.1%, respectively. Age 9 and older herring are expected to comprise 78.7 % of the return.

Norton Sound District

The biomass projected to return to Norton Sound in year 2000 is 26,924 tons. A 20% exploitation rate would result in a harvest of 5,385 tons (Table 7). Inseason assessment of herring biomass will supersede projected biomass for management of the Norton Sound herring fishery, except where weather prevents obtaining an inseason estimate. The beach seine harvest is, by regulation, 10% of the projected harvest, or 538 tons.

The year 2000 herring fishery will be opened by emergency order. The fishery will close by emergency order when up to 20% of the available herring biomass has been harvested. Varied harvest rates may be applied to individual subdistricts based on biomass distribution, roe quality, weather, and sea ice conditions.

Ages 7, 12 and 9 are expected to comprise well over one-half the returning biomass (23.3%, 22.1% and 13%, respectively). Age 9 and older herring are expected to contribute over two-thirds of the return.

Port Clarence District

The Department does not generally project an outlook for the Port Clarence fishery due to the lack of data on Port Clarence herring and the very limited scope of the fishery. The guideline harvest of 165 tons established by the Board of Fisheries in 1981 will determine the allowable harvest in 2000. This harvest guideline is based on two years research by the Department in both the Port Clarence and Kotzebue Districts. Even though this guideline has not appeared in the regulation book since 1984, it still represents the best estimate of harvestable biomass at this time.

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Table 1. Pacific herring harvests by commercial fishermen during the sac roe fisheries in the northeastern Bering Sea, Alaska, 1909-1999.

	Herring (st) [a]									Spawn on Kelp (st)
Year	Security Cove	Goodnews Bay	Cape Avinof	Nelson Island	Nunivak Island	Cape Romanzof	Norton Sound	Port Clarence	Total Harvest	Norton Sound
1909-1916	-	-	-	-	-	-	[b]	-	-	-
1916-1928	-	-	-	-	-	-	1,881	-	1,881	-
1929	-	-	-	-	-	-	166	-	166	-
1930	-	-	-	-	-	-	441	-	441	-
1931	-	-	-	-	-	-	86	-	86	-
1932	-	-	-	-	-	-	529	-	529	-
1933	-	-	-	-	-	-	31	-	31	-
1934	-	-	-	-	-	-	4	-	4	-
1935	-	-	-	-	-	-	15	-	15	-
1936	-	-	-	-	-	-	-	-	-	-
1937	-	-	-	-	-	-	6	-	6	-
1938	-	-	-	-	-	-	10	-	10	-
1939	-	-	-	-	-	-	6	-	6	-
1940	-	-	-	-	-	-	14	-	14	-
1941	-	-	-	-	-	-	3	-	3	-
1942-1944	-	-	-	-	-	-	-	-	-	-
1945	-	-	-	-	-	-	-	-	-	-
1946	-	-	-	-	-	-	-	-	-	-
1947-1963	-	-	-	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	20	-	20	-
1965	-	-	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	12	-	12	-
1967	-	-	-	-	-	-	-	-	-	-
1968	-	-	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	2	-	2	-
1970	-	-	-	-	-	-	8	-	8	-
1971	-	-	-	-	-	-	20	-	20	-
1972	-	-	-	-	-	-	17	-	17	-
1973	-	-	-	-	-	-	35	-	35	-
1974	-	-	-	-	-	-	2	-	2	-
1975	-	-	-	-	-	-	-	-	-	-
1976	-	-	-	-	-	-	9	-	9	-
1977	-	-	-	-	-	-	11	-	11	<1
1978	286	-	-	-	-	-	15	-	301	4
1979	424	90	-	-	-	-	1,292	-	1,806	13
1980	697	448	-	-	-	611	2,452	-	4,208	24
1981	1,173	657	-	-	-	720	4,371	-	6,921	47
1982	813	486	-	-	-	657	3,933	-	5,889	38
1983	1,073	435	-	-	-	816	4,582	-	6,906	29
1984	335	717	-	-	-	1,185	3,662	-	5,899	19 [c]
1985	733	724	-	977	358	1,299	3,548	-	7,639	-
1986	751	557	-	886	511	1,865	5,194	-	9,764	-
1987	313	321	-	923	414	1,342	4,082	146	7,541	-
1988	324	483	348	775	-	1,119	4,672	80	7,801	-
1989	554	616	129	233	116	926	4,771 [d]	-	7,345	-
1990	234	455	50	-	-	329	6,439	-	7,507	-
1991	570	263	267	-	59	526	5,672	-	7,357	-
1992	834	740	451	246	27	530	-	-	2,828	-
1993	5	954	215	739	-	371	5,079	-	7,363	-
1994	-	1,062	427	717	14	456	960	-	3,636	-
1995	1,292	1,054	485	1,113	41	541	6,773	-	11,289	-
1996	1,859	1,204	820	1,030	101	752	6,220	-	11,986	-
1997	892	805	687	778	0	879	3,976	-	8,017	-
1998	1,012	831	656	1,250	202 [e]	727	2,632 [f]	-	7,310	9 [g]
1999	1,072	1,366	533	1,366	-	533	2,760 [h]	-	7,630	4 [i]

a Pre-1964 harvest primarily in summer and fall for food; post 1964 harvest primarily in spring for sac roe. Wastage is included.
b Fishery occurred some years but harvest data unavailable.
c Additional 3 st harvested from imported kelp (*Macrocystis* sp.) not included.
d Includes 200 st harvested with purse seine during aerial survey calibration study.
e Includes 8.3 tons harvested during a directed bait fishery.
f Includes 2,100 lbs of wild kelp and 16,083 lbs of *Macrocystis* kelp (preliminary numbers).
g Includes 8.3 tons harvested during a directed bait fishery.
h 7,482 lbs of *Macrocystis* kelp (preliminary numbers).

Table 2. Estimated biomass and commercial harvest of Pacific herring in northeastern Bering Sea fishing districts, Alaska, 1992-1999.

Year	District	Estimated Biomass(st)	Harvest (st) Sac roe	Bait	Waste	Total	Roe %	Estimated Value ($ x 1,000)	Exploitation Rate (%)
1999	Security Cove	5,261	1,016	56	1	1,072	11.0	338	20.4
	Goodnews Bay	6,896	1,332	33	0	1,366	11.3	301	19.8
	Cape Avinof	3,555 a	516	18	0	533	11.0	185	15.0
	Nelson Island	6,655	1,267	97	2	1,366	11.2	430	20.5
	Nunivak Island b	3,319 a	-	-	-	-	-	-	-
	Cape Romanzof	3,800 a	378	155	0	533	10.2	127	14.0
	Norton Sound	34,314	2,702	53	5	2,760	10.5	615 c	8.0
Total		63,800	7,211	412	8	7,630	10.9	1,996	12.0
1998	Security Cove	4,017 a	1,012	0	0	1,012	11.5	232	25.2
	Goodnews Bay	4,064 a	831	0	0	831	11.3	118	20.5
	Cape Avinof	4,287 a	656	0	0	656	11.6	152	15.3
	Nelson Island	7,136 a	1,250	0	0	1,250	11.8	296	17.5
	Nunivak Island	3,778 a	202 d	0	0	202	9.8	26 e	5.4
	Cape Romanzof	4,500 a	617	110	0	727	10.0	131	16.2
	Norton Sound	52,033	2,624	8	0	2,632	9.2	203 c	5.1
Total		79,815	7,192	118	0	7,310	10.2	1,158	9.2
1997	Security Cove	4,640 a	884	3	5	892	12.5	221	19.2
	Goodnews Bay	4,752 a	805	0	0	805	14.2	228	16.9
	Cape Avinof	4,600 a	687	0	0	687	11.5	157	14.9
	Nelson Island	7,900 a	778	0	0	778	12.7	198	9.8
	Nunivak Island	3,801 a	0	0	0	0	-	-	0
	Cape Romanzof	5,000 a	879	0	0	879	10.2	186	17.6
	Norton Sound	47,791	3,709	263	5	3,976	9.9	612	8.3
Total		78,484	7,742	266	10	8,017	11.1	1,602	10.2
1996	Security Cove	6,867	1,795	59	5	1,859	11.6	1,251	27.1
	Goodnews Bay	6,315	1,191	13	0	1,204	12.5	895	19.1
	Cape Avinof	4,500 a	820	0	0	820	13.4	659	18.2
	Nelson Island	6,638 a	986	44	0	1,030	11.4	679	15.5
	Nunivak Island	4,195 a	61	40	0	101	9.9	39	2.4
	Cape Romanzof	6,000 a	750	1	0	752	10.6	638	12.5
	Norton Sound	27,307 a	6,061	109	50	6,220	10.6	4,569	22.8
Total		61,822	11,664	266	55	11,986	11.2	8,730	19.4
1995	Security Cove	6,702 a	1,292	0	0	1,292	12.3	956	19.3
	Goodnews Bay	4,219 a	1,051	0	3	1,054	13.5	848	25.0
	Cape Avinof	3,627 a	485	0	0	485	12.5	363	13.4
	Nelson Island	7,754	1,113	0	0	1,113	10.6	710	14.3
	Nunivak Island	4,579 a	33	7	0	41	11.0	22	0.9
	Cape Romanzof	5,000 a	541	0	0	541	10.1	328	10.8
	Norton Sound	37,779	6,647	116	10	6,773	10.4	4,206	17.9
Total		69,660	11,162	123	13	11,299	11.0	7,433	16.2
1994	Security Cove b	7,638 a	-	-	-	-	-	-	-
	Goodnews Bay	5,679 a	1,061	0	1	1,062	12.3	391	18.7
	Cape Avinof	2,827 a	427	0	0	427	12.2	156	15.1
	Nelson Island	5,564	713	4	0	717	11.0	235	12.9
	Nunivak Island	4,921	14	0	0	14	8.6	4	0.3
	Cape Romanzof	5,000 a	456	0	0	456	9.2	124	9.1
	Norton Sound	37,829	958	2	0	960	10.3	271	2.5
Total		69,458	3,629	6	1	3,636	11.1	1,181	5.2
1993	Security Cove	6,995	5	0	0	5	12.8	2	0.1
	Goodnews Bay	6,211	945	9	0	954	10.3	293	15.4
	Cape Avinof	2,837 a	206	9	0	215	12.0	75	7.6
	Nelson Island	4,944	613	52	74	739	10.6	198	14.9
	Nunivak Island b	5,176	-	-	-	-	-	-	-
	Cape Romanzof	4,000 a	371	0	0	372	9.6	110	9.3
	Norton Sound	46,549	4,713	321	45	5,079	9.9	1,411	10.9
Total		76,712	6,853	391	119	7,363	10.1	2,089	9.6
1992	Security Cove	7,773	697	127	10	834	9.2	285	10.7
	Goodnews Bay	5,572	711	29	0	740	9.5	286	13.3
	Cape Avinof	3,446	442	9	0	451	9.9	178	13.1
	Nelson Island	5,275	188	52	6	246	8.3	78	4.7
	Nunivak Island	5,703	7	20	0	27	8.5	4	0.5
	Cape Romanzof	4,500 a	516	14	0	530	8.0	159	11.8
	Norton Sound b	57,974	-	-	-	-	-	-	-
Total		90,243	2,561	251	16	2,828	9.1	990	3.1 f

a Inseason biomass estimate from poor aerial survey, therefore projected biomass or some other method of estimating biomass was used.
b No commercial fishery.
c Includes values from sac-roe fishery only, does not include directed bait, or kelp fisheries values.
d Includes 200 tons from the purse seine catch associated with an aerial survey calibration study.
e Includes estimated value of $25,000 for the purse seine catch associated with an aerial survey calibration study.
f Total exploitation rate for fishing districts which had a commercial fishery in 1992 is 8.8%.

Table 3. Number of buyers and fishermen participating in northeastern Bering Sea Pacific herring fisheries, Alaska, 1992-1999.

Year	District	Number of Buyers	Number of Fishermen		
			Gillnet	Beach Seine [a]	Totals
1999	Security Cove	8	87	-	-
	Goodnews Bay	5	94	-	-
	Cape Avinof	3	117	-	-
	Nelson Island	4	94	-	-
	Nunivak Island	0	0	-	-
	Cape Romanzof	1	57	-	-
	Norton Sound	4	119	0	122 [b]
1998	Security Cove	9	78	-	-
	Goodnews Bay	2	84	-	-
	Cape Avinof	2	109	-	-
	Nelson Island	2	86	-	-
	Nunivak Island	1	7	-	8 [c]
	Cape Romanzof	1	41	-	-
	Norton Sound	2	35	0	47 [d]
1997	Security Cove	14	222	-	-
	Goodnews Bay	3	139	-	-
	Cape Avinof	2	145	-	-
	Nelson Island	3	105	-	-
	Nunivak Island	1	12	-	-
	Cape Romanzof	3	65	-	-
	Norton Sound	9	214	6	220
1996	Security Cove	14	326	-	-
	Goodnews Bay	5	182	-	-
	Cape Avinof	2	161	-	-
	Nelson Island	3	109	-	-
	Nunivak Island	2	24	-	-
	Cape Romanzof	3	63	-	-
	Norton Sound	10	281	6	287
1995	Security Cove	12	106	-	-
	Goodnews Bay	4	127	-	-
	Cape Avinof	2	93	-	-
	Nelson Island	4	100	-	-
	Nunivak Island	2	13	-	-
	Cape Romanzof	2	49	-	-
	Norton Sound	6	209	6	215
1994	Security Cove	0	0	-	-
	Goodnews Bay	2	103	-	-
	Cape Avinof	1	85	-	-
	Nelson Island	3	104	-	-
	Nunivak Island	1	12	-	-
	Cape Romanzof	2	55	-	-
	Norton Sound	7	212	3	215
1993	Security Cove	1	9	-	-
	Goodnews Bay	3	63	-	-
	Cape Avinof	1	97	-	-
	Nelson Island	1	73	-	-
	Nunivak Island	0	0	-	-
	Cape Romanzof	2	41	-	-
	Norton Sound	6	256	7	263
1992	Security Cove	6	58	-	-
	Goodnews Bay	3	78	-	-
	Cape Avinof	2	121	-	-
	Nelson Island	3	85	-	-
	Nunivak Island	1	14	-	-
	Cape Romanzof	2	73	-	-
	Norton Sound	0	0	-	-

a Gear prohibited in all districts except Norton Sound and Port Clarence.
b Includes 119 gillnet fishermen, 1 bait fisherman and 2 kelp fishermen.
c Includes 7 gillnet fishermen and 1 seine fisherman.
d Includes 35 gillnet fishermen, 1 bait fisherman and 11 kelp fishermen.

Table 4. Pacific herring subsistence harvest (st) and effort data from selected northeastern Bering Sea areas, Alaska, 1978-1999.[a]

Village	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Nelson Island																						
Tununak	38	34	65	40	48	94	-	43	63	48[c]	49[c]	47[c]	54[c]	21[c]	32[c]	45	42	30	25.8	-	-	-
Umkumiut	11	8	3	10	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toksook Bay	37	51	29	14	35	-	-	46	70	51	58	52	46	40	43	23	53	46	41.5	-	-	-
Nightmute	-	-	-	-	-	-	-	3[b]	21	15	16	15	18	8	10	9	13	13	16.2	-	-	-
Newtok	-	-	-	-	-	-	-	7[b]	13	10	12	10	8	1	7	6	9	9	11.5	-	-	-
Total	86	93	97	64	83	94	-	99	167	124	136	124	126	70	92	82	117	98	95	-	-	-
No. Fishing Families	83	54	70	93	65	43	-	65[b]	72[b]	96	104	[b]	100	85	97	89	-	91	96	-	-	-
Nunivak Island																						
Mekoryuk	-	-	-	-	-	-	-	<1	<1	-	-	-	5	4	4	2	-	-	-	-	-	-
No. Fishing Families	-	-	-	-	-	-	-	11	6[b]	-	-	-	19	20	17	16	-	-	-	-	-	-
Other Kuskokwim Delta																						
Chefornak	-	-	-	-	-	-	-	13[b]	-	14	-	-	-	-	-	-	-	-	-	-	-	-
Kipnuk	-	-	-	-	-	-	-	9	-	14	-	-	-	-	-	-	-	-	-	-	-	-
Kongiganak	-	-	-	-	-	-	-	3	2[b]	-	-	-	-	-	-	-	-	-	-	-	-	-
Kwigillingok	-	8	13	-	13	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	8	13	-	13	-	-	30	2	28	-	-	-	-	-	-	-	-	-	-	-	-
No. Fishing Families	-	22	19	-	21	-	-	55[b]	12[b]	49	-	-	-	-	-	-	-	-	-	-	-	-
Yukon Delta																						
Scammon Bay	1	6	3	8	4	3	4	2	2	1	2	1	2	1	1	3	1	1	1	1	<1	6.0
Chevak	-	2	4	2	2	1	3	2	1	1	2	<1	1	<1	<1	<1	2	1	<1	<1	<1	2.3
Hooper Bay	4	3	4	4	5	5	4	4	4	1	4	2	6	2	2	2	3	4	2	2	1	4.2
Total	5	11	11	14	11	9	11	8	6	3	7	3	8	3	4	5	6	6	3	3	2	12.5
No. Fishing Families	30	84	61	45	43	37	47	44	40	23	32	24	32	18	30	42	48	42	29	34	15	67

[a] Subsistence survey results are believed to accurately reflect harvest trends however, reported catches reflect minimum figures since all fishermen cannot be contacted.
[b] Fishing families were not interviewed or only a portion of fishing families were interviewed as catch was enumerated while on drying racks.
[c] Umkumiut effort included with Tununak.

Table 5. Pacific herring estimated biomass in the northeastern Bering Sea, Alaska, 1978-1999.

	Herring (st)								
Year	Security Cove	Goodnews Bay	Cape Avinof	Nelson Island	Nunivak Island	Cape Romanzof [a]	Norton Sound	Port Clarence	Total Biomass
1978	1,323	441	-	5,952	805	2,976	5,291	-	16,788
1979	21,495	7,385	-	5,952	-	2,976	7,716	-	45,524
1980	1,213	1,213	-	5,952	-	2,976	8,377	-	19,731
1981	8,267	4,299	-	3,968	19	4,850	22,360	-	44,331
1982	5,071	2,646	-	3,968	-	4,850	19,403	-	33,951
1983	6,393	3,197	-	7,275	7,606	5,512	26,841	-	58,092
1984	5,071	4,079	-	11,023	6,695	6,063	21,475	-	56,079
1985	4,900	4,300	2,000	9,500 [b]	5,700 [b]	7,000	20,000	-	51,400
1986	3,700 [b]	3,000 [b]	-	7,300 [b]	6,000	7,500	28,100	-	55,600
1987	2,300 [b]	2,000 [b]	1,225	8,100	4,400 [b]	7,200	32,370	932	57,332
1988	4,906	4,479	4,108	7,152	2,800 [b]	6,600	33,924	788	64,757
1989	2,830	4,040	2,780 [b]	3,320	620	4,400	25,981	-	43,970
1990	2,650	2,577	2,020 [b]	2,705	422	4,500	39,384	-	54,258
1991	4,434	4,387	2,083	2,385	3,903	4,500	42,854	-	64,546
1992	7,773	5,572	3,446	5,275	5,703	4,500	57,974	1,652	91,895
1993	6,995	6,211	2,837 [b]	4,944	5,176	4,000	46,549	822	77,534
1994	7,638 [b]	5,679 [b]	2,827 [b]	5,564	4,921	5,000	37,829	92	69,550
1995	6,702 [b]	4,219 [b]	3,627 [b]	7,754	4,579 [b]	5,000	37,779	-	69,660
1996	6,867	6,315	4,500 [b]	6,638 [b]	4,195 [b]	6,000	27,307 [b]	-	61,822
1997	4,640 [b]	4,752 [b]	4,600 [b]	7,900 [b]	3,801 [b]	5,000 [c]	47,791	-	78,484
1998	4,017 [b]	4,064 [b]	4,287 [b]	7,136 [b]	3,778 [b]	4,500 [d]	52,033	-	79,815
1999	5,261	6,896	3,555 [b]	6,655	3,319 [b]	3,800 [e]	34,314		63,800

[a] Biomass estimate based on limited aerial survey information, spawn deposition, age composition, and CPUE from commercial and test fisheries.

[b] Unacceptable aerial survey conditions for estimating herring biomass, therefore projected biomass or some other method of estimating biomass was used.

[c] Biomass listed for Cape Romanzof is midpoint for estimated range of 4,500 to 5,500 tons.

[d] Biomass listed for Cape Romanzof is midpoint for estimated range of 4,000 to 5,000 tons.

[e] Biomass listed for Cape Romanzof is midpoint for estimated range of 3,300 to 4,300 tons.

Table 6. Summary of Pacific herring commercial harvest by fishing period for northeastern Bering Sea fishing districts, Alaska, 1999.

District	Subdistrict Sec/Area	Gear	Period	Date	Time	Total Hours	Harvest (st)
Security Cove		Gillnet	1	5/25	1500-1700	2.0	333.6
			2	5/26	0400-0700	3.0	498.4
			3	5/26	1600-1900	4.0	240.2
					Total	9.0	1,072.2
Goodnews Bay		Gillnet	1	5/29	0500-1100	6.0	48.9
			2	5/29	1700-2300	6.0	61.0
			3	5/30	0600-1200	6.0	5.0
			4	5/30	1800-2400	6.0	97.6
			5	5/31	0700-1500	8.0	496.2
			6	5/31-6/01	1900-0200	7.0	260.0
			7	6/01	0700-1400	7.0	331.8
			8	6/01	2100-2400	3.0	65.4
					Total	49.0	1365.9
Cape Avinof		Gillnet	1	6/11	0700-1000	3.0	16.8
			2	6/11	1800-2400	6.0	27.1
			3	6/12	0700-1300	6.0	67.9
			4	6/12-13	1900-0100	6.0	123.3
			5	6/13	0800-1400	6.0	43.3
			6	6/13-14	2000-0200	6.0	94.0
			7	6/14	0800-1400	6.0	40.1
			8	6/14-15	2100-0300	6.0	87.1
			9	6/15	0930-1530	6.0	33.5
					Total	51.0	533.1
Nelson Island		Gillnet	1	6/4	1200-2100	9.0	406.9
			2	6/7	1600-2200	6.0	421.7
			3	6/8	1700-2400	7.0	537.5
					Total	22.0	1,366.1
Nunivak Island		Gillnet		No Commercial Opening			
Cape Romanzof		Gillnet	1	6/5	0630-0800	1.5	64.5
			2	6/7	0630-0930	3.0	103.5
			3	6/7	1930-2130	2.0	107.8
			4	6/9	2100-2230	1.5	176.8
			5	6/12-13	2230-0030	2.0	67.1
			6	6/13	1300-1400	1.0	0.8
			7	6/13-14	2330-0200	2.5	12.4
					Total	13.5	532.9
Norton Sound	1,2,3	Gillnet	1	6/14	0500-1300	8.0	349.5
			2	6/15	0700-1100	4.0	183.0
			3	6/16	0700-1900	12.0	481.3
			4	6/17	0800-2000	12.0	625.3
			5	6/18	0800-0000	16.0	491.2
			6	6/19	0800-2200	14.0	89.9
			7	6/20	0800-2200	14.0	355.6
			8	6/21	0800-2200	14.0	149.6
			9	6/22	0800-1500	7.0	21.5
			Waste				5.0
						101.0	2,751.8

-continued-

Table 6. (p. 2 of 2)

District	Subdistrict Sec/Area	Gear	Period	Date	Time	Total Hours	Harvest (st)
Norton Sound	2,3	Beach Seine	1	6/18	1300-1700	4.0	0.0
	1		2	6/21	1300-1700	4.0	0.0
						8.0	0.0
	7	Gillnet - Bait	1	6/16-30	continuous	342.0	8.3
	1,2,3,4,5,6	Open Pound	1	5/18-6/28	continuous		3.7 [a]
	1	Wild Kelp	1	5/28	1800-0400	4.0	0.0
					Total	455.0	2,760.1 [b]

[a] Product weight

[b] Does not include spawn on kelp product weight.

Table 7. Projections of Pacific herring spawning biomass and harvest guideline for commercial fishing districts in the northeastern Bering Sea, Alaska, 2000.

District	Threshold	Projected [a] Biomass (st)	Exploitation Rate (%)	Harvest (st) [a] Guideline
Security Cove	1,200	3,622	20	724
Goodnews Bay	1,200	4,665	20	933
Cape Avinof	500	2,868	15	430
Nelson Island	3,000	4,672	16	734 [b]
Nunivak Island	1,500	2,823	20	565
Cape Romanzof	1,500	2,567 [c]	20	513 [c]
Norton Sound	7,000	26,924	20	5,385
Port Clarence	-	-	-	165 [d]
Totals		48,141		9,450

a Preseason projection. Biomass and harvest may be adjusted based on inseason estimates.

b Nelson Island commercial harvest is 20% of projected biomass minus 200 st for subsistence harvest.

c Projection from midpoint of 1999 biomass estimate of 3,300 to 4,300 tons which was based on spawn deposition, age composition, and CPUE from commercial and test fisheries. Allowable harvest will range from 463 to 563 tons based on inseason indicators of abundance.

d Harvest guideline of 165 st (150 mt).

Table 8. Herring harvest by gear type and subdistrict, Norton Sound District, 1982-1999.

	NORTON SOUND HERRING CATCHES																	
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
GILLNET HARVEST (tons)																		
St. Michael	2,062	434	-	1,538	2,560	2,214	3,215	2,927	4,491	-	-	2,288	249	2,359	3,074	1,575	1,543	285
Unalakleet	946	1,264	-	95	-	-	42	10	618	731	-	120	12	374	-	20	-	324
Cape Denbigh	925	2,692	3,244	1,599	2,420	1,545	1,211	1,414	923	4,419	-	1,659	619	1,467	2,507	1,884	1,081	2,138
Elim	-	65	-	147	-	-	6	-	-	-	-	225	41	1,774	-	-	-	-
Golovin	-	85	-	-	-	-	-	-	-	-	-	-	-	191	-	-	-	-
Nome																		8
Total [a]	3,933	4,540	3,244	3,379	4,980	3,759	4,474	4,351	6,032	5,150	[b]	4,291	921	6,166	5,581	3,459	2,632	2,755
SEINE HARVEST (tons)																		
St. Michael (beach)	-	-	-	-	-	4	45	329	6	-	-	-	1	-	-	472	-	-
Unalakleet (beach)	-	-	-	93	-	-	58	50	332	149	-	467	24	230	111	41	-	-
Cape Denbigh (beach)	-	41	327	76	30	293	98	11	9	373	-	222	15	57	325	-	-	-
Elim (beach)	-	-	-	-	185	-	-	-	-	-	-	54	-	334	153	-	-	-
Cape Denbigh (purse)	-	-	-	-	-	26	-	-	-	-	-	-	-	-	-	-	-	-
Total [a]	0	41	327	169	215	323	198	390	347	522	[b]	743	40	621	589	513	0	0
TOTAL HARVEST (tons) [a]	3,933	4,581	3,571	3,548	5,195	4,082	4,672	4,741	6,380	5,672	0	5,034	961	6,787	6,170	3,972	2,632	2,755
Percent of total harvest																		
Gillnet Harvest	100	99.1	90.8	95.2	95.9	92.1	95.8	91.8	94.6	90.8		85.2	95.9	90.9	90.5	87.1	100	100
Seine Harvest	0	0.9	9.2	4.8	4.1	7.9	4.2	8.2	5.4	9.2		14.8	4.1	9.1	9.5	12.9	0	0

a Totals do not include waste.
b No commercial fishery.

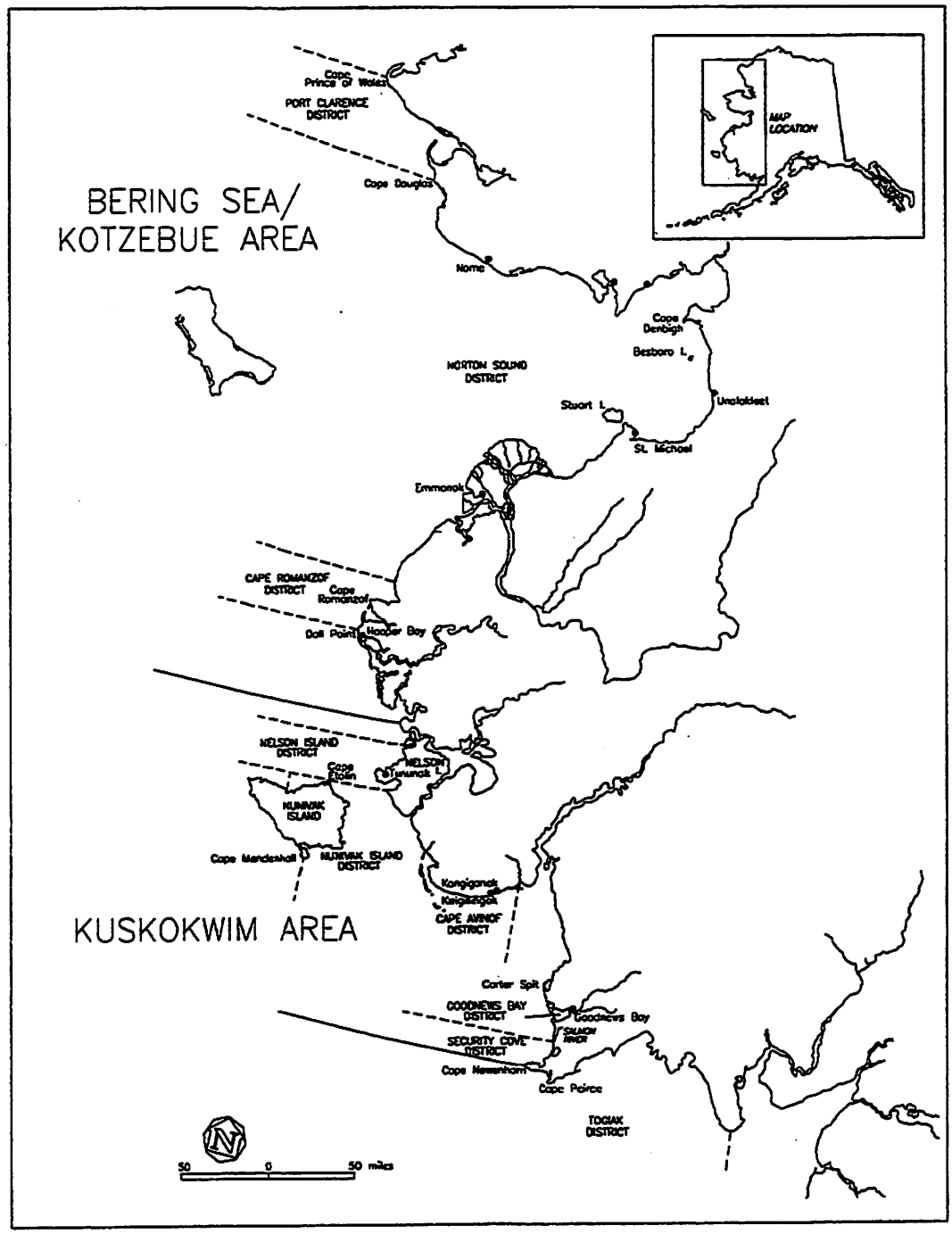

Figure 1. Commercial herring fishing districts within the Arctic-Yukon -Kuskokwim Region of the northeastern Bering Sea, Alaska.

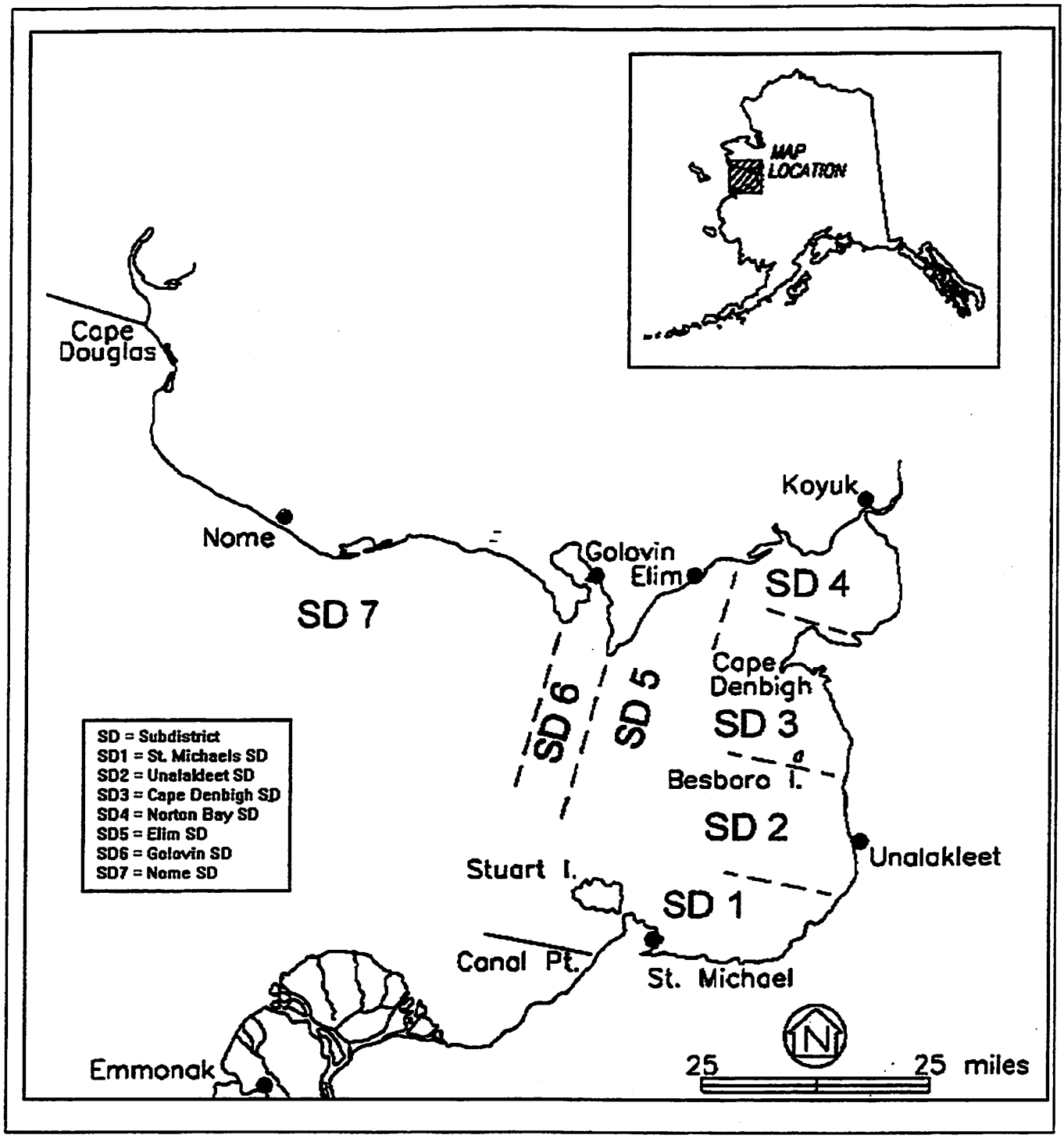

Figure 2. Norton Sound commercial herring subdistricts.

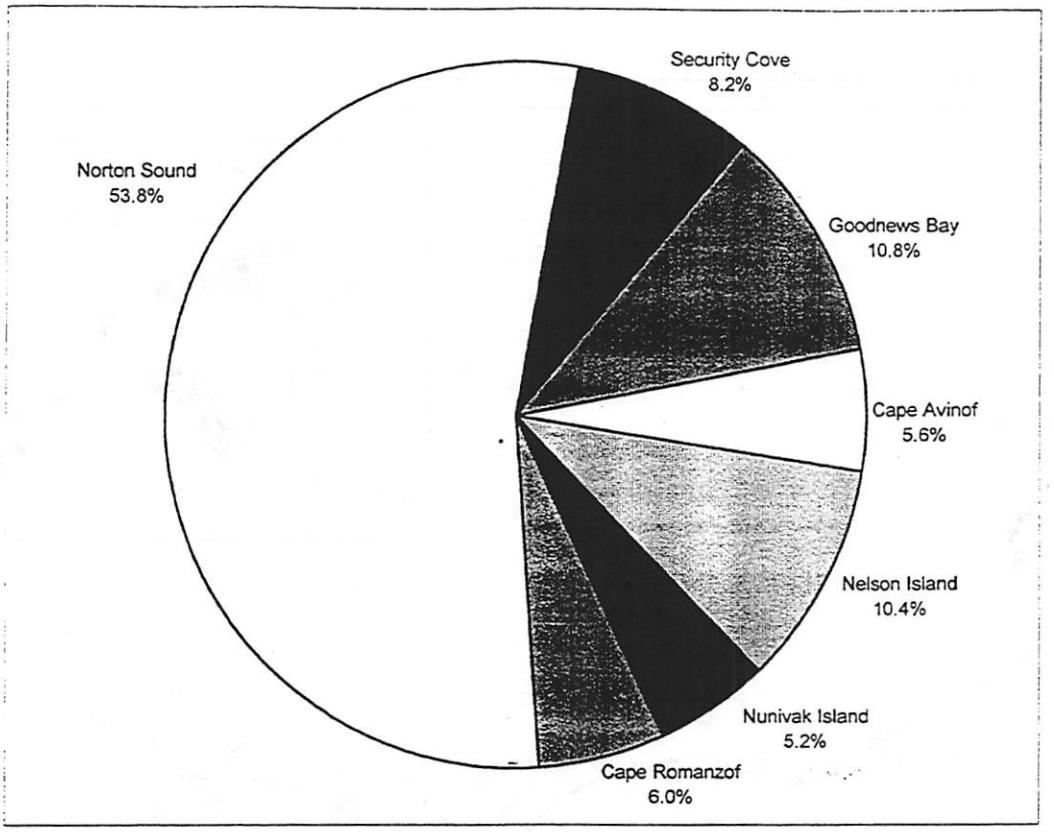

Figure 3. Pacific herring run biomass distribution by commercial fishing district, Arctic-Yukon-Kuskokwim Region, Alaska, 1999.

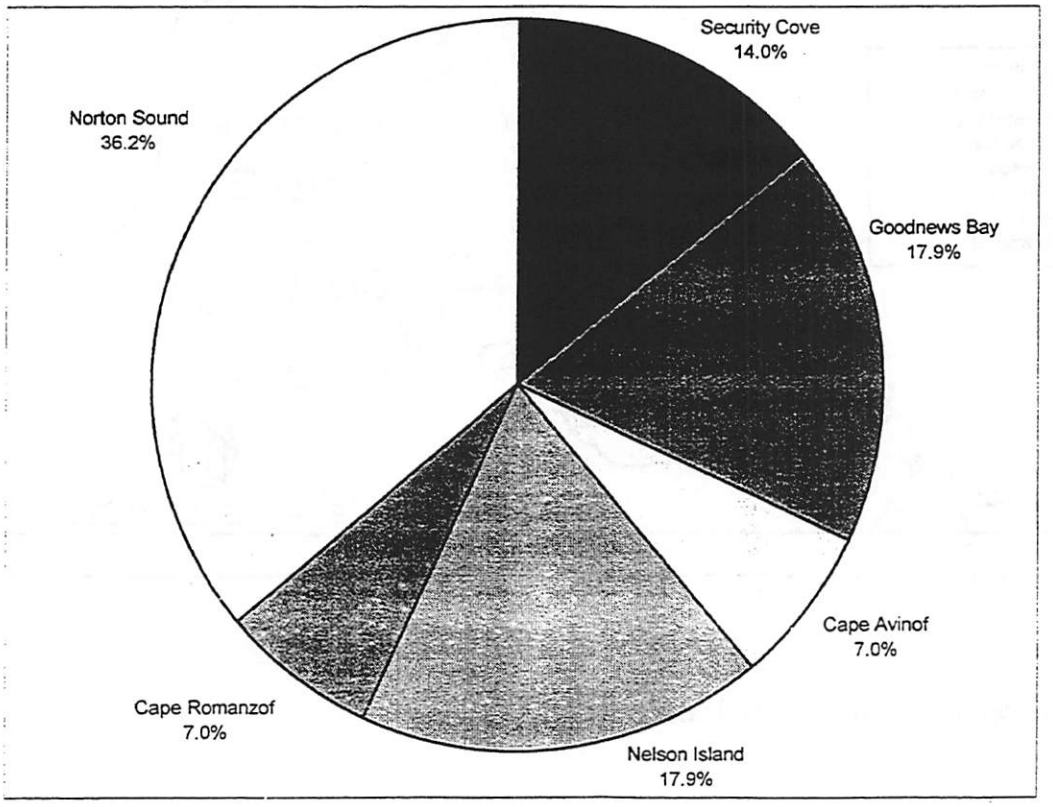

Figure 4. Pacific herring commercial harvest distribution by fishing district, Arctic-Yukon-Kuskokwim Region, Alaska, 1999.

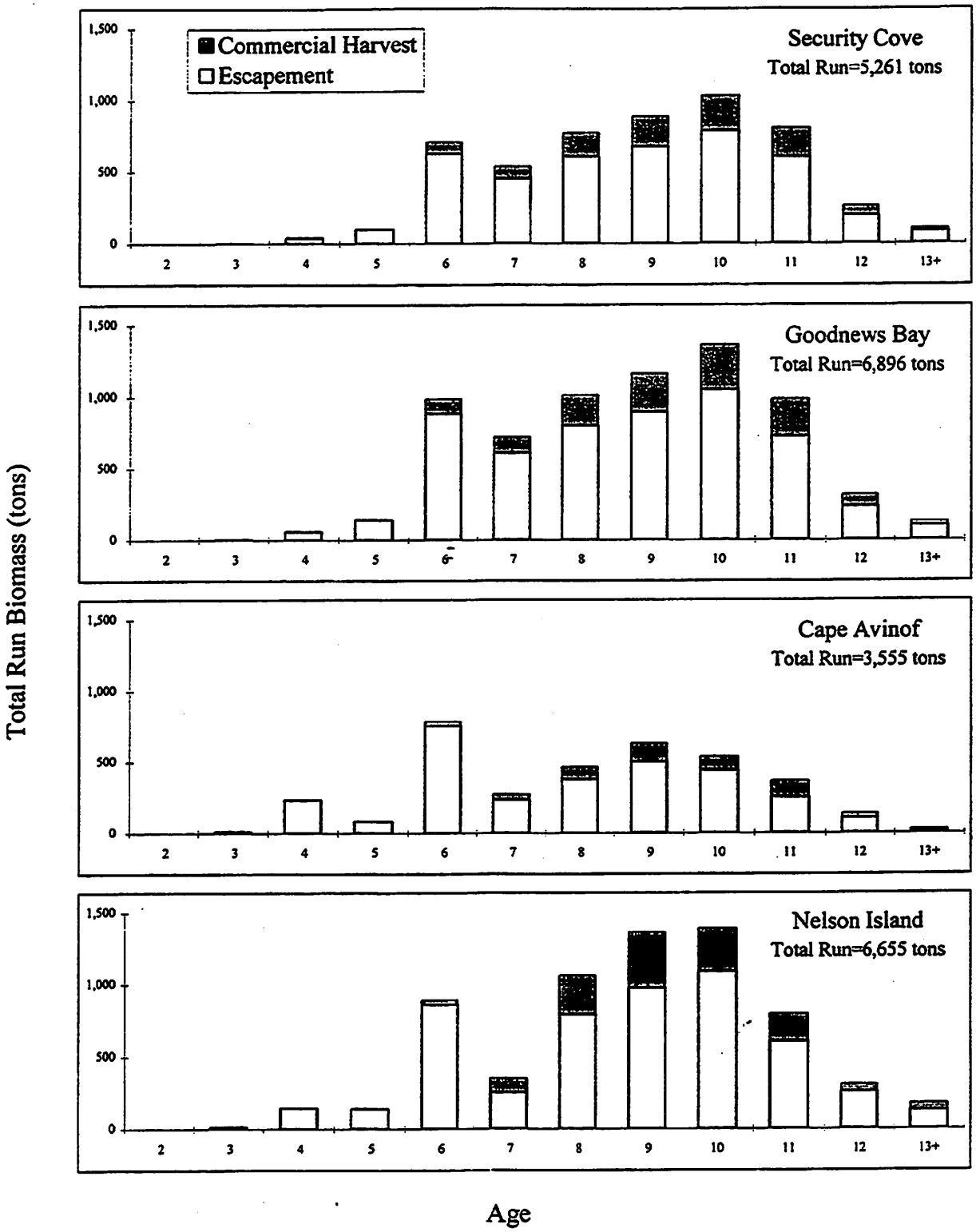

Figure 5. Age composition of Pacific herring for the total run, escapement and harvest biomass for the Security Cove, Goodnews Bay, Cape Avinof, and Nelson Island Districts within the Arctic-Yukon-Kuskokwim Region, Alaska, 1999.

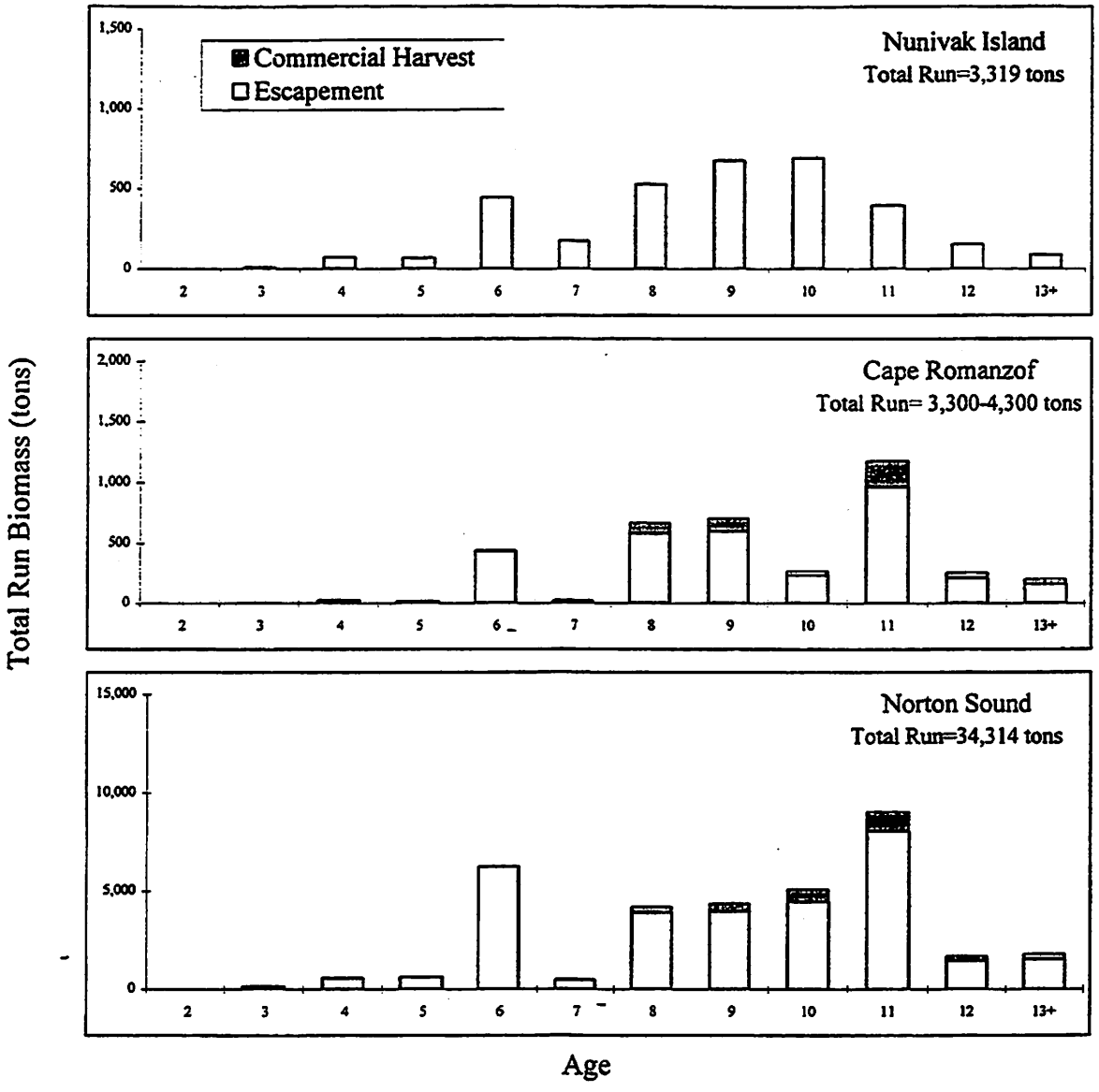

Figure 6. Age composition of Pacific herring for the total run, escapement and harvest biomass for the Nunivak Island, Cape Romanzof, and Norton Sound Districts within the Arctic-Yukon-Kuskokwim Region, Alaska, 1999.

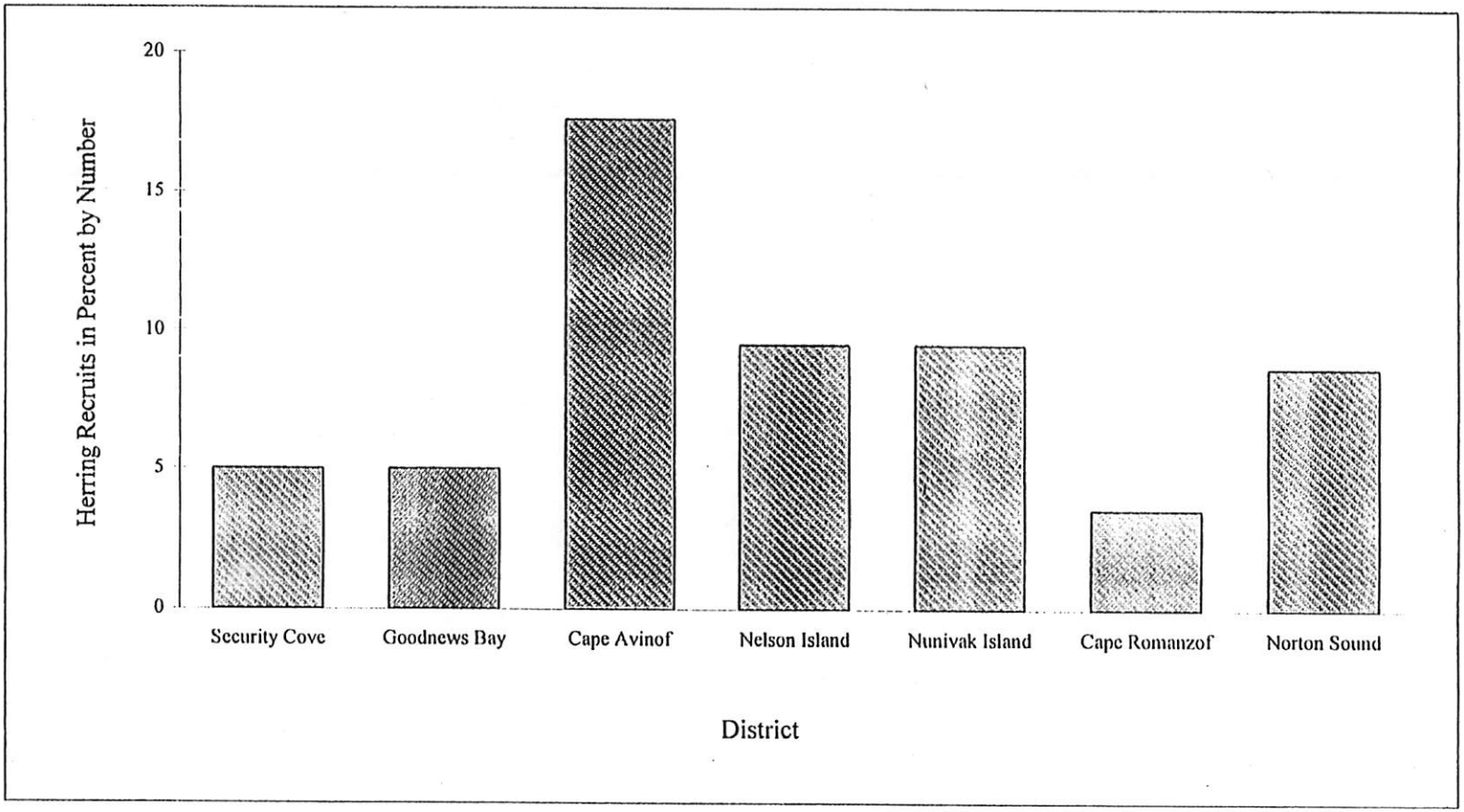

Figure 7. Pacific herring recruits (ages 2 through 5) for commercial fishing districts within the Arctic-Yukon-Kuskokwim Region, Alaska, 1999.

D-1
Suppl.

FISHING VESSEL OWNERS' ASSOCIATION
INCOPORATED

ROOM 232, WEST WALL BUILDING • 4005 20TH AVE. W.
SEATTLE, WASHINGTON 98199-1290
PHONE (206) 284-4720 • FAX (206) 283-3341

SINCE 1914

November 30, 1999

Mr. Rick Lauber, Chairman
North Pacific Fishery Management Council
605 W. 4th Ave., Suite 306
Anchorage, AK 99501-2252

Dear Chairman Lauber:

This letter concerns agenda item D-1 on your agenda for the December Council meeting. Our specific issue of concern is the sablefish TAC apportionments by regulatory area.

It became evident at the Plan Team meeting in Seattle that there was going to be some dispute about how much of the sablefish TAC to put in the respective regulatory areas. The Plan Team has done this, in the past, based on the longline survey and tri-annual trawl survey. This year, there were several analyses of industry CPUE to determine apportionment.

The difference between using the survey information or the industry numbers can be significant for some areas. For example, the Plan Team looked at a "fixed-average ABC", which averaged the CPUE of the industry with the survey information. Under this option, West Yakutat would take a 40% increase, and the Aleutians, a 25% decrease from what the Plan Team developed using the survey information only. In fact, there were three apportionment options.

The Plan Team verbally indicated that there was not a biological problem should there be more quota allocated to certain regulatory areas taken from other areas. FVOA finds this weakened advice from the Plan Team to be unfortunate, because the apportionment issue, which seemed to be settled with the use of survey data, has now become political. FVOA members collectively have purchased quota shares in all of the regulatory areas. These purchases are based on the assumption that apportionments are fairly developed by the Council, hopefully with the use of research information. The comments from the Plan Team suggest there can be some movement of the apportionment between the different regulatory areas without creating a biological problem. Therefore, the Plan Team concluded to let the Council decide the apportionments as it is allocative. If this is truly the case, perhaps NMFS will be less concerned should fishers harvest their quotas in the wrong areas. This of course will lead to chaos.

FVOA recommends that the Council use last years methodology to apportion the year

2000 sablefish TAC, which is based on a 5- year averaging method with the use of the surveys. FVOA requests that the Council charge the Plan Team with the task of providing an assessment of the sablefish populations per regulatory area for the 2001 year. This issue is not a trivial issue and it is unfortunate that the Plan Team has minimized the importance of their apportionment methodology that has been in use for five seasons. It could call into question, the science used for the rest of their recommendations as well.

Sincerely,

Robert D. Alverson
Manager

RDA:cb

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The SSC feels that the biomass adjusted $F_{35\%}$ exploitation strategy is appropriately conservative. Nevertheless, we encourage the assessment authors and Plan Teams to continue their analyses of alternative harvest strategies and to continue development of an age-structured stock synthesis model to supersede the current stock reduction analysis.

Public testimony by Bob Alverson (Fishing Vessel Owners Association) and Tim Henkel (Deep Sea Fishermen's Union) indicated that the commercial fishery has also observed a drop in abundance in BSAI sablefish. They recommended that a commercial CPUE index be developed as a complement to the domestic longline survey. The SSC suggests that the potential for such a commercial index be explored.

Jan. 16, 1996

The SSC underscores that future ABCs are expected to decline, and that it is important that all biological removals be accounted for, including catches within state waters.

We encourage future assessments to incorporate fishery-based information which, when adequate, may provide additional insights into this stock, including size by area, trends in CPUE and changes in species composition at differing locales. We encourage the use of State of Alaska fish ticket information as a means to assess size composition, and consideration of voluntary logbook information as an indicator of CPUE.

Jan. 28, 1997

The AP requests the Council recommend NMFS increase its efforts to incorporate observer data and log book information on CPUE, length , sex, and age data into the sablefish stock assessment for 1999. We further request NMFS develop and test new assessment techniques such as port sampling and pre-recruits surveys to improve the accuracy of the sablefish assessment under the IFQ fishing regime. Funds from the IFQ fee program should be prioritized for this work. Motion carries unanimously (21/0).

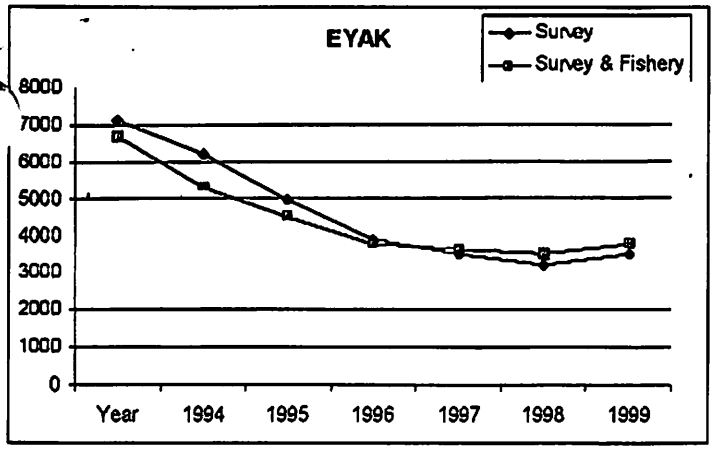
5.1.2 Response to Council, SSC, and Plan Team comments

At their December 1998 meeting, the Council recommended that: (1) NMFS increase its efforts to incorporate observer data and logbook information on CPUE, length, sex, and age data into the sablefish stock assessment for 1999; and (2) NMFS develop and test new assessment techniques, such as port sampling and pre-recruit surveys to improve the accuracy of the sablefish assessment under the IFQ fishing regime. We added CPUE, length, and sex data from 1990 to 1999 to the current assessment. We expanded the sablefish logbook program in 1999 to include data from logbooks required for vessels over 60 feet, adding to the data already collected through the voluntary logbook program. Observers began collecting otoliths from the 1999 longline fishery and sampling levels will be increased in 2000. We will not add port sampling unless the expanded observer collections are unable to achieve reasonable sample sizes. NMFS began a pre-recruit survey for age-0 sablefish in 1995.

At their October 1999 meeting, the SSC recommended that more informative priors than the uniform priors on M and q be used. We examined the effect of using more informative priors; see section 5.8.4.

At their September 1999 meeting, the Plan Teams requested that we examine an alternate model which excludes fishery catch rate data and that we project yields based on recruitment estimates from the whole time series of 1957+, from 1977+, and from 1982+. We examined the effect of excluding fishery catch rates; see section 5.7.1. We projected yields using three time intervals for recruitment estimates; see section 5.8.3.

Oct. 14, 1999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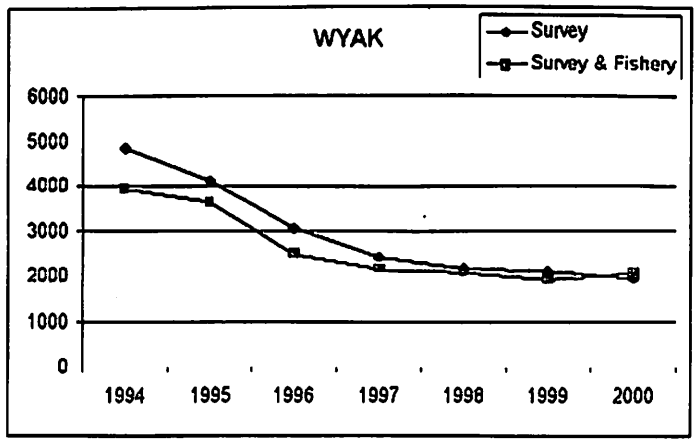
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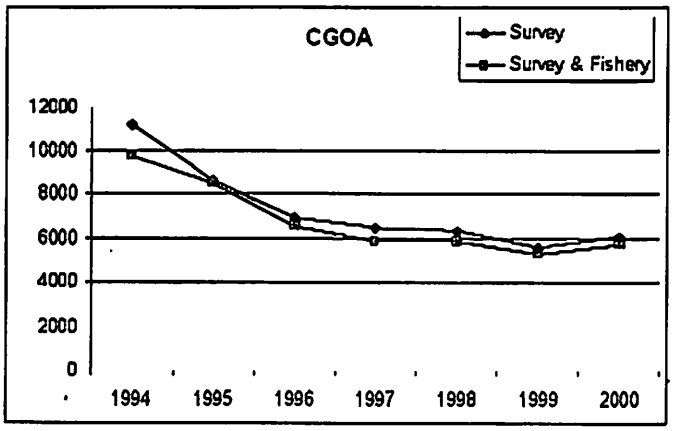
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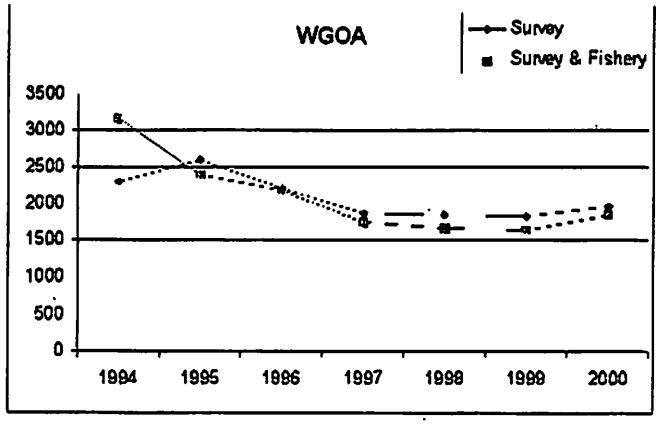
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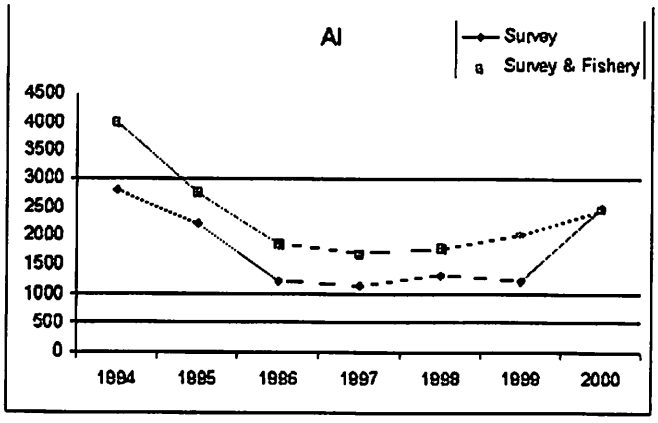
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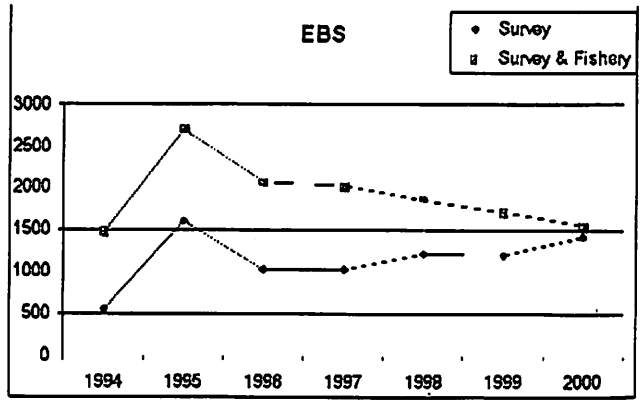
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Combined average from survey and fishery								ABC
ABC	EBS	AI	GOA	WGOA	CGOA	WYAK	EYSE	Total
1994	1,450	3,983	23,467	3,160	9,693	3,933	6,681	28,900
1995	2,692	2,750	19,758	2,401	8,449	3,611	5,297	25,200
1996	2,065	1,862	15,674	2,177	6,535	2,469	4,492	19,600
1997	2,018	1,711	13,471	1,740	5,844	2,148	3,738	17,200
1998	1,855	1,780	13,166	1,652	5,822	2,074	3,618	16,800
1999	1,697	1,996	12,207	1,650	5,189	1,892	3,476	15,900
2000	1,542	2,434	13,323	1,835	5,724	2,021	3,743	17,300

Percent change

ABC	EBS	AI	GOA	WGOA	CGOA	WYAK	EYSE	Total
1994	na	na	na	na	na	na	na	na
1995	86%	-31%	-16%	-24%	-13%	-8%	-21%	-13%
1996	-23%	-32%	-21%	-9%	-23%	-32%	-15%	-22%
1997	-2%	-8%	-14%	-20%	-11%	-13%	-17%	-12%
1998	-8%	4%	-2%	-5%	0%	-3%	-3%	-2%
1999	-9%	12%	-7%	0%	-11%	-9%	-4%	-5%
2000	-9%	22%	9%	11%	10%	7%	8%	9%

[1] Apportionment from NMFS Alaska Regional Office web page

Year	Bering	Aleutians	Western	Central	West Yakutat	Southeast	Eastern (trawl)	
1993	1,275	2,600	2,030	9,610	3,830	5,430		
1994	540	2,800	2,290	11,220	4,850	7,140		
1995	1,600	2,200	2,600	8,600	4,100	6,200		
1996	1,018	1,230	2,200	6,900	3,040	4,940		
1997	1,018	1,155	1,860	6,410	2,410	3,840		
1998	1,203	1,328	1,840	6,320	2,175	3,487		298
1999	1,188	1,226	1,820	5,590	2,090	3,200	[illegible]	

Percent change

Year	Bering	Aleutians	Western	Central	West Yakutat	Southeast	Eastern (trawl)
1993	na	na	na	na	na	na	
1994	-58%	8%	13%	17%	27%	31%	
1995	196%	-21%	14%	-23%	-15%	-13%	
1996	-36%	-44%	-15%	-20%	-26%	-20%	
1997	0%	-6%	-15%	-7%	-21%	-22%	
1998	18%	15%	-1%	-1%	-10%	-9%	na
1999	-1%	-8%	-1%	-12%	-4%	-8%	

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COMMENTS ON POLLOCK ASSESSMENT

1) **No analysis in SAFE supporting hypothesis that productivity of pollock stocks effected by regime shift. In absence of such analysis it would have been more appropriate to base ABC on Model 5, which incorporates entire data series from 1964 to present, and was model used in last year's pollock assessment.**

2) **Population risk lower**
   - **Multiple year classes present in population with 1996 year class now recruiting to 3+ biomass as above average year class.**
   - **Due to changing environmental conditions (e.g. bottom water temperature regime), pollock stocks was not distributed into the Russian portion of the Bering Sea.**
     1. **Results from 1999 EIT survey**
     2. **Distribution of fishing effort during B season 1999 compared with B season 1998**
     3. **Very poor fishing results reported this year by Russian vessels in Russian portion of Bering Sea**
   - **Pollock biomass on increasing trend**

3) **ABC recommended by SSC is conservative**
   - **Model 2, Tier 1 more conservative than last year's model (Model 5)**
   - **F40%**
   - **Biomass2000/Bmsy > 1.0**

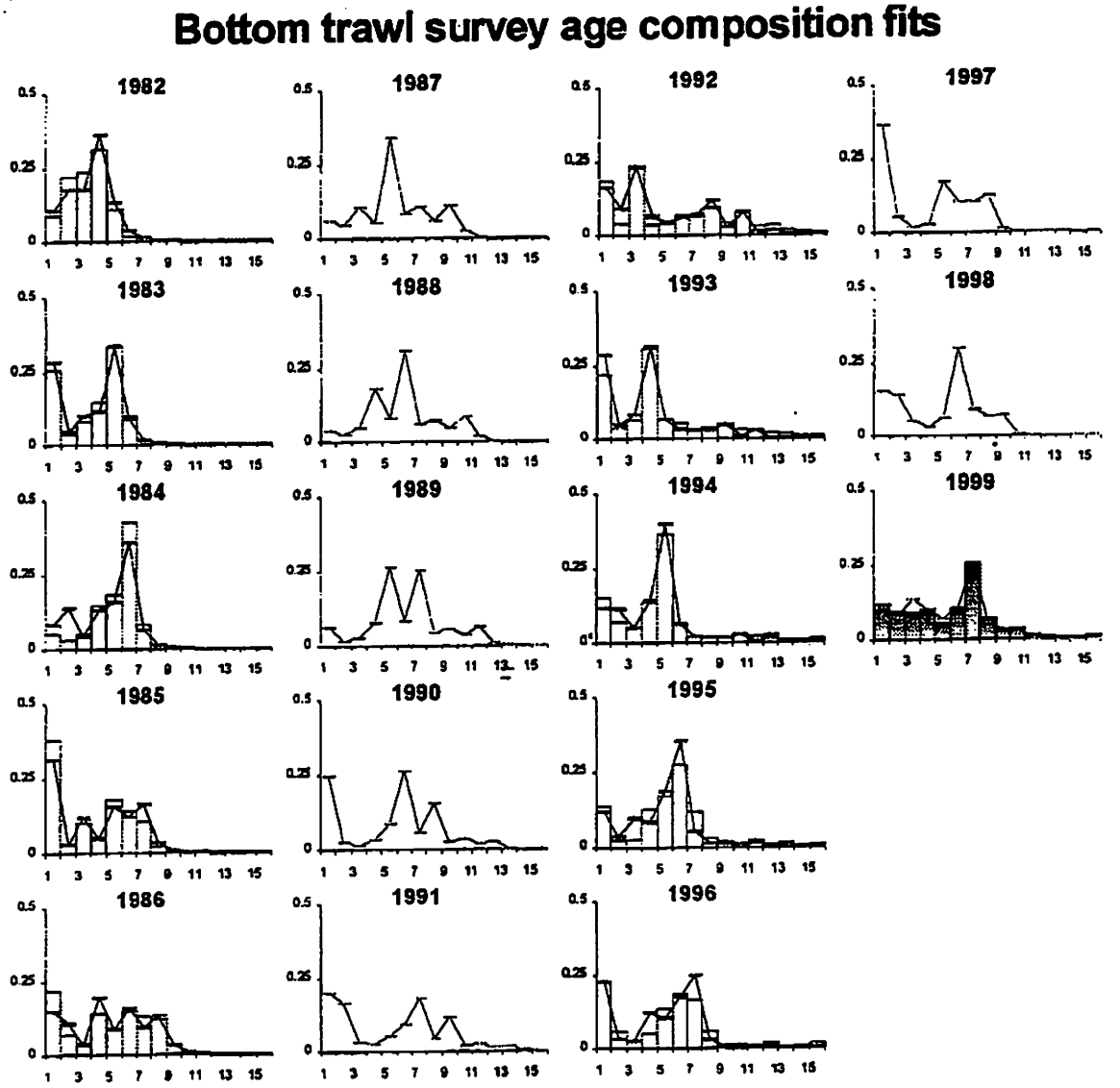

Figure 1.18. Model 2 fit to the bottom trawl survey age composition data (proportions) for EBS walleye pollock. Lines represent model predictions while the vertical columns represent the data. Data new to this assessment are shaded.

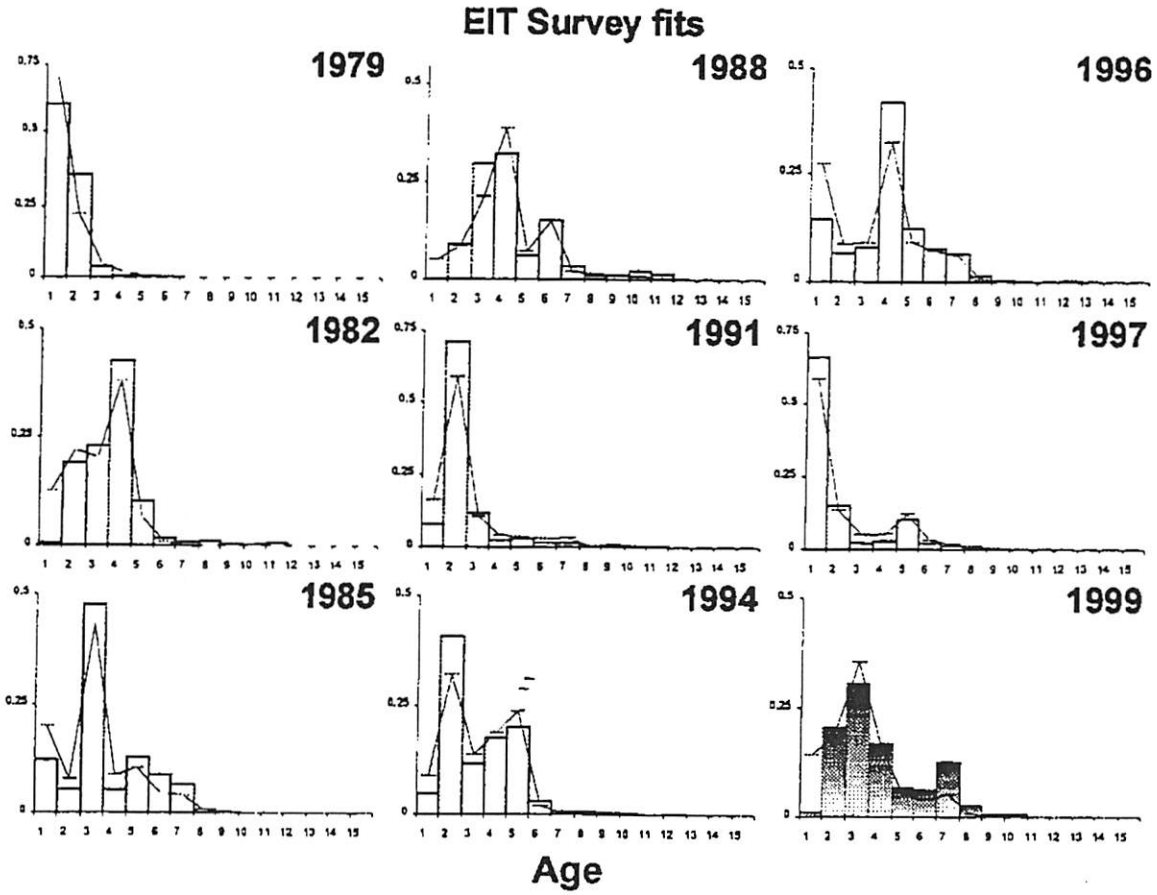

Figure 1.20. Model 2 fit to the EIT survey EBS walleye pollock age composition data (proportions). Lines represent model predictions while the vertical columns represent the data. Data new to this assessment are shaded.

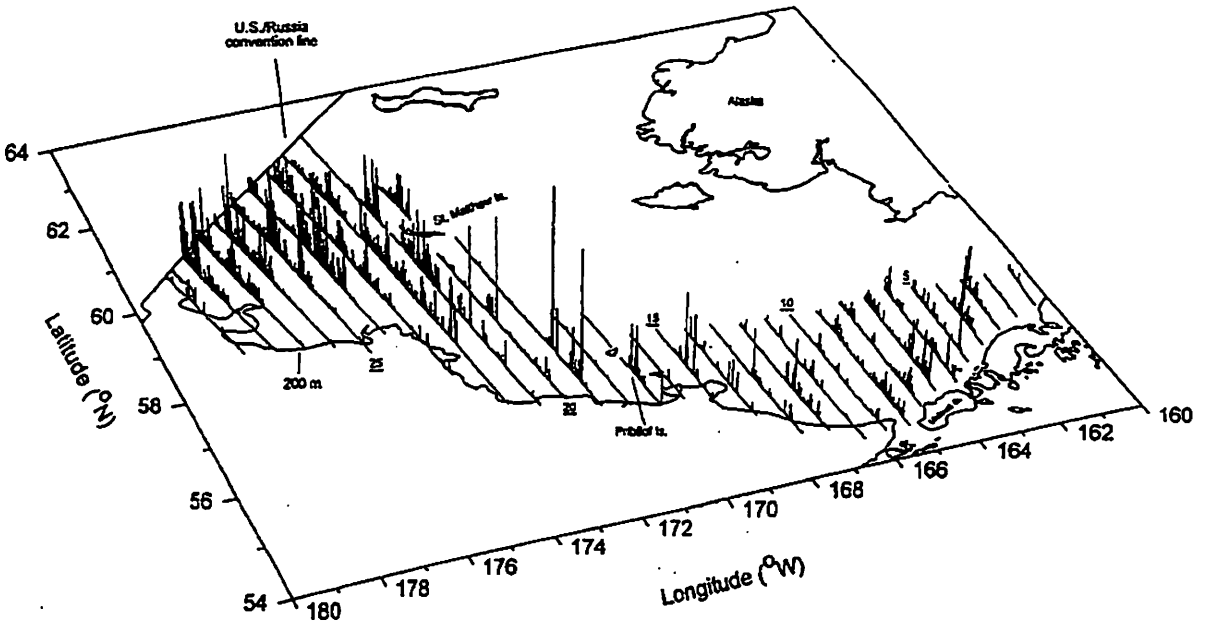

Figure 3 Pollock acoustic backscatter along trackline during the summer 1996 acoustic-trawl survey of the eastern Bering Sea shelf. Transect numbers are underlined.

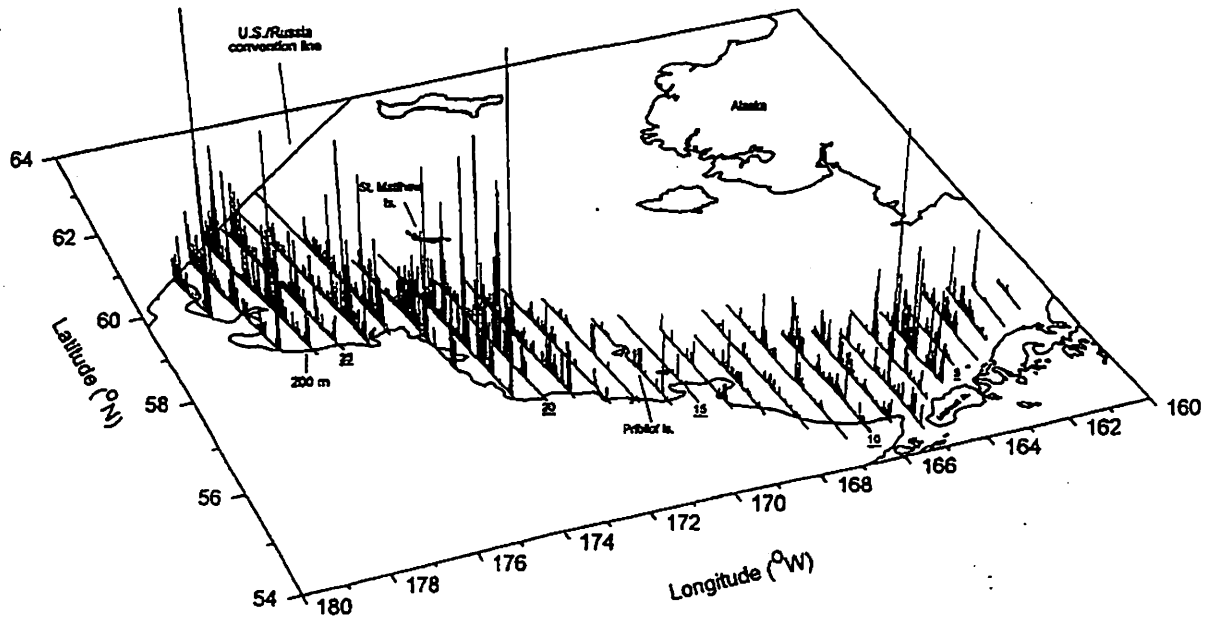

Figure 4 Pollock acoustic backscatter along trackline during the summer 1994 acoustic-trawl survey of the eastern Bering Sea shelf. Transect numbers are underlined.

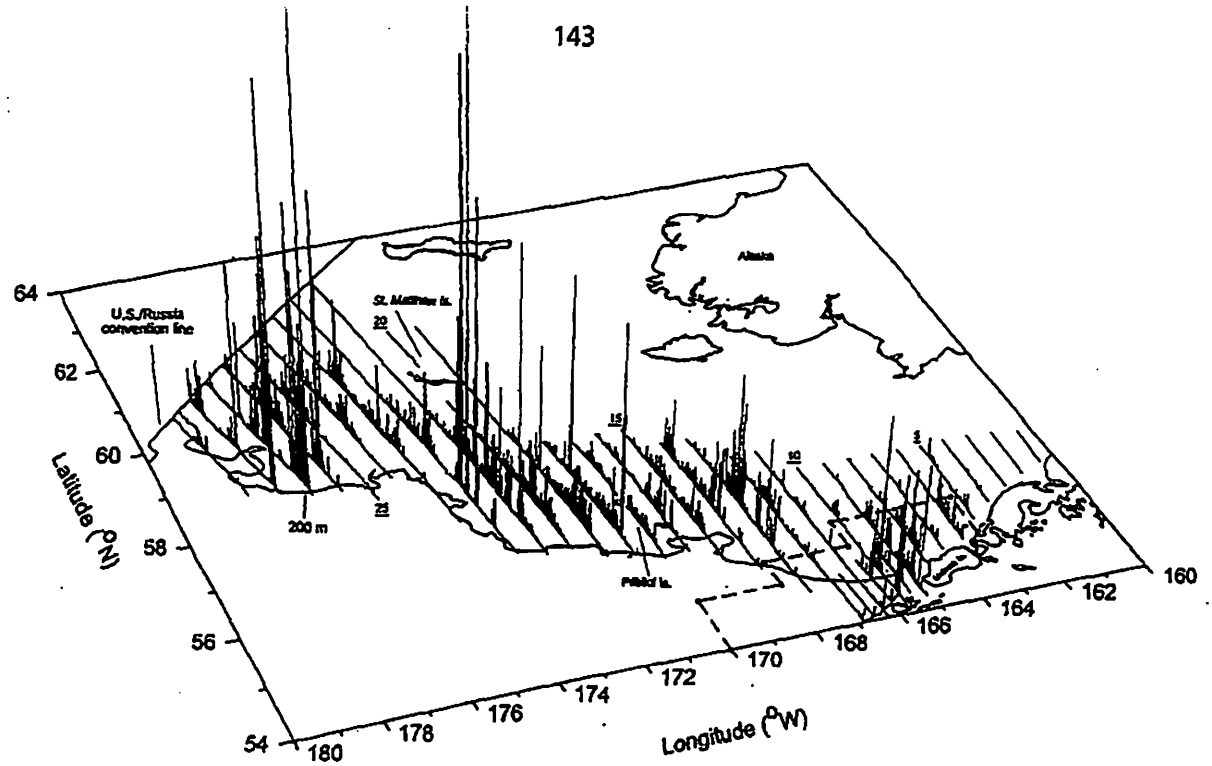

Figure 1. Pollock acoustic backscatter along trackline during the summer 1999 acoustic-trawl survey of the eastern Bering Sea shelf. Transect numbers are underlined, and the Critical Habitat area is outlined.

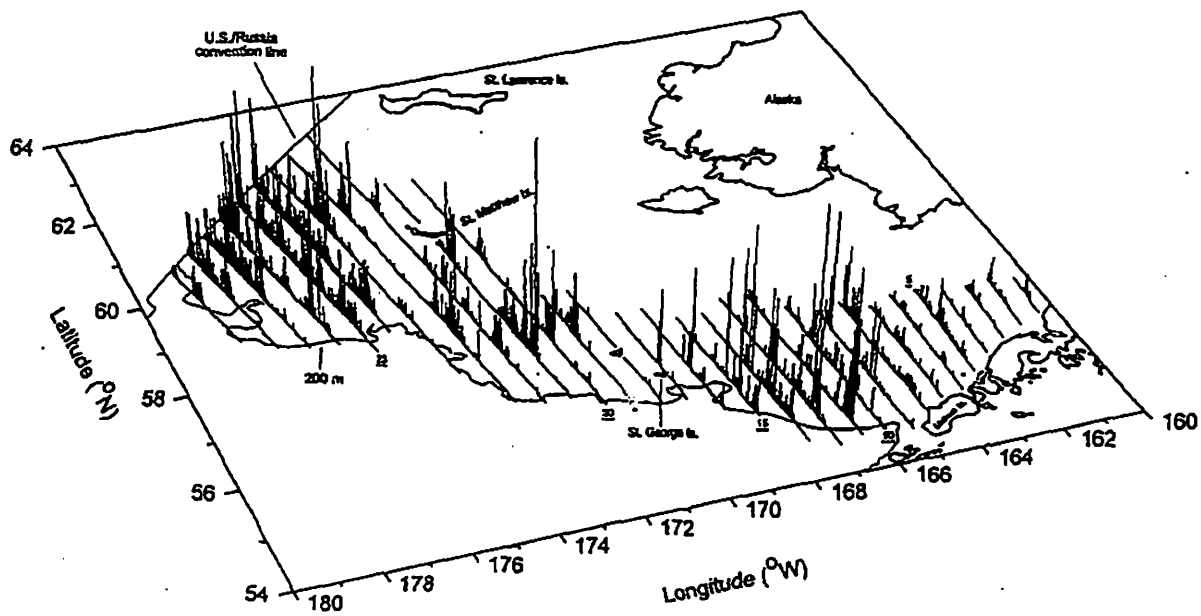

Figure 2 Pollock acoustic backscatter along trackline during the summer 1997 acoustic-trawl survey of the eastern Bering Sea shelf. Transect numbers are underlined.

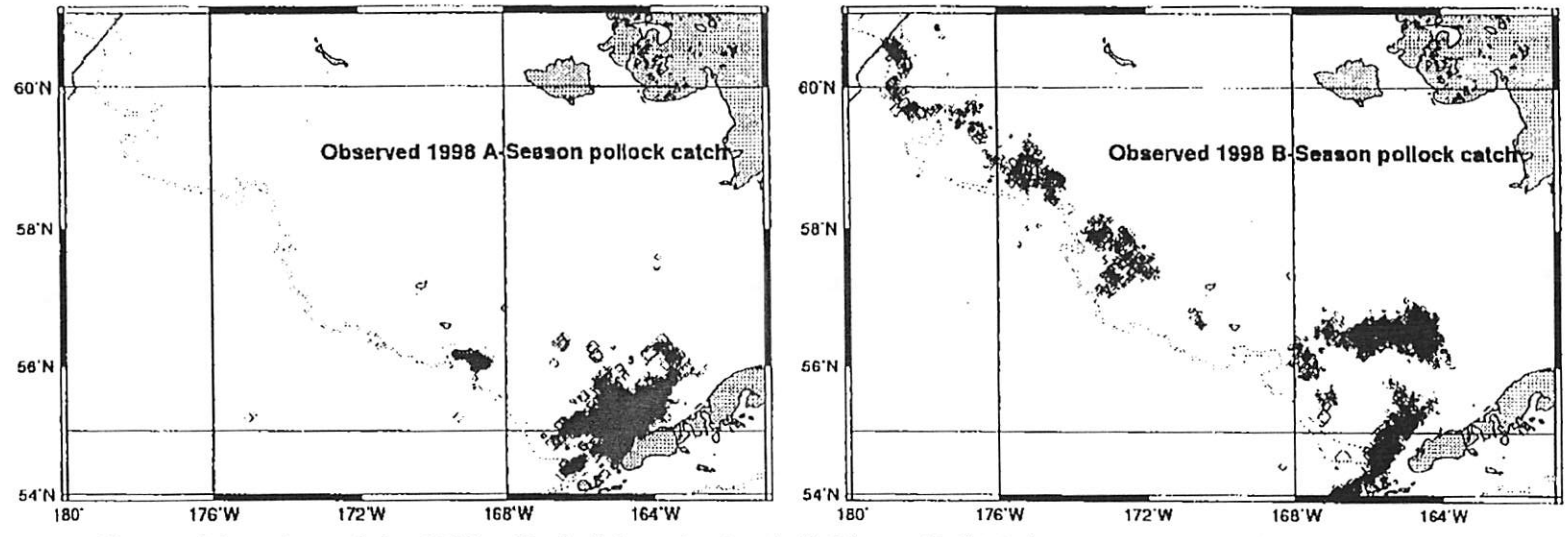

Figure 1.2. Observed locations of the 1998 pollock fishery in the A-(left) and B-(right) seasons on the EBS shelf. The size of the circles approximates nominal catch rates.

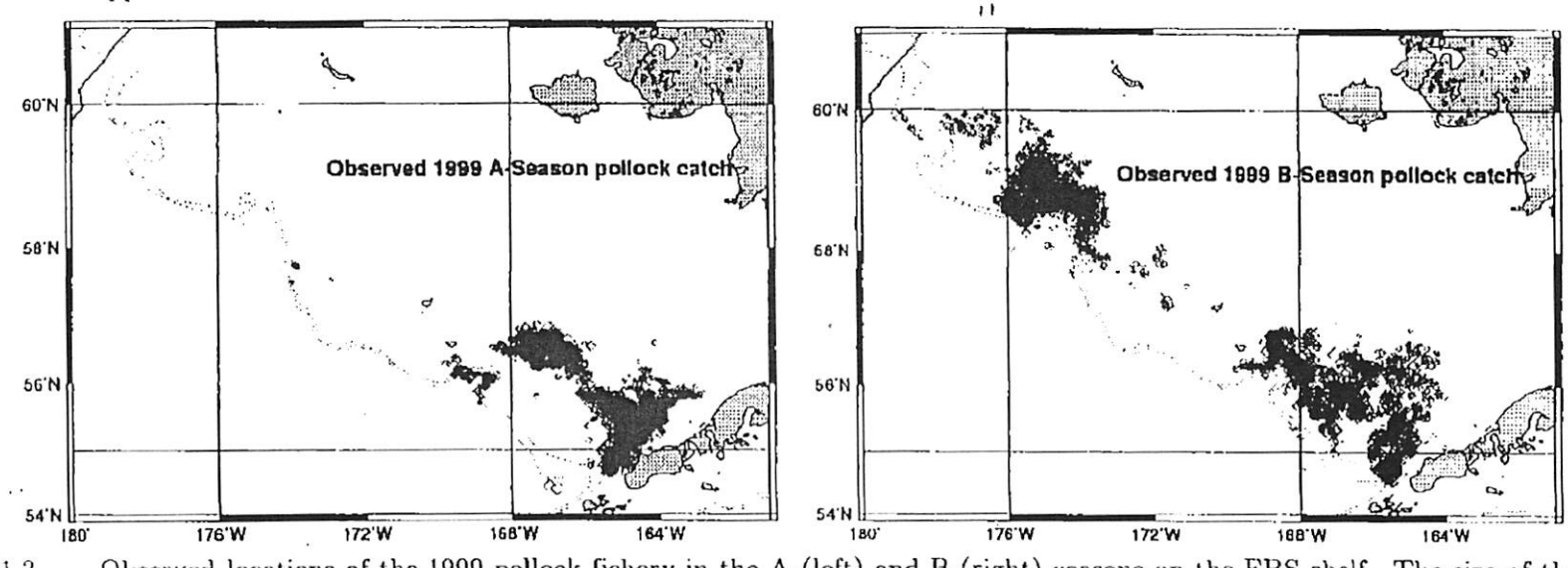

Figure 1.3. Observed locations of the 1999 pollock fishery in the A-(left) and B-(right) seasons on the EBS shelf. The size of the circles approximates nominal catch rates. NOTE: These data are preliminary.

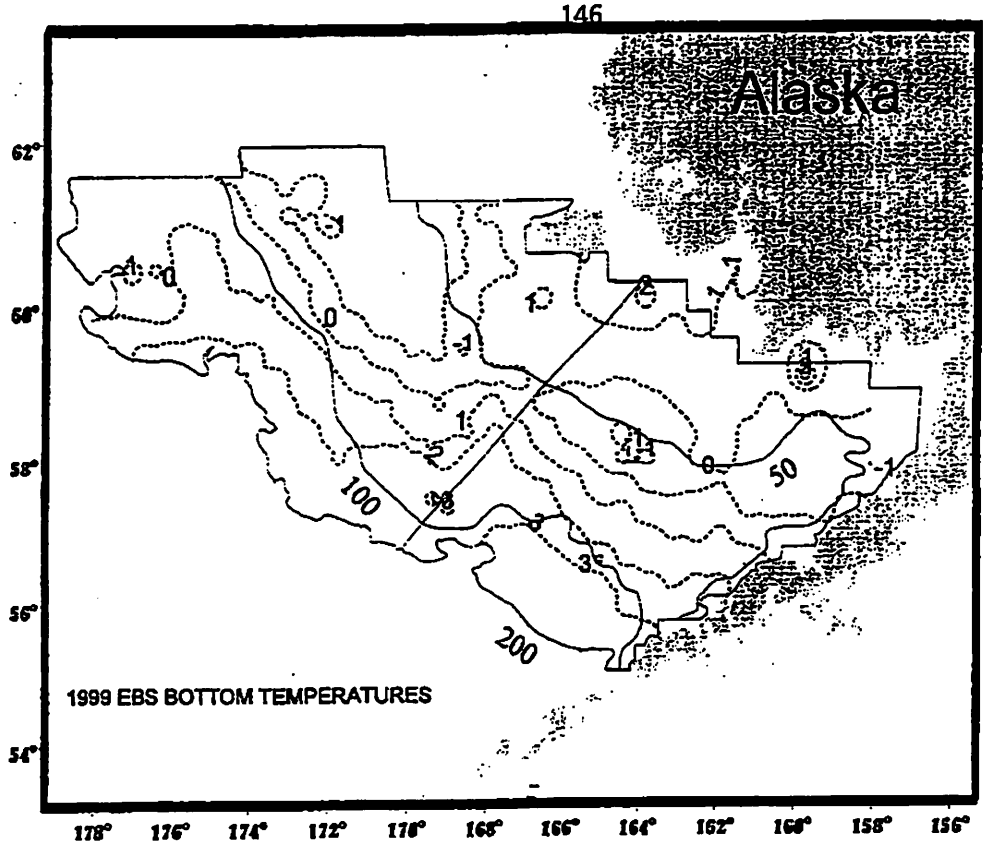

Figure 6 1999 EASTERN BERING SEA BOTTOM TEMPERATURES

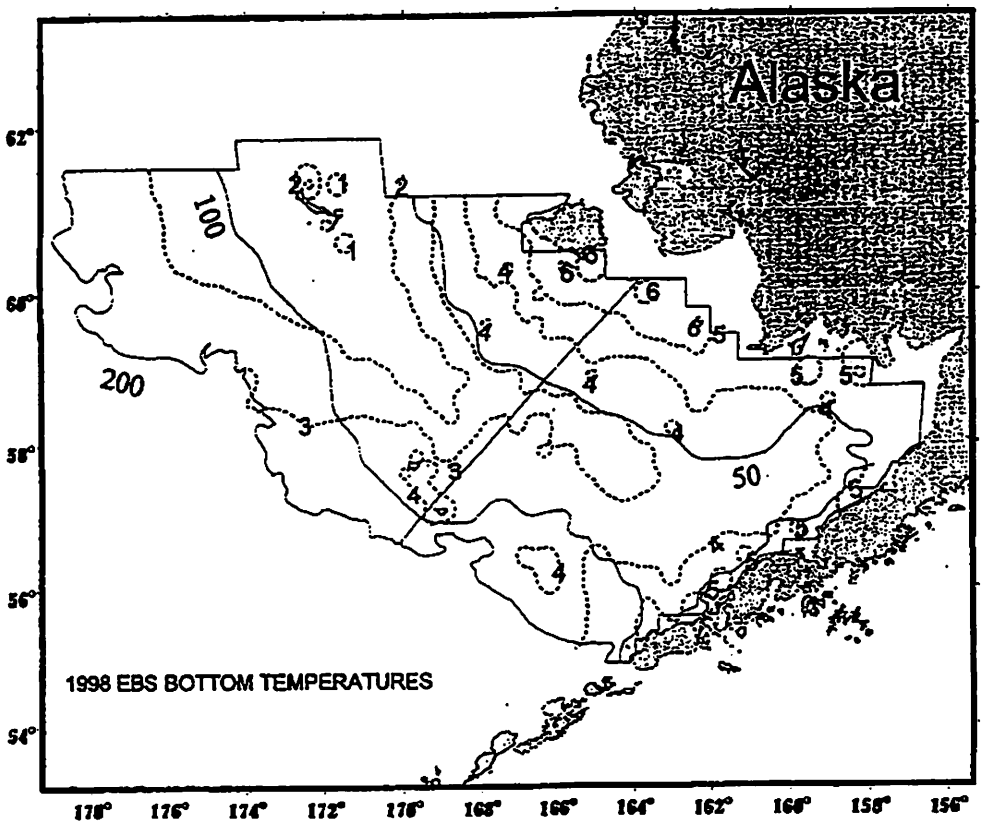

Figure 7