

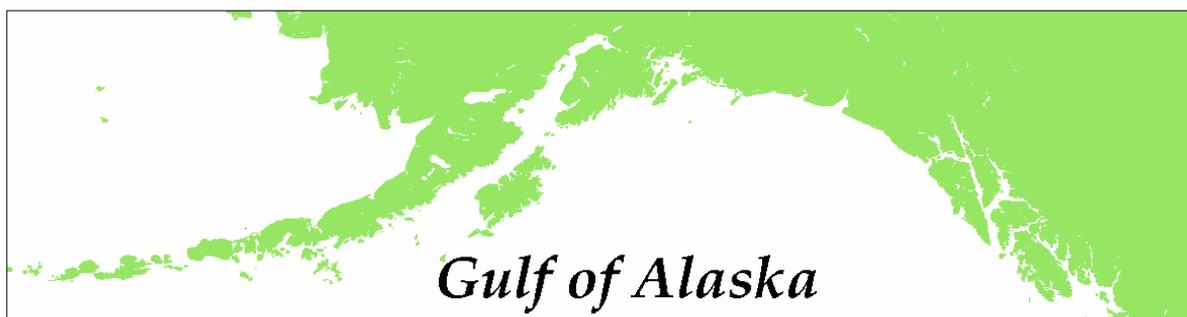
APPENDIX B

STOCK ASSESSMENT AND FISHERY EVALUATION REPORT

FOR THE GROUND FISH RESOURCES OF THE GULF OF ALASKA

Compiled by

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Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska as Projected for 2004

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Summary

by

The Plan Team for the Groundfish Fisheries of the Gulf of Alaska

Introduction

The *National Standard Guidelines for Fishery Management Plans* published by the National Marine Fisheries Service (NMFS) require that a stock assessment and fishery evaluation (SAFE) report be prepared and reviewed annually for each fishery management plan (FMP). The SAFE reports are intended to summarize the best available scientific information concerning the past, present, and possible future condition of the stocks and fisheries under federal management. The FMPs for the groundfish fisheries managed by the Council require that drafts of the SAFE reports be produced each year in time for the December North Pacific Fishery Management Council (Council) meetings.

The SAFE report for the Gulf of Alaska (GOA) groundfish fisheries is compiled by the Plan Team for the Gulf of Alaska Groundfish FMP from chapters contributed by scientists at NMFS Alaska Fisheries Science Center (AFSC) and the Alaska Department of Fish and Game (ADF&G). The stock assessment section includes recommended acceptable biological catch (ABC) levels for each stock and stock complex managed under the FMP. The ABC recommendations, together with social and economic factors, are considered by the Council in determining total allowable catches (TACs) and other management strategies for the fisheries.

The GOA Groundfish Plan Team met in Seattle on November 17-21st, 2003 to review the status of stocks of sixteen species or species groups that are managed under the FMP. The Plan Team review was based on presentations by ADF&G and NMFS AFSC scientists with opportunity for public comment and input. Members of the Plan Team who compiled the SAFE report were James Ianelli and Diana Stram (co-chairs), Sandra Lowe, Jeff Fujioka, Jon Heifetz, Kathy Kuletz, Bill Bechtol, Bob Foy, Sarah Gaichas, Victoria O'Connell, Tom Pearson, Beth Sinclair, and Farron Wallace.

During the past year many stock assessment authors were tasked with contributing to the programmatic groundfish SEIS, the EFH EIS, and preparing the stock assessments.

The GOA FMP recognizes single species and species complex management strategies. Single species management is recommended for stocks that are easily targeted by the harvesting sector and for which minimal mixing of other species occurs in the targeted catch. In the Gulf of Alaska, Pacific cod, pollock, sablefish, Pacific ocean perch, thornyhead rockfish, flathead sole, rex sole, arrowtooth flounder, northern rockfish, and Atka mackerel are managed as single species. Other groundfish species that are usually caught in groups have been managed as complexes (also called assemblages). For example, shortraker and rougheye rockfish, other slope rockfish, pelagic shelf rockfish, demersal shelf rockfish, deepwater flatfish, shallow water flatfish, and "other species" have been managed within complexes.

The FMP authorizes splitting species, or groups of species, from the complexes for purposes of promoting the goals and objectives of the FMP. Atka mackerel was split out from "other species" beginning in 1994. In 1998, black and blue rockfish were removed from the GOA FMP and management was deferred to ADF&G. Beginning in 1999, osmerids (eulachon, capelin and other smelts) were removed from the "other species" category and placed in a separate forage fish category. A new assessment of the forage fish group is presented in Appendix A. While directed commercial fisheries on forage species are prohibited, monitoring the status of this group is considered important for ecosystem considerations.

Along these lines, in 2003 a directed skate fishery developed in the GOA. The Plan Team recommended this species group be split from the "Other species" category in 1999. Now that a draft assessment on skates has been completed, the Team recommended that the NMFS moves quickly to include skates as an actively managed species.

Groundfish catches are managed against TAC specifications for EEZ and near coastal waters of the GOA. State of Alaska internal water groundfish populations are not surveyed by NMFS and catches from internal water fisheries should not be counted against the TAC. The Team has recommended that these catches represent unassessed fish, and should not be counted against an ABC or TAC. The Team noted that internal water incidental catch of shortraker/rougheye rockfish in Chatham Strait are counted against the Federal TAC and that this practice should not continue. Beginning in 2000, the pollock assessment has incorporated the ADF&G survey pollock biomass, therefore, the Plan Team acknowledges that it would be appropriate to reduce the Western (W), Central (C) and West Yakutat (WY) combined GOA pollock ABC by the anticipated Prince William Sound (PWS) harvest level for the State fishery. Therefore, the 2003 PWS GH of 920 mt should be deducted from the W/C/WY pollock ABC before area apportionments are made.

The Plan Team has provided subarea ABC recommendations on a case by case basis since 1998 based on the following rationale. The Plan Team recommended splitting the EGOA ABC for species/complexes that would be disproportionately harvested from the West Yakutat area by trawl gear. The Team did not split EGOA ABCs for species that were prosecuted by multi-gear fisheries or harvested as bycatch. For those species where a subarea ABC split was deemed appropriate, two approaches were examined. The point estimate for WY biomass distribution based on survey results was recommended for seven species/complexes to determine the WY and East Yakutat/Southeast Outside subarea ABC splits. For some species/complexes, a range was recommended bounded by the point estimate and the upper end of the 95% confidence limit from all three surveys. The rationale for providing a range was based on a desire to incorporate the variance surrounding the distribution of biomass for those species/complexes that could potentially be constrained by the recommended ABC splits. In prior assessments, the Team recommended this range for the pelagic shelf rockfish complex. However, the last two survey estimates (2003 and 1999) of the WY proportion were considerably smaller than in previous surveys. Concerned that the abundance may have actually decreased in WY, the Team no longer recommends using the upper 95% CI. The Team continues to support this rationale for determining 2004 ABCs for Pacific ocean perch. The Team presents both the point estimate and the upper 95% confidence limit, but based its 2004 recommendations on the upper 95% confidence limit.

No Split	Split, Point Estimate	Split, Upper 95% CI
Pacific cod	Pollock	Pacific ocean perch
Atka mackerel	Sablefish	
Shortraker/rougheye	Deep-water flatfish	
Thornyhead	Shallow-water flatfish	
Northern rockfish	Rex sole	
Demersal shelf rockfish	Arrowtooth flounder	
	Flathead sole	
	Other slope rockfish	
	Pelagic shelf rockfish	

Since the Stock Assessment and Fishery Evaluation Report (SAFE) for 2003 was issued (NPFMC 2002), the following new information has been incorporated in the stock assessments:

- 1) Pollock: (a) total catch and age composition from the 2002 fishery; (b) biomass and age composition from the 2003 Shelikof Strait echo integration trawl (EIT) survey; (c) biomass and length composition from the 2003 ADF&G coastal trawl survey and age composition from the 2002 ADF&G survey; (d) biomass and age composition for the 2003 NMFS bottom trawl survey; and (e) a new ageing error transition matrix using percent agreement between age readers and testers for 1987-2002.

- 2) Pacific cod: (a) size composition data from the 2002 and January-September 2003 commercial fisheries; (b) catch data for the 2003 assessment were recomputed catch data for 1991-2002; (c) size composition data from the 2003 GOA bottom trawl survey; (d) biomass estimate from the 2003 GOA bottom trawl survey (the 2003 estimate increased 6% from the 2001 estimate); (e) recomputed survey biomass estimates from 1984-2001.
- 3) Sablefish: (a) relative abundance and length data from the 2003 longline survey, (b) relative abundance and length data from the 2002 longline fishery, and (c) age data from the 2002 longline survey and longline fisheries.
- 4) Flatfish: (a) the 2003 NMFS bottom trawl survey provided updated estimates of biomass for flatfish species, (b) new data on the maximum age of Dover sole decreased the estimate of natural mortality, (c) catch data from 2002 was updated.
- 5) Arrowtooth: (a) the 2003 NMFS bottom trawl survey, (b) updated catch and fishery length data for 2002 and 2003 catch and fishery length data were added to the model.
- 6) Flathead sole: (a) the 2003 survey biomass and length data, (b) 2003 catch and length data, and (c) analysis of maturity by age and length was used in this assessment to estimate fishing mortality values
- 7) Pacific ocean perch: (a) 2003 survey biomass index, (b) fishery age data for 1998, 1999, and 2002, (c) revised weight and length at age matrices.
- 8) Northern rockfish: (a) biomass and length data from the 2003 bottom trawl survey; (b) survey age data from 2001; (c) fishery age, length and catch from 2003; (d) fishery age from 2002.
- 9) Other slope rockfish: (a) results of the 2003 Gulf of Alaska trawl survey and (b) 2003 catch data.
- 10) Pelagic shelf rockfish: (a) new data from the 2003 Gulf of Alaska trawl survey, and (b) an age-structured model for light dusky rockfish: (c) lengths from the 2002 commercial fishery, (d) age compositions from the 2001 trawl survey, and (e) length compositions from the 2003 trawl survey
- 11) Demersal shelf rockfish: (a) data from the 2003 line transect survey for the CSEO and EYKT management areas, (b) new average weight data from CSEO and SSEO, and (c) age data from the 2002 commercial fishery.
- 12) Thornyheads: (a) total catch and length compositions from the 2002 fishery; (b) biomass and length composition from the 2003 GOA bottom trawl survey; (c) relative population numbers and length composition from the 2003 sablefish longline survey; (d) recomputed catch and discard information from the blend database 1991-2002.
- 13) Atka mackerel: revised total catch in 2002.
- 14) Groundfish, generally: Updated catch data from the NMFS Observer Program and Regional Office for 2002 and through November 8th, 2003. The 2003 NMFS summer bottom trawl survey (down to 700 m) was also available for consideration in this year's assessment. The annual NMFS longline survey provided abundance indices for a number of key groundfish species.

Background Information

Management Areas and Species

The Gulf of Alaska (GOA) management area lies within the 200-mile U.S. Exclusive Economic Zone (EEZ) of the United States (Figure 1). Five categories of finfishes and invertebrates have been designated for management purposes. They are, target species, other species, prohibited species, forage fish species and non-specified species. This SAFE report describes stock status of target species only. Species or complexes included in each of the first three categories are listed below.

Target Species	Other Species	Prohibited Species
Pollock	Octopus	Pacific halibut
Pacific cod	Squid	Pacific herring
Flounders	Sculpins	Pacific salmon
Rockfishes	Sharks	Steelhead trout
Sablefish	Skates	King crab
Atka mackerel		Tanner crab

No specifications are set for forage fish and catch records need not be kept. All other species of fish and invertebrates taken incidentally that are not managed by other FMPs and are associated with groundfish fisheries are designated as “non-specified species.” No specifications are set and catch records need not be kept. A species or species group from within the target species category may be split out and assigned an appropriate harvest level. Similarly, species in the target species category may be combined and a single harvest level assigned to the new aggregate species group. The harvest level for demersal shelf rockfish in the Eastern Regulatory Area is specified by the Council each year. However, management of this fishery is deferred to the State of Alaska with Council oversight.

Biological Reference Points

A number of biological reference points are used in this SAFE. Among these are the fishing mortality rate (F) and stock biomass level (B) associated with MSY (F_{MSY} and B_{MSY} , respectively). Fishing mortality rates reduce the level of spawning biomass per recruit to some percentage P of the pristine level ($F_{P\%}$). Fishing mortality rate reduces the slope of the yield per recruit curve (plotted against F) to 10% of the slope at the origin ($F_{0.1}$). The fishing mortality rate used to compute ABC is designated F_{ABC} , and the fishing mortality rate used to compute the overfishing level (OFL) is designated F_{OFL} .

Definition of Acceptable Biological Catch and the Overfishing Level

Amendment 56 to the BSAI Groundfish FMP, approved by the Council in June 1998, defines ABC and OFL for the BSAI groundfish fisheries. The new definitions are shown below, where the fishing mortality rate is denoted F , stock biomass (or spawning stock biomass, as appropriate) is denoted B , and the F and B levels corresponding to MSY are denoted F_{MSY} and B_{MSY} respectively.

Acceptable Biological Catch is a preliminary description of the acceptable harvest (or range of harvests) for a given stock or stock complex. Its derivation focuses on the status and dynamics of the stock, environmental conditions, other ecological factors, and prevailing technological characteristics of the fishery. The fishing mortality rate used to calculate ABC is capped as described under “overfishing” below.

Overfishing is defined 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 listed below in descending order of preference, corresponding to descending order of information availability. The SSC will have 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. For tier (1), a pdf refers to a probability density function. For tiers (1-2), if a reliable pdf of B_{MSY} is available, the preferred point estimate of B_{MSY} is the geometric mean of its pdf. For tiers (1-5), if a reliable pdf of B is available, the preferred point estimate is the geometric mean of its pdf. For tiers (1-3), the coefficient α is set at a default value of 0.05, with the understanding that the SSC may establish a different value for a specific stock or stock complex as merited by the best available scientific information. For tiers (2-4), a designation of the form “ $F_{X\%}$ ” refers to the F associated with an equilibrium level of spawning per recruit (SPR) equal to $X\%$ of the equilibrium level of spawning per recruit in the absence of any fishing. If reliable information sufficient to characterize the entire maturity schedule of a species is not available, the SSC may choose to view SPR calculations based on a knife-edge maturity assumption as reliable. For tier (3), the term $B_{40\%}$ refers to the long-term average biomass that would be expected under average recruitment and $F=F_{40\%}$.

Tier	<p>1) Information available: <i>Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.</i></p> <p>1a) Stock status: $B/B_{MSY} > 1$ $F_{OFL} = \mu_A$, the arithmetic mean of the pdf $F_{ABC} \leq \mu_H$, the harmonic mean of the pdf</p> <p>1b) Stock status: $\alpha < B/B_{MSY} \leq 1$ $F_{OFL} = \mu_A \times (B/B_{MSY} - \alpha)/(1 - \alpha)$ $F_{ABC} \leq \mu_H \times (B/B_{MSY} - \alpha)/(1 - \alpha)$</p> <p>1c) Stock status: $B/B_{MSY} \leq \alpha$ $F_{OFL} = 0$ $F_{ABC} = 0$</p> <p>2) Information available: <i>Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{35\%}$, and $F_{40\%}$.</i></p> <p>2a) Stock status: $B/B_{MSY} > 1$ $F_{OFL} = F_{MSY}$ $F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%})$</p> <p>2b) Stock status: $\alpha < B/B_{MSY} \leq 1$ $F_{OFL} = F_{MSY} \times (B/B_{MSY} - \alpha)/(1 - \alpha)$ $F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - \alpha)/(1 - \alpha)$</p> <p>2c) Stock status: $B/B_{MSY} \leq \alpha$ $F_{OFL} = 0$ $F_{ABC} = 0$</p> <p>3) Information available: <i>Reliable point estimates of B, $B_{40\%}$, $F_{35\%}$, and $F_{40\%}$.</i></p> <p>3a) Stock status: $B/B_{40\%} > 1$ $F_{OFL} = F_{35\%}$ $F_{ABC} \leq F_{40\%}$</p> <p>3b) Stock status: $\alpha < B/B_{40\%} \leq 1$ $F_{OFL} = F_{35\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$ $F_{ABC} \leq F_{40\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$</p> <p>3c) Stock status: $B/B_{40\%} \leq \alpha$ $F_{OFL} = 0$ $F_{ABC} = 0$</p> <p>4) Information available: <i>Reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$.</i> $F_{OFL} = F_{35\%}$ $F_{ABC} \leq F_{40\%}$</p> <p>5) Information available: <i>Reliable point estimates of B and natural mortality rate M.</i> $F_{OFL} = M$ $F_{ABC} \leq 0.75 \times M$</p> <p>6) Information available: <i>Reliable catch history from 1978 through 1995.</i> $OFL =$ 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 $ABC \leq 0.75 \times OFL$</p>
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Overview of Stock Assessments

The current status of individual groundfish stocks managed under the FMP is summarized in this section. The abundances of Pacific ocean perch, northern rockfish, light dusky rockfish, thornyheads, flathead sole, and

arrowtooth flounder are above target stock size. The abundances of pollock, Pacific cod, and sablefish are below target stock size. The relative abundances of deep-water flatfish, shallow-water flatfish, rex sole, shorttraker rockfish, rougheye rockfish, demersal shelf rockfish, pelagic shelf rockfish, other slope rockfish, Atka mackerel, and skates are unknown.

Tables 1 and 2 provide a summary of the current status of the groundfish stocks, including catch statistics, ABCs, and TACs for 2003, and recommendations for ABCs and overfishing levels (OFLs) for 2004. Fishing mortality rates (F) and OFLs used to set these specifications are listed in Table 3. ABCs and TACs are specified for each of the Gulf of Alaska regulatory areas illustrated in Figure 1. Table 4 provides a list of species for which the ABC recommendations are below the maximum permissible. Table 5 provides historical groundfish catches in the GOA, 1956-2003.

The sum of the preliminary 2004 ABCs for target species is 508,010 mt, which is within the FMP-approved optimum yield (OY) of 116,000 - 800,000 mt for the Gulf of Alaska. The sum of 2004 OFLs is 660,320 mt. The Team notes that because of halibut bycatch mortality considerations in the high-biomass flatfish fisheries, an overall OY for 2004 will be considerably under this upper limit. For perspective, the sum of the 2003 TACs was 236,440 mt, and the sum of the ABCs was 416,600 mt.

The following conventions in this SAFE are used:

- (1) "Fishing mortality rate" refers to the full-selection F (i.e., the rate that applies to fish of fully selected sizes or ages). A full-selection F should be interpreted in the context of the selectivity schedule to which it applies.
- (2) For consistency and comparability, "exploitable biomass" refers to projected age+ biomass, which is the total biomass of all cohorts greater than or equal to some minimum age. The minimum age varies from species to species and generally corresponds to the age of recruitment listed in the stock assessment. Trawl survey data may be used as a proxy for age+ biomass. The minimum age (or size), and the source of the exploitable biomass values are defined in the summaries. These values of exploitable biomass may differ from listed in the corresponding stock assessments if the technical definition is used (which requires multiplying biomass at age by selectivity at age and summing over all ages). In those models assuming knife-edge recruitment, age+ biomass and the technical definitions of exploitable biomass are equivalent.
- (3) The values listed as 2002 and 2003 ABCs correspond to the values (in mt) approved by NMFS. The Council TAC recommendations for pollock were modified to accommodate revised area apportionments in the measures implemented by NMFS to mitigate pollock fishery interactions with Steller sea lions and for Pacific cod due to an increase in the Kodiak area State water fishery that reduced the Council Pacific cod TAC recommendation by 1,535 mt. The values listed for 2004 correspond to the Plan Team recommendations.
- (4) The exploitable biomass for 2002 and 2003 that are reported in the following summaries were estimated by the assessment in those years. Comparisons of the project 2004 biomass with previous years' levels should be made with biomass levels from the revised hindcast reported in each assessment.

Rockfish harvest strategy

Recently, the use of the $F_{40\%}$ harvest strategy has come into question for rockfish in an NPFMC harvest strategy review. Adoption of a more conservative strategy such as $F_{50\%}$ has been suggested for West Coast rockfish in recent literature. These papers do not apply particularly well to Gulf of Alaska rockfish, which likely are more resilient than West Coast stocks. Therefore, we recommend continuing to harvest at $F_{40\%}$ for stocks where reliable harvest rate estimates are available, unless new information suggests otherwise.

Summaries

1. Walleye Pollock

Status and catch specifications (mt) of pollock in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2004 are those recommended by the Plan Team. Catch data current through 11/08/2003. The 2004 ABC is reduced by 920 mt to accommodate the Prince William Sound GHL.

Area	Year	Age 3+ Bio.	OFL	ABC	TAC	Catch
GOA	2002	755,310	92,780	58,250	58,250	50,390
	2003	727,830	86,710	54,350	54,350	49,300
	2004	769,420	99,750	71,260		n/a
W/C/WYK	2002	726,600	84,090	47,890	47,890	50,710
	2003	699,120	78,020	47,950	47,950	49,300
	2004	740,440	91,060	64,740		n/a
EYK/SEO	2002	28,710	8,610	6,460	6,460	17
	2003	28,710	8,610	6,460	6,460	0
	2004	28,980	8,690	6,520		n/a

The age-structured model developed using AD Model Builder and used for GOA pollock assessments in 1999-2002 is fundamentally unchanged. This year's pollock chapter features the following new data: (1) total catch and age composition from the 2002 fishery; (2) biomass and age composition from the 2003 Shelikof Strait echo integration trawl (EIT) survey; (3) biomass and length composition from the 2003 ADF&G coastal trawl survey and age composition from the 2002 ADF&G survey; (4) biomass and age composition for the 2003 NMFS bottom trawl survey; and (5) new ageing error transition matrix using percent agreement between age readers and testers for 1987-2002.

The 2003 NMFS bottom trawl survey biomass estimate increased 86% over a comparable area surveyed in 2001. The 2003 Shelikof Strait EIT survey biomass estimate increased 18% over the 2002 estimate, although a continued decline in adult biomass was indicated. In addition, the 2003 ADF&G nearshore survey biomass estimate declined 30% from 2002. Stock concerns include the continued decline in Shelikof Strait spawning activity and continued reduction in estimated size of the 1999 year class.

The Plan team examined two independent reviews of the Gulf of Alaska pollock assessment, and the author addressed the modeling aspects of review comments but recognized that reviewer suggestions that involve survey design may be financially or practically difficult to implement. Preliminary analysis based on peer reviews suggested: (1) there is no compelling evidence that $F_{35\%}$ is inappropriate as a proxy for F_{MSY} ; and (2) fishing effects have not been overly detrimental to GOA pollock recruitment patterns relative to environmental effects.

The stock assessment authors evaluated six models: Model 1 estimated NMFS trawl survey catchability; Model 2 fixed trawl survey catchability at 1.0 (similar to previous assessments) and estimated other catchabilities; Model 3 was similar to Model 2 but excluded the 2002 Shelikof EIT data; Model 4 was similar to Model 2 but excluded the NMFS bottom trawl survey data; Model 5 was similar to Model 2 but excluded the ADF&G 2002 trawl survey data; and Model 6 was similar to Model 2 but excluded the historical NMFS 400-mesh Eastern trawl survey data. The Plan Team concurred with the author's recommendation in selecting Model 2 for stock biomass projections. Successive annual assessments have continued to reduce the estimated strength of the 1999 year class, although it is not clear whether the downward trend in the estimated magnitude of the 1999 year class is attributable to increased predation of juvenile pollock. Several components of conservatism included in Model 2 are: (1) fixing trawl catchability at 1.0; (2) assuming an average 1999 year class instead of the model estimate; (3) not adjusting the 2003 Shelikof strait survey biomass estimate despite evidence suggesting an unexpectedly low fraction of the stock spawned in Shelikof

Strait in 2003; and (4) applying a more conservative harvest rate than the maximum permissible F_{ABC} . The team agreed with the author's recommendation based on Model 2, resulting in an ABC of 65,660 mt for GOA waters west of 140 degrees W. longitude. Area and season apportionments, including deduction of 920 mt for the state managed pollock fishery in Prince William Sound, are tabulated below. Model results, which assume an average abundance for the 1999 year class, produced an estimated 2004 spawning biomass of 165,580 mt, or 27% of unfished spawning biomass. The $B_{40\%}$ estimate of 248,130 mt for 2004 is similar to estimates in the 2000 to 2002 assessments. Because model estimated 2004 biomass is below $B_{40\%}$, Gulf of Alaska pollock are in Tier 3b. The projected 2004 age-3+ biomass estimate is 740,440 mt under an assumption of average abundance for the 1999 year class. Markov Chain Monte Carlo analysis indicated the probability of the stock being below $B_{20\%}$ to be less than 1% in 2004 and subsequent years. The OFL fishing mortality rate under Tier 3b is 91,060 mt.

Area-season apportionment of pollock by area for the Gulf of Alaska.					
Season	Shumagin (610)	Chirikof (620)	Kodiak (630)	West Yakutat	Total
A	3,749	9,026	3,090		15,865
B	3,749	10,703	1,412		15,864
C	7,717	3,380	4,768		15,865
D	7,717	3,379	4,768		15,864
Total	22,932	26,488	14,038	1,282	64,740

Includes deduction of 920 mt for Prince William Sound.

2. Pacific Cod

Status and catch specifications (mt) of Pacific cod in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch includes state management fisheries current through 11/08/2003.						
Area	Year	Age 3+ Bio.	OFL	ABC	TAC	Catch
GOA	2002	468,000	72,100	57,600	44,230	44,730
	2003	428,000	70,100	52,800	40,540	52,270
	2004	484,000	102,000	62,810		n/a

The author described an analysis to examine changes in fishing patterns for Pacific cod with respect to fishing gear, area, and month for the past five years; for most categories, significant changes were not exhibited. This year's Pacific cod chapter features the following new data: (a) size composition data from the 2002 and January-September 2003 commercial fisheries; (b) catch data for 2003 including recompiled catch data for 1991-2002; (c) size composition data from the 2003 GOA bottom trawl survey; (d) biomass estimate from the 2003 GOA bottom trawl survey (the 2003 estimate increased 6% from the 2001 estimate); (e) recompiled survey biomass estimates from 1984-2001. This year's base model, using a length-structured Synthesis approach, is identical in structure to all base model assessments used for GOA Pacific cod stock since 1997. Of note was the 29% decrease to the recompiled 1987 trawl survey estimate, resulting in a general decrease in model estimates of stock biomass early in the time series and increased biomass estimates in the recent portion of the time series.

While this stock was managed under Tier 3b in last year's assessment, the increase in absolute current biomass in this year's assessment, places the GOA Pacific cod stock in Tier 3a. Estimated 2004 spawning stock biomass is 103,000 mt, an increase of 17% over the 2003 estimate and above the $B_{40\%}$ value of 88,900 mt. Similar to assessments during 2000-2003, the 2004 ABC was set at 87% of the maximum permissible F_{ABC} to compensate for the large uncertainty surrounding the M and q model parameters. The team concurred with the author's recommendation to set the 2004 ABC at 62,800 t, corresponding to a fishing mortality rate of 0.29. The OFL fishing mortality under Tier3a was set at 102,000 mt, corresponding to a fishing mortality

rate of 0.41. The Team concurred with the author's recommendation to apportion the 2004 ABC according to the average of biomass distribution in the three most recent surveys; the apportioned ABC values become 22,610 mt Western (36%), 35,800 mt Central (57%), and 4,400 mt Eastern (7%).

3. Sablefish

Status and catch specifications (mt) of sablefish in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.						
Area	Year	Biomass	OFL	ABC	TAC	Catch
GOA	2002	188,000	19,350	12,820	12,820	12,246
	2003	182,000	20,020	14,890	14,890	13,995
	2004	179,000	22,160	16,550		

Sablefish are assessed as a single stock for the GOA and BSAI areas. This year's sablefish assessment features the following new information: relative abundance and length data from the 2003 longline survey, relative abundance and length data from the 2002 longline fishery, and age data from the 2002 longline survey and longline fisheries.

The 2003 sablefish longline survey index decreased 8% in weight for the combined stock compared to 2002. This decrease follows recent increases from low levels in 1994-1995, so that stock relative abundance in 2003 is now at the 1996-2002 average level. Spawning biomass is now estimated to be at 40% of the unfished level and is considered to be at a moderate level. The 1997 year class is an important part of the recent increase in total biomass and is projected to account for 31% of 2004 spawning biomass. The recent increase in biomass appears to have peaked and spawning biomass is projected to decrease to 33% of unfished levels by 2007. While the overall stock abundance has increased to 40% of the unfished level, a consistent decline in spawning biomass in the West Yakutat and Southeast/East Yakutat areas since the early 1990's was noted as a point of concern. The Eastern Gulf of Alaska is considered an important spawning area for the combined Alaska sablefish stock.

The Plan Team also discussed the discrepancy between TAC and catch in the Bering Sea/Aleutian Islands area. Fishery catch rates have been low in this area and there is industry concern about the large apportionment to this area. The apportionment is a result of the large amount of sablefish habitat in the BSAI area in spite of the low density. Average fish size is smaller in the BSAI area compared to the GOA. The use of exploitable biomass rather than relative population weight (RPW) might be evaluated for future apportionments for this area. The increase in the use of pot gear may improve fishing success by reducing whale depredation. However, the different selectivity for pots and longline gear should be explored in the assessment.

The SSC has determined that reliable estimates of $B_{40\%}$ (=211,000 mt), $F_{40\%}$ (=0.131), and $F_{35\%}$ (=0.161) exist for this stock, placing this stock under Tier 3b (the estimated 2004 spawning biomass is 210,000 mt). The maximum permissible ABC under Tier 3b ($F_{40\%}$ adjusted from 0.131 to 0.130) is 25,400 mt for 2004. However, this number represents a 22% increase over recent catch levels. The assessment presented a risk analysis of two harvest strategy options equivalent to 80% and 90% of the maximum permissible fishing rate, resulting in 2004 ABCs of 20,700 mt and 23,000 mt, respectively. Given the projected declining stock trend, the authors recommended that the 2004 ABC be less than the maximum permissible. The Plan Team agreed that an increase in ABC of 22% was not appropriate. The 90% option (23,000 mt) was recommended as it is unlikely to have a negative stock effect and can be re-evaluated in next year's assessment.

Area apportionments for the 2004 ABC are based on a 5-year exponential weighting of the survey and fishery indices of relative population weight. The 2004 ABC is apportioned as Bering Sea 3,000 mt, Aleutian Islands 3,450 mt, and the Gulf of Alaska 16,550 mt. The GOA is further apportioned as Western 2,930 mt, Central 7,300 mt, West Yakutat 2,550 mt and East Yakutat/Southeast 3,770 mt. Five percent of the Southeast/East

Yakutat ABC has been subtracted from Southeast/East Yakutat and added to the trawl portion of the West Yakutat ABC.

The OFL fishing mortality rate under Tier 3b is an $F_{35\%}$ adjusted from 0.161 to 0.160, resulting in a combined stock OFL of 30,800 mt apportioned by region to the Bering Sea (4,020 mt), Aleutian Islands (4,620 mt), and Gulf of Alaska (22,160 mt) by the same method as the ABC apportionments.

Area apportionments of GOA sablefish ABC's for 2004 are:

Western	Central	West Yakutat	Southeast outside	Total
2,930	7,300	2,550	3,770	16,550

4. Flatfish

Status and catch specifications (mt) of flatfish management categories in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Species	Year	Biomass	OFL	ABC	TAC	Catch
Deep water (Dover sole included)	2002	68,260	6,430	4,880		550
	2003	68,260	6,430	4,880	4,880	930
	2004	99,620	8,010	6,070	-	-
Dover sole	2002	68,210				490
	2003	68,210				920
	2004	99,330	7,760	5,880	-	-
Rex sole	2002	71,330	12,320	9,470		2,940
	2003	71,330	12,320	9,470	9,470	3,330
	2004	99,950	16,480	12,650	-	-
Shallow water	2002	349,990	61,810	49,550		6,200
	2003	349,990	61,810	49,340	21,620	4,470
	2004	375,950	63,840	52,070	-	-
Flatfish Sub-total	2002	489,580		86,590		12,520
	2003	489,580	80,560	63,690	35,970	8,730
	2004	575,520	88,330	70,790	-	-
Flathead sole	2002	290,590	29,530	22,690	9,280	2,150
	2003	291,420	51,560	41,390	11,150	2,220
	2004	292,670	64,750	51,720	-	-
Arrowtooth flounder	2002	1,760,000	171,060	146,260	38,000	21,230
	2003	1,813,980	181,390	155,140	38,000	28,620
	2004	2,453,390	228,130	194,930		

New data for this year's flatfish assessment includes the 2003 NMFS bottom trawl survey, but the survey only went to a depth of 700 m. The 2003 survey biomass estimates were used to calculate ABC's for 2004 for all species except Greenland turbot and deepsea sole, where the mean catch from 1978 to 1995 was used. New data on the maximum age of Dover sole decreased the estimate of natural mortality from 0.10 to 0.085 which is reflected in the 2004 estimates.

The flatfish group is subdivided into arrowtooth flounder, deep water flatfish, flathead sole, rex sole, and shallow water flatfish. Flathead sole and arrowtooth flounder are presented in separate assessments using age-structured models. The 2004 exploitable biomass for each group (except for flathead sole and arrowtooth flounder) is based on results from the 2003 NMFS trawl survey. ABC and OFL were calculated by species, with individual species identified as Tier 4, 5, or 6 depending upon the available data. The ABC's for northern and southern rock sole were estimated based on Tier 4 with $F_{ABC} = F_{40\%}$ (Southern rock sole $F_{40\%} = 0.162$; Northern rock sole $F_{40\%} = 0.204$) and $F_{OFL} = F_{35\%}$ (southern rock sole $F_{35\%} = 0.192$; northern rock sole $F_{35\%} = 0.245$) while other flatfish ABC's were estimated with $F_{ABC} = 0.75 M$ and $F_{OFL} = M$ (Tier 5).

Greenland turbot and deep-sea sole ABC's were estimated at Tier 6 with $ABC=0.75 \text{ OFL}$ and $OFL=\text{average catch from 1978 to 1995}$. Total flatfish ABC for 2004 was 7,100 mt greater than the 2003 estimate.

ABC's were apportioned among the regulatory areas by applying the average fraction of the catch in each area from 1991 to 1995. As in 2003, the Plan Team recommends splitting the eastern GOA ABC between the WY and EYAK/SEO sub areas.

A new age-structured assessment of Dover sole was developed and reviewed by the Plan Team. It is expected that the Dover sole will be a separate SAFE chapter next year and the new model will be used.

Area apportionment

Flatfish group	Western	Central	WYAK	EYAK/SEO	Total
Deep water	310	2970	1880	910	6,070
Rex sole	1680	7340	1340	2290	12,650
Shallow water	21,580	27,250	2,030	1,210	52,070

5. Arrowtooth flounder

Status and catch specifications (mt) of arrowtooth flounder in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Year	Biomass	OFL	ABC	TAC	Catch
2002	1,760,000	171,060	146,260	38,000	21,230
2003	1,813,980	181,390	155,140	38,000	28,620
2004	2,453,390	228,130	194,930		

This year's arrowtooth flounder assessment features new data from the 2003 NMFS bottom trawl survey. Catch and fishery length data for 2002 were updated and 2003 catch and fishery length data were added to the model.

The 2004 exploitable biomass of 2,391,550 mt is based on abundance estimates derived from an age-structured model. Data from halibut trawl surveys in the 1960's, groundfish trawls in the 1970's, and NMFS triennial trawl surveys from 1984 to 2003 were included in the model. Similar to the previous assessment, the model accommodated an observed higher proportion of females in the larger size intervals of both survey and fishery data by giving males a higher mortality rate than females.

The ABC estimate was based on Tier 3a calculations due to the fact that the estimated 2004 female spawning biomass (1,306,460 mt) is greater than the $B_{40\%}$ estimate (620,340 mt). Therefore, $F_{OFL}=F_{35\%}=0.165$ and $F_{ABC}=F_{40\%}=0.142$ resulting in an ABC recommendation that is 39,800 mt larger than last year's estimate (194,930 mt). The overfishing level for arrowtooth flounder is estimated to be 228,130 mt.

The Plan Team recommended that ABC be apportioned among regulatory areas in proportion to biomass distributions in the 2003 trawl survey as follows:

Western	Central	West Yakutat	East Yakutat/SE	Total
23,590	151,840	10,590	8,910	194,930

6. Flathead sole

Status and catch specifications (mt) of flathead sole in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Year	Biomass	OFL	ABC	TAC	Catch
2002	290,590	29,530	22,690	9,280	2,150
2003	291,420	51,560	41,390	11,150	2,220
2004	292,670	64,750	51,720	-	-

New data for this year's flathead sole assessment includes the 2003 survey biomass and length data, and 2003 catch and length data. Analysis of maturity by age and length for the 2003 assessment was used in this assessment to estimate fishing mortality values. Prior to 2002, flathead sole was included in the flatfish complex. The 2004 biomass estimate is based on abundance estimates derived from an age-structured model developed with AD Model Builder software. Model estimates of age 3+ biomass increased from about 256,600 mt in 1984 to about 298,900 mt in 1996, decreased to about 287,000 mt in 2000, then increased to 291,400 mt in 2003.

The Plan Team concludes that reliable estimates of $B_{40\%}$ exist. The projected 2004 female spawning biomass is estimated at 109,980 mt, well above the $B_{40\%}$ level estimated at 47,700. Therefore, flathead sole would be in Tier 3a of the ABC and overfishing definitions. Under this definition, $F_{OFL}=F_{35\%}$, and F_{ABC} is less than or equal to $F_{40\%}$. The ABC for 2004 using $F_{40\%} = 0.47$ was estimated at 51,721 mt. The overfishing level using $F_{35\%} = 0.63$, results in 64,750 mt.

Area apportionments of flathead sole ABC's for 2004 (using $F_{40\%}$) are based on the fraction of the 2003 survey biomass in each area:

Western	Central	West Yakutat	East Yakutat/SE	Total
13,410	34,430	3,430	450	51,720

Slope rockfish

Status and catch specifications (mt) of slope rockfish management category in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Species	Year	Biomass	OFL	ABC	TAC	Catch
Pacific ocean perch	2002	293,240	15,670	13,190	13,190	11,729
	2003	298,820	16,240	13,660	13,660	10,745
	2004	266,960	15,840	13,340	13,340	
Northern rockfish	2002	94,350	5,910	4,980	4,980	3,334
	2003	108,830	6,560	5,530	5,530	5,301
	2004	95,150	5,790	4,870	4,870	
Shortraker & rougheye	2002	66,830	2,340	1,620	1,620	1,291
	2003	66,830	2,340	1,620	1,620	1,560
	2004	73,000	2,510	1,760	1,760	
Other slope rockfish	2002	107,960	6,610	5,040	990	774
	2003	107,960	6,610	5,040	990	1,072
	2004	89,460	5,150	3,900		

Area apportionments of ABC for slope rockfish for 2004.						
Species	Western	Central	Eastern	West Yakutat	East Yakutat/SE	Total
Pacific ocean perch	2,520	8,390		830	1,600	13,340
Northern rockfish	770	4,100				4,870
Shortraker & rougheye	340	870	550			1,760
Other slope rockfish	40	300		130	3,430	3,900

7. Pacific ocean perch

Status and catch specifications (mt) of Pacific ocean perch in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Species	Year	Biomass	OFL	ABC	TAC	Catch
Pacific ocean perch	2002	293,240	15,670	13,190	13,190	11,729
	2003	298,820	16,240	13,660	13,660	10,745
	2004	266,960	15,840	13,340	13,340	

This year's Pacific ocean perch assessment features a new index of biomass from the 2003 biennial survey, age compositions from the 1998, 1999, and 2002 fisheries, and catch from the 2003 fishery. The assessment is now reported separately from other members of the slope rockfish assemblage. A preliminary evaluation of uncertainty presented last year indicated some potential problems with model specification. To resolve this problem the authors constructed a new length-age transition matrix and relaxed some model constraints. The base model from last year is contrasted with four alternative models. A model that includes two length-age transition matrices, one for older length data and one for recent length data, and estimates q and M simultaneously was chosen to compute ABC. The length age matrix for the older data was constructed to reflect slower growth of Pacific when biomass was high. This model produced a much better fit to the data than last year's model, especially for fishery size and survey age data. Overall, compared to the other models this updated model fit the data better and provided reasonable estimates of M , q , and current and historical stock status.

ABCs at maximum allowable F from the five models ranged from 9,410 to 19,900 mt. The ABC from the recommended model is based on Tier 3a. From this model, the 2004 female spawning biomass of 95,760 mt is greater than $B_{40\%}$ (89,800 mt), where $B_{40\%}$ is determined from the average recruitment of the 1977-1997 year classes. The estimate of $F_{40\%}$ is 0.060. According to the definition for Tier 3a, F_{ABC} is ≤ 0.060 , so that $ABC \leq 13,340$ mt. The Plan Team concurred that the 2004 ABC for Pacific ocean perch be set at 13,340 mt. The OFL ($F_{35\%} = 0.071$) is 15,840 mt.

The Team and authors also concurred with the method of ABC apportionment used in the past. This results in weighting of 4:6:9 for biomass in the 1999, and 2001, and 2003 surveys, respectively, and area apportionments of 19% for the Western area, 63% for the Central area, and 18% for the Eastern area. Therefore, recommended ABCs for 2003 are 2,520 mt for the Western area, 8,390 mt for the Central area, and 2,430 mt for the Eastern area. Using the same apportionment produces OFLs of 2,700 mt in the Western area, 9,960 mt in the Central area, and 2,880 mt in the Eastern area.

Amendment 41 prohibited trawling in the Eastern area east of 140° W longitude. Since Pacific ocean perch are caught exclusively with trawl gear, there is concern that the entire Eastern area TAC not be taken in the area between 140° and 147° W longitude, that remains open to trawling. Thus, as was done last year, the Team recommends that a separate ABC be set for Pacific ocean perch in WYAK. The weighted average method described above results in a point estimate of 0.22 for the proportion of the exploitable biomass in the Eastern area that occurs in WYAK. However, there is considerable uncertainty in this estimate. In an effort to balance this uncertainty with associated costs to the industry, the Team recommends that apportionments to WYAK be based on the weighted average of the upper 95% confidence limit of the proportion of biomass in WYAK (0.34). This corresponds to an ABC of 830 mt for WYAK. Under this apportionment strategy, very

little of the 1,600 mt assigned to the remaining Eastern area (East Yakutat/Southeast Outside area) is expected to be harvested.

8. Northern Rockfish

Status and catch specifications (mt) of northern rockfish in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Species	Year	Biomass	OFL	ABC	TAC	Catch
Northern rockfish	2002	94,350	5,910	4,980	4,980	3,334
	2003	108,830	6,560	5,530	5,530	5,301
	2004	95,150	5,790	4,870	4,870	

This year's northern rockfish assessment features a new index of biomass from the 2003 survey, new survey age compositions from 2001, survey length compositions from 2003, and fishery age compositions from 2002. The assessment is now reported separately from other members of the slope rockfish assemblage. There are no changes in the model from that used in last year's SAFE.

Tier 3a is used to compute ABC and OFL. Current female spawning biomass ($B_{2004} = 36,482$ mt) is greater than $B_{40\%}$ (23,930 mt), where $B_{40\%}$ is determined from the average recruitment of the 1977-95 year classes. The current estimate of $F_{40\%}$ is 0.057. Applying Tier 3a results in $F_{ABC} \leq 0.056$ and an $ABC \leq 4,870$ mt. The authors and Plan Team recommended that the ABC for northern rockfish for the 2004 fishery in the Gulf of Alaska be set at 4,870 mt. The overfishing level based on Tier 3a ($F_{35\%} = 0.068$) is 5,790 mt. In view of recent weak recruitment estimates, harvest projections are likely to decline in the near term.

Apportioning the ABC based on the same method used for Pacific ocean perch results in ABCs of 770 mt in the Western area and 4,100 mt in the Central area, and 1 mt in the Eastern area. Northern rockfish are combined with other slope rockfish in the Eastern area.

9. Shortraker & rougheye and other slope rockfish

Status and catch specifications (mt) of slope rockfish management category in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Species	Year	Biomass	OFL	ABC	TAC	Catch
Shortraker & rougheye	2002	66,830	2,340	1,620	1,620	1,291
	2003	66,830	2,340	1,620	1,620	1,560
	2004	73,000	2,510	1,760	1,760	
Other slope rockfish	2002	107,960	6,610	5,040	990	774
	2003	107,960	6,610	5,040	990	1,072
	2004	89,460	5,150	3,900		

The assessment for shortraker/rougheye and "other" species of slope rockfish is now reported separately from Pacific ocean perch and the northern rockfish. The average of the exploitable biomasses in the three most recent trawl surveys (1999, 2001, and 2003) is used to determine current exploitable biomass, excluding the 1-100 m depth stratum. This results in an exploitable biomass of 73,000 mt for shortraker/rougheye and 89,460 mt for "other" slope rockfish. The SSC has determined that reliable estimates of natural mortality exist for shortraker and "other" slope rockfish, thereby qualifying for management under Tier 5. The Plan team recommends setting F_{ABC} at the maximum permissible rate of $0.75 \times M$ for shortraker and "other" slope rockfish, excluding sharpchin. The recommended F_{ABC} for shortraker rockfish is 0.023 (i.e., 0.75×0.03) and for "other" slope species is 0.023 (i.e., 0.75×0.05). Applying the definitions for ABC and OFL places

rougheye and sharpchin rockfish in Tier 4 that allows for a $F_{ABC} = F_{40\%}$, but, as in the past, we recommend a lower harvest rate by applying $F_{ABC} = M$. This results in an F_{ABC} of 0.025 for rougheye rockfish and 0.05 for sharpchin. Applying this combination of F rates results in ABC's of 1,760 mt for shortraker/rougheye and 3,900 mt for "other" slope rockfish. Overfishing is defined to occur at the harvest rate set equal to $F_{35\%}$ for Tier 4 species (0.038 for rougheye rockfish and 0.064 for sharpchin) and at the $F=M$ rate of 0.030 for shortraker rockfish and 0.05 for "other" slope species. Applying these harvest rates to estimates of exploitable biomass results in an overfishing level of 2,510 mt for shortraker/rougheye and 5,150 mt "other" slope rockfish.

The SSC expressed concern for lumping shortraker and rougheye into a single ABC when catch of shortraker may exceed the species specific ABC (750 mt). The Plan Team recognizes this concern, but current data may be inadequate to properly assess current catch to the species level. The Plan Team recommends additional analysis of the relative catch estimates of shortraker and rougheye by gear type and geographic area be included in next year's assessment.

10. Pelagic shelf rockfish

Status and catch specifications (mt) of pelagic shelf rockfish in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Area	Year	Biomass	OFL	ABC	TAC	Catch
GOA	2002	62,489	8,220	5,490	5,490	3,318
	2003	62,489	8,220	5,490	5,490	2,975
	2004	57,412 ¹	5,570	4,470		

1. Represents total biomass for light dusky rockfish and exploitable biomass for yellowtail, dark dusky, and widow rockfishes.

This year's pelagic shelf rockfish assessment features new data from the 2003 Gulf of Alaska trawl survey, and for light dusky rockfish: lengths from the 2002 commercial fishery, age compositions from the 2001 trawl survey, and length compositions from the 2003 trawl survey.

The authors provided two methods for assessment of light dusky rockfish, an age-structured model and average trawl survey exploitable biomass estimates. The model was first presented in the 2002 assessment as an appendix. Substantial refinements have been made to the 2002 model and model fits have improved. The model's starting point is 1977 and contains all available data. The trawl survey is generally uninformative for providing an estimate of light dusky biomass as evidenced by the lack of trend in the data and the large variance estimates in most years. The 2003 trawl survey estimate was very imprecise. After discussion, the Plan Team decided that it was better to use the age-structured model as it incorporated all sources of data, did not have to be constrained, and may be more informative than the trawl survey average biomass. However, sample sizes for age data are limited and only one year of fishery ages were available.

There was discussion regarding the lower biomass estimate from the model compared to average survey biomass. Average survey biomass was 54,000 mt compared to a total biomass estimate of 50,380 mt from the age-structured model. The Plan Team requested that the authors explore estimation of historic catches as this could explain some of the signals in the data. The authors and the Plan Team agreed that more age data would be useful and the authors plan to include either fishery or survey age data in next year's assessment. If sufficient data exist, the authors will also construct an aging error matrix.

Current total biomass for light dusky based on the age-structured model is estimated at 50,380 mt. Current exploitable biomass for yellowtail, dark dusky, and widow rockfishes is computed using the average of the 1999, 2001, and 2003 trawl survey estimates. This averaging technique was used because of the uncertainty of the biomass estimates and the desire to avoid placing too much emphasis on the results of an individual survey. Exploitable biomass estimates were 980 mt for dark dusky rockfish, 5,870 mt for yellowtail rockfish, and 190 mt for widow rockfish for a total of 7,040 mt.

The SSC determined that reliable estimates of B_{MSY} are not available for yellowtail, widow, and dusky rockfish. This year the Team believes that there is a reliable estimate of $B_{40\%}$ for light dusky rockfish based on the age-structured model. Therefore, we propose that light dusky rockfish be managed under Tier 3. The projected 2004 female spawning biomass for light dusky rockfish is 16,160 mt compared to the estimate of $B_{40\%}$ of 14,280, therefore light dusky rockfish are in Tier 3a. The maximum permissible F_{ABC} is $F_{40\%} = 0.123$ which is associated with a yield of 4,000 mt and is the Plan Team's recommendation for the 2004 light dusky ABC. The OFL ($F_{35\%} = 0.153$) is 4,900 mt.

Yellowtail and widow rockfish are managed under Tier 5 as there are no reliable estimates of $F_{40\%}$ and $F_{35\%}$. The ABCs for yellowtail, widow and dark dusky rockfish under Tier 5 are based on $F = .75M = 0.0675$ (it was assumed that M for these species was similar to that of light dusky rockfish of 0.09). The 2004 recommended ABC for yellowtail, widow and dark dusky rockfish combined is 470 mt. The OFL ($F=M=0.09$) for yellowtail, widow, and dark dusky rockfish is 670 mt.

Apportionment is based on weighting of the surveys at 4:6:9 (for 1999, 2001, and 2003). Based on this weighting scheme, the percent distribution of pelagic shelf rockfish is 8.3% in Western, 67.3% in Central, and 24.4% in Eastern. The Eastern area is further apportioned based on the point estimate of the weighted average of the estimates of the eastern Gulf biomass proportion that is in the West Yakutat (0.19). In the recent past, this apportionment was based on the upper 95% confidence bound to limit fluctuations and effects on industry. However, the last two survey biomass estimates were low for West Yakutat and may reflect lower biomass in this area. The Team recommends using the weighted average of the last three surveys rather than the upper confidence interval.

Area apportionments for pelagic shelf rockfish ABC's in 2004:

Western	Central	West Yakutat	SEO	Total
370	3,010	210	880	4,470

11. Demersal shelf rockfish

Status and catch specifications (mt) of demersal shelf rockfish in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Area	Year	Biomass	OFL	ABC	TAC	Catch
GOA	2002	15,615	480	350	350	292
	2003	17,510	540	390	390	229
	2004	20,168	690	450		

This year's demersal shelf rockfish chapter features new data from the 2003 line transect survey for the CSEO and EYKT management areas, new average weight data from CSEO and SSEO, and age data from the 2002 commercial fishery.

Density and biomass is based on yelloweye rockfish only. Generally the fits to the line transect probability detection functions were superior this year compared to the most recent past estimate. The 2003 survey estimate of density in CSEO is lower compared to the last estimate (1,865 adult yelloweye/km² compared to 2,534 in 1997) and higher in EYKT compared to the last estimate (3,557 adult yelloweye/km² compared to 2,323 in 1999). The increase in the density estimate for EYKT is responsible for the increase in the biomass estimate compared to 2003.

The SSC determined that reliable estimates of B_{MSY} are not available for this stock. Because there are reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$, the species is managed under Tier 4. Total exploitable biomass is based on the sum of the lower 90% confidence limit of the point estimates for each management area. Maximum allowable ABC under Tier 4 is set at $F_{40\%} = 0.023$. Demersal shelf rockfish are particularly vulnerable to overfishing given their longevity, late maturation, and sedentary and habitat-specific residency. We recommend a harvest rate lower than the maximum allowed under Tier 4. By applying $F=M=0.02$ to this

biomass and adjusting for the 10% of other DSR species, the recommended 2004 ABC is 450 mt. This rate is more conservative than the maximum allowed using Tier 4 definitions.

The OFL fishing mortality rate under Tier 4 is $F_{35\%} = 0.031$. Adjusting 10% for the DSR species other than yelloweye, the overfishing level for 2004 is 690 mt.

12. Thornyheads

Status and catch specifications (mt) of thornyheads in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Area	Year	Biomass	OFL	ABC	TAC	Catch
GOA	2002	77,840	2,330	1,990	1,990	1,125
	2003	75,896	3,050	2,000	2,000	1,185
	2004	86,200 ¹	2,590	1,940		

¹ The average of 1999 & 2003 NMFS bottom trawl survey biomass estimates used for the Tier 5 calculation

The same stock assessment model was presented this year as in past years for the thornyhead assessment. Seven alternative models were presented in addition to the base model recommended by the authors for the past three years. To explore model behavior, these models fixed natural mortality rates and selectivities, used different assumptions about length at age, and varied the prior assumption about natural mortality. The best fits to the available data were achieved with the model using the highest prior assumption about natural mortality, $M=0.10$. This natural mortality rate seems excessively high for a species suspected to have very slow growth and long life, but the result is consistent with the tendency from previous years for the model to estimate relatively high natural mortality rates. The model as currently configured seems unable to reconcile assumptions about length at age and longevity particularly given the small number of length samples from the longline fishery. The problem is ongoing, and is unlikely to be resolved until actual age data is available for use in the model and until length sampling from the longline fishery is improved. The Plan Team supported the use of the model in general but concurred with the authors' opinion that the available data, especially the lack of age information, do not support age structured modeling for this population at this time. The Plan Team identified the minimal information that would be necessary to use the model for estimating ABC and OFL in the future: age composition from GOA trawl surveys, age composition from sablefish longline surveys, and improved length sampling from longline and trawl fisheries.

An alternative method for setting ABC and OFL under Tier 5 was introduced this year in response to continued discomfort with the model estimates of natural mortality and other parameters. The average of the two most recent complete GOA trawl survey biomass estimates (1999 and 2003) was used as an estimate of exploitable biomass of 86,200 mt. The ABC was determined by multiplying the exploitable biomass by $M=0.03$ and 0.75 giving 1,940 mt. The corresponding OFL recommendation results in 2,590 mt. The Plan Team preferred this option to modifying unsatisfactory model output to arrive at more conservative harvest recommendations than those suggested by the stock assessment model and limited length and age data.

The OFL fishing mortality rate under Tier 5 is set equal to the estimate of M , so $F_{OFL}=0.03$.

Area apportionments for thornyhead ABC's in 2004.

Western	Central	Eastern	Total
407	1,009	524	1,940

13. Atka mackerel

Status and catch specifications (mt) of Atka mackerel in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Catch data are current through 11/08/2003.

Area	Year	Biomass	OFL	ABC	TAC	Catch
GOA	2002	NA	6,200	600	600	84
	2003	NA	6,200	600	600	565
	2004	NA	6,200	600		

There is no assessment model utilized for GOA Atka mackerel. Updated catch data are presented and the significant increases in Atka mackerel catches in the 2003 fishery are discussed. Observations of Atka mackerel in the fishery and the 2003 GOA trawl survey extended well into the Central Gulf for the first time in recent history. Age data from the 2003 GOA survey are primarily comprised of age-4 fish from the 1999 year class, which has been documented as an above average year class in the Aleutian Islands Atka mackerel assessment. Fishery catches reflect the same length distributions found in the survey, and it is inferred that the 2003 fishery catches are also 4-year-olds from the 1999 year class.

The SSC determined that reliable estimates of current biomass do not exist for GOA Atka mackerel due to high variability in the survey estimates; thus, GOA Atka mackerel are in Tier 6. The Plan Team continues to support a non-target fishery as a conservative harvest policy for Atka mackerel because: (1) there is no reliable biomass estimate; (2) localized depletion may occur; (3) this species has previously exhibited a particular vulnerability to fishing pressure; and (4) although increased numbers of Atka mackerel are appearing in the GOA, they are comprised primarily of the 1999 year class. It is noted that an ABC of 600 mt has been sufficient to allow for non-target retention of Atka mackerel in other directed fisheries.

The OFL under Tier 6 is 6,200 mt.

14. Skates

Summary of status and catch specifications (mt) of skates from the 2003 assessment.							
Species group	Area	Year	Biomass	OFL	ABC	TAC	Catch
Big skates	GOA Wide	2004	56,540				
Longnose skate	GOA Wide	2004	37,310				
“Other skates”	GOA Wide	2004	21,060		1,580		
Big & Longnose skates	GOA Wide	2004	93,850		7,040		
	E	2004	21,190		1,590		
	C	2004	59,720		4,480	3,280 ¹	
	W	2004	12,940		970		
All skates combined	GOA Wide	2003					3,330 ²
	GOA Wide	2004	114,900	10,860			

¹ Plan Team recommended 2004 TAC (see text)

² Preliminary all-skate species combined catch estimate (Source: ADFG Fishtickets as of Nov. 3, 2003)

In 2003, a directed fishery for certain skate species developed in the Gulf of Alaska (GOA). Until now, skates have been managed as part of the “other species” category under the GOA FMP, along with other potentially economically important species such as sharks, sculpins, squids, and octopi. In 2004, skates will likely be managed separately from the rest of the other species category. This new assessment presents all available information on the life history of skates pertinent to management, and summarizes survey and

fishery data to evaluate all sources of skate mortality including the new directed fishery. Skate incidental catch in groundfish (by area, gear, and target) and halibut fisheries 1997-2002 is was presented, as well as the relative merits and limitations of trawl survey biomass estimates. The authors discussed the potential use of IPHC and sablefish longline surveys and limitations for skate stock assessment, and made suggestions for incorporating additional survey information in the future.

Information available suggests that bycatch of skates in the Gulf of Alaska was predominantly longnose skates and big skates, while retained catch of skates was predominantly large female big skates from the Central GOA. Literature on skate fisheries worldwide suggests large species like big skates and longnose skates are likely to be vulnerable to overfishing, and would require long recovery times if overfished. Furthermore, they may experience severe localized depletion if subjected to heavy fishing pressure. Stable to increasing survey biomass trends suggest that the historical incidental catch of skates by groundfish and halibut fisheries has not represented heavy fishing pressure. However, the addition of a directed fishery targeting the largest individuals of the largest skate species might result in excessive fishing mortality. The spatial concentration of the directed fishery in particular suggests that management should guard against localized depletion of skates, especially when little is known of migratory habits or population structure for any skate species in Alaska.

Based on the information summarized above, the assessment authors recommended separate ABC and OFL based on Tier 5 criteria for big skates and longnose skates for each area in the GOA. Because no target fishery currently exists for all of the other skate species in the genus *Bathyraja*, the assessment authors recommended Gulfwide ABC and OFL for this species complex. Biomass estimates are the average of the most recent three surveys (1999, 2001, and 2003) except for the Eastern GOA which is the average of the 1999 and 2003 surveys. Natural mortality was estimated at $M=0.10$ based on empirical relationships for similar species in other areas. This M was extended to all skates in the complex because there is currently no information to indicate it should differ between species. When compared with estimates of historical catch in groundfish and halibut fisheries, these ABCs and OFLs appeared to permit historical levels of incidental skate catch in addition to a limited target fishery for big and longnose skates, albeit a smaller target fishery than developed this year in the Central GOA.

Based on public input related to the uncertainty in past estimates of skate catch by species in groundfish and halibut fisheries, the Plan Team chose to sum all skate OFLs provided by the assessment authors into a gulfwide, skate complex level OFL. The Plan Team recommended area specific ABCs for big and longnose skates combined into a single *Raja* species complex, and retained the authors recommendation for a gulfwide *Bathyraja* ABC. Finally, the Plan Team strongly recommended that a TAC be set for the *Raja* complex in the Central GOA equivalent to the OFL for big skates to prevent overfishing of this species by the target fishery. Without this additional measure, overfishing of big skates in the Central GOA is likely to occur next year. These are considered interim measures to provide minimal levels of protection to skates in the target fishery while collecting additional information on the species composition of incidental catches next year to determine the full effects on target fisheries.

Since this section represents a new assessment, the SSC has yet to determine the tier that is most appropriate for this species group. The authors and the Plan Team both recommend setting the ABC based on Tier 5. This was the same method presented to the Plan Team and SSC in the preliminary assessment for GOA other species in 1999. The Plan Team believes that the trawl survey provides reliable biomass and species composition for skates in the GOA, comparable to flatfish species.

The OFL fishing mortality rate under Tier 5 is set equal to the estimate of M , so $F_{OFL}=0.10$ for all skate species in the complex.

The revised management of skates as described above is contingent upon Secretarial approval of GOA FMP Amendment 63. This amendment is in process and could be approved and implemented as early as March 2004.

Overview of Appendices

Forage fish

The first assessment of forage fish species in the Gulf of Alaska is provided in **Appendix A**. A directed fishery for forage fish is prohibited and other limitations are placed on the bycatch, sale, barter, trade, or processing of any species in this group by amendment 39 to the GOA Groundfish FMP. The purpose of this assessment was to compile the available data for forage fish species in the gulf and to assess future assessment needs. A preliminary assessment was updated to include data from the 2003 GOA trawl survey. No specific surveys are conducted for sampling forage fish species, thus data collection is notably problematic for these species. However, available surveys and catch data do provide some initial data for assessing these species. Increases in capelin and eulachon were seen in 2003 in comparison to calculated biomass estimates from previous years. Calculated exploitation rates for capelin and eulachon based on 1999 and 2001 surveys were found to be 1% or less. The chapter was initially focused upon smelts but will be expanded in future years to focus attention on additional species.

Pacific halibut discard mortality rates

Pacific halibut discard mortality rates (DMRs) in the Alaskan groundfish fisheries are estimated from viability data collected by the NMFS Observer Program. Analysis by staff of the International Pacific Halibut Commission (IPHC) results in recommendations to the North Pacific Fishery Management Council for managing halibut bycatch for the 2004-2006 open access and 2004 Community Development Quota (CDQ) fisheries. The IPHC recommendations are included in the summary given in **Appendix B**, Table 10. IPHC staff recommendations for 2004-2006 are based on data from the most recent 10-year period. Most of the 31 BSAI and GOA groundfish target fisheries in the analysis had a full 10-year data set. Changes in the mean DMRs from the two time periods were small in most cases, on the order of 1-3 percentage points. In the GOA, (not counting “Atka mackerel” fishery) six fishery DMRs decreased, four increased, and 3 did not change. The largest increase occurred in the arrowtooth flounder trawl fishery with higher recent DMRs driving the long-term average up from 62% to 69%.

Prohibited Species Catch Summary for Halibut

Information on halibut bycatch in the groundfish fisheries conducted in the Gulf of Alaska is provided in **Appendix C**. The PSC limits for halibut in the Gulf of Alaska are set by gear type and apportioned seasonally over the fishing year (Amendment 21 to the GOA Groundfish FMP). For 2003, the Council recommended the following halibut PSC apportionments for the Gulf of Alaska groundfish fisheries:

2003 Trawl		2003 Hook and Line		
Jan 1 – Apr 1	550 mt	1 st trimester:	Jan 1 – Jun 10	250 mt
Apr 1 – Jun 29	400 mt	2 nd trimester:	Jun 10 – Sep 1	5 mt
Jun 29 – Sep 1	600 mt	3 rd trimester:	Sep 1 – Dec 31	35 mt
Sep 1 – Oct 1	150 mt			
Oct 1 – Dec 31	300 mt	DSR	Jan 1 – Dec 31	10 mt
Total	2,000 mt			300 mt

Bycatch mortality of Pacific halibut in the 2003 Gulf of Alaska groundfish fisheries totaled 2,286 mt for combined trawl and hook-and-line fisheries through November 15, 2003. Halibut mortality from each sector individually totaled 1,990 from trawl gear and 296 mt from hook-and-line gear.

Shelikof Strait echo-integration trawl survey

A report on echo integration-trawl survey results for walleye pollock in the Gulf of Alaska during February and March, 2003 is presented in **Appendix D**. Scientists from the Midwater Assessment and Conservation Engineering (MACE) Program of the Alaska Fisheries Science Center (AFSC) routinely conduct acoustic-trawl surveys in the Gulf of Alaska (GOA) to estimate walleye pollock (*Theragra chalcogramma*) distribution and abundance. Most of the effort has focused on the Shelikof Strait area, which has been surveyed annually

since 1980, except in 1982 and 1999. With the exception of surveys in the Shumagin Islands area between 1994 and 1996 and in 2001, surveys outside the Shelikof Strait area have not indicated large amounts of pollock, although these efforts have been restricted temporally and spatially.

Acronyms

A collection of acronym definitions used in the SAFE has been included as **Appendix E**.

Table 1. Gulf of Alaska groundfish 2003 and 2004 OFLs and ABCs, 2003 TACs, and 2003 catches reported through November 8, 2003.

Species		OFL 2003	ABC 2003	TAC 2003	*Catch 2003	OFL 2004	ABC 2004
Pollock	W (61)		16,788	16,788	16,574		22,930
	C (62)		19,685	19,685	19,504		26,490
	C (63)		10,339	10,339	12,283		14,040
	WYAK	69,410	1,078	1,078	943		1,280
	SubTotal	69,410	47,890	47,890		91,060	64,740
	EYAK/SEO	8,610	6,460	6,460	0	8,690	6,520
	Total	78,020	54,350	54,350	49,304	99,750	71,260
Pacific Cod	W		20,600	15,450	16,108		22,610
	C		29,000	22,690	24,549		35,800
	E		3,200	2,400	66		4,400
	Total	70,100	52,800	40,540	40,723	102,000	62,810
Sablefish	W		2,570	2,570	2,058		2,930
	C		6,440	6,440	6,957		7,300
	WYAK		2,320	2,320	1,801		2,550
	SEO		3,560	3,560	3,179		3,770
	Total	20,020	14,890	14,890	13,995	22,160	16,550
Deep water flatfish ¹	W		180	180	28		310
	C		2,220	2,220	903		2,970
	WYAK		1,330	1,330	2		1,880
	EYAK/SEO		1,150	1,150	3		910
	Total	6,430	4,880	4,880	936	8,010	6,070
Rex sole	W		1,280	1,280	763		1,680
	C		5,540	5,540	2,642		7,340
	WYAK		1,600	1,600	1		1,340
	EYAK/SEO		1,050	1,050	1		2,290
	Total	12,320	9,470	9,470	3,407	16,480	12,650
Shallow water flatfish ²	W		23,480	4,500	192		21,580
	C		21,740	13,000	4,289		27,250
	WYAK		1,160	1,160	0		2,030
	EYAK/SEO		2,960	2,960	3		1,210
	Total	61,810	49,340	21,620	4,484	63,840	52,070
Flathead sole	W		16,420	2,000	496		13,410
	C		20,820	5,000	1,725		34,430
	WYAK		2,900	2,900	0		3,430
	EYAK/SEO		1,250	1,250	0		450
	Total	51,560	41,390	11,150	2,221	64,750	51,720
Arrowtooth flounder	W		17,990	8,000	8,120		23,590
	C		113,050	25,000	20,412		151,840
	WYAK		18,190	2,500	40		10,590
	EYAK/SEO		5,910	2,500	45		8,910
	Total	181,390	155,140	38,000	28,617	228,130	194,930

Table 1. (continued).

Species		OFL 2003	ABC 2003	TAC 2003	*Catch 2003	OFL 2004	ABC 2004
Other Slope rockfish	W		90	90	130		40
	C		550	550	698		300
	WYAK		270	150	226		130
	EYAK/SEO		4,140	200	18		3,430
	Total	6,610	5,050	990	1,072	5,150	3,900
Northern rockfish	W		890	890	530		770
	C		4,640	4,640	4,771		4,100
	E ³		0	0	0		0
	Total	6,560	5,530	5,530	5,301	5,790	4,870
Pacific ocean perch	W	3,220	2,700	2,700	2,139	2,990	2,520
	C	10,120	8,510	8,510	8,000	9,960	8,390
	WYAK		810	810	606		830
	SEO		1,640	1,640	0		1,600
	E	2,900				2,890	
	Total	16,240	13,660	13,660	10,745	15,840	13,340
Shortraker/ rougheye	W		220	220	238		340
	C		840	840	935		870
	E		560	560	387		550
	Total	2,340	1,620	1,620	1,560	2,510	1,760
Pelagic shelf rockfish	W		510	510	219		370
	C		3,480	3,480	2,200		3,010
	WYAK		640	640	607		210
	EYAK/SEO		860	860	11		880
	Total	8,220	5,490	5,490	3,037	5,570	4,470
Demersal Shelf Rockfish	Total	540	390	390	229	690	450
Thornyhead rockfish	W		360	360	339		410
	C		840	840	748		1,010
	E		800	800	98		520
	Total	3,050	2,000	2,000	1,185	2,590	1,940
Atka Mackerel	Total	6,200	600	600	565	6,200	600
Skates	Big and longnose skates	W					970
		C					4,480
		E					1,590
	Total	NA	NA	NA	NA		7,040
"other" skates	Total	NA	NA	NA	NA		1,580
All skates	Total	NA	NA	NA	NA	10,860	
Other Species	Total	NA	NA	11,260	6,108	NA	NA
Total		531,410	416,600	236,440	173,489	660,320	508,010

¹ "Deep water flatfish" includes Dover sole, Greenland turbot and deepsea sole.

² "Shallow water flatfish" includes rock sole, yellowfin sole, butter sole, starry flounder, English sole, Alaska plaice, and sand sole.

³ The EGOA ABC of 5 mt for northern rockfish has been included in the WYAK ABC for other slope rockfish.

NOTE: ABCs and TACs are rounded to nearest 10 mt.

*2003 catch data through 11/08/03; source: NMFS Blend Reports.

Table 2. Gulf of Alaska 2004 ABCs, biomass, overfishing levels, and estimated trends (mt) for Western, Central, Eastern, Gulfwide, West Yakutat, and Southeast Outside regulatory areas.

Species	Area	2004			Abundance, ² Trend
		ABC	Biomass	Overfishing Level	
Pollock	W (61)	22,930			Below, Increasing
	C (62)	26,490			
	C (63)	14,040			
	WYAK	1,280			
	Subtotal	64,740	740,440	91,060	
	EYAK/SEO	6,520	28,980	8,690	
	TOTAL	71,260	769,420	99,750	
Pacific Cod	W	22,610			Below, Declining
	C	35,800			
	E	4,400			
	TOTAL	62,810	484,000	102,000	
Sablefish	W	2,930			Moderate, Declining
	C	7,300			
	WYAK	2,550			
	EY/SEO	3,770			
	TOTAL	16,550	179,000	22,160	
Deep water flatfish	W	310			Unknown, Unknown
	C	2,970			
	WYAK	1,880			
	EYAK/SEO	910			
	TOTAL	6,070	99,620 ⁴	8,010	
Rex sole	W	1,680			Unknown, ⁵ Stable
	C	7,340			
	WYAK	1,340			
	EYAK/SEO	2,290			
	TOTAL	12,650	99,950	16,480	
Shallow water flatfish	W	21,580			Unknown, ³ Stable
	C	27,250			
	WYAK	2,030			
	EYAK/SEO	1,210			
	TOTAL	52,070	375,950	63,840	
Flathead sole	W	13,410			Above, Stable
	C	34,430			
	WYAK	3,430			
	EYAK/SEO	450			
	TOTAL	51,720	292,670	64,750	
Arrowtooth flounder	W	23,590			Above, Increasing
	C	151,840			
	WYAK	10,590			
	EYAK/SEO	8,910			
	TOTAL	194,930	2,453,390	228,130	

1/ The EGOA ABC of 10 mt for northern rockfish has been included in the WYAK ABC for other slope rockfish.

2/ Abundance relative to target stock size as specified in SAFE documents.

3/ Historically lightly exploited therefore expected to be above the specified reference point.

4/ Biomass of Dover sole; biomass of Greenland turbot and deep-sea sole is unknown.

NOTE: ABCs are rounded to nearest 10. Overfishing is defined Gulf-wide, except for pollock and POP.

Table 2. (Continued).

Species	Area	2004			Abundance, ² Trend
		ABC	Biomass	Overfishing Level	
Other Slope rockfish	W	40			Unknown, Unknown
	C	300			
	WYAK	130 ¹			
	EYAK/SEO	3,430			
	TOTAL	3,900	89,460	5,150	
Northern rockfish	W	770			Above, Declining
	C	4,100			
	E	0 ¹			
	TOTAL	4,870	95,150	5,790	
Pacific ocean perch	W	2,520	50,430	2,992	Above, Declining
	C	8,390	167,901	9,962	
	WYAK	830	16,610		
	EY/SEO	1,600	32,019	2,885	
	TOTAL	13,340	266,960	15,840	
Shortraker/ rougheye	W	340			Unknown, Unknown
	C	870			
	E	550			
	TOTAL	1,760	73,000	2,510	
Pelagic shelf rockfish	W	370			Unknown, Unknown
	C	3,010			
	WYAK	210			
	EY/SEO	880			
	TOTAL	4,470	57,400	5,570	
Light Dusky					Above, Declining
Demersal shelf rockfish	SEO	450	20,168	690	Unknown,
Thornyhead rockfish	Western	410			Above, Stable
	Central	1,010			
	Eastern	520			
	Total	1,940	86,200	2,590	
Atka mackerel	GW	600	Unknown	6,200	Unknown,
Skates					Unknown, Stable
	Big and longnose skates	W	970	12,940	
		C	4,480	59,720	
		E	1,590	21,190	
	Total	7,040	93,850		
"other" skates	Total	1,580	21,050		
All skates	Total	8,620	114,900	10,860	
Other species					TAC = 5% of GF TACS
Total		508,010	5,557,238	660,320	

1/ The EGOA ABC of 10 mt for northern rockfish has been included in the WYAK ABC for other slope rockfish.

2/ Abundance relative to target stock size as specified in SAFE documents.

3/ Historically lightly exploited therefore expected to be above the specified reference point.

4/ Biomass of Dover sole; biomass of Greenland turbot and deep-sea sole is unknown.

Table 3. Summary of fishing mortality rates and overfishing levels for the Gulf of Alaska, 2004.

Species	Tier	F _{ABC} ¹	Strategy	F _{OFL} ²	Strategy
Pollock	3b	0.16	F _{ABC}	0.22	F _{35%} adjusted
Pacific cod	3a	0.29	F _{ABC}	0.41	F _{35%}
Sablefish	3b	0.117	F _{ABC}	0.124	F _{35%} adjusted
Deepwater flatfish	5,6 ³	0.064	F _{ABC} ³	0.085	F _{OFL} ⁴
Rex sole	5	0.15	F=.75M	0.20	F=M
Flathead sole	3a	0.47	F _{40%}	0.63	F _{35%}
Shallow water flatfish	4,5 ⁵	0.15-0.20	F=.75M, F _{40%} ⁵	0.2-0.25	F _{35%} , F=M ⁶
Arrowtooth	3a	0.142	F _{40%}	0.168	F _{35%}
Pacific ocean perch	3a	0.061	F _{40%}	0.071	F _{35%}
Shortraker/rougheye	4,5 ⁷	0.023/0.025	F=.75M, F=M ⁷	0.03/.038	F=M, F _{35%} ⁸
Other slope rockfish	4,5 ⁹	0.03-0.75	F=.75M, F=M ⁹	0.04-0.10	F _{35%} , F=M ¹⁰
Northern rockfish	3a	0.057	F _{40%}	0.068	F _{35%}
Pelagic Shelf Rockfish	3a, 5 ¹¹	0.123, .067	F _{40%} , F=.75M ¹¹	0.153, 0.09	F _{35%} , F=M ¹²
Demersal Shelf Rockfish	4	0.02	F=M	0.031	F _{35%}
Thornyhead rockfish	5	0.0225	F=.75M	0.03	F=M
Atka mackerel	6	NA	F _{ABC} ¹³	NA	F _{OFL} ¹⁴
Skates	5	0.075	F=.75M	0.10	F=M

1/ Fishing mortality rate corresponding to acceptable biological catch.

2/ Maximum fishing mortality rate allowable under overfishing definition.

3/ F_{ABC}=.75M for Dover sole (Tier 5), ABC=.75 x average catch (1978-1995) for other deepwater flatfish (Tier 6).

4/ F=M for Dover sole, average catch (1978-1995) for other deepwater flatfish.

5/ F_{40%} for rocksole (Tier 4), F=.75M for remaining shallow water flatfish (Tier 5).

6/ F_{35%} for rocksole, F=M for remaining shallow water flatfish.

7/ F=.75M for shortraker (Tier 5), F=M for rougheye (Tier 4).

8/ F=M for shortraker, F_{35%} for rougheye.

9/ F=M for sharpchin rockfish (Tier 4), F=.75M for other species (Tier 5).

10/ F_{35%} for sharpchin, F=M for other species.

11/ F_{40%} for dusky rockfish (Tier 3a), F=.75M for widow and yellowtail rockfish (Tier 5).

12/ F_{35%} for dusky rockfish, F=M for widow and yellowtail rockfish.

13/ ABC for Atka mackerel is 600 mt for bycatch in other target fisheries.

14/ OFL for Atka mackerel is equal to average catch from 1978 to 1995.

Table 4. Maximum permissible fishing mortality rates and ABCs as defined in Amendment 56 to the GOA and BSAI Groundfish FMPs, and the Plan Team's 2004 recommended fishing mortality rates and ABCs, for those species whose recommendations were below the maximum.

Species	Tier	2003		2004	
		$Max F_{ABC}$	$Max ABC$	F_{ABC}	ABC
Pollock	3b	0.19	77,960	0.16	65,660 ¹
Pacific cod	3a	0.34	71,200	0.29	62,800
Sablefish	3b	0.130	18,270	0.104	16,550
Rougheye rockfish	4	0.032	1,290	0.025	1,010
Shortraker rockfish	5	0.023	750	0.023	750
Total Shortraker/Rougheye	4,5		2,040		1,760
Other slope rockfish (sharpchin)	4	0.053	1,100	0.05	1,040
Other slope rockfish (redstripe)	5	0.075	840	0.075	840
Other slope rockfish (harlequin)	5	0.045	400	0.045	400
Other slope rockfish (silvergrey)	5	0.03	1,130	0.03	1,130
Other slope rockfish (redbanded)	5	0.045	310	0.045	310
Other slope rockfish (minor species)	5	0.045	180	0.045	180
Total other slope rockfish	4,5		3,960		3,900
Demersal shelf rockfish	4	0.025	560	0.02	450
Atka mackerel	6	NA	4,700	NA	600

1/ The Plan Team recommended 2004 W/C pollock ABC of 64,740 mt is reduced by 920 mt to accommodate the Prince William Sound GHL. For comparisons in this table, the maximum permissible ABC of 77,960 mt should be compared with the full ABC of 65,660 mt.

Table 5. Groundfish landings (metric tons) in the Gulf of Alaska, 1956-2003.

Year	Pollock	Pacific Cod	Sable Fish	Flat Fish	Arrowtooth Flounder	Slope Rock Fish ^a
1956			1,391			
1957			2,759			
1958			797			
1959			1,101			
1960			2,142			
1961			897			16,000
1962			731			65,000
1963			2,809			136,300
1964	1,126	196	2,457	1,028		243,385
1965	2,749	599	3,458	4,727		348,598
1966	8,932	1,376	5,178	4,937		200,749
1967	6,276	2,225	6,143	4,552		120,010
1968	6,164	1,046	15,049	3,393		100,170
1969	17,553	1,335	19,376	2,630		72,439
1970	9,343	1,805	25,145	3,772		44,918
1971	9,458	523	25,630	2,370		77,777
1972	34,081	3,513	37,502	8,954		74,718
1973	36,836	5,963	28,693	20,013		52,973
1974	61,880	5,182	28,335	9,766		47,980
1975	59,512	6,745	26,095	5,532		44,131
1976	86,527	6,764	27,733	6,089		46,968
1977	112,089	2,267	17,140	16,722		23,453
1978	90,822	12,190	8,866	15,198		8,176
1979	98,508	14,904	10,350	13,928		9,921
1980	110,100	35,345	8,543	15,846		12,471
1981	139,168	36,131	9,917	14,864		12,184
1982	168,693	29,465	8,556	9,278		7,991
1983	215,567	36,540	9,002	12,662		7,405
1984	307,400	23,896	10,230	6,914		4,452
1985	284,823	14,428	12,479	3,078		1,087
1986	93,567	25,012	21,614	2,551		2,981
1987	69,536	32,939	26,325	9,925		4,981
1988	65,625	33,802	29,903	10,275		13,779
1989	78,220	43,293	29,842	11,111		19,002
1990	90,490	72,517	25,701	15,411		21,114
1991	107,500	76,997	19,580	20,068		13,994
1992	93,904	80,100	20,451	28,009		16,910
1993	108,591	55,994	22,671	37,853		14,240
1994	110,891	47,985	21,338	29,958		11,266
1995	73,248	69,053	18,631	32,273		15,023
1996	50,206	67,966	15,826	19,838	22,183	14,288
1997	89,892	68,474	14,129	17,179	16,319	15,304
1998	123,751	62,101	12,758	11,263 ⁱ	12,974	14,402
1999	95,637	68,613	13,918	8,821	16,209	18,057
2000	71,876	54,492	13,779	13,052	24,252	15,683
2001	70,485	41,614	12,127	11,817	19,964	16,479
2002	50,390 ^j	44,730	12,246	12,520	21,230	17,128
2003 ^h	49,304	52,270	13,995	8,730	28,620	18,678

a/ Catch defined as follows: (1) 1961-78, Pacific ocean perch (*S. alutus*) only; (2) 1979-1987, the 5 species of the Pacific ocean perch complex; 1988-90, the 18 species of the slope rock assemblage; 1991-1995, the 20 species of the slope rockfish assemblage.

b/ Catch from Southeast Outside District.

c/ Thornyheads were included in the other species category, and are foreign catches only.

d/ After numerous changes, the other species category was stabilized in 1981 to include sharks, skates, sculpins, eulachon, capelin (and other smelts in the family Osmeridae and octopus. Atka mackerel and squid were added in 1989. Catch of Atka Mackerel is reported separately for 1990-1992; thereafter Atka mackerel was assigned a separate target species.

Table 5. (cont'd) Groundfish landings (metric tons) in the Gulf of Alaska, 1956-2003.

Year	Pelagic Shelf Rockfish	Demersal Shelf Rockfish ^b	Thorny Heads ^c	Atka Mackerel ^e	Skates	Other Species ^d	Total All Species
1956							1,391
1957							2,759
1958							797
1959							1,101
1960							2,142
1961							16,897
1962							65,731
1963							139,109
1964							248,192
1965							360,131
1966							221,172
1967							139,206
1968							125,822
1969							113,333
1970							84,983
1971							115,758
1972							158,768
1973							144,478
1974							153,143
1975							142,015
1976							174,081
1977			0	19,455		4,642	195,768
1978			0	19,588		5,990	160,830
1979			0	10,949		4,115	162,675
1980			1,351	13,166		5,604	202,426
1981			1,340	18,727		7,145	239,476
1982		120	788	6,760		2,350	234,001
1983		176	730	12,260		2,646	296,988
1984		563	207	1,153		1,844	356,659
1985		489	81	1,848		2,343	320,656
1986		491	862	4		401	147,483
1987		778	1,965	1		253	146,703
1988	1,086	508	2,786	-		647	158,411
1989	1,739	431	3,055	-		1,560	188,253
1990	1,647	360	1,646	1,416		6,289	236,591
1991	2,342	323	2,018	3,258		1,577	247,657
1992	3,440	511	2,020	13,834		2,515	261,694
1993	3,193	558	1,369	5,146		6,867	256,482
1994	2,990 ^f	540	1,320	3,538		2,752	232,578
1995	2,891	219 ^g	1,113	701		3,433	216,585
1996	2,302	401	1,100	1,580		4,302	199,992
1997	2,629	406	1,240	331		5,409	231,312
1998	3,111	552	1,136	317		3,748	246,113
1999	4,826	297	1,282	262		3,858	231,780
2000	3,730	406	1,307	170		5,649	204,396
2001	3,008	301	1,339	76		4,801	182,011
2002	3,318	292	1,125	84		3,748	166,811
2003	2,975	229	1,185	565	3,330	na	179,881

e/ Atka mackerel was added to the Other Species category in 1988 and separated out in 1994

f/ PSR includes light dusky rockfish, black rockfish, yellowtail rockfish, widow rockfish, dark dusky rockfish, and blue rockfish.

g/ Does not include at-sea discards.

h/ Catch data reported through November 8, 2003.

i/ Includes all species except arrowtooth.

j/ Does not include state fisheries

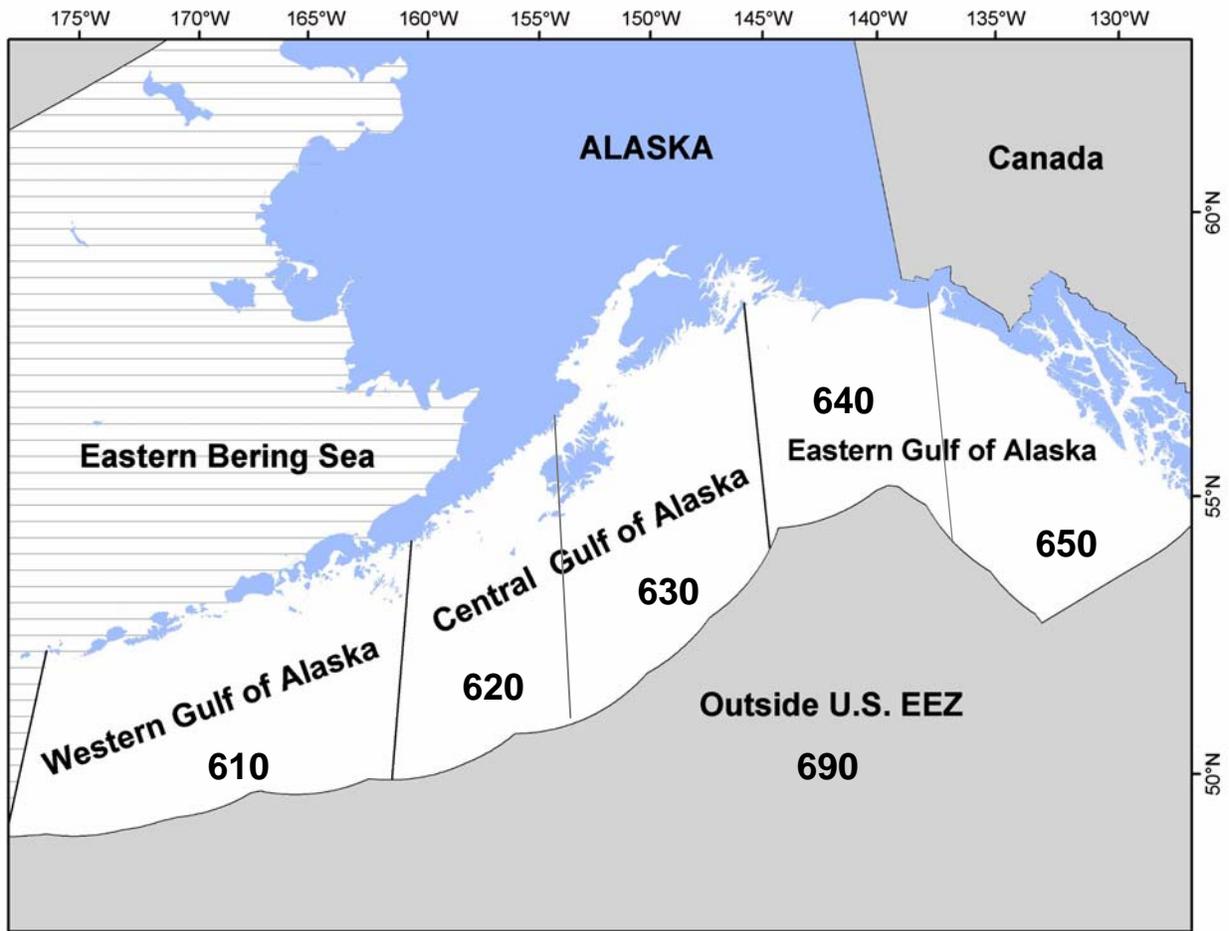


Figure 1. Gulf of Alaska statistical and reporting areas.