# APPENDIX B

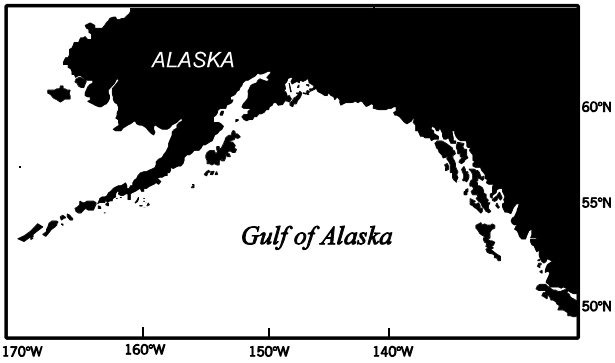
# STOCK ASSESSMENT AND FISHERY EVALUATION REPORT

# FOR THE GROUNDFISH RESOURCES

# OF THE GULF OF ALASKA

**Compiled by**

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

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**North Pacific Fishery Management Council**
**605 W 4th Avenue, Suite 306**
**Anchorage, AK 99501**

**Stock Assessment and Fishery Evaluation Report**
**for the Groundfish Resources**
**of the Gulf of Alaska**
**as Projected for 2001**

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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 October and 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 6-9, 2000 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, and the 2000 sablefish longline survey. Members of the Plan Team who compiled the SAFE report were Jim Ianelli (acting chair), Jane DiCosimo (plan coordinator), Bill Bechtol, Jeff Fujioka, Jon Heifetz, Dave Jackson, Kathy Kuletz, Victoria O'Connell, Tom Pearson, Beth Sinclair, Farron Wallace, and Gregg Williams.

During Summer 2000, all of the stock assessment authors were tasked with contributing to the programmatic groundfish SEIS and preparing the stock assessments. As a result, numerous planned revisions to the various assessments did not occur. For some assessments, this included the addition of 2000 catch data, age composition data, and new age-structured models. Plan Team review of the assessments was also affected for many species. For instance, the pollock and Atka mackerel assessments were distributed during the Plan Team meeting and only preliminary assessments for Pacific cod and Atka mackerel are included in this SAFE report. No new assessment will be prepared for thornyheads or "other species" this year; the 1999 assessments should be examined for the methodology that supported the 2001 thornyhead OFL and ABC projections and for determining TAC species apportionment for "other species." However, sufficient data and analyses were available to provide adequate evaluation of trends in stocks for which full assessments could not be conducted.

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.

Fishermen do not catch species in a complex in proportion to the species composition, i.e., certain segments of the complex may be more easily harvested than others, or they may be more valuable. Consequently, the implicit risk in species complex management is that one or more of the species in the complex may be overharvested or underharvested. Recognition of this risk is important. Alternative management strategies can be imposed to limit this risk, including removing a species from a complex and managing as a single species, or reducing the quota of the complex to protect the more vulnerable species. The Plan Team gave close scrutiny to the species composition of the catch from the species complex management units and made recommendations for adjustments as required.

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, along with other species found to be primary food sources for other marine animals. As part of that same action, directed commercial fisheries on species in this category were prohibited. This year, the Plan Team recommends apportioning the "other species" TAC to its individual components (sharks, skates, squid, octopus and sculpins) based on the 1999 draft other species stock assessment. The Team further recommends moving to individual stock assessments in the near future and will submit a groundfish proposed to that effect in the next call for proposals.

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 bycatches 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 2001PWS GHL of 1,400 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 based on the following rationale since 1998. 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 three 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. The Team continues to support this rationale for determining 2001 ABCs. The Team presents both the point estimate and the upper 95% confidence limit, but based its 2001 recommendations on the upper 95% confidence limit.

| NO SPLIT | SPLIT, POINT ESTIMATE | SPLIT, UPPER 95% CL |
|---|---|---|
| Pacific cod | Deepwater flatfish | Pacific ocean perch |
| Atka mackerel | Shallowwater flatfish | Pelagic shelf rockfish |
| Shortraker/rougheye | Rex sole | |
| Thornyhead | Sablefish | |
| Northern rockfish | Arrowtooth flounder | |
| Demersal shelf rockfish | Flathead sole | |
| | Other slope rockfish | |
| | Pollock | |

Since the Stock Assessment and Fishery Evaluation Report (SAFE) for 2000 was issued (NPFMC 1999), the following new information has been incorporated in the stock assessments:

(1) Pollock: a) 1999 trawl survey age composition; b) age composition from the 1999 fishery; c) 2000 Shelikof Strait echo integration trawl (EIT) survey biomass and length composition; d) 2000 ADF&G coastal trawl survey biomass and length composition; and e) new estimates of weight at age for the Shelikof Strait EIT survey (1992-1998), triennial bottom trawl survey (1984-1999), and fishery (1990-1999).

(2) Pacific cod: a) Size composition data from the 1999 and January-August 2000 commercial fisheries and were incorporated into the model; b) biomass and size composition from the 1999 bottom trawl survey; c) weight-at-length data from recent bottom trawl surveys.

(3) Flatfish: Updated catch information through August 2000.

(4) Arrowtooth: Updated catch information through August 2000.

(5) Sablefish: a) Relative abundance and length data from the 2000 longline survey; b) relative abundance and length data from the 1999 longline fishery; c) length data from the 1999 trawl fishery, and age data from the 1981 and 1999 longline survey.

(6) Slope Rockfish: Updated catch information through August 2000.

(7) Pelagic shelf rockfish: a) Updated catch information through August 2000; b) aging data from 1996 trawl survey.

(8) Demersal shelf rockfish: a) Updated catch information; b) yelloweye average weight and standard error data was updated using 1999 port samples; c) new age data from the 1998 and 1999 fishery.

(9) Thornyheads: No new information.

(10) Atka mackerel: Updated catch information through August 2000.

(11) Groundfish, generally: Updated harvest and discard data from the NMFS Observer Program and Regional Office for 1999 and 2000 (through August).

# 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 $\alpha$ 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 1) *Information available: Reliable point estimates of B and $B_{MSY}$ and reliable pdf of $F_{MSY}$.*

*1a) Stock status:* $B/B_{MSY} > 1$

$F_{OFL} = \mu_A$, the arithmetic mean of the pdf

$F_{ABC} \le \mu_H$, the harmonic mean of the pdf

*1b) Stock status:* $\alpha < B/B_{MSY} \le 1$

$F_{OFL} = \mu_A \times (B/B_{MSY} - \alpha)/(1 - \alpha)$

$F_{ABC} \le \mu_H \times (B/B_{MSY} - \alpha)/(1 - \alpha)$

*1c) Stock status:* $B/B_{MSY} \le \alpha$

$F_{OFL} = 0$

$F_{ABC} = 0$

2) *Information available: Reliable point estimates of B, $B_{MSY}$, $F_{MSY}$, $F_{35\%}$, and $F_{40\%}$.*

*2a) Stock status:* $B/B_{MSY} > 1$

$F_{OFL} = F_{MSY}$

$F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%})$

*2b) Stock status:* $\alpha < B/B_{MSY} \le 1$

$F_{OFL} = F_{MSY} \times (B/B_{MSY} - \alpha)/(1 - \alpha)$

$F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - \alpha)/(1 - \alpha)$

*2c) Stock status:* $B/B_{MSY} \le \alpha$

$F_{OFL} = 0$

$F_{ABC} = 0$

3) *Information available: Reliable point estimates of B, $B_{40\%}$, $F_{35\%}$,* and $F_{40\%}$.

*3a) Stock status:* $B/B_{40\%} > 1$

$F_{OFL} = F_{35\%}$

$F_{ABC} \leq F_{40\%}$

*3b) Stock status:* $\alpha < B/B_{40\%} \leq 1$

$F_{OFL} = F_{35\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$

$F_{ABC} \leq F_{40\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$

*3c) Stock status:* $B/B_{40\%} \leq \alpha$

$F_{OFL} = 0$

$F_{ABC} = 0$

4) *Information available: Reliable point estimates of B, $F_{35\%}$,* and $F_{40\%}$.

$F_{OFL} = F_{35\%}$

$F_{ABC} \leq F_{40\%}$

5) *Information available: Reliable point estimates of B and natural mortality rate M.*

$F_{OFL} = M$

$F_{ABC} \leq 0.75 \times M$

6) *Information available: Reliable catch history from 1978 through 1995.*

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

$ABC \leq 0.75 \times OFL$

# OVERVIEW OF STOCK ASSESSMENTS

The current status of individual groundfish stocks managed under the FMP are summarized in this section. The abundances of Pacific cod, northern rockfish, thornyhead, and arrowtooth flounder are above target stock size. The abundances of pollock, Pacific ocean perch, and sablefish are below target stock size. The relative abundances of deep-water flatfish, shallow-water flatfish, flathead sole, demersal shelf rockfish, pelagic shelf rockfish, other slope rockfish, and Atka mackerel are unknown.

Tables 1 and 2 provide a summary of the current status of the groundfish stocks, including catch statistics, ABCs, and TACs for 2000, and recommendations for ABCs and overfishing levels (OFLs) for 2001. 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, 1956-2000.

The sum of the preliminary 2001 ABCs for target species is 447,710 mt, which is within the FMP-approved optimum yield (OY) of 116,000 - 800,000 mt for the Gulf of Alaska. The sum of 2001 OFLs is 556,500 mt. The Team notes that because of halibut bycatch mortality considerations in the high-biomass flatfish fisheries, an overall OY for 2001 will be considerably under this upper limit. For perspective, the sum of the 2000 TACs was 298,510 mt, and the sum of the ABCs was 448,010 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 1999 and 2000 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 2001 correspond to the Plan Team recommendations.

(4) The exploitable biomass for 1999 and 2000 that are reported in the following summaries were estimated by the assessment in those years. Comparisons of the 2001 biomass with previous years' levels should be made with biomass levels from the revised hindcast reported in each assessment.

POLLOCK

| | ABC W/C/WYK | EYK/SEO | TOTAL | EXPLOITABLE BIOMASS | CATCH |
|---|---|---|---|---|---|
| 1999 | 94,590 | 8,620 | 103,210 | 737,670 | 95,590 |
| 2000 | 93,540 | 6,460 | 100,000 | 588,000 | 71,417[1] |
| 2001 | 99,350 | 6,460 | 105,810 | 699,000 | |

1/ Catch through October 28, 2000.

Projected exploitable biomass for age-3+ pollock in 2001 is 699,000 mt as derived from the current assessment model. Projected spawning biomass in 2001 for the Western, Central and West Yakutat areas is 202,800 mt, which is below the $B_{40\%}$ value of 247,000 mt and places Gulf pollock in Tier 3b. The Plan Team expressed the following concerns: (1) the stock biomass is now at an all time low; (2) the stock is projected to continue to decline into 2002; and (3) there is large variability around the biomass estimate from the 1999 trawl survey. The Team also recognized that data from additional surveys (EIT, biennial bottom trawl, and ADF&G bottom trawl) is anticipated to be available in 2001 and will facilitate monitoring of this stock. Following extensive discussion, the Plan Team concurred with the author's recommended 2001 ABC of 99,350 mt for the Western, Central, and West Yakutat areas. This harvest rate corresponds to an $F_{40\%\,adjusted}$ = 0.28. As in the previous assessment, the guideline harvest level (1,420 mt) for the state-managed pollock fishery in Prince William Sound (PWS) was deducted from the GOA ABC prior to area apportionment of the 2001 GOA ABC.

The Plan Team recommends the 2001 ABC be apportioned according to mean distribution of the exploitable population biomass in the four most recent bottom trawl surveys. Using just the 1999 trawl survey distributions was not selected because of high variability observed in the 1999 trawl survey distributions. This resulted in the apportionments listed below. In the Western and Central areas, the ABC is further apportioned among four reporting areas in the A and B seasons and among three reporting areas in the C and D seasons. The West Yakutat ABC is not seasonally apportioned. OFL for Western, Central, and West Yakutat pollock in 2001 is defined as $F_{35\%adjusted}$ = 117,750 mt.

Pollock in the Southeast Outside and East Yakutat areas fall into a Tier 5 assessment. Under this approach, 2001 ABC is 6,460 mt, based on exploitable biomass of 28,710 mt as derived from CPUE data during the 1999 Gulf trawl survey and a natural mortality estimate of 0.30. The 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 1991-2000.

Area Apportionment of Western, Central, and West Yakutat ABC

| Area | Shumagin | Chirikof | Kodiak | Shelikof | West Yakutat | SE | Total |
|---|---|---|---|---|---|---|---|
| ABC (mt) | 35,240 | 14,260 | 26,650 | 20,680 | 2,520 | 6,460 | 105,810 |

PACIFIC COD

| YEAR | ABC | EXPLOITABLE BIOMASS[1] | CATCH[2] |
|---|---|---|---|
| 1999 | 84,400 | 648,000 | 81,566 |
| 2000 | 76,400 | 567,000 | 54,026 |
| 2001 | 67,800 | 526,000 | |

1/ Age 3+ biomass
2/ Includes State management fisheries.
3/ Catch through October 28, 2000.

Only size composition and total catch data from the 1999 and January-August 2000 commercial fisheries (federal and state) were incorporated into the 2000 Pacific cod assessment model. The Bayesian meta-analysis that has formed the basis for a risk-averse ABC recommendation in each of the last four years, was not performed. Instead, the ratio between last year's recommended $F_{ABC}$ and $F_{40\%}$ (0.87) was assumed to apply this year as well.

The estimated 2001 spawning biomass for the GOA stock is 93,800 mt, down about 15% from last year's estimate for 2000 and down about 7% from last year's $F_{ABC}$ projection for 2001. The estimated 2001 total age 3+ biomass for the GOA stock is 526,000 mt, down about 7% from last year's estimate for 2000 and down about 5% from last years $F_{40\%}$ projection for 2001. While the population is still projected to decrease, it is still above the estimated $B_{40\%}$ level.

The Plan Team concurs with the author's recommended 2001 ABC for the GOA stock of 67,800 mt, obtained by applying the ratio of 0.87 to the updated model fit. This is down about 11% from last year's recommendation for 2000 and down about 5% from last year's $F_{ABC}$ projection for 2001. The estimated 2001 OFL for the GOA stock is 91,200 t, down about 11% from last year's estimate for 2000.

Apportioning the ABC between regulatory areas in proportion to the biomass estimates from the most recent trawl survey, results in the following: Western-36% , Central-57%, and Eastern-7%, which would result in 24,400 mt, 38,650 mt, and 4,750 mt, respectively.

FLATFISH

| 1999 Fishery | ABC | EXPLOITABLE BIOMASS | CATCH |
|---|---|---|---|
| Deep water | 6,050 | 78,300 | 2,285 |
| Rex sole | 9,150 | 72,330 | 3,057 |
| Shallow water | 43,150 | 314,960 | 2,545 |
| Flathead sole | 26,110 | 206,340 | 891 |
| TOTAL | 84,460 | 671,930 | 8,778 |

| 2000 Fishery | ABC | EXPLOITABLE BIOMASS | CATCH |
|---|---|---|---|
| Deep water | 5,300 | 74,460 | 965 |
| Rex sole | 9,440 | 74,600 | 3,493 |
| Shallow water | 37,860 | 299,100 | 6,443 |
| Flathead sole | 26,270 | 207,520 | 1,497 |
| TOTAL | 78,870 | 655,680 | 12,398[1] |

| 2001 Fishery | ABC | EXPLOITABLE BIOMASS |
|---|---|---|
| Deep water | 5,300 | 74,460 |
| Rex sole | 9,440 | 81,020 |
| Shallow water | 37,860 | 299,100 |
| Flathead sole | 26,270 | 207,520 |
| TOTAL | 78,870 | 655,680 |

1/Catch through October 28, 2000.

The flatfish group is subdivided into deep-water flatfish, rex sole, shallow-water flatfish, and flathead sole. The 2001 exploitable biomass for each category is based on a delay difference model that includes estimates of growth, natural mortality, and recruitment, as well as biomass estimates from the 1996 and 1999 bottom trawl surveys. ABC and OFL were calculated by species, with individual species identified as tier 4, 5, or 6 depending upon the available data. With catch being the only updated information, estimates of exploitable biomass and ABC totaled 655,680 mt and 78,870 mt, respectively, the same values as in the previous assessment. Apportioning ABCs among the regulatory areas in proportion to biomass distributions in the 1999 trawl survey results in the area apportionments listed below. The Team further recommends splitting the eastern GOA ABC between the WY and EYAK/SEO subareas. The resulting 2001 ABCs are:

| | WESTERN | | CENTRAL | | WYAK | EYAK/SEO | | TOTAL |
|---|---|---|---|---|---|---|---|---|
| Deep-water | 280 | 2,710 | 1,240 | | 1,070 | 5,300 | | |
| Rex sole | 1,230 | 5,660 | | 1,540 | | 1,010 | 9,440 | |
| Shallow water | 19,510 | | 16,400 | | 790 | | 1,160 | 37,860 |
| Flathead sole | 8,490 | 15,720 | | 1,440 | | 620 | | 26,270 |
| TOTAL | 29,510 | | 40,490 | | 5,010 | | 3,860 | 78,870 |

The overfishing levels for the flatfish groups are determined by the fishing mortality rates determined from the tier structure of the exploitable biomass estimates. Those fishing mortality rates and associated catch levels are:

| | $F_{ABC}$ | $F_{OFL}$ | OVERFISHING LEVEL | TIER |
|---|---|---|---|---|
| Deep water | 0.075 | NA | 6,980 | 5,6 |
| Rex sole | 0.15 | 0.20 | 12,300 | 5 |
| Shallow water | 0.15-0.17 | 0.2-.21 | 45,330 | 4,5 |
| Flathead sole | 0.15 | 0.20 | 34,210 | 5 |

ARROWTOOTH FLOUNDER

| YEAR | ABC | EXPLOITABLE BIOMASS | CATCH[1] |
|---|---|---|---|
| 1999 | 217,110 | 2,126,714 | 16,062 |
| 2000 | 145,360 | 1,571,670 | 24,056 |
| 2001 | 148,150 | 1,586,530 | |

1/ Catch through October 28, 2000.

The 2001 exploitable biomass of 1,586,530 mt is based on abundance estimates derived from an age-structured model developed with AD Model Builder software. Similar to the previous assessment, the model accommodated a higher proportion of females in the larger size intervals of both survey and fishery data by giving males a higher mortality rate than females. Exploitable biomass in 2001 is estimated to be greater than $B_{40\%}$ and ABC was determined to be 148,150 mt based on Tier 3a calculations ($F_{40\%} = 0.134$). The Team recommended that ABC be apportioned among regulatory areas in proportion to biomass distributions in the 1999 trawl survey. The resulting ABCs are:

| WESTERN | CENTRAL | WYAK | EYAK/SEO | TOTAL |
|---|---|---|---|---|
| 16,480 | 99,590 | 24,220 | 7,860 | 148,150 |

Using Tier 3a criteria, the overfishing level based on $F_{35\%} = 0.159$ is estimated at 173,550 mt.

SABLEFISH

| YEAR | ABC | EXPLOITABLE BIOMASS[1] | CATCH |
|---|---|---|---|
| 1999 | 12,700 | 150,000 | 12,267 |
| 2000 | 13,300 | 169,000 | 13,571[2] |
| 2001 | 12,840[3] | 188,000 | |

1/Age 4+ Biomass.
2/Catch through October 28, 2000.
3/Apportionment based on survey and fishery CPUE data.

The longline survey abundance index for sablefish decreased 10% in numbers and 8% in weight between 1999 and 2000. This follows an increase between 1998 and 1999 and returns relative abundance to the 1998 level. Fishery abundance data for 2000 were not analyzed because the fishery remains open. Exploitable and spawning biomass are projected to increase 3% and 4%, respectively, between 2000 and 2001. Abundance is projected to increase slowly; the size of the increase depends on the actual strength of the (projected) above-average 1997 and 1998 year classes.

The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 213,000 mt (combined across the EBS, AI, and GOA), 0.12, and 0.15, respectively. Projected spawning biomass (combined areas) for 2001 is 178,000 mt. This places sablefish in sub-tier "b" of Tier 3, where a default ABC value of 16,900 mt is obtained from an adjusted $F_{40\%}$ strategy.

A simple Bayesian analysis was completed by examining the effect of uncertainty in natural mortality and survey catchability on parameter estimation. A decision analysis was completed using the posterior probability from the Bayesian analysis to determine what catch levels likely will decrease abundance. The decision analysis indicates that a yield of 16,800 mt will maintain spawning biomass.

Given that the default combined ABC of 16,900 mt closely approximates the catch that would maintain spawning biomass at current levels, the Team recommends a 2001 ABC of 16,900 mt for the combined stock. This value is a 2% decrease from the 2000 combined ABC of 17,300 mt.

Prior to 2000, apportionment of the combined ABC to regions and areas were based solely on estimates of relative abundance obtained from survey data. Although the Council apportioned the 2000 ABC based on both survey and fishery data, the Team has no biological concern over the differences in apportionment results.

A 5-year exponential weighting of longline survey relative abundance would apportion the combined 2001 ABC among regions, resulting in the following values: EBS--1,365 mt, AI--2,615 mt, and GOA--12,920 mt. The apportionment of the GOA would be: WGOA–2,240 mt, CGOA–5,630 mt, WY--1,770 mt, EY/SE--3,280 mt.

If apportionment of ABC is based on survey and fishery CPUE estimates of relative abundance as was adopted by the Council for 2000, the combined 2001 ABC would be distributed as follows: EBS--1,560 mt, AI--2,500 mt, and GOA--12,840 mt. The apportionment of the GOA would be: WGOA--2,010 mt, CGOA--5,410 mt, WY–1,880 mt, and EY/SE--3,540 mt.

The OFL computed under Tier 3b would be 20,700 mt for the combined regions. Using the survey-based apportionment scheme described above, 2001 OFL also may be apportioned among regions and results in the following values: EBS–1,910 mt, AI–3,070 mt, and GOA–15,720 mt. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

SLOPE ROCKFISH

| | | ABC | EXPLOITABLE BIOMASS | CATCH |
|---|---|---|---|---|
| 1999 | Pacific ocean perch | 13,120 | 228,190 | 10,472 |
| | shortraker/rougheye | 1,590 | 65,380 | 1,311 |
| | northern rockfish | 5,000 | 83,870 | 5,399 |
| | other slope rockfish | 5,260 | 103,710 | 788 |
| | TOTAL | 24,970 | 485,150 | 17,970 |
| 2000 | Pacific ocean perch | 13,020 | 200,310 | 10,138 |
| | shortraker/rougheye | 1,730 | 70,890 | 1,727 |
| | northern rockfish | 5,120 | 85,360 | 3,325 |
| | other slope rockfish | 4,900 | 102,510 | 572 |
| | TOTAL | 24,770 | 459,070 | 15,762[1] |
| 2001 | Pacific ocean perch | 13,510 | 211,160 | |
| | shortraker/rougheye | 1,730 | 70,890 | |
| | northern rockfish | 4,880 | 93,850 | |
| | other slope rockfish | 4,900 | 102,510 | |
| | TOTAL | 25,020 | 478,410 | |

1/ Catch through October 28, 2000.

*PACIFIC OCEAN PERCH*

Relative to last year's assessment the only update to the model was the inclusion of updated catch data for 1999 and 2000. Current stock condition is based on a projection using the results from the 1999 age-structured model.

Tier 3 is used to compute ABC and OFL. The current female spawning biomass ($B_{2001}$ = 95,760 mt) is less than $B_{40\%}$ (110,120 mt), where $B_{40\%}$ is determined from the average recruitment of the 1977-92 year classes. Since $B_{2001}$ 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 $F_{ABC} \leq 0.067$ and an ABC $\leq$ 13,510 mt. The Team recommends that the ABC for Pacific ocean perch for the 2001 fishery in the Gulf of Alaska be set at 13,510 mt. The overfishing level based on Tier 3b (adjusted $F_{35\%}$ = 0.078) is 15,960 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, 1996, and 1999 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 1,280 mt for the Western area, 9,610 mt for the Central area, and 2,620 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 1,520 mt in the Western area, 11,350 mt in the Central area, and 3,090 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 might be taken in the area that will remain open to trawling (WYAK). Thus, as done last year, the Team recommends that a separate ABC be set for Pacific ocean perch in WYAK. 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 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 West Yakutat be based proportionately on the upper 95% confidence limit of 0.33. This corresponds to an ABC of 870 mt for WYAK. Under this apportionment strategy, very little of the 1,750 mt assigned to the remaining Eastern area (EYAK/SEO) is expected to be harvested. Note that the combined ABC for the WYAK and EYAK/SEO should not exceed 2,620 mt.

*SHORTRAKER/ROUGHEYE*

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

As in last year's assessment, the Team recommends that the same ABC apportionment methodology used for Pacific ocean perch be applied to shortraker and rougheye rockfish. This method results in ABCs of 210

mt for the Western area, 930 mt for the Central area and 590 mt for the Eastern area. The Team did not split the Eastern area ABC into subareas defined by the 140° W longitude boundary in Amendment 41 because this bycatch-only fishery is harvested by both longline and trawl gear.

*NORTHERN ROCKFISH*

For the first time, the stock assessment for northern rockfish is based on an age-structured model constructed using AD Model Builder software. A detailed report describing the model configuration and preliminary results was presented in last year's SAFE report. New data added for this assessment included the 1999 survey age compositions, catch data from 1999 and 2000 fishery, and the 1999 fishery length data.

A few minor modifications were made to the model configuration which resulted in a satisfactory description of the population dynamics of the stock. The most important of these changes resulted in an improved fit to the survey age composition. This was accomplished by removing the survey length composition data from the model and increasing the likelihood weight for survey age composition from 1 to 10. Last year the Plan Team pointed out that the survey length composition data was already used in the model to expand the stratified survey age data. Survey age composition weights were based on a sensitivity analysis conducted last year. The sensitivity test indicated that a weighting value of ten was just as effective at fitting the age data as the higher weight of fifty used in last year's alternative case model, but that the lower weight had less of an impact on the fits to the other data.

Tier 3a is used to compute ABC and OFL. Current female spawning biomass ($B_{2001}$ = 39,090 mt) is greater than $B_{40\%}$ (21,830 mt), where $B_{40\%}$ is determined from the average recruitment of the 1977-94 year classes. The current estimate of $F_{40\%}$ is 0.055. Applying Tier 3a results in $F_{ABC} \leq 0.055$ and an ABC ≤ 4,880 mt. The Team recommends that the ABC for northern rockfish for the 2001 fishery in the Gulf of Alaska be set at 4,880 mt. The overfishing level based on Tier 3a ($F_{35\%}$ = 0.065) is 5,780 mt. In view of recent weak recruitment estimates, the Team noted that 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 600 mt in the Western area and 4,280 mt in the Central area. Northern rockfish are combined with other slope rockfish in the Eastern area.

*OTHER SLOPE ROCKFISH*

As in the past, the recommended ABC for other slope rockfish is based on F = M or F = 0.75M applied to exploitable biomass. Exploitable biomass is determined from the average of the three most recent trawl surveys. Applying the definitions for ABC and OFL places sharpchin rockfish in Tier 4 where $F_{ABC} \leq F_{40\%}$, 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. 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. Overfishing is defined as $F_{35\%}$ = 0.064 for sharpchin rockfish and F=M for the other species. This results in an OFL of 6,390 mt.

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 in West Yakutat and 3,890 mt in the remaining Eastern area.

PELAGIC SHELF ROCKFISH

| YEAR | ABC | EXPLOITABLE BIOMASS | CATCH |
|---|---|---|---|
| 1999 | 4,880 | 54,220 | 4,657 |
| 2000 | 5,980 | 66,440 | 3,727[1] |
| 2001 | 5,980 | 66,440 | |

1/ Catch through October 28, 2000.

The pelagic shelf rockfish (PSR) assemblage is comprised of dusky, yellowtail, and widow rockfishes. 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 2000 exploitable biomass was calculated to be 66,440 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 for this assemblage. The Team continues to encourage the authors to develop an age-structured assessment for dusky rockfish based on data that has become available in recent years. Given the rationale described 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 apportionment 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. Point estimates for West Yakutat and SEO are 580 and 770 respectively. The updated point estimate of $F_{OFL}$ under the Amendment 56 overfishing definitions is $F_{35\%}$ (0.136) producing a gulfwide overfishing level of 9,040 mt.

| Western | Central | West Yakutat | SEO | Total |
|---|---|---|---|---|
| 550 | 4,080 | 580 | 770 | 5,980 |

DEMERSAL SHELF ROCKFISH

| YEAR | ABC | EXPLOITABLE BIOMASS | CATCH[1] |
|---|---|---|---|
| 1999 | 560 | 25,031 | 381 |
| 2000 | 340 | 15,100 | 253[2] |
| 2001 | 330 | 14,695 | |

1/ Unreported mortality not included in catch.

2/ Catch through October 28, 2000.

Demersal Shelf Rockfish (DSR) is comprised of 7 species of rockfishes, of which yelloweye is the commercial fishery target species. A submersible is used to conduct line transects to estimate yelloweye density. Adult yelloweye biomass is estimated for each management area as the product of density, mean weight, and areal estimates of DSR habitat. The lower 90% CI (log-based) for each area is used as the best estimate of biomass.

Revisions to the DSR stock assessment from last year are limited to inclusion of the 1999 average weight data and associated standard error, 1999 fishery age data, and updated catch data. Using these data and the 1999 survey data, the 2001 exploitable biomass estimate for yelloweye rockfish in Southeast/East Yakutat, is 14,695 mt. This is a decrease of 3% compared to last year. 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, yielding an ABC of 330 mt. This is more conservative than the $F_{40\%}$ level. The overfishing level was set at $F_{35\%}$=0.0279 = 410 mt.

THORNYHEAD ROCKFISH

| YEAR | ABC | EXPLOITABLE BIOMASS | CATCH |
|---|---|---|---|
| 1999 | 1,999 | 53,200 | 1,283 |
| 2000 | 2,360 | 52,950 | 1,282[1] |
| 2001 | 2,310 | 52,100 | |

1/ Catch through October 28, 2000.

A new assessment for shortspine thornyhead was not conducted for 2000 since only limited new data were available and this species is relatively long-lived and has relatively low-recruitment variability. The author recommended that the projection model results for 2001 as presented in the 1999 assessment be used. The stock is well above its $B_{40\%}$ level and the survey trends (from deeper waters where this species resides) has been showing an increase (even though the model indicated a gradual decline). The Team concurred with this approach noting that it is likely to be conservative since the actual catch was less than that used in the projections. Therefore, the 2001 ABC is 2,310 mt (based on Tier 3a; $F_{ABC}$ = 0.077). The corresponding overfishing level is 2,770 mt ($F_{OFL}$=0.092).

The area specific apportionments are 420, 970, and 920 mt to the Western, Central and Eastern areas, respectively.

ATKA MACKEREL

| YEAR | ABC | CATCH |
|---|---|---|
| 1999 | 600 | 262 |
| 2000 | 600 | 170[1] |
| 2001 | 600 | |

1/ Through October 28, 2000.

Prior to 1997, exploitable biomass and ABC for 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 2001 to satisfy bycatch needs in other fisheries. Under Tier 6 criteria, the overfishing level is equal to 6,200 mt, the average catch for 1978-1995.

OVERVIEW OF APPENDICES

## Appendix A: Pacific Halibut Stock Assessment and Fishery Evaluation

A separate SAFE report on the Pacific halibut (*Hippoglossus stenolepis*) resource and fishery has been prepared by the staff of the International Pacific Halibut Commission (IPHC) and is included in this SAFE report as Appendix A.

The Teams reviewed the IPHC report during their November meeting. Commercial catches increased slightly in 1999 over 1998 as did estimates of personal use, whereas removals from fishery discards, bycatch mortality and the sport fishery declined slightly.

The most recent assessment was conducted by IPHC in the fall of 1999. Using an age- and length-structured model which incorporates fishery and survey data, individual assessments were done for IPHC Areas 2A/B, 2C, and 3A. Assessments of Area 3B and 4 were hampered somewhat by low exploitation of the stocks in those areas.

A major modification in the assessment was the lowering of catchability for the setline assessment surveys carried out in the 1990s. This adjustment dropped the estimates of exploitable biomass in all areas. IPHC conducted dedicated experiment in 2000 to examine differences in halibut catch rates between a salmon-herring baiting scheme versus salmon-only. The results are expected to be incorporated into the 2001 assessment.

Total coastwide exploitable biomass estimates remain high, however, totaling 135,000 mt (round weight), (396 million pounds net weight). Overall setline CEY (Constant Exploitation Yield) was still very high at 21,300 mt (round weight) (62.6 million pounds net weight).

The assessment also showed that the 1987 year class is strong, with subsequent year classes not as strong, although those age classes were estimated imprecisely in 1999. Overall, recruitment remains low in all areas according to IPHC setline survey results. However, NMFS trawl survey data suggest that juvenile halibut abundance may not be as low as the surveys indicate.

## Appendix B: Pacific Halibut Discard Mortality Rates

The report by IPHC staff on the results of analyses of 1999 observer data examining halibut discard mortality rates (DMRs) is included as Appendix B. The report was reviewed in a joint session of the Plan Teams during the November meeting. The Teams endorse the IPHC recommendations for the use of a long-term average as Preseason Assumed DMRs for the 2001-2003 open access fisheries. The IPHC recommendation also includes a provision that revised DMRs would be proposed should analysis indicate that a fishery's annual DMR diverges substantially (up or down) from the long-term average.

The IPHC recommendations are included in the summary table below. The recommended Preseason Assumed DMRs are based on an average of fishery DMRs during 1990-1999, with the exception of the BSAI hook-&-line fishery for Pacific cod which is based on an average of 1996-1999.

Data for CDQ fisheries were collected in 1999; hook-&-line fishing was directed towards Pacific cod. Pollock, rockfish, yellowfin sole, and atka mackerel were targeted by trawls. The DMRs calculated for 1999 for those fisheries were carried forward as recommendations for monitoring in 2001 CDQ targets. The analysis recommends monitoring bycatch mortality in other CDQ targets using the open access DMRs.

The DMR recommendation for the IFQ fishery was 0.23, which is a mean of the 1990-1994 BSAI and GOA sablefish fishery DMRs. Data collection in the IFQ fishery currently is not adequate for estimating DMRs.

**Recommendations for Preseason Assumed DMRs for monitoring halibut bycatch mortality in 2001.**

| BSAI Target | Recommendations for 2001 | GOA Target | Recommendations for 2001 |
|---|---|---|---|
| ***Trawl*** | | ***Trawl*** | |
| **Atka mackerel** | **75** | **Atka mackerel** | **70** |
| **Bottom pollock** | **76** | **Bottom pollock** | **61** |
| **Pacific cod** | **67** | **Pacific cod** | **61** |
| **Other Flatfish** | **71** | **Deep water flatfish** | **60** |
| **Rockfish** | **69** | **Shallow water flatfish** | **69** |
| **Flathead sole** | **67** | **Rockfish** | **69** |
| **Other species** | **67** | **Flathead sole** | **58** |
| **Pelagic pollock** | **84** | **Other species** | **61** |
| **Rock sole** | **76** | **Pelagic pollock** | **72** |
| **Sablefish** | **50** | **Sablefish** | **66** |
| **Turbot** | **70** | **Arrowtooth flounder** | **62** |
| **Yellowfin sole** | **81** | **Rex sole** | **61** |
| ***Pot*** | | ***Pot*** | |
| **Pacific cod** | **8** | **Pacific cod** | **14** |
| **Other species** | **8** | **Other species** | **14** |
| ***Longline*** | | ***Longline*** | |
| **Pacific cod** | **12** | **Pacific cod** | **14** |
| **Rockfish** | **25** | **Rockfish** | **8** |
| **Other species** | **12** | **Other species** | **14** |
| **Turbot** | **18** | | |
| ***IFQ*** | | ***IFQ*** | |
| All targets | 23 | All targets | 23 |
| ***CDQ Trawl*** | | | |
| Atka mackerel | 82 | | |
| Bottom pollock | 88 | | |
| Pelagic Pollock | 90 | | |
| Rockfish | 88 | | |
| Yellowfin sole | 83 | | |
| ***CDQ Longline*** | | | |
| Pacific cod | 10 | | |

## Appendix C: Prohibited Species Catch Summary for Halibut

Information on halibut bycatch in the groundfish fisheries conducted in the Gulf of Alaska (GOA) is provided in Appendix C. It is intended for use by the Council in its utilization of the halibut species bycatch framework measures.

The PSC limits for halibut in the Gulf of Alaska are set by gear type and apportioned seasonally over the fishing year (Amendment 21). For 2000 the Council recommended the following halibut PSC apportionments for the Gulf of Alaska groundfish fisheries:

| **Trawl gear** | | **Hook and Line gear** | |
|---|---|---|---|
| 1st quarter | 600 mt (30%) | 1st trimester | 250 mt (86%) |
| 2nd quarter | 400 mt (20%) | 2nd trimester | 15 mt (5%) |
| 3rd quarter | 600 mt (30%) | 3rd trimester | 25 mt (9%) |
| 4th quarter | 400 mt (20%) | DSR | 10 mt |
| TOTAL | 2,000 mt | | 300 mt |

Bycatch mortality of Pacific halibut in the 2000 Gulf of Alaska groundfish fisheries totaled 2,128 mt for trawl and hook-and-line fisheries through October 21, 2000. Halibut mortality was 1,847 mt from trawl gear and 281 mt for hook-and-line gear.

## Appendix D: Echo Intergration-Trawl Survey Results for Walleye Pollock in the Gulf of Alaska during 2009

Since 1980, scientists from the Midwater Assessment and Conservation Engineering group at the Alaska Fisheries Science Center (AFSC), Seattle, WA, have conducted annual echo integration-trawl (EIT) surveys (except in 1982 and 1999) in the Gulf of Alaska to assess the distribution and abundance of walleye pollock (*Theragra chalcogramma*), hereafter referred to as pollock. The surveys focused primarily on pre-spawning pollock in the Shelikof Strait area. Results from surveys outside of Shelikof Strait generally did not indicate large amounts of pollock, although these efforts were quite restrictive both temporally and spatially (Williamson 1989, Karp 1990, and references therein). The only substantial pre-spawning aggregations of pollock found outside of Shelikof Strait were detected in 1994-96 during surveys of the Shumagin Islands (Wilson 1994, Wilson et al. 1995, Wilson et al. 1996). Only the Shelikof Strait area has been surveyed since 1997. The primary objectives of the most recent survey were to determine abundance estimates as well as various biological characteristics of pollock. This survey (AFSC cruise number is MF2000-04) was conducted during late winter/early spring 2000.

## Appendix E: Gulf of Alaska Other species, Forage fish, and Non-specified species 1999 Catch Summary

This information is provided as a supplement to the GOA 2000 SAFE. We estimated the catch of all non-target species in the Gulf of Alaska for 1999 using fishery observer data in combination with the official target species catch records from the NMFS Alaska Regional Office.

Catches were estimated by species group for 1999, using the following method: within each year, each vessel's observed catch of a given species group was summed within statistical area, gear type, and week. A "target fishery" was then assigned to each vessel's weekly catch, generally by assuming that the species with the highest retained catch for that week was the target species. We used a target assignment algorithm which is consistent that used in the inseason management system at the regional office. Catch by species (target and non-target) was then summed for each year over all observed vessels within each area, gear, and target fishery. The ratio of observed non-target species group catch to observed target species catch within each area, gear, and target fishery was multiplied by the total reported (regional office blend-estimated) target species catch within that area, gear, and target fishery. The results of this extrapolation for 1999 are reported below in Table 1. These catches represent our best estimates of non-target species catch for 1999. Catches of Other species, Forage fish, and grenadiers were estimated for 1990 through 1998 as part of the annual stock assessment process and are reported in annual SAFE documents for the BSAI (Fritz 1999, 98, and back) and the GOA (Gaichas et al, 1999).

## Appendix F: Definitions of Common Acronyms

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

Table 1. Gulf of Alaska groundfish 1999 and 2000 ABCs, 1999 TACs, and 1999 catches reported through October 28, 2000. MSY is unknown for all species.

| SPECIES | | ABC (mt) 2001 | | ABC (mt) 2000 | TAC 2000 | CATCH 2000 |
|---|---|---|---|---|---|---|
| Pollock | W (61) | 35,240 | W (61) | 29,290 | 29,290 | 21,418 |
| | C (62) | 14,260 | C (62) | 17,430 | 17,430 | 286 |
| | C (63) | 26,650 | C (63) | 22,930 | 22,930 | 21,229 |
| | Shelikof | 20,680 | | 21,550 | 21,550 | 26,384 |
| | WYAK | 2,520 | E | 2,340 | 2,340 | 2,096 |
| | EYAK/SEO | 6,460 | | 6,460 | 6,460 | 4 |
| | **TOTAL** | 105,810 | **TOTAL** | 100,000 | 100,000 | 71,417 |
| Pacific Cod | W | 24,400 | W | 27,500 | 20,625 | 21,661 |
| | C | 38,650 | C | 43,550 | 34,080 | 31,949 |
| | E | 4,750 | E | 5,350 | 4,010 | 416 |
| | **TOTAL** | 67,800 | **TOTAL** | 76,400 | 58,715 | 54,026 |
| Deep water flatfish[1] | W | 280 | W | 280 | 280 | 26 |
| | C | 2,710 | C | 2,710 | 2,710 | 797 |
| | WYAK | 1,240 | E | 1,240 | 1,240 | 116 |
| | EYAK/SEO | 1,070 | | 1,070 | 1,070 | 26 |
| | **TOTAL** | 5,300 | **TOTAL** | 5,300 | 5,300 | 965 |
| Rex sole | W | 1,230 | W | 1,230 | 1,230 | 866 |
| | C | 5,660 | C | 5,660 | 5,660 | 2,623 |
| | WYAK | 1,540 | E | 1,540 | 1,540 | 4 |
| | EYAK/SEO | 1,010 | | 1,010 | 1,010 | 0 |
| | **TOTAL** | 9,440 | **TOTAL** | 9,440 | 9,440 | 3,493 |
| Shallow water flatfish[2] | W | 19,510 | W | 19,510 | 4,500 | 564 |
| | C | 16,400 | C | 16,400 | 12,950 | 5,872 |
| | WYAK | 790 | E | 790 | 790 | 5 |
| | EYAK/SEO | 1,160 | | 1,160 | 1,160 | 2 |
| | **TOTAL** | 37,860 | **TOTAL** | 37,860 | 19,400 | 6,443 |
| Flathead sole | W | 8,490 | W | 8,490 | 2,000 | 274 |
| | C | 15,720 | C | 15,720 | 5,000 | 1,214 |
| | WYAK | 1,440 | E | 1,440 | 1,440 | 9 |
| | EYAK/SEO | 620 | | 620 | 620 | 0 |
| | **TOTAL** | 26,270 | **TOTAL** | 26,270 | 9,060 | 1,497 |
| Arrowtooth flounder | W | 16,480 | W | 16,160 | 5,000 | 6,159 |
| | C | 99,590 | C | 97,710 | 25,000 | 17,508 |
| | WYAK | 24,220 | E | 23,770 | 2,500 | 133 |
| | EYAK/SEO | 7,860 | | 7,720 | 2,500 | 256 |
| | **TOTAL** | 148,150 | **TOTAL** | 145,360 | 35,000 | 24,056 |
| Sablefish | W | 2,010 | W | 1,840 | 1,840 | 1,578 |
| | C | 5,410 | C | 5,730 | 5,730 | 6,102 |
| | WYAK | 1,880 | WYK | 2,207 | 2,207 | 2,059 |
| | SEO | 3,540 | SEO | 3,553 | 3,553 | 3,832 |
| | **TOTAL** | 12,840 | **TOTAL** | 13,330 | 13,330 | 13,571 |
| Other Slope rockfish | W | 20 | W | 20 | 20 | 49 |
| | C | 740 | C | 740 | 740 | 361 |
| | WYAK | 250 [3] | E | 250 | 250 | 117 |
| | EYAK/SEO | 3,890 | | 3,890 | 3,890 | 45 |
| | **TOTAL** | 4,900 | **TOTAL** | 4,900 | 4,900 | 572 |

(Table 1 continued)

| SPECIES | | ABC (mt) 2001 | | ABC (mt) 2000 | TAC 2000 | CATCH 2000 |
|---|---|---|---|---|---|---|
| Northern rockfish | W | 600 | W | 630 | 630 | 747 |
| | C | 4,280 | C | 4,490 | 4,490 | 2,578 |
| | E | 0 [3] | E | | | 0 |
| | **TOTAL** | 4,880 | **TOTAL** | 5,120 | 5,120 | 3,325 |
| Pacific ocean perch | W | 1,280 | W | 1,240 | 1,240 | 1,161 |
| | C | 9,610 | C | 9,240 | 9,240 | 8,359 |
| | WYAK | | E | 840 | 840 | 616 |
| | SEO | | | 1,700 | 1,700 | 2 |
| | E | 2,620 | | | | 0 |
| | **TOTAL** | 13,510 | **TOTAL** | 13,020 | 13,020 | 10,138 |
| Shortraker/rougheye | W | 210 | W | 210 | 210 | 138 |
| | C | 930 | C | 930 | 930 | 882 |
| | E | 590 | E | 590 | 590 | 707 |
| | **TOTAL** | 1,730 | **TOTAL** | 1,730 | 1,730 | 1,727 |
| Pelagic shelf rockfish | W | 550 | W | 550 | 550 | 189 |
| | C | 4,080 | C Inshore | 4,080 | 4,080 | 3,073 |
| | WYAK | 580 | C Offshore | 580 | 580 | 445 |
| | EYAK/SEO | 770 | E | 770 | 770 | 20 |
| | **TOTAL** | 5,980 | **TOTAL** | 5,980 | 5,980 | 3,727 |
| Demersal Shelf Rockfish | | 330 | | 340 | 340 | 253 |
| Atka Mackerel | GW | 600 | GW | 600 | 600 | 170 |
| Thornyhead rockfish | | 420 | Western | 430 | 430 | 333 |
| | | 970 | Central | 990 | 990 | 546 |
| | | 920 | Eastern | 940 | 940 | 403 |
| | **TOTAL** | 2,310 | **TOTAL** | 2,360 | 2,360 | 1,282 |
| Other Species | GW | NA | GW | NA | 14,215 | 5,606 |
| **TOTAL** | | 447,710 | | 448,010 | 298,510 | 202,268 |

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.
GW means Gulfwide.
Catch data source: NMFS Blend Reports.

Table 2. Gulf of Alaska 2001 ABCs, biomass, overfishing levels, and estimated trends (mt) for Western, Central, Eastern, Gulfwide, West Yakutat, and Southeast Outside regulatory areas.

| | | | | 2001 | |
|---|---|---|---|---|---|
| SPECIES | | ABC | Biomass | Overfishing Level | Abundance,[2] Trend |
| Pollock | W (61) | 35,240 | (W/C + WYAK) | | Below, |
| | C (62) | 14,260 | 699,00 | 117,750 | Increasing |
| | C (63) | 26,650 | | | |
| | Shelikof | 20,680 | | | |
| | WYAK | 2,520 | (EYAK/SEO) | | |
| | EYAK/SEO | 6,460 | 28,710 | 8,610 | |
| | **TOTAL** | 105,810 | | 126,360 | |
| Pacific Cod | W | 24,400 | | | Above, |
| | C | 38,650 | | | Declining |
| | E | 4,750 | | | |
| | **TOTAL** | 67,800 | 526,000 | 91,200 | |
| Deep water flatfish | W | 280 | | | Unknown, |
| | C | 2,710 | | | Unknown |
| | WYAK | 1,240 | | | |
| | EYAK/SEO | 1,070 | | | |
| | **TOTAL** | 5,300 | 74,460 [4] | 6,980 | |
| Rex sole | W | 1,230 | | | Unknown,[3] |
| | C | 5,660 | | | Stable |
| | WYAK | 1,540 | | | |
| | EYAK/SEO | 1,010 | | | |
| | **TOTAL** | 9,440 | 81,020 | 12,300 | |
| Shallow water flatfish | W | 19,510 | | | Unknown,[3] |
| | C | 16,400 | | | Stable |
| | WYAK | 790 | | | |
| | EYAK/SEO | 1,160 | | | |
| | **TOTAL** | 37,860 | 299,100 | 45,330 | |
| Flathead sole | W | 8,490 | | | Unknown,[3] |
| | C | 15,720 | | | Stable |
| | WYAK | 1,440 | | | |
| | EYAK/SEO | 620 | | | |
| | **TOTAL** | 26,270 | 207,520 | 34,210 | |
| Arrowtooth flounder | W | 16,480 | | | Above, |
| | C | 99,590 | | | Declining |
| | WYAK | 24,220 | | | |
| | EYAK/SEO | 7,860 | | | |
| | **TOTAL** | 148,150 | 1,586,530 | 173,550 | |
| Sablefish | W | 2,010 | | | Low, |
| | C | 5,410 | | | Stable |
| | WYAK | 1,880 | | | |
| | EY/SEO | 3,540 | | | |
| | **TOTAL** | 12,840 | 188,000 | 15,720 | |
| Other Slope rockfish | W | 20 | | | Unknown, |
| | C | 740 | | | Unknown |
| | WYAK | 250 [1] | | | |
| | EYAK/SEO | 3,890 | | | |
| | **TOTAL** | 4,900 | 102,510 | 6,390 | |

(Table 2 continued)

| SPECIES | | ABC | | 2001 Overfishing Level | Abundance,[2] Trend |
|---|---|---|---|---|---|
| Northern rockfish | W | 600 | | | Above, |
| | C | 4,280 | | | Declining |
| | E | 0 [1] | | | |
| | **TOTAL** | 4,880 | 93,850 | 7,510 | |
| Pacific ocean perch | W | 1,280 | | 1,520 | Below, |
| | C | 9,610 | | 11,350 | Increasing |
| | WYAK | | | | |
| | EY/SEO | | | 3,090 | |
| | WY/EY/SEO | 2,620 | | | |
| | **TOTAL** | 13,510 | 211,160 | 15,960 | |
| Shortraker/ rougheye | W | 210 | | | Unknown, |
| | C | 930 | | | Unknown |
| | E | 590 | | | |
| | **TOTAL** | 1,730 | 70,890 | 2,510 | |
| Pelagic shelf rockfish | W | 550 | | | Unknown, |
| | C | 4,080 | | | Unknown |
| | WYAK | 580 | | | |
| | EY/SEO | 770 | | | |
| | **TOTAL** | 5,980 | 66,440 | 9,040 | |
| Demersal shelf rockfish | SEO | 330 | 14,695 | 420 | Unknown, Unknown |
| Atka mackerel | GW | 600 | Unknown | 6,200 | Unkown, Unknown |
| Thornyhead rockfish | Western | 420 | | | Above, |
| | Central | 970 | | | Stable |
| | Eastern | 920 | | 2,820 | |
| | **Total** | 2,310 | 52,100 | | |
| Other species | | | | | TAC = 5% of the sum of TACs. |
| TOTAL | | 447,710 | | 556,500 | |

1/ The EGOA ABC of 5 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 3. Summary of fishing mortality rates and overfishing levels for the Gulf of Alaska, 2000.

| Species | Tier | $F_{ABC}$[1] | Strategy | $F_{OFL}$[2] | Strategy |
|---|---|---|---|---|---|
| Pollock | 3b | 0.28 | $F_{40\% \text{ adjusted}}$ | 0.34 | $F_{35\% \text{ adjusted}}$ |
| Pacific cod | 3a | 0.33 | $F_{ABC}$ | 0.46 | $F_{35\%}$ |
| Deepwater flatfish | 5,6[3] | 0.075 | $F_{ABC}$[3] | NA | $F_{OFL}$[4] |
| Rex sole | 5 | 0.15 | F=.75M | 0.20 | F=M |
| Flathead sole | 5 | 0.15 | F=.75M | 0.20 | F=M |
| Shallow water flatfish | 4,5[5] | 0.15-0.17 | F=.75M, $F_{40\%}$[5] | .2-.21 | $F_{35\%}$, F=M[6] |
| Arrowtooth | 3a | 0.134 | $F_{.40\%}$ | 0.159 | $F_{35\%}$ |
| Sablefish | 3b | 0.1 | $F_{40\% \text{ adjusted}}$ | 0.124 | $F_{35\% \text{adjusted}}$ |
| Pacific ocean perch | 3b | 0.067 | $F_{40\% \text{ adjusted}}$ | 0.078 | $F_{35\% \text{ adjusted}}$ |
| Shortraker/rougheye | 4,5[7] | 0.023/0.025 | F=.75M, F=M[7] | 0.03/.038 | F=M, $F_{35\%}$[8] |
| Rockfish (other slope) | 4,5[9] | 0.03-0.75 | F=.75M, F=M[9] | 0.04-0.10 | $F_{35\%}$, F=M[10] |
| Northern rockfish | 3a | 0.055 | $F_{40\%}$ | 0.065 | $F_{35\%}$ |
| Pelagic Shelf Rockfish | 4 | 0.09 | F=M | 0.136 | $F_{35\%}$ |
| Demersal Shelf Rockfish | 4 | 0.02 | F=M | 0.028 | $F_{35\%}$ |
| Thornyhead rockfish | 3a | 0.077 | $F_{40\%}$ | 0.092 | $F_{35\%}$ |
| Atka mackerel | 6 | NA | $F_{ABC}$[11] | NA | $F_{OFL}$[12] |

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 shallowater 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 (Tier4).
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/ ABC for Atka mackerel is 600 mt for bycatch in other target fisheries.
12/ 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 2001 Plan Team recommended fishing mortality rates and ABCs, for those species whose recommendations were below the maximum.

Gulf of Alaska

| Species | Tier | 2001 Max. Permissible $F_{ABC}$ | 2001 Max. Permissible ABC | 2001 $F_{ABC}$ | 2001 ABC |
|---|---|---|---|---|---|
| Pacific cod | 3a | 0.37 | 76,700 | 0.33 | 67,800 |
| Rougheye rockfish | 4 | 0.032 | 1,550 | 0.025 | 1,210 |
| Shortraker rockfish | 5 | 0.023 | 520 | 0.023 | 520 |
| **Total Shortraker/Rougheye** | 4,5 | | 2,070 | | 1,730 |
| Other slope rockfish (sharpchin) | 3a | 0.055 | 1,980 | 0.050 | 1,800 |
| Other slope rockfish (redstripe) | 5 | 0.075 | 1,240 | 0.075 | 1,240 |
| Other slope rockfish (harlequin) | 5 | 0.045 | 560 | 0.045 | 560 |
| Other slope rockfish (silvergrey) | 5 | 0.030 | 780 | 0.030 | 780 |
| Other slope rockfish (redbanded) | 5 | 0.045 | 290 | 0.045 | 290 |
| Other slope rockfish (minor species) | 5 | 0.045 | 220 | 0.045 | 220 |
| **Total other slope rockfish** | 4,5 | | 5,070 | | 4,900 |
| Pelagic shelf rockfish | 4 | 0.110 | 7,310 | 0.090 | 5,980 |
| Demersal shelf rockfish | 4 | 0.025 | 420 | 0.020 | 330 |
| Atka mackerel | 6 | NA | 4,700 | NA | 600 |

Table 5. Groundfish landings (metric tons) in the Gulf of Alaska, 1956-2000.

| Year | Pollock | Pacific Cod | Flat Fish | Arrowtooth Flounder | Sable Fish | 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 | 1,028 | | 2,457 | 243,385 |
| 1965 | 2,749 | 599 | 4,727 | | 3,458 | 348,598 |
| 1966 | 8,932 | 1,376 | 4,937 | | 5,178 | 200,749 |
| 1967 | 6,276 | 2,225 | 4,552 | | 6,143 | 120,010 |
| 1968 | 6,164 | 1,046 | 3,393 | | 15,049 | 100,170 |
| 1969 | 17,553 | 1,335 | 2,630 | | 19,376 | 72,439 |
| 1970 | 9,343 | 1,805 | 3,772 | | 25,145 | 44,918 |
| 1971 | 9,458 | 523 | 2,370 | | 25,630 | 77,777 |
| 1972 | 34,081 | 3,513 | 8,954 | | 37,502 | 74,718 |
| 1973 | 36,836 | 5,963 | 20,013 | | 28,693 | 52,973 |
| 1974 | 61,880 | 5,182 | 9,766 | | 28,335 | 47,980 |
| 1975 | 59,512 | 6,745 | 5,532 | | 26,095 | 44,131 |
| 1976 | 86,527 | 6,764 | 6,089 | | 27,733 | 46,968 |
| 1977 | 112,089 | 2,267 | 16,722 | | 17,140 | 23,453 |
| 1978 | 90,822 | 12,190 | 15,198 | | 8,866 | 8,176 |
| 1979 | 98,508 | 14,904 | 13,928 | | 10,350 | 9,921 |
| 1980 | 110,100 | 35,345 | 15,846 | | 8,543 | 12,471 |
| 1981 | 139,168 | 36,131 | 14,864 | | 9,917 | 12,184 |
| 1982 | 168,693 | 29,465 | 9,278 | | 8,556 | 7,991 |
| 1983 | 215,567 | 36,540 | 12,662 | | 9,002 | 7,405 |
| 1984 | 307,400 | 23,896 | 6,914 | | 10,230 | 4,452 |
| 1985 | 284,823 | 14,428 | 3,078 | | 12,479 | 1,087 |
| 1986 | 93,567 | 25,012 | 2,551 | | 21,614 | 2,981 |
| 1987 | 69,536 | 32,939 | 9,925 | | 26,325 | 4,981 |
| 1988 | 65,625 | 33,802 | 10,275 | | 29,903 | 13,779 |
| 1989 | 78,220 | 43,293 | 11,111 | | 29,842 | 19,002 |
| 1990 | 90,490 | 72,517 | 15,411 | | 25,701 | 21,114 |
| 1991 | 107,500 | 76,997 | 20,068 | | 19,580 | 13,994 |
| 1992 | 93,904 | 80,100 | 28,009 | | 20,451 | 16,910 |
| 1993 | 108,591 | 55,994 | 37,853 | | 22,671 | 14,240 |
| 1994 | 110,891 | 47,985 | 29,958 | | 21,338 | 11,266 |
| 1995 | 73,248 | 69,053 | 32,273 | | 18,631 | 15,023 |
| 1996 | 50,206 | 67,966 | 19,838 | 22,183 | 15,826 | 14,288 |
| 1997 | 89,892 | 68,474 | 17,179 | 16,319 | 14,129 | 15,304 |
| 1998 | 123,751 | 62,101 | 11,263 [I] | 12,974 | 12,758 | 14,402 |
| 1999/h | 95,637 | 68,613 | 8,821 | 16,209 | 13,918 | 18,057 |
| 2000/j | 71,417 | 54,026 | 12,398 | 24,056 | 13,571 | 15,762 |

a/ Catch defined as follows: (1) 1961-78, Pacific ocean perch (S. alutus) only; (2) 1979-1987, the 5 sp
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 stablized 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 1990-1
thereafter Atka mackerel was assigned a seperate target species.

Table 5. (continued)

| Year | Pelagic Shelf Rockfish | Demersal Shelf Rockfish[b] | Thorny Heads[c] | Atka Mackerel[e] | 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 | 230,448 |
| 1998 | 3,111 | 552 | 1,136 | 317 | 3,748 | 246,113 |
| 1999 | 4,826 | 297 | 1,282 | 262 | 3,858 | 233,779 |
| 2000 | 3,727 | 253 | 1,282 | 170 | 5,606 | 202,268 |

e/ Atka mackerel was added to the Other Species category in 1988.

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

g/ Does not include at-sea discards.

h/ Catch data reported through December 31, 1999.

i/ Includes all species except arrowtooth.

j/ Catch data reported through October 28, 2000.

For 1999 other species includes sculpins, sharks, skates, squid and octopus.

Eulachon and capelin are forage fish

Figure 1

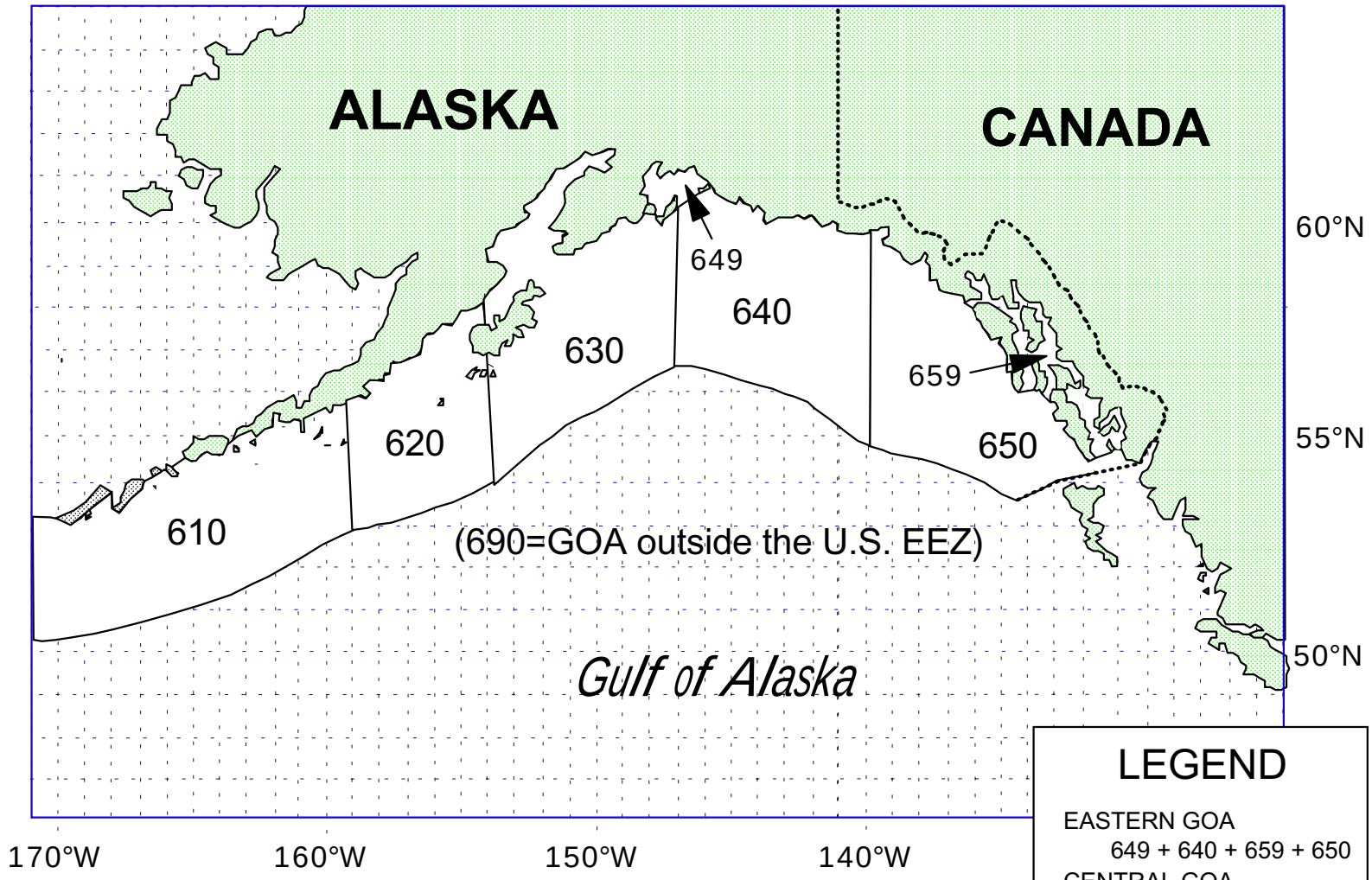


Figure 3 to Part 679. Gulf of Alaska statistical and reporting areas

a. Map

# GOA Statistical and Reporting Areas