



UNITED STATES DEPARTMENT OF COMMERCE  
Office of the Under Secretary for  
Oceans and Atmosphere  
Washington, D.C. 20230

DEC 27 1999

To all Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act, an environmental review has been performed on the following action.

TITLE: Environmental Assessment for the Interim and Final Total Allowable Catch Specifications for the Year 2000 Alaska Groundfish Fisheries

LOCATION: Federal Waters of the Bering Sea and Aleutian Islands and Gulf of Alaska

SUMMARY: These interim and final harvest specifications will, if approved, become the upper limit of groundfish harvested in the fisheries during calendar year 2000.

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The environmental review process led us to conclude that this action will not have a significant impact on the environment. Therefore, an environmental impact statement was not prepared. A copy of the finding of no significant impact, including the environmental assessment, is enclosed for your information. Also, please send one copy of your comment to me in Room 5805, PSP, U.S. Department of Commerce, Washington, D.C. 20230.

Sincerely,

*Susan Tucker*

Director of the Office of Policy  
and Strategic Planning

Enclosure



ENVIRONMENTAL ASSESSMENT  
For The Interim and Final Total Allowable Catch Specifications for the Year 2000  
Alaska Groundfish Fisheries

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 23, 1999

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**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 interim and final groundfish total allowable catch specifications for fishing year 2000 in the exclusive economic zones of 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

The federal action is the establishment of harvest quotas for harvest that will take place during calendar year 2000. Interim and final total allowable catch (TAC) specifications are being promulgated. The purpose of this Environmental Assessment (EA) is to assess the impacts of groundfish harvest accruing from harvest at these interim and final TAC specifications. This EA tiers off the broader action of groundfish fishing under various levels of TAC specifications which were analyzed in a supplemental environmental impact statement (SEIS) (NMFS 1998a) prepared to supplement the original Environmental Impact Statements (EISs) for the Fishery Management Plans for the Gulf of Alaska (GOA) and Bering Sea and Aleutian Islands (BSAI).

This EA updates the information available and pertinent to changing the TAC amounts from those set for previous fishing years to these proposed for fishing year 2000. Impacts of groundfish harvest at the year 2000 TAC specifications on target groundfish species, higher trophic level species, Endangered Species Act (ESA) listed species, marine habitat, other predators and prey which together constitute the ecosystem, and socioeconomic impacts are addressed in this EA.

Species listed under the 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 and anadromous fish. The US Fish and Wildlife Service is the expert agency for ESA listed seabirds. The action, establishment harvest quotas in the EEZ off Alaska, must be in compliance with the ESA. Re-initiated consultations under Section 7 of the ESA were completed for ESA listed marine mammals and Pacific salmon using information specific to the year 2000 TAC specifications, and for the endangered short-tailed albatross using the TAC specifications established for calendar year 1999. These new consultations were concluded with determinations of no jeopardy to listed species or adverse impacts to Critical Habitat. A Section 7 Biological Opinion on all ESA listed species present in the fishery management areas for the entire groundfish fisheries program is pending at this time; expected completion date is spring 2000.

Still in process are fishery management actions to implement mitigation measures for Steller sea lion determined necessary in Section 7 consultations prepared in 1998 (NMFS 1998b) and the revised final reasonable and prudent alternatives for that Biological Opinion. NMFS acknowledges that mitigation measures must be in place before the start of the year 2000 BSAI and GOA groundfish fisheries in order that a finding of no significant impact can be reached on the action, setting 2000 TAC specifications, considered in this EA. The mitigation measures will be promulgated in an emergency 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. 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 as necessary to avoid jeopardy and adverse modification of Steller sea lion critical habitat until such time that mitigation measures can be fully implemented.

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 Stock Assessment and Fishery Evaluation (SAFE) Reports for the Groundfish Resources of the BSAI and GOA as Projected for 2000 (Appendices A and B). The economic status of the groundfish fisheries off Alaska are updated in Appendix C. Ecosystem considerations are presented in Appendix D. An assessment of impacts to essential fish habitat is contained in Appendix E. All of this information was available to members of the North Pacific Fishery Management Council (Council), its

Scientific and Statistical Committee, and Advisory Panel, and the general public during deliberations on the setting of TAC specifications for the year 2000.

The following are the sums of the Council-recommended ABC, TAC, and OFL specifications for the year 2000. The OY levels were established in the Fishery Management Plans for the Groundfish Fishery of the BSAI (NPFMC 1995) and the GOA (NPFMC 1994).

Parameters	Year 2000 BSAI (metric tons)	Year 2000 GOA (metric tons)
OY (upper limit)	2,000,000	800,000
ABC	2,260,113	431,410
TAC	2,000,000	299,650
OFL	3,139,274	581,040

## **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 North Pacific Fishery Management Council (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. Determinations of ABC and OFL amounts for each of the FMP established target species or species group 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 Stock Assessment and Fishery Evaluation (SAFE) reports. The 2000 SAFE reports 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 December 1999 meeting, the Council, its Advisory Panel (AP), Scientific and Statistical Committee (SSC), and the public reviewed the SAFE reports and made recommendations based on that information about the condition of groundfish stocks in the respective fishing areas. The TAC specifications recommended by the Council for the year 2000 harvest quotas, therefore, were 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. SAFE reports 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, annually. Preliminary SAFE reports are produced by the end of September and final SAFE reports by the end of November. Since 1990, specifications of interim harvest levels are made. Interim specifications are, with a few exceptions, the 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. Interim TAC specifications are effective upon filing with the *Federal Register*. Final TAC specification



recommendations are made by the Council at its December meeting following completion of analysis of any new stock status information. Those TAC specifications and PSC limits are being recommended to the Secretary for implementation in fishing year 2000. The final specifications are generally implemented in February and replace the interim specifications as soon as they are effective.

## **1.2 Regulatory Changes**

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

The Council adopted Amendment 61 to the BSAI FMP which would implement major provisions of the American Fisheries Act (AFA). Proposed regulatory changes include a new formula to allocate the BSAI pollock TAC between the Community Development Quota (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.

The Council adopted Amendment 58 to the BSAI FMP which would implement reductions in chinook salmon bycatch. When implemented (December 21, 1999) this action will adjust the prohibited species catch limits of chinook salmon in Chinook Salmon Savings Area (CHSSA) of the BSAI. This action will modify slightly the boundaries of the CHSSA, set new CHSSA closure dates, and reduce the chinook salmon bycatch limit in the CHSSA to 41,000 fish in the year 2000.

The groundfish harvest quotas are also affected by the annual guideline harvest levels (GHL) of groundfish fisheries managed by the Alaska Department of Fish and Game that occur in state of Alaska 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**

The federal action is establishment of harvest quotas for harvest that will take place during calendar year 2000. Two actions are necessary to accomplish the overall conservation objective of preventing overharvest of groundfish resources: interim and final TAC specifications.

Interim TAC specifications are amounts of harvest and bycatch that can be taken for each category of groundfish and prohibited species taken in groundfish fisheries in federal waters in the BSAI and GOA fishery management areas. Interim specifications are based on the proposed initial harvest specifications for groundfish and associated management measures for the 2000 fishing year (BSAI at 64 FR 69464 and GOA at 64 FR 69457.) Regulations require one-fourth of each proposed TAC and apportionment thereof (not including the reserves and the first seasonal allowance of pollock), one-fourth of the proposed halibut PSC amounts, and the proposed first seasonal allowance of pollock become available for harvest at 0001 hours, Alaska local time, January 1, on an interim basis and remain in effect until superseded by the final harvest specifications. See Tables 1 and 2 for year 2000 interim specifications.

Final TAC specifications are upper limits on the amounts of harvest and bycatch that can be taken for each category of groundfish and prohibited species taken in groundfish fisheries in federal waters in the BSAI and GOA fishery management areas during the calendar year. Final specifications are based on current information about the population status of both target and prohibited species and scientific interpretation of appropriate harvest quotas using that information. Current information is contained in the year 2000 SAFE reports (Appendices A and B) explained above. The TAC specifications (Council recommended TAC specifications, Tables 1 and 2 and Alternative 9 in Tables 13 and 14), if approved, define upper harvest limits, or fishery removals, on harvests occurring during the year 2000. Absent approval within the first quarter of calendar year 2000, directed fishing in excess of the interim TAC specifications is unauthorized.

The purpose of this Environmental Assessment (EA) is to assess the impacts of groundfish harvest accruing from harvest at these interim and final TAC specifications. This EA tiers off the broader analysis of groundfish fishing under various levels of TAC specifications which was documented in a supplemental environmental impact statement (SEIS) (NMFS 1998a) prepared to supplement the original Environmental Impact Statements (EISs) for the Fishery Management Plans for the Gulf of Alaska (GOA) and Bering Sea and Aleutian Islands (BSAI). 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 National Environmental Policy Act (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).

## **2.0 PROPOSED ACTION and ALTERNATIVES TO THE PROPOSED ACTION**

Alternatives 1 through 5 were designed to provide a range of harvest alternatives that were likely to bracket the final TAC specifications for the year 2000. Using the same alternative descriptions, the stock assessment authors prepared analyses accordingly with their respective species' data and presented the results in the SAFE chapters and at the November Plan Team meetings. For purpose of the analysis in Alternatives 1 through 4, the proposed  $F$  is extrapolated into future years so that a theoretical biomass can be calculated. This has the effect of making the result of each  $F$  level more tangible in the long term scenario. This process involves the inclusion of a variety of assumptions, however, it does offer information about how each alternative could affect the trends in biomass, either decreasing, increasing, or stable.

The Plan Teams considered the findings of Alternatives 1 through 5, and made a finding of their own which is captured as Alternative 6. The results of those six alternatives were presented to the Council, its SSC, and AP and the general public during the Council's December meeting. For presentation purposes, the ABC recommendations from the Council's SSC are captured as Alternative 7, the TAC recommendations from the Council's AP are captured as Alternative 8, and the Council's ABC and TAC recommendations are Alternative 9.

**Alternative 1:** Set  $F$  equal to  $\max F_{ABC}$  for the year 2000 harvest, " $\max F_{ABC}$ " refers to the maximum permissible value of  $F_{ABC}$  under Amendment 56. Historically, TAC has been constrained by ABC, so this alternative provides a likely upper limit on future TACs.

**Alternative 2:** Set the fishing mortality rate equal to the stock assessment author's recommended ABC.  $F$  is set equal to a constant fraction of  $\max F_{ABC}$ , where this fraction is equal to the ratio of the  $F_{ABC}$  value for the year 2000 recommended in the assessment to the  $\max F_{ABC}$  for the year 2000. The stock assessment author's recommended fractions of  $\max F_{ABC}$  may vary between stocks, based on other considerations unique to individual stocks.

**Alternative 3:** Set  $F$  equal to 50% of  $\max F_{ABC}$  for year 2000 harvest. This alternative provides a likely lower bound on  $F_{ABC}$  that still allows future harvest rates to be adjusted downward should stocks fall below reference levels.

**Alternative 4:** Set  $F$  equal to the 1994-1998 average  $F$  for year 2000 harvest. This alternative recognizes that for some stocks, TAC may be set well below ABC, and recent average  $F$  may provide a better indicator of  $F_{TAC}$  than  $F_{ABC}$ .

**Alternative 5:** Set  $F$  equal to zero for year 2000 harvest. This alternative recognizes that, in extreme cases, TAC may be set at a level close to zero. This is the **no action alternative**.

**Alternative 6:** Set  $F$  equal to the North Pacific Fishery Management Council's Plan Teams' recommended ABCs. This alternative results from the Plan Teams' review of the stock assessment authors' recommendations.

**Alternative 7:** Set  $F$  equal to the North Pacific Fishery Management Council's Science and Statistical Committee's (SSC) recommended ABC. This alternative is the result of the SSC's review of the stock assessment authors and Plan Team recommendations. The SSC reviewed the selection of the assessment model alternative, tier determination, other ABC considerations, and considered public testimony.

**Alternative 8:** Set  $F$  equal to the North Pacific Fishery Management Council's Advisory Panel (AP) TAC recommendations. This alternative represents the best way to achieve optimum yield from the groundfish fisheries. Socioeconomic concerns are addressed in the TAC recommendations. The AP also recommended annual and seasonal apportionments of prohibited species catch (PSC) amounts to optimize opportunities to harvest groundfish. Public testimony received on TAC and PSC apportionments was considered by the AP to be of critical importance.

**Alternative 9:** Set  $F$  equal to the North Pacific Fishery Management Council TAC recommendations. This alternative focuses on the biological condition of the groundfish stocks, effects of the groundfish fisheries on endangered, prohibited, and other species dependant upon the marine environment and their

habitat. ABC, TAC and PSC recommendations are based on these considerations as well as socioeconomic concerns to achieve optimum yield in the groundfish fisheries. Consideration of public testimony was also of critical importance in arriving at this recommendation. This alternative incorporates the most recent and best scientific information available, therefore, is the **preferred alternative**.

### **3.0 ENVIRONMENTAL AND ECONOMIC CONSEQUENCES**

The groundfish fisheries occur in the North Pacific Ocean and Bering Sea in the U.S. EEZ from 50° N to 65°N. These TAC specifications affect groundfish fishing throughout the BSAI and GOA management area. Descriptions of the affected environment are given in the SEIS (NMFS 1998a). Substrate is described at section 3.1.1, water column at 3.1.3, temperature and nutrient regimes at 3.1.4, currents at 3.1.5, groundfish and their management at 3.3, marine mammals at 3.4, seabirds at 3.5, benthic infauna and epifauna at 3.6, prohibited species at 3.7, and the socioeconomic environment at 3.10. Additionally, the status of each target species category, biomass estimates, and acceptable biological catch specifications are presented both in summary and in detail in the annual GOA and BSAI stock assessment and fishery evaluation (SAFE) reports (Appendices A and B of this EA.)

An EA is prepared pursuant to 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 are 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 or species group 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 the information about target species stock status as it is known in 1999 and recommends appropriate harvest levels in the year 2000 based on that current biological information.

This EA tiers off scientific information and analytical methods for setting harvest levels presented in the SEIS (NMFS 1998a); 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) non-specified species--those species and species groups that currently have little economic value but are taken by the groundfish fishery in Federal waters 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 (Appendices A and B). OFLs, ABC, TAC, and catch (through October 30) in 1999, along with 2000 interim specifications, OFLs, ABCs, and the Council's recommended year 2000 TAC specifications for the BSAI area are presented in Table 1 and discussed below. Harvest alternatives considered are presented in Table 13. 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 mt, an increase of 27% from the 1997 estimate, the last year an echo-integration trawl survey was conducted in this region. Exploitable biomass of the EBS pollock stock is estimated to be 7.7 million mt. 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 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 mt. 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 mt, 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 mt, 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 mt, 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 SSC and Council recommended an ABC of 1,139,000 mt. The AP and Council recommended a TAC of 1,139,000 mt.

The 1997 bottom trawl survey of the Aleutian Islands region resulted in an exploitable 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 mt, 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 mt, 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 SSC and Council concur with the Plan Team's ABC recommendation of 23,800 mt. The AP and Council recommended a TAC of 2,000 mt to allow for the retention of incidental catch only.

The 1999 hydroacoustic survey of the Bogoslof region resulted in an exploitable biomass estimate of 475,000 mt. In 1998, the SSC determined that reliable estimates of  $B_{40\%}$ ,  $F_{40\%}$ , and  $F_{30\%}$  existed for this stock, with values of 2,000,000 mt, 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). The 1999 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 mt, 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. The SSC and Council recommended an OFL of 30,400 mt and an ABC of 22,300 mt. The AP and Council recommended a TAC of 1,000 mt to allow for retention of incidental catch only.

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. Exploitable biomass of the Atka mackerel stock for 2000 is estimated to be 536,000 mt. 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 mt, 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 mt, 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 mt, 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 mt. The SSC and Council concur with the Plan Team's ABC recommendations of 16,400, 24,700, and 29,700 mt for the Eastern, Central, and Western Aleutian Island areas respectively. The AP and Council recommended that TAC be set equal to ABC amounts.

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 mt, a 9% increase relative to last year's estimate. Exploitable biomass is estimated to be 1.3 million mt. 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 mt, 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 mt, 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 mt, 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 mt, 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. In year 2000, a catch of 193,000 mt would represent an increase of 9% over the 1999 ABC of 177,000 mt, 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 mt), 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 SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at the ABC level.

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 mt. 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 report, 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 data from the U.S. longline fishery from 1990 through 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 analyzes. Recruitment variability was significantly different compared to last year's assessment. This was due to the addition of true ageing error estimates. Exploitable biomass for 2000 is estimated to be 18,000 mt in the Eastern Bering Sea and 33,000 mt in the Aleutian Islands areas.

The Team selected the  $F_{40\%}$  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. The SSC concurred with the Plan



Team's ABC recommendation and the AP recommended that TAC be set at ABC levels. The Council recommended that the BSAI ABC recommendation of 3,900 mt be apportioned to the Eastern Bering Sea based on an alternative that includes consideration of commercial fisheries information. This resulted in an apportionment of 1,470 mt to the Eastern Bering Sea and 2,430 mt to the Aleutian Islands areas. The Council recommended that TAC be set at ABC levels.

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 mt, 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. Exploitable biomass is estimated to be 2,820,000 mt in 2000. 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 mt. The SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at 123,262 mt.

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 mt. 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 mt, a 22% decrease relative to last year's estimate. The biomass estimate from the 1998 survey constituted a 20% decrease relative to 1997. Exploitable biomass is estimated to be 2,070,000 mt in 2000. 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 mt. The SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended a TAC of 134,760 mt.

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 mt. 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. Exploitable biomass is estimated to be 233,000 mt in 2000. 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 mt, 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 the 1998 assessment: In that 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 mt, 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 mt. 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 SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at ABC levels and apportioned 6,231 mt to the Bering Sea and 3,069 mt to the Aleutian Islands areas.

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 mt. 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 mt, a 29% decrease relative to last year's estimate. Exploitable biomass is estimated to be 785,000 mt in 2000. 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 mt, 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 mt. The SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at the ABC level.

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 mt. 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 mt, 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. Exploitable biomass is estimated to be 611,000 mt in 2000. 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 mt. The SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended a TAC of 52,652 mt.

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 mt. 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. Exploitable biomass is estimated to be 829,000 mt in 2000. 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 SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at 83,813 mt.

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. Exploitable biomass is estimated to be 47,700 mt in 2000. 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 mt, 0.057, and 0.069, respectively. Projected spawning biomass for 2000 is 24,900 mt, 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 mt, 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 SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at the ABC level.

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 mt, 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. Exploitable biomass is estimated to be 192,000 mt. 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 mt, 0.072, and 0.085, respectively. Projected spawning biomass for 2000 is 97,800 mt, 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 mt, 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 SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at the ABC levels of 3,120, 3,510, and 5,670 mt in the Eastern, Central and Western Aleutian Islands areas respectively.

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 mt, 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. Exploitable biomass is estimated to be 8,200 mt in 2000. 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. The SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at the ABC level.

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). Exploitable biomass is estimated to be 115,000 mt in 2000. 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 mt. The SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at the ABC level.

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). Exploitable biomass is estimated to be 41,500 mt in 2000. 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 SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at the ABC level.

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 mt. As a Tier 5 stock complex, it is not possible to determine whether the AI shorttraker/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. Exploitable biomass is estimated to be 7,030 mt in the Eastern Bering Sea and 13,000 mt in the Aleutian Islands areas in 2000. 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 SSC and Council concur with the Plan Team's ABC recommendations. The AP and Council recommended that TAC be set at ABC levels.

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. Estimates of exploitable biomass are not available. 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. The SSC and Council concur with the Plan Team's ABC recommendation. The AP and Council recommended that TAC be set at the ABC level.

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 mt, a 7% decrease from last year’s estimate of 556,000 mt. Exploitable biomass is estimated to be 611,000 mt in 2000. 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. The SSC and Council recommended that the ABC be set using the using the ten year stair step strategy leading to maximum permissible ABC begun in 1999 resulting in an ABC of 31,360 mt. The AP and Council recommended that TAC be set at the ABC level.

Under Tier 5, the 2000 OFL computed by the above method is 71,500 mt. 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. Groundfish harvest specifications for the Bering Sea and Aleutian Islands management area. For the year 1999 these data include: OFLs (revised), ABC, TAC specifications, and actual catch (January 1, 1999 through October 30, 1999); For the year 2000 these data include: Council recommended interim specifications, OFLs, ABCs, and TAC specifications. All values are in metric tons.

Species	1999 Specifications					Council Recommended 2000 Specifications			
	Area	OFL	ABC	TAC	Actual Catch	Interim Specifications	OFL	ABC	Final TAC
Pollock	Bering Sea (BS)	2,210,000	92,000	992,000	978,301	378,943	1,680,000	1,139,000	1,139,000
	Aleutian Is. (AI)	31,700	23,800	2,000	1,019	2,000	31,700	23,800	2,000
	Bogoslof District	115,000	15,300	1,000	21	1,000	30,400	22,300	1,000
Pacific cod	BSAI	215,000	177,000	177,000	160,084	40,931	240,000	193,000	193,000
Sablefish	BS	1,600	1,340	1,340	628	155	1,750	1,470	1,470
	AI	2,200	1,860	1,380	629	79	3,090	2,430	2,430
Atka mackerel	Total	126,000	73,300	66,400	52,962	36,690	119,000	70,800	70,800
	Western AI	.....	30,700	27,000				29,700	29,700
	Central AI	.....	25,600	22,400				24,700	24,700
	Eastern AI/BS	.....	17,000	17,000				16,400	16,400
Yellowfin sole	BSAI	251,000	212,000	207,980	67,885	48,096	226,000	191,000	123,262
Rock sole	BSAI	367,000	309,000	120,000	40,362	27,750	273,000	230,000	134,760
Greenland turbot	Total	21,000	14,200	9,000	5,937	2,195	42,000	9,300	9,300
	BS	.....	9,515	6,030					6,231
	AI	.....	4,685	2,970					3,069
Arrowtooth flounder	BSAI	170,000	140,000	134,354	10,679	31,069	160,000	131,000	131,000
Flathead sole	BSAI	95,600	77,300	77,300	17,777	17,875	90,000	73,500	52,652
Other flatfish	BSAI	197,000	154,000	154,000	15,184	35,613	141,000	117,000	83,813
Pacific ocean perch	BS	2,300	1,900	1,400	376	324	3,100	2,600	2,600
	AI Total	16,200	13,500	13,500	11,776	3,311	14,400	12,300	12,300
	Western AI	.....	6,220	6,220				5,670	5,670
	Central AI	.....	3,850	3,850				3,510	3,510
	Eastern AI	.....	3,430	3,430				3,120	3,120
Other red rockfish	BS	356	267	267	217	62	259	194	194
Sharpchin/Northern	AI	5,640	4,230	4,230	5,181	978	6,870	5,150	5,150
Shortraker./rougheye	AI	1,290	965	965	474	223	1,180	885	885
Other rockfish	BS	492	369	369	137	86	492	369	369
	AI	913	685	685	632	159	913	685	685
Squid	BSAI	2,620	1,970	1,970	413	456	2,620	1,970	1,970
Other species	BSAI	129,000	32,860	32,860	18,396	7,599	71,500	31,360	31,360
TOTAL		3,961,911	2,247,846	2,000,000	1,389,070	635,594	3,139,274	2,260,113	2,000,000



### 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. OFLs, ABC, TAC, and catch (through October 30) in 1999, along with 2000 interim specifications, OFLs, ABCs, and the Council's recommended year 2000 TAC specifications for the BSAI area are presented in Table 2 and discussed below. Harvest alternatives considered are presented in Table 14. For detailed life history, ecology, and fishery management information regarding groundfish stocks in the GOA see Section 3.3 of the SEIS.

Walleye pollock The GOA pollock biomass can be described as below target stock size and increasing. Relative to the 1999 SAFE report, 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. Exploitable biomass for 2000 is estimated to be 588,000 mt.

Projected spawning biomass in 2000 for the Western, Central and West Yakutat (WYK) areas is 214,900 mt, which is below the  $B_{40\%}$  value of 247,000 mt and places Gulf pollock in Tier 3b. Exploitable biomass is estimated to be 588,000 in the W/C/WYK combined areas. 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 permissible of  $F_{40\% \text{ adjusted}} = 0.34$ , 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 that from 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  $F_{35\% \text{ adjusted}} = 0.40$ . 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 Plan Team's total recommended 2000 ABC for pollock in the GOA is 103,020 mt, up from 100,920 mt in 1999. The SSC and Council recommended using an adjusted  $F_{45\%}$  exploitation strategy ( $F_{ABC}=0.28$ ) for the western population. The recommended ABCs of 38,352, 22,824, 30,027, and 2,339 mt in areas 610, 620, 630, and 640 also reflect proportional reductions in these areas based on the 2000 pollock guideline harvest level in Prince William Sound. The SSC and Council concur with the Plan Team's recommended ABC for area 650 of the Eastern GOA of 6,460. The AP and Council recommended that TAC be set at ABC levels.

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 the year 2000 under an  $F_{OFL}$  harvest policy, less than  $B_{35\%}$  (216,000 mt), but greater than  $\frac{1}{2}$  of  $B_{35\%}$ . At  $F_{OFL}$ , the projected mean spawning biomass in 2010 is 239,100 mt, 111% of  $B_{35\%}$ . Therefore, GOA pollock stocks are not currently overfished. The projected mean spawning biomass in 2002 is 166,600 mt, less than  $B_{35\%}$ , but greater than  $\frac{1}{2}$  of  $B_{35\%}$ . Projected mean spawning biomass in 2012 is 236,300 mt, 109% of  $B_{35\%}$ . 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 Southeast Outside (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 the 1999 SAFE report, new sources of information include: 1) size composition data from the 1998 and January through 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. Exploitable biomass for 2000 is estimated to be 567,000 mt.

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  $F_{40\%}$  ( $=0.38$ ) and  $F_{35\%}$  ( $=0.46$ ) yields 86,000 and 102,000 mt, respectively. The projected age 3+ exploitable 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 assessment author's ABC recommendation of 76,400 mt is the geometric mean of the posterior distribution of 2000 catch obtained under an  $F_{40\%}$  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 assessment 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 Plan Team's total recommended 2000 ABC for Pacific cod in the GOA is 76,400 mt, down from 84,400 mt in 1999. The SSC and Council concur with the Plan Team's recommended ABC and areas apportionments. The AP and Council recommended TACs lower than ABCs by 25% in the Western GOA, 19.25% in the Central GOA, and 25% in the Eastern GOA, based on the 2000 guideline harvest levels of Pacific cod in the state waters fishery.

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  $B_{35\%}$  (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  $B_{35\%}$ . 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 the 1999 SAFE report, 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. Exploitable biomass for 2000 is estimated to be 74,460 mt.

The 2000 exploitable biomass for deep water flatfish is based on abundance estimated from the 1999 triennial trawl survey biomass distributions in the 1999 trawl survey and is estimated to be 74,460 mt. 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 ABCs are 280, 2,710, 1,240, and 1,070 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

The Plan Team's total recommended 2000 ABC for deep water flatfish in the GOA is 5,300 mt, down from 6,050 mt in 1999. The SSC and Council concur with the Plan Team's ABC and area apportionments. The AP and Council recommended that TAC be set at ABC levels.

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 the 1999 SAFE report, 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 and is estimated to be 72,330 mt. 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 ABCs are 1,230, 5,660, 1,540, and 1,010 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

The Plan Team's total recommended 2000 ABC for rex sole in the GOA is 9,440 mt, up from 9,150 mt in 1999. The SSC and Council concur with the Plan Team's ABC and area apportionments. The AP and Council recommended that TAC be set at ABC levels.

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. Exploitable biomass for 2000 is estimated to be 299,100 mt. 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 ABCs are 19,510, 16,400, 790, and 1,160 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

The Plan Team's total recommended 2000 ABC for shallow water flatfish in the GOA is 37,860 mt, down from 43,150 mt in 1999. The SSC and Council concur with the Plan Team's ABC and area apportionments. The AP and Council recommended TACs of 4,500, 12,950, 790, and 1,160 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

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 the 1999 SAFE report, 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 and is estimated to be 207,520 mt. 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 ABCs are 8,490, 15,270, 1,440, and 620 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

The Plan Team's total recommended 2000 ABC for flathead sole in the GOA is 26,760 mt, up from 26,110 mt in 1999. The SSC and Council concur with the Plan Team's ABC and area apportionments. The AP and Council recommended TACs of 4,500, 12,950, 790, and 1,160 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

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 the 1999 SAFE report, 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 and is estimated to be 1,571,670 mt. 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 ABCs are 16,160, 97,710, 23,770, and 7,720 mt for the Western, Central, West Yakutat, and Southeast Outside Districts respectively.

The Plan Team's total recommended 2000 ABC for arrowtooth flounder in the GOA is 145,360 mt, down from 217,110 mt in 1999. The SSC and Council concur with the Plan Team's ABC and area apportionments. The AP and Council recommended TACs of 5,000, 25,000, 2,500, and 2,500 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively.

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  $B_{35\%}$  (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  $B_{35\%}$ . 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 the 1999 SAFE report, 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 data from the U.S. longline fishery from 1990 through 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. Exploitable biomass for 2000 is estimated to be 169,000 mt.

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  $F_{40\%}$  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 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.

As in 1999, the Plan Team recommended that five percent of the East Yakutat/SEO area ABC be subtracted, and added to the West Yakutat area ABC. This adjustment of ABC allows five 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 ABCs (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 SEO areas respectively.

The Plan Team's total recommended 2000 ABC for sablefish in the GOA is 13,400 mt, up from 12,700 mt in 1999. The SSC concurs with the Plan Team's ABC and area apportionments and the AP recommended that TACs be set at those levels. The Council recommended an alternate ABC apportionment based on inclusion of commercial fisheries data with the survey estimates. These ABCs are 1,840, 5,730, 2,207, and 3,553 mt for the Western, Central, West Yakutat, and Southeast Outside areas respectively. These apportionments also take into account the effect of allocating 5 % of combined Eastern Gulf sablefish TACs to trawl gear in the West Yakutat area without affecting the amounts allocated to hook-and-line gear in each area. The Council recommended that TAC be set at ABC levels.

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  $\frac{1}{2}$  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  $\frac{1}{2}$  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  $F_{35\% \text{ adjusted}} = 0.136$  is 16,700 mt.

Other slope rockfish include all species in the genus *Sebastes* excluding Pacific Ocean perch, northern rockfish, shorttraker 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 the 1999 SAFE report, 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 and is estimated to be 102,510 mt. Applying the definitions for ABC and OFL places sharpchin rockfish in Tier 4 where  $F_{ABC} \leq F_{40\%}$ , and the other species of other slope rockfish in Tier 5 where  $F_{ABC} \leq 0.75M$ . 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 Yakutat 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 Plan Team's total recommended 2000 ABC for other slope rockfish in the GOA is 4,900 mt, down from 5,270 mt in 1999. The SSC and Council concur with the Plan Team's ABC and area apportionments. The AP and Council recommended that TAC be set at ABC levels.

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 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 the 1999 SAFE report, 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 biomass in the three most recent surveys (1993, 1996, and 1999) were used to determine current exploitable biomass. This results in exploitable biomass estimate 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, respectively. 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  $F_{ABC} \leq F_{40\%}$ . 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 impracticable to manage.

The Plan Team's total recommended 2000 ABC for northern rockfish in the GOA is 5,120 mt, up from 4,990 mt in 1999. The SSC and Council concur with the Plan Team's ABC and area apportionments. The AP and Council recommended that TAC be set at ABC levels.



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 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 increasing. Relative to the 1999 SAFE report, 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. Exploitable biomass for 2000 is estimated to be 200,310 mt.

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  $F_{ABC} \leq 0.065$  and an ABC  $\leq 13,020$  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.

The Plan Team's total recommended 2000 ABC for POP in the GOA is 13,020 mt, down from 13,120 mt in 1999. The SSC and Council concur with the Plan Team's ABC and area apportionments. The AP and Council recommended that TAC be set at ABC levels.

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  $\frac{1}{2}$  B35%. At FOFL, the projected mean spawning biomass in 2010 is 102,440 mt, 101% of B35%. Therefore, GOA POP stocks are not currently overfished. The projected mean spawning biomass in 2002 is 98,478 mt, greater than B35%. Therefore, 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 the 1999 SAFE report, 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) were 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  $F_{ABC} \leq 0.75M$ . Thus, the recommended  $F_{ABC}$  for shortraker rockfish is 0.023 (i.e.,  $0.75 \times 0.03$ ). Applying Tier 4 to rougheye rockfish (i.e.,  $F_{ABC} \leq F_{40\%}$ ) allows an  $F_{ABC} = M = 0.025$  which is less than  $F_{40\%} = 0.032$ . 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 Plan Team's total recommended 2000 ABC for other shortraker and rougheye rockfish in the GOA is 1,730 mt, up from 1,590 mt in 1999. 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 mid-water 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 the 1999 SAFE report, 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 rationale 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 respectively. 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 SSC and Council concur with the Plan Team's ABC and area apportionments. The AP and Council recommended that TAC be set at ABC levels.

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 the 1999 SAFE report, new sources of information include: 1) updated catch information; 2) density estimates for 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, side-scan 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<sup>2</sup> compared to 5,758 km<sup>2</sup> 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 Plan Team's 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 SSC and Council concur with the Plan Team's ABC. The AP and Council recommended that TAC be set at ABC level.

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 the 1999 SAFE report, 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 14. 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 the 1999 SAFE report, 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. Exploitable biomass for 2000 is estimated to be 53,200 mt. 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 t (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 Plan Team's total recommended 2000 ABC for thornyhead rockfish in the GOA is 2,360 mt, up from 1,990 mt in 1999. The SSC and Council concur with the Plan Team's ABC and area apportionments. The AP and Council recommended that TAC be set at ABC levels.

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 thornyhead stocks are not currently overfished. The projected mean spawning biomass in 2002 is 21,223 mt, greater than B35%. Therefore, 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. The Council recommended that NMFS place the “other species” assemblage be placed on bycatch status.

Table 2. Groundfish harvest specifications for the Gulf of Alaska management area. For the year 1999 these data include: OFLs (revised), ABCs, TAC specifications, and actual catch (January 1, 1999 through October 30, 1999); For the year 2000 these data include: Council recommended interim specifications, OFLs, ABCs, and final TAC specifications. All values are in metric tons.

Species	1999 Specifications					Year 2000 Council Recommendations				
	Area	OFL	ABC	TAC	Catch	Interim Specs	Area	OFL	ABC	Final TAC
Pollock	W (610)		23,120	23,120	23,385		W (610)		38,350	38,350
	C (620)		38,840	38,840	38,129		C (620)		22,820	22,820
	C (630)		30,520	30,520	30,093		C (630)		30,030	30,030
	subtotal	134,100	92,480	92,480	91,607	23,120	WYK (640)		2,340	2,340
	WYK (640)			2,110	1,759	528	subtotal	130,760	93,540	93,540
	SEO(6500			6,330	4	1,582	SEO (650)	8,610	6,460	6,460
	subtotal	12,300	8,440	8,440	1,763	2,110				
	Total	146,400	100,920	100,920	93,370	25,230	Total	139,370	100,000	100,000
Pacific Cod	W		29,540	23,630	23,154	4,726	W		27,500	20,625
	C		53,170	42,935	44,722	8,687	C		43,550	35,165
	E		1,690	1,270	874	254	E		5,350	4,010
	Total	134,000	84,400	67,835	68,750	13,567	Total	102,000	76,400	59,800
Flatfish, Deep Wat	W		240	240	22	60	W		280	280
	C		2,740	2,740	1,865	685	C		2,710	2,710
	WYK		1,720	1,720	389	430	WYK		1,240	1,240
	SEO		1,350	1,350	9	337	SEO		1,070	1,070
	Total	8,070	6,050	6,050	2,285	1,512	Total	6,980	5,300	5,300
Rex Sole	W		1,190	1,190	603	298	W		1,230	1,230
	C		5,490	5,490	2,391	1,373	C		5,660	5,660
	WYK		850	850	41	212	WYK		1,540	1,540
	SEO		1,620	1,620	22	405	SEO		1,010	1,010
	Total	11,920	9,150	9,150	3,057	2,288	Total	12,300	9,440	9,440
Flatfish, Shal Water	W		22,570	4,500	252	1,125	W		19,510	4,500
	C		19,260	12,950	2,282	3,237	C		16,400	12,950
	WYK		250	250	6	62	WYK		790	790
	SEO		1,070	1,070	5	268	SEO		1,160	1,160
	Total	59,540	43,150	18,770	2,545	4,692	Total	45,330	37,860	19,400
Flathead Sole	W		8,440	2,000	184	500	W		8,490	2,000
	C		15,630	5,000	680	1,250	C		15,720	5,000

Species	1999 Specifications					Year 2000 Council Recommendations				
	Area	OFL	ABC	TAC	Catch	Interim Specs	Area	OFL	ABC	Final TAC
Arrowtooth	WYK		1,270	1,270	16	318	WYK		1,440	1,440
	SEO		770	70	11	192	SEO		620	620
	Total	34,010	26,110	9,040	891	2,260	Total	34,210	26,270	9,060
	W		34,400	5,000	3,656	1,250	W		16,160	5,000
	C		155,930	25,000	11,787	6,250	C		97,710	25,000
	WYK		13,260	2,500	382	625	WYK		23,770	2,500
Sablefish	SEO		13,520	2,500	241	625	SEO		7,720	2,500
	Total	295,970	217,110	35,000	16,066	8,750	Total	173,910	145,360	35,000
	W		1,820	1,820	1,487	455	W		1,840	1,840
	C		5,590	5,590	5,896	1,398	C		5,730	5,730
	WYK			2,090	1,709	456	WYK		2,207	2,207
	SEO			3,200	3,158	800	SEO		3,553	3,553
Rockfish, Oth Slope	E subtotal		5,290	5,290		1,256			5,760	5,760
	Total	19,720	12,700	12,700	2,250	3,175	Total	16,660	13,330	13,330
	W		20	20	40	5	W		20	20
	C		650	650	615	162	C		740	740
	WYK		470	470	122	117	WYK		250	250
	SEO		4,130	4,130	12	1,033	SEO		3,890	3,890
Rockfish, Northern	Total	7,560	5,270	5,270	789	1,317	Total	6,390	4,900	4,900
	W		840	840	573	210	W		630	630
	C		4,150	4,150	4,826	1,037	C		4,490	4,490
	E		na	na	na	na	E		na	na
	Total	9,420	4,990	4,990	5,399	1,247	Total	7,510	5,120	5,120
	W	2,610	1,850	1,850	850	462	W	1,460	1,240	1,240
POP	C	9,520	6,760	6,760	7,501	1,690	C	10,930	9,240	9,240
	WYK		1,350	820	610	205	WYK		840	840
	SEO		3,160	3,160		790	SEO		1,700	1,700
	E subtotal	6,360					E subtotal	3,000		
	Total	18,490	13,120	12,590	8,961	3,147	Total	15,390	13,020	13,020
	W		160	160	194	40	W		210	210
Shortraker/Rough	C		970	970	579	242	C		930	930
	E		460	460	536	115	E		590	590
	Total	2,740	1,590	1,590	1,309	397	Total	2,510	1,730	1,730
	W		530	530	130	132	W		550	550
Rockfish, Pel Shelf										



Species	1999 Specifications					Year 2000 Council Recommendations				
	Area	OFL	ABC	TAC	Catch	Interim Specs	Area	OFL	ABC	Final TAC
Rockfish, DemShelf Atka Mackerel Thornyhead	C		3,370	3,370	3,835	843	C		4,080	4,080
	WYK		740	740	672	185	WYK		580	580
	SEO		240	240	21	60	SEO		770	770
	Total	8,040	4,880	4,880	4,658	1,220	Total	9,040	5,980	5,980
	SEO	950	560	560	243	140	SEO	420	340	340
	Gulfwide	6,200	600	600	262	150	Gulfwide	6,200	600	600
	W		260	260	282	65	W		430	430
	C		700	700	582	175	C		990	990
	E		1,030	1,030	416	257	E		940	940
	Total	2,840	1,990	1,990	1,280	497	Total	2,820	2,360	2,360
Other Species	Gulfwide		NA	15,570	3,698	3,650	Gulfwide		NA	14,270
GULF OF ALASKA	TOTAL	778,890	532,590	327,046	227,454	73,239	TOTAL	581,040	448,010	299,650

### 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 except 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". The Council adopted Amendment 58 to the BSAI FMP which would implement reductions in chinook salmon bycatch. When implemented this action will adjust the prohibited species catch limits of chinook salmon in Chinook Salmon Savings Area (CHSSA) of the BSAI. This action will modify slightly the boundaries of the CHSSA, set new CHSSA closure dates, and reduce the Chinook Salmon bycatch limit in the CHSSA to 41,000 fish in 2000.

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-ro-e 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 was 10.66 million pounds (4,835 mt), which included 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 were 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 have 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 was 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 was 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 was closed to the harvest of *C. bairdi* Tanner crabs for the 1999

and 2000 fishing seasons. 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 exceeded 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	359,411	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 GHF 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 GHF 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 1995, 1994) 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. This assessment addresses the effects of the authorization of the proposed and final specifications on EFH pursuant to the requirements of 50 CFR 600.920(h) and in coordination with the review procedures required under the National Environmental Policy Act.

The assessment of the impacts on EFH (Appendix E) concludes that fishing actions may have substantial adverse impacts on fish habitat essential to the spawning, breeding, feeding and growth to maturity of managed and un-managed species. In formal response to the assessment dated December 17, 1999, the NMFS Habitat Conservation Division, Alaska Region (HCD) concurred with the assessment that fishing may have adverse impacts on EFH for managed species but concluded that any adverse effects have been minimized to the extent practicable (NMFS 1999a). As a result of the actions authorized by the year 2000 harvest specifications have been mitigated, and are continually being mitigated, as a result of protective measures taken by the Council under the Magnuson-Stevens Act. The NPFMC has already set aside areas of essential habitat or have curtailed fishing in a season or location as a result of previous, and ongoing, NPFMC actions, or has taken measures to protect critical habitat for the Steller sea lion that also benefits EFH for managed species in those areas. The NMFS HCD believes that these mitigative measures have minimized any substantial impacts on EFH of this Federal action to the extent practicable, and offered no additional EFH recommendations.

Given an EFH assessment has been completed with the mandatory requirements and components of an EFH assessment as specified in 50 CFR 600.920 (g)(2), and given that 50 CFR Section 600.920(h)(3) states that once a Federal agency has submitted to NMFS an EFH assessment completed in accordance with paragraph (g) of this section that the Federal agency has fulfilled its consultation requirement under paragraph (a), NMFS believes the consultation requirements as required under the statute have been fulfilled.

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 D. 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 1999b.) 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			Percent change	
	1994	1996	1998	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				Percent change	
		1994	1997	1998	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 Fjords 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 reinstate 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 is 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 effects on the listed species. Formal consultations, resulting in biological opinions, are conducted for Federal actions that may have an adverse effect 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<sup>1</sup> 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.

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	<i>Balaena glacialis</i>	Endangered
Bowhead Whale <sup>1</sup>	<i>Balaena mysticetus</i>	Endangered
Sei Whale	<i>Balaenoptera borealis</i>	Endangered
Blue Whale	<i>Balaenoptera musculus</i>	Endangered
Fin Whale	<i>Balaenoptera physalus</i>	Endangered
Humpback Whale	<i>Megaptera novaeangliae</i>	Endangered
Sperm Whale	<i>Physeter macrocephalus</i>	Endangered
Snake River Sockeye Salmon	<i>Onchorynchus nerka</i>	Endangered
Short-tailed Albatross	<i>Phoebastria albatrus</i>	Endangered
Steller Sea Lion	<i>Eumetopias jubatus</i>	Endangered and Threatened <sup>2</sup>
Snake River Fall Chinook Salmon	<i>Onchorynchus tshawytscha</i>	Threatened
Snake River Spring/Summer Chinook Salmon	<i>Onchorynchus tshawytscha</i>	Threatened
Puget Sound Chinook Salmon	<i>Onchorynchus tshawytscha</i>	Threatened
Lower Columbia River Chinook Salmon	<i>Onchorynchus tshawytscha</i>	Threatened
Upper Willamette River Chinook Salmon	<i>Onchorynchus tshawytscha</i>	Threatened
Upper Columbia River Spring Chinook Salmon	<i>Onchorynchus tshawytscha</i>	Endangered
Upper Columbia River Steelhead	<i>Onchorynchus mykiss</i>	Endangered
Snake River Basin Steelhead	<i>Onchorynchus mykiss</i>	Threatened
Lower Columbia River Steelhead	<i>Onchorynchus mykiss</i>	Threatened
Upper Willamette River Steelhead	<i>Onchorynchus mykiss</i>	Threatened
Middle Columbia River Steelhead	<i>Onchorynchus mykiss</i>	Threatened
Spectacled Eider	<i>Somateria fishcheri</i>	Threatened
Steller Eider	<i>Polysticta stelleri</i>	Threatened

<sup>1</sup> The bowhead whale is present in the Bering Sea area only.

<sup>2</sup> 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 and anadromous fish species. The USFWS is the expert agency for ESA listed seabirds. The fisheries as a whole including the year 2000 TAC specifications rule must be in compliance with the ESA.

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<sup>1</sup> 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)].

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. Determinations as to whether consultations should be re-initiated with respect to this proposed action, establishment of year 2000 TAC specifications, for each listed species were also done. Re-initiated consultations were considered necessary for the marine mammal species, particularly Steller sea lion and the 12 ESA listed evolutionarily significant units (ESUs) of Pacific salmon and steelhead. The results of these consultations are summarized below along with the consultations prepared in December 1998 at the time of promulgation of the year 1999 TAC specifications. In addition, a Section 7 Biological Opinion on all ESA listed species present in the fishery management areas for the entire groundfish fisheries program is pending at this time; expected completion date is spring 2000.

#### Steller sea lions and other ESA listed marine mammals.

A Biological Opinion for the action authorizing the pollock and Atka mackerel fisheries for the years 1999 through 2002 was issued December 3, 1998, by the Office of Protected Resources of NMFS (NMFS 1998b.). The scope of the consultation was the Atka mackerel fishery of the BSAI, and the pollock fisheries in the BSAI and the GOA. The conclusions were: 1) 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, and 2) the GOA and BSAI 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 sufficient 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, Biological Opinion 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 Biological Opinion back to NMFS for further analysis and explanation.

To comply with the Court's Order, NMFS conducted additional analyses and developed Revised Final



Reasonable and Prudent Alternatives (RFRPAs) (October 1999). NMFS has initiated rulemaking to implement these conservation measures for the year 2000 and beyond. They will be implemented under an emergency action running parallel with the TAC specifications rules. Although the subject of separate rulemaking, NMFS considers implementation of these conservation measures a necessary part of this action, because without these mitigating measures in place, this action cannot proceed.

A second Biological Opinion on the action of authorization of the BSAI and GOA groundfish fisheries (other than pollock and Atka mackerel) year 1999 TAC specifications was issued December 24, 1998, by the Office of Protected Resources of NMFS (NMFS 1998c). That Biological Opinion examined the year 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 conclusion was 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.

The December 24, 1998, biological opinion (NMFS 1998c) was also the subject of a Court challenge leading to a reinitiated consultation including preparation of a programmatic consultation to be completed in conjunction with the programmatic SEIS, as well as consultation on the year 2000 TAC specifications. The consultation on the year 2000 TAC specifications was issued December 23, 1999, and contained a determination of no jeopardy and no adverse modification to critical habitat for Steller sea lion. The Biological Opinion examined three actions: 1) authorization of the BSAI groundfish fisheries based on the year 2000 interim and final TAC specifications recommended by the Council, 2) authorization of the GOA groundfish fisheries based on year 2000 interim and final TAC specifications recommended by the Council, and 3) authorization of BSAI and GOA groundfish fisheries based on implementation of the American Fisheries Act of 1998. The opinion considered the potential effect of these three actions on protected species that occur in the corresponding action areas. The protected species include northern right whales, blue whales, fin whales, sei whales, humpback whales, sperm whales, the eastern population of Steller sea lions, and the western population of Steller sea lions. The opinion concluded that these three actions were not likely to jeopardize the continued existence of protected species in the action areas, nor destroy or adversely modify designated critical habitat for the Steller sea lion (the only relevant protected species for which critical habitat has been designated in the action areas). The conclusions were based, in part, on implementation of conservation measures originating from the Revised Final Reasonable and Prudent Alternatives (RFRPAs) issued by NMFS on October 15, 1999, for the pollock fisheries, and conservation measures for the Atka mackerel fishery recommended by the Council in June of 1998 and being implemented over the period from 1999 to 2002. The opinion also identified important areas for further analysis of potential conflicts between the western population of Steller sea lions and the Pacific cod fisheries in the BSAI and GOA regions, and required that those areas be addressed again in the programmatic consultation to be conducted by NMFS in the year 2000, or in a separate consultation on the cod fisheries in the year 2000. The opinion also included conservation recommendations urging more extensive survey effort to understand the distribution of fished stocks throughout the year, rather than in summer months only, and greater effort to determine the relative importance of various target species to the diet of Steller sea lions. The opinion was accompanied by an Incidental Take Statement setting limits on the number of individuals of each protected species that could be taken before consultation would be re-initiated.

#### ESA Listed Pacific Salmon

When the first Section 7 consultations for ESA listed Pacific salmon taken by the groundfish fisheries were done in 1994 and 1995 only three ESUs of Pacific salmon were listed that ranged into the fishery

management areas (NMFS 1994, 1995). Additional ESUs of Pacific salmon and steelhead were listed under the ESA in 1998 and 1999. Only the Snake River fall chinook salmon has designated critical habitat and none of that designated habitat is marine habitat. Under Section 7 regulations consultation should be reinitiated in the event of additional listings. Using the year 2000 proposed TAC specifications, NMFS reinitiated consultations for ESA listed Pacific salmon for all twelve ESUs of Pacific salmon that are thought to range into Alaskan waters. The consultation for the Pacific salmon species was issued December 22, 1999, and contained a determination of not likely to jeopardize their continued existence. No critical habitat has been designated for these species within the action area, therefore, none will be affected by the proposed fisheries. The biological opinion reviewed the status of Snake river fall chinook, Snake River spring/summer chinook, Puget Sound chinook, Upper Columbia river spring chinook, Upper Willamette River chinook, Lower Columbia river chinook, Upper Columbia river steelhead, Upper Willamette River steelhead, Middle Columbia river steelhead, Lower Columbia river steelhead, and Snake river Basin steelhead, the environmental baseline for the action area, the effects of the proposed fishery and the cumulative effects. The opinion was accompanied by an Incidental Take Statement that states the catch of listed fish will be limited specifically by the measures proposed to limit the total bycatch of chinook salmon. Bycatch should be minimized to the extent possible and in any case should not exceed 55,000 chinook per year in the BSAI fisheries or 40,000 chinook salmon per year in the GOA fisheries.

#### Short-tailed Albatross

A Biological Opinion 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 a 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. Consultations on short-tailed albatross was not re-initiated for the year 2000 TAC specifications because the March 19, 1999, biological opinion covered through the end of calendar year 2000.

### **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 *Economic Status of the Groundfish Fisheries Off Alaska, 1998*, dated November 19, 1999 (hereinafter 1999 Economic Safe). These reports, incorporated herein by reference, present 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 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 interim and final 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 (Appendices 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)

Species/Area		Alternative 1 $F=\max F_{abc}$	Alternative 2 Assessment Author's ABC	Alternative 3 $F=50\% \max F_{abc}$	Alternative 4 $F='94-'98 \text{ ave } F$	Alternative 5 $F=0$
Pollock	EBS	1,200,000	1,100,000	604,000	843,000	0
	AI	23,800	23,800	11,900	37,356	0
	Bogslof	71,300	71,300	35,650	276	0
	Pacific cod	206,000	193,000	108,000	152,000	0
Yellowfin sole		191,000	191,000	97,000	135,000	0
Greenland turbot		34,700	9,300	18,185	7,891	0
Arrowtooth		131,000	131,000	66,314	10,927	0
Rock sole		230,000	230,000	116,933	32,530	0
Flathead sole		73,500	73,500	38,647	15,262	0
Other flatfish		117,000	117,000	62,231	15,847	0
Sablefish						
	EBS	1,410	1,384	725	1,360	0
	AI	2,490	2,446	1,280	2,403	0
POP	EBS	2,600	2,600	1,316	1,665	0
	AI	12,300	12,300	6,240	10,099	0

Species/Area	Alternative 1 $F=\max F_{abc}$	Alternative 2 Assessment Author's ABC	Alternative 3 $F=50\% \max F_{abc}$	Alternative 4 $F=\text{'94-'98ave} F$	Alternative 5 $F=0$
Other red rockfish	194	194	97	204	0
Sharpchin/North	5,150	5,150	2,575	4,173	0
Shortraker/Rough	885	885	442	779	0
Other rockfish					
EBS	369	369	184	191	0
AI	685	685	342	296	0
Atka mackerel	103,000	70,800	54,754	47,007	0
Squid	1,970	1,970	985	925	0
Other species	91,600	26,800	45,800	23,780	0
Total	2,500,953	2,265,483	1,273,600	1,342,971	0

Table 13.continued. Bering Sea Aleutian Islands Area Year 2000 Harvest Alternatives (values are in mt)

Species/Area	Alternative 6 Plan Team ABC	Alternative 7 SSC ABC	Alternative 8 AP TAC	Alternative 9 Council TAC	Tier
Pollock EBS	1,100,000	1,139,000	1,139,000	1,139,000	1a
AI	23,800	23,800	2,000	2,000	5
Bogoslof	71,300	22,300	1,000	1,000	5
Pacific cod	193,000	193,000	193,000	193,000	3b
Yellowfin sole	191,000	191,000	123,262	123,262	3a
Greenland turbot	9,300	9,300	9,300	9,300	3a
Arrowtooth	131,000	131,000	131,000	131,000	3a
Rock sole	230,000	230,000	134,760	134,760	3a
Flathead sole	73,500	73,500	52,652	52,652	3a
Other flatfish	117,000	117,000	83,813	83,813	3a
Sablefish					
EBS	1,410	1,410	1,410	1,470	3b
AI	2,490	2,490	2,490	2,430	3b
POP					
EBS	2,600	2,600	2,600	2,600	3b
AI	12,300	12,300	12,300	12,300	3b
Other red rockfish	194	194	194	194	5
Sharpchin/North	5,150	5,150	5,150	5,150	5
Shortraker/Roug	885	885	885	885	5
Other rockfish					
EBS	369	369	369	369	5
AI	685	685	685	685	5
Atka mackerel	70,800	70,800	70,800	70,800	3a
Squid	1,970	1,970	1,970	1,970	6
Other species	26,800	31,360	31,360	31,360	5

Species/Area	Alternative 6 Plan Team ABC	Alternative 7 SSC ABC	Alternative 8 AP TAC	Alternative 9 Council TAC	Tier
Total	2,265,553	2,260,113	2,000,000	2,000,000	

Table 14. Gulf of Alaska Year 2000 Harvest Alternatives (values are in mt)

Species/Area	Alternative 1 $F=\max F_{abc}$	Alternative 2 Assessment Author's ABC	Alternative 3 $F=50\% \max F_{abc}$	Alternative 4 $F='94-'98 \text{ ave } F$	Alternative 5 $F=0$
Pollock					
W/C/WYK	111,310	96,560	58,980	60,150	0
EYK/SEO	6,460	6,460	3,230	30	0
Pacific cod	86,600	76,400	45,500	41,300	0
Flatfish(deep)	5,300	5,300	2,650	2,700	0
Rex sole	9,440	9,440	4,720	6,020	0
Flathead sole	26,270	26,270	13,140	2,400	0
Flatfish(shal)	37,860	37,860	18,930	3,920	0
Arrowtooth	145,360	145,360	76,400	11,640	0
Sablefish	13,400	13,170	6,900	12,940	0
POP	13,020	13,020	6,600	11,280	0
SR/RE	2,070	1,730	1,850	1,030	0
Other rockfish	5,010	4,900	1,070	2,500	0
Northern rockfish	6,400	5,120	4,010	3,240	0
Pelagic rockfish	7,310	5,980	3,650	3,090	0
Thornyhead	2,360	2,360	1,190	1,370	0
Demer rockfish	380	340	290	300	0
Atka mackerel	4,700	600	2,350	1,300	0
Total	483,250	450,870	251,460	165,210	0

Note: Does not include "other species" assemblage.

Table 14. continued. Gulf of Alaska Year 2000 Harvest Alternatives (values are in mt)

Species/Area	Alternative 6 Plan Team ABC	Alternative 7 SSC ABC	Alternative 8 AP TAC	Alternative 9 Council TAC	Tier
Pollock					
W/C/WYK	96,560	93,540	93,540	93,540	3b
EYK/SEO	6,460	6,460	6,460	6,460	5
Pacific cod	76,400	76,400	59,800	59,800	3a
Flatfish (deep)	5,300	5,300	5,300	5,300	5,6
Rex sole	9,440	9,440	9,440	9,440	5
Flathead sole	26,270	26,270	9,060	9,060	5
Flatfish (shallow)	37,860	37,860	19,400	19,400	4,5

Species/Area	Alternative 6 Plan Team ABC	Alternative 7 SSC ABC	Alternative 8 AP TAC	Alternative 9 Council TAC	Tier
Arrowtooth	145,360	145,360	35,000	35,000	3a
Sablefish	13,400	13,170	13,400	13,330	3b
POP	13,020	13,020	13,020	13,020	3b
SR/RE	1,730	1,730	1,730	1,730	4.5
Other rockfish	4,900	4,900	4,900	4,900	4.5
Northern rockfish	5,120	5,120	5,120	5,120	4
Pelagic rockfish	5,980	5,980	5,980	5,980	4
Thornyhead	2,360	2,360	2,360	2,360	3a
Demersal rockfish	340	340	340	340	4
Atka mackerel	600	600	600	600	6
Total	451,100	447,850	285,450	285,380	

Note: Does not include "other species" assemblage.

The Plan Teams determined that the OFLs and ABCs implemented for the year 2000 fisheries is based on the most current information available. After reviewing the new information and listening to public comments, the Council recommends these TAC specifications (as listed in Alternative 9 Tables 13 and 14) for the year 2000 to the Secretary of Commerce.

#### **4.2 Effects on Species Prohibited in Groundfish Fisheries Harvest**

Fishing at the Council proposed TAC levels in fishing year 2000 (Alternative 9) 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.

#### **4.3 Effects on Essential Fish Habitat**

The management areas where the fisheries take place are identified as essential fish habitat (EFH) for all the managed species listed in the fishery management plans. NMFS prepared an assessment of impacts to essential fish habitat (Appendix E) and received a letter of consultation in reply (NMFS 1999a). In that letter NMFS stated it concurs with the assessment that fishing may have adverse impacts on EFH for managed species but concluded that any adverse effects have been minimized to the extent practicable. No EFH recommendations were offered. See Section 3.4 for a summary of the consultation.

#### **4.4 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 SEIS (NMFS 1998a). 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 emergency rulemaking to implement the revised final reasonable



and prudent alternatives for the pollock fishery in fishing year 2000. Section 7 consultations on impacts of the year 2000 TAC specifications to marine mammals, particularly Steller sea lion, were concluded December 22, 1999, with a no jeopardy and no adverse modification to critical habitat determination (NMFS 1999b). See section 3.7 for a summary of the considerations.

Using the year 2000 proposed TAC specifications, NMFS reinitiated consultations for ESA listed Pacific salmon for all twelve ESUs of Pacific salmon that are thought to range into Alaskan waters. The consultation for the Pacific salmon species was issued December 20, 1999, and contained a determination of no jeopardy and no adverse modification of critical habitat (NMFS 1999c). See section 3.7 for a summary of the considerations.

#### **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 the 1999 Economic SAFE (Appendix C).

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.

#### 4.5 Finding Of No Significant Impact

The federal action is establishment of year 2000 interim and final groundfish TAC specifications. NMFS acknowledges that mitigation measures for the Walleye pollock fisheries must be in place before the start of fishing in the BSAI and GOA groundfish fisheries. Absent that, a finding of no significant impact cannot be reached. An emergency interim rule implementing the Revised Final Reasonable and Prudent Alternatives for the BSAI and GOA Walleye pollock fisheries as outlined by NMFS in the December 3, 1998, Biological Opinion (NMFS 1998b) and subsequent Revised Final Reasonable and Prudent Alternatives document must be effective prior to January 20, 2000. If the mitigation measures are not effective prior to scheduled regulatory opening of the trawl fisheries on January 20, 2000, NMFS, by emergency rule under authority of the Magnuson-Stevens Act, will close directed fishing with trawl gear in the BSAI and GOA until such time that these mitigation measures can be implemented.

For the reasons discussed above, implementation of the preferred alternative, Council recommended interim and final TAC specifications with mitigation measure in place pursuant to the Revised Final Reasonable and Prudent Alternatives, would not significantly affect the quality of the human environment. Therefore, the preparation of an environmental impact statement is not required by section 102(2)(C) of NEPA or its implementing regulations.

Gary C. Matlock for PDD

12-23-99

Date

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