

APPENDIX A

STOCK ASSESSMENT AND FISHERY EVALUATION REPORT

FOR THE GROUND FISH RESOURCES

OF THE BERING SEA/ALEUTIAN ISLANDS REGIONS

Compiled by

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

With Contributions by

S. Barbeaux, E. Brown, J. DiCosimo, M. Dorn, J. Fujioka, S. Gaichas, J. Ianelli, R. Lauth,
S. Lowe, C. Lunsford, D. Nichol, R. Reuter, T. Sample, M. Sigler, P. Spencer,
G. Thompson, G. Walters, T. Wilderbuer, G. Williams, N. Williamson, H. Zenger

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North Pacific Fishery Management Council
605 West 4th Ave., Suite 306

Anchorage, AK 99501

**Stock Assessment and Fishery Evaluation Report
for the Groundfish Resources
of the Bering Sea/Aleutian Islands Region**

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SUMMARY

by

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of the Bering Sea and Aleutian Islands

INTRODUCTION

The Guidelines for Fishery Management Plans published by the National Marine Fisheries Service (NMFS) require that a stock assessment and fishery evaluation (SAFE) report be prepared and reviewed annually for each fishery management plan (FMP). The SAFE reports are intended to summarize the best available scientific information concerning the past, present, and possible future condition of the stocks, marine ecosystems, and fisheries being managed under Federal regulation, thereby providing information to the Councils for determining annual harvest levels from each stock, documenting significant trends or changes in the resource, marine ecosystems, and fishery over time, and assessing the relative success of existing state and Federal fishery management programs. In the case of the FMP for the Groundfish Fishery of the Bering Sea and Aleutian Islands (BSAI) Area, the SAFE report is published in three sections: a “Stock Assessment” section, which comprises the bulk of the present document, and “Fishery Evaluation” and “Ecosystem Considerations” sections, which are bound separately.

The Stock Assessment section of the SAFE report for the BSAI groundfish fisheries is compiled by the BSAI Groundfish Plan Team from chapters contributed by scientists at NMFS Alaska Fisheries Science Center (AFSC) and includes a recommended acceptable biological catch (ABC) and an overfishing level (OFL) for each stock and stock complex managed under the FMP. The ABC recommendations are reviewed by the Scientific and Statistical Committee (SSC), which may confirm the Plan Team recommendations or develop its own. The ABC recommendations, together with social and economic factors, are considered by the North Pacific Fishery Management Council (Council) in determining total allowable catches (TACs) and other measures used to manage the fisheries.

The BSAI groundfish FMP requires that a draft of the SAFE report be produced each year in time for the December meeting of the Council. Each stock or stock complex is represented in the report by a chapter containing the latest stock assessment. New or revised stock assessment models are generally previewed at its September Plan Team meeting, and considered by the Plan Team at its November meeting for setting specifications for the following fishing year.

Members of the Plan Team who compiled this SAFE report were Loh-lee Low (chair), Jane DiCosimo (BSAI FMP coordinator), Kerim Aydin, Lowell Fritz, Kathy Kuletz, Brenda Norcross, Michael Sigler, Andrew Smoker, Grant Thompson, Ivan Vining, and Farron Wallace.

BACKGROUND INFORMATION

Management Areas and Species

The BSAI management area lies within the 200-mile U.S. Exclusive Economic Zone (EEZ) of the United States (Figure 1). International North Pacific Fisheries Commission (INPFC) statistical areas 1 and 2 make up the EBS. The Aleutian Islands (AI) region is INPFC area 5.

Four categories of finfishes and invertebrates have been designated for management purposes (Table 1). They are (a) prohibited species, (b) target species, (c) other species, (d) forage fish, and (e) non-specified species. This SAFE report describes the status of the stocks in categories (b) and (c) only.

Historical Catch Statistics

Catch statistics since 1954 are shown for the EBS subarea in Table 2. The initial target species was yellowfin sole. During the early period of these fisheries, total catches of groundfish reached a peak of 674,000 metric tons (t) in 1961. Following a decline in abundance of yellowfin sole, other species (principally walleye pollock) were targeted, and total catches rose to 2.2 million t in 1972. Walleye pollock is now the principal fishery, with recent catches approximately 1.4-1.5 million t in 2001-2003. After the Magnuson Fishery Conservation and Management Act was adopted in 1976, catch restrictions and other management measures were placed on the fishery and all-species catches have since varied from one to two million t.

Catches in the Aleutian region have always been much smaller than those in the EBS. Target species have also been different (Table 3). Pacific ocean perch (POP) was the initial target species. As POP abundance declined, the fishery diversified to other species. During the early years of exploitation, overall catches of Aleutian groundfish reached a peak of 112,000 t in 1965. Atka mackerel is the largest fishery (46,000 t in 2002) in the AI, followed by Pacific cod (31,000 t in 2002). Total catches from the Aleutians in recent years have been about 100,000 t annually, after peaking at 191,000 t in 1996. Total BSAI catches through November 15, 2003 were 1.8 million t.

Recent Total Allowable Catches

Amendment 1 to the BSAI Groundfish FMP provides the framework to manage the groundfish resources as a complex. Maximum sustainable yield (MSY) for this complex was originally estimated at 1.8 to 2.4 million t. The optimum yield (OY) range was set at 85% of the MSY range, or 1.4 to 2.0 million t. The sum of the TACs equals OY for the BSAI groundfish complex, which is currently constrained by the 2.0 million t cap.

Fifteen percent (15%) of the total TACs is set aside as a reserve (except for pollock, squid, and hook-and-line and pot gear allocation of sablefish), which may be released during the season by the NMFS Regional Administrator. The ITAC, or initial TAC, for each species or complex is the remainder of the TAC after the subtraction of the reserve. Except as noted above, one half of the reserve, or 7.5 percent, is designated as a Community Development Quota (CDQ) reserve for use by CDQ participants. The reserve is released to directed fishing later in the fishing year. Ten percent of the pollock TAC is allocated as a directed fishing allowance for CDQ participants.

Definition of Acceptable Biological Catch and the Overfishing Level

Amendment 56 defined ABC and OFL for the BSAI groundfish fisheries. The 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 described next.

Overfishing is defined as any amount of fishing in excess of the maximum fishing mortality threshold (MFMT). This MFMT 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 $F=F_{40\%}$.

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
 $F_{ABC} \leq \mu_H$, the harmonic mean of the pdf
- 1b) Stock status: $\alpha < B/B_{MSY} \leq 1$
 $F_{OFL} = \mu_A \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
 $F_{ABC} \leq \mu_H \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
- 1c) Stock status: $B/B_{MSY} \leq \alpha$
 $F_{OFL} = 0$
 $F_{ABC} = 0$

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

- 2a) Stock status: $B/B_{MSY} > 1$
 $F_{OFL} = F_{MSY}$
 $F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%})$
- 2b) Stock status: $\alpha < B/B_{MSY} \leq 1$
 $F_{OFL} = F_{MSY} \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
 $F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
- 2c) Stock status: $B/B_{MSY} \leq \alpha$

$$F_{\text{OFL}} = 0$$

$$F_{\text{ABC}} = 0$$

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

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

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

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

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

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

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

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

$$F_{\text{OFL}} = 0$$

$$F_{\text{ABC}} = 0$$

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

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

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

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

$$F_{\text{OFL}} = M$$

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

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

$$\text{ABC} \leq 0.75 \times \text{OFL}$$

OVERVIEW OF “STOCK ASSESSMENT” SECTION

Summary and Use of Terms

Plan Team recommendations for 2004 ABCs are summarized in Tables 4-5. The sum of the recommended ABCs for 2004 is about 3,660,000 t, approximately 360,000 t above the sum of 2003 ABCs. This is about 1.66 million t above the 2 million t TAC cap employed by the Council as a conservation measure. Overall, the status of the stocks continues to appear relatively favorable, although some stocks are declining due to poor recruitment in recent years. Total biomass for 2004 (19.9 million t) is relatively unchanged since last year. Stock status is summarized, ABC recommendations are given, and OFLs presented on a species-by-species basis in the remainder of this Overview, with the following conventions observed:

- 1) “Fishing mortality rate” refers to the full-selection F (i.e., the rate that applies to fish of fully selected sizes or ages), except in the case of the EBS walleye pollock assessment. For EBS walleye pollock, the fishing mortality rate consists of the ratio between catch (in biomass) and age 3+ biomass at the start of the year.
- 2) “Projected age+ biomass” refers to the total biomass of all cohorts of ages greater than or equal to some minimum age, as projected for January 1 of the coming year. The minimum age varies from species to species. When possible, the minimum age corresponds to the age of recruitment listed in

the respective stock assessment. Otherwise, the minimum age corresponds to the minimum age included in the assessment model. When a biomass estimate from the trawl survey is used as a proxy for projected age+ biomass, the minimum age is equated with the age of recruitment, even though the survey may not select that age fully and undoubtedly selects fish of younger ages to some extent. Note that a projected age+ biomass listed in this summary section may differ from a projected “exploitable” biomass listed in the corresponding stock assessment, which may be computed by multiplying biomass at age by selectivity at age and summing over all ages (in models assuming knife-edge recruitment, age+ biomass and exploitable biomass are equivalent).

- 3) “Exploitation rate” refers to the ratio between catch (in numbers) and start-of-year stock size (also in numbers). Where information is lacking, the exploitation rate is sometimes multiplied by start-of-year biomass to compute ABC.
- 4) Projected ABC, OFL, and biomass levels are reported to three significant digits, except when quoting a Council-approved value with more than three significant digits or when a stock-specific ABC is apportioned among areas on a percentage basis, in which case four significant digits are used. Fishing mortality rates are reported to two significant digits.
- 5) The figures listed as last year’s ABCs correspond to the values approved by the Council. The figures listed as next year’s ABCs correspond to the Plan Team’s recommendations.

Projection Scenarios and Status Determination

A standard set of projections is required for each stock managed under tiers 1, 2, or 3 of Amendment 56. This set of projections encompasses seven harvest scenarios designed to satisfy the requirements of Amendment 56, the National Environmental Policy Act, and the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA).

For each scenario, the projections begin with the vector of 2003 numbers at age estimated in the assessment. This vector is then projected forward to the beginning of 2004 using the schedules of natural mortality and selectivity described in the assessment and the best available estimate of total (year-end) catch for 2003. In each subsequent year, the fishing mortality rate is prescribed on the basis of the spawning biomass in that year and the respective harvest scenario. In each year, recruitment is drawn from a distribution whose parameters consist of maximum likelihood estimates determined from the time series of recruitments estimated in the assessment. Because an environmental regime shift appears to have occurred around 1977, only year classes spawned after 1976 are included in this time series. Spawning biomass is computed in each year based on the time of peak spawning and the maturity and weight schedules described in the assessment. Total catch is assumed to equal the catch associated with the respective harvest scenario in all years. This projection scheme is run 1000 times to obtain distributions of possible future stock sizes, fishing mortality rates, and catches.

Five of the seven standard scenarios will be used in an Environmental Assessment prepared in conjunction with the final SAFE. These five scenarios, which are designed to provide a range of harvest alternatives that are likely to bracket the final TAC for 2004, are as follow (“max F_{ABC} ” refers to the maximum permissible value of F_{ABC} under Amendment 56):

Scenario 1: In all future years, F is set equal to max F_{ABC} . (Rationale: Historically, TAC has been constrained by ABC, so this scenario provides a likely upper limit on future TACs.)

Scenario 2: In all future years, F is set equal to a constant fraction of $\max F_{ABC}$, where this fraction is equal to the ratio of the F_{ABC} value for 2004 recommended in the assessment to the $\max F_{ABC}$ for 2004. (Rationale: When F_{ABC} is set at a value below $\max F_{ABC}$, it is often set at the value recommended in the stock assessment.)

Scenario 3: In all future years, F is set equal to 50% of $\max F_{ABC}$. (Rationale: This scenario provides a likely lower bound on F_{ABC} that still allows future harvest rates to be adjusted downward when stocks fall below reference levels.)

Scenario 4: In all future years, F is set equal to the average F from the period 1998-2002. (Rationale: For some stocks, TAC can be well below ABC, and recent average F may provide a better indicator of F_{TAC} than F_{ABC} .)

Scenario 5: In all future years, F is set equal to zero. (Rationale: In extreme cases, TAC may be set at a level close to zero.)

Two other scenarios are needed to satisfy the MSFCMA's requirement to determine whether a stock is currently in an overfished condition or is approaching an overfished condition. These two scenarios are as follow (for Tier 3 stocks, the MSY level is defined as $B_{35\%}$):

Scenario 6: In all future years, F is set equal to F_{OFL} .

Scenario 7: In 2004 and 2005, F is set equal to $\max F_{ABC}$, and in all subsequent years, F is set equal to F_{OFL} .

Harvest scenarios #6 and #7 are intended to permit determination of the status of a stock with respect to its minimum stock size threshold (MSST). Any stock that is below its MSST is defined to be overfished. Any stock that is expected to fall below its MSST in the next two years is defined to be approaching an overfished condition. Harvest scenarios #6 and #7 are used in these determinations as follows:

Is the stock overfished? This depends on the stock's estimated spawning biomass in 2004:

- (1) If spawning biomass for 2004 is estimated to be below $\frac{1}{2} B_{35\%}$, the stock is below its MSST.
If spawning biomass for 2004 is estimated to be above $B_{35\%}$, the stock is above its MSST.
- (2) If spawning biomass for 2004 is estimated to be above $\frac{1}{2} B_{35\%}$ but below $B_{35\%}$, the stock's status relative to MSST is determined by referring to harvest scenario #6. If the mean spawning biomass for 2014 is below $B_{35\%}$, the stock is below its MSST. Otherwise, the stock is above its MSST.

Is the stock approaching an overfished condition? This is determined by referring to harvest scenario #7:

- (1) If the mean spawning biomass for 2006 is below $\frac{1}{2} B_{35\%}$, the stock is approaching an overfished condition.

- (2) If the mean spawning biomass for 2006 is above $B_{35\%}$, the stock is not approaching an overfished condition.
- (3) If the mean spawning biomass for 2006 is above $\frac{1}{2} B_{35\%}$ but below $B_{35\%}$, the determination depends on the mean spawning biomass for 2016. If the mean spawning biomass for 2015 is below $B_{35\%}$, the stock is approaching an overfished condition. Otherwise, the stock is not approaching an overfished condition.

It is currently impossible to evaluate the status of stocks in Tiers 4 through 6 with respect to their MSSTs because stocks qualify for management under these tiers only if reference stock levels (such as MSST) cannot be estimated reliably.

Uncertainty / Ecosystem Considerations / Research

Uncertainty is addressed in individual assessments, and to some degree is addressed by the tiers used to establish ABCs. In the sablefish assessment, additional analysis of parameter uncertainty was undertaken and the resulting ABC recommendation adjusted accordingly. In the Pacific cod and Greenland turbot assessments, uncertainty was dealt with by recommending a more precautionary ABC (below the maximum allowed under the tiers).

Ecosystem concerns were discussed in the stock assessment chapters. The Team was unable to isolate individual cases where ABC adjustments needed to be made to address ecosystem concerns. These discussions have been expanded since last year and the Team encouraged the authors to continue the development of an ecosystem analysis for next year. All BSAI groundfish species are predators or prey at some life stage. A review of ecosystem status and trends is provided in the Ecosystem Considerations chapter.

Walleye Pollock

Status and catch specifications (t) 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 are current through 11/08/03.

<u>Area</u>	<u>Year</u>	<u>Age 3+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
EBS	2002	9,800,000	3,530,000	2,110,000	1,485,000	1,484,927
	2003	11,100,000	3,530,000	2,330,000	1,491,760	1,489,419
	2004	11,000,000	2,740,000	2,560,000	n/a	n/a
AI	2002	106,000	31,700	23,800	1,000	1,079
	2003	175,000	52,600	39,400	1,000	1,641
	2004	175,000	52,600	39,400	n/a	n/a
Bogoslof	2002	232,000	46,400	4,310	100	38
	2003	227,000	45,300	4,070	50	24
	2004	198,000	39,600	29,700	n/a	n/a

Eastern Bering Sea:

The present assessment is a straightforward update of last year's assessment, incorporating new data from the 2003 fishery and bottom trawl survey. The 2003 bottom trawl survey estimated a biomass of 8,510,000 t, an increase of 77% relative to the 2002 estimate and the highest estimate in the entire time series. Other new inputs include age composition data from the 2002 fishery and the 2002 echo-integration trawl survey. The 1991-2002 time series of total catch was recompiled for this assessment.

Seven alternative models are presented in the chapter, all of which follow the statistical age-structured approach that has been used for the last several years. All of these models give point estimates of 2004 age 3+ biomass in the range 8,710,000 t to 15,800,000 t. Concurring with the assessment authors, the Plan Team based its recommendations for 2004 on the reference model (Model 1), which is identical to last year's model. The current assessment provides results very similar to last year's assessment, with the main difference being that the current assessment's estimates of biomass tend to be slightly higher than last year's assessment (Figure 1.32).

The SSC has determined that reliable estimates of B_{MSY} and the probability density function for F_{MSY} exist for this stock, and that EBS walleye pollock therefore qualify for management under Tier 1. The senior assessment author continues to feel that the Tier 1 reference points are reliably estimated given the structure of the model, a conclusion with which the Plan Team concurs. The updated estimate of B_{MSY} from the present assessment is 2,470,000 t, compared to 2,290,000 t from last year's assessment. The projected spawning biomass for 2004 is 4,080,000 t, placing EBS walleye pollock in sub-tier "a" of Tier 1. This year's assessment uses a new method to compute the maximum permissible ABC for Tier 1a. The new method is more consistent with the Tier 1a formula and is based on the ratio between MSY and the equilibrium age 3+ biomass corresponding to MSY. The harmonic mean of this ratio (0.233) is multiplied by the geometric mean of the projected age 3+ biomass for 2004 (11,000,000 t) to obtain the maximum permissible ABC for 2004,

which is 2,560,000 t. This ABC is about 1% higher than the 2004 yield corresponding to an $F_{40\%}$ strategy. In each of the last two years, the senior assessment author, Plan Team, and SSC all recommended setting ABC at the maximum permissible value. This year, the senior author again recommends setting ABC at the maximum permissible value, a recommendation with which the Plan Team concurs.

Given that TAC will necessarily be set below the recommended ABC, the assessment also provides alternative harvest scenarios, including the seven standard scenarios analyzed in all age-structured assessments and two constant catch scenarios (1,300,000 t and 1,500,000 t).

The OFL harvest ratio under Tier 1a is 0.250, the arithmetic mean of the ratio between MSY and the equilibrium age 3+ biomass corresponding to MSY. The product of this ratio and the geometric mean of the projected age 3+ biomass for 2004 (11,000,000 t) is the OFL for 2004, which is 2,740,000 t.

Aleutians:

This year's assessment introduces 17 new models of the Aleutian Islands stock, all of which focus on the portion of the stock to the west of 174°W. Because none of these new models were presented at its September meeting, the Plan Team did not feel that they had been sufficiently reviewed to be accepted for management use at this time. However, the Plan Team believes that these models represent a step in the right direction and encourages their continued development.

Last year, the SSC determined that Aleutian pollock qualified for management under Tier 5. Because the Aleutian Islands were not surveyed this year, the best available biomass estimate is the estimate of 175,000 t from the 2002 bottom trawl survey. The maximum permissible for 2004 ABC is identical to the 2003 ABC of 39,400 t, which is the Plan Team's recommended ABC. The 2004 OFL is identical to the 2003 OFL of 52,600 t. As a Tier 5 stock, it is not possible to determine whether Aleutian pollock is overfished or whether it is approaching an overfished condition.

Bogoslof:

The 2003 hydroacoustic survey of the Bogoslof region resulted in a biomass estimate of 198,000 t. Last year, the SSC determined that Bogoslof pollock qualified for management under Tier 5. The maximum permissible ABC under Tier 5 is 75% of the product of the natural mortality rate (0.20) and biomass, giving a value of 29,700 t, which is the Plan Team's recommendation for 2004 ABC. For several years, the Plan Team has recommended setting ABC for this stock at the maximum permissible level while the SSC has used a much more conservative approach. If the formula used by the SSC is applied, the resulting fishing mortality rate is 0.014, giving a 2004 ABC of 2,570 t. The overfishing level under Tier 5 is the product of the natural mortality rate and biomass, giving an OFL of 39,600 t for 2004. As a Tier 5 stock, it is not possible to determine whether Bogoslof pollock is overfished or whether it is approaching an overfished condition.

Recommendations for next year's assessment:

In the new assessment model for the Aleutian Islands stock, the Plan Team suggests that the assessment authors consider computing ABC and OFL by using a survey-based expansion factor to convert the assessment results into quantities that include the portion of the stock to the east of 174°W.

Pacific Cod

Status and catch specifications (t) of **Pacific cod** 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 are current through 11/8/03.

<u>Area</u>	<u>Year</u>	<u>Age 3+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	2002	1,540,000	294,000	223,000	200,000	184,937
	2003	1,680,000	324,000	223,000	207,500	176,314
	2004	1,660,000	350,000	223,000	n/a	n/a

The present assessment is a straightforward update of last year's assessment, incorporating new catch and survey information. This year's EBS bottom trawl survey resulted in a biomass estimate of 606,000 t, down 2% from the 2002 estimate and near the minimum for the time series (534,000 t). The Aleutian Islands were surveyed in 2002. Biomass decreased 39% from 2000 and is the lowest value of the time series. Estimates of abundance are almost unchanged from the 2003 assessment. For example, estimated 2004 spawning biomass for the BSAI stock is 435,000 t, down about 1% from last year's F_{ABC} projection for 2004. The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, and that this stock therefore qualifies for management under tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 422,000 t, 0.39 and 0.47, respectively. The point estimates for $F_{40\%}$ and $F_{35\%}$ are substantially higher than the last two years' values. For example, $F_{40\%}$ was 0.35 in the 2003 assessment and 0.30 in the 2002 assessment. Pacific cod qualify for management under sub-tier "a" of tier 3 because projected biomass for 2004 is about 1% above $B_{40\%}$. Fishing at an instantaneous rate of 0.39 is projected to result in a 2004 catch of 297,000 t, which is the maximum permissible ABC under Amendment 56. The ABC for 2004 recommended by the authors is 223,000 t based on a constant catch approach. The 2004 ABC recommendation is the same as the 2002 and 2003 ABC value.

The Plan Team concurs with the authors recommendation to set 2004 ABC at 223,000 t, equal to the 2002 and 2003 ABC and 25% below the maximum permissible level. This ABC corresponds to a fishing mortality rate of 0.29, below the value of 0.39 which constitutes the upper limit on F_{ABC} under tier 3a. The Team is concerned about the overall decline in spawning biomass. Estimated spawning biomass declined substantially from 1988 to 1998, was stable from 1998 to 2001, and increased from 2001 to 2003. The Team also is concerned that Pacific cod abundance may be overestimated due to the assumed values of survey catchability and natural mortality and their interaction with the estimated parameters for growth and dome-shaped selectivity. Trawl catchability is assumed to equal 1, yet estimated age-3+ biomass is much greater than survey biomass (Figure 2.6). The model estimate of trawl survey selectivity is sharply dome-shaped (Table 2.23), implying that significant amounts of large cod are missed by the shelf trawl survey. However, the Plan Team is concerned that comparison of 2002 slope and shelf survey length data may not support this implication, meaning that the dome-shaped selectivity currently estimated for the shelf survey may not be due to large fish residing on the slope at the time of the survey.

The Plan Team's recommended OFL was determined from the tier 3a formula, where fishing at a rate of 0.47 gives a 2004 value of 350,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Recommendations for next year's assessment:

A fundamental challenge for the Pacific cod assessment is the lack of age data, which exacerbates the uncertainty in natural mortality, growth, and dome-shaped selectivity. Research has been completed on an appropriate method for ageing Pacific cod. The Team strongly recommends that production ageing of Pacific cod be given a high priority. The senior assessment author stated that one to two years of survey age data now are available. The Plan Team recommends that the assessment authors add this data to the assessment model. The Plan Team expects that adding this data will substantially reduce uncertainty of the model results.

The Team also recommends that the authors add their comparison of slope and shelf survey length data to the stock assessment model. The additional data provides information about the degree of dome-shape for the shelf survey compared to the slope survey and may improve the accuracy of the selectivity estimates.

Liz Conners (AFSC) described a cod tagging study that has been underway on a spawning concentration in the Unimak Pass area. Preliminary analyses of the tag recapture data are being conducted. The results of these analyses may provide abundance estimates from mark-recapture analyses and information about fish movement. The Plan Team finds the preliminary results (large numbers of tag returns) compelling and requests a report on the status of these studies and results in next year's assessment.

Area Allocation of Harvests

In this year's assessment, the assessment authors pointed out that the ABC of BSAI Pacific cod is not allocated by area. Pacific cod is something of an exception in this regard. The same multiplier (1.17) that is currently used to expand the results of the EBS assessment model into BSAI-wide amounts could be used to apportion the Pacific cod ABC between the EBS and AI management areas. If the 2004 ABC is set at 223,000 t, the EBS and AI portions under this approach would be 191,000 t and 32,000 t, respectively. An AI ABC of 32,000 t would be higher than the 2002 AI catch of 30,801 t and thus would not be expected to result in significant new constraints on the existing fishery. However, it would help to constrain future expansion in a precautionary manner until such time as a more rigorous apportionment methodology can be developed. The Plan Team concurs with the concerns raised by the authors. However this ABC split may have substantial implications for Pacific cod management and allocation. The Plan Team requests that the authors bring this issue back to next year's September Plan Team meeting in order to discuss completely the biological and management implications of the change before making a recommendation. The Plan Team also requests that the authors reexamine the basis for the multiplier used to expand the results of the EBS assessment model into BSAI-wide amounts.

Sablefish

Status and catch specifications (t) of **sablefish** 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 are current through 11/08/03.

<u>Area</u>	<u>Year</u>	<u>Age 4+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
EBS	2002	28,000	2,900	1,930	1,930	893
	2003	31,000	4,290	2,900	2,900	948
	2004	32,000	4,020	3,010	n/a	n/a
AI	2002	39,000	3,850	2,550	2,550	994
	2003	39,000	4,590	3,100	3,100	1,076
	2004	39,000	4,620	3,450	n/a	n/a

Sablefish abundance increased during the mid-1960s due to strong year classes from the late 1950s and 1960s. Abundance subsequently dropped during the 1970s due to heavy fishing; catches from the combined Bering Sea/Aleutians Islands/Gulf of Alaska stock peaked at 56,988 t in 1972. The population recovered due to exceptional year classes from the late 1970's; spawning abundance peaked again in 1987. The population then decreased as these exceptional year classes died off.

The survey abundance index decreased 7% from 2002 to 2003. This decrease follows recent increases, so that relative abundance in 2003 is 10% higher than in 2000. The fishery abundance index also generally increased and is 6% higher in 2002 than in 2000 (2003 data are not available yet).

Spawning biomass is projected to decrease slightly (<1%) from 2003 to 2004. Sablefish abundance is moderate; projected 2004 spawning biomass is 40% of unfished biomass. Abundance has increased from a low during 1998 to 2000. The 1997 year class is an important part of the total biomass and is projected to account for 31% of 2004 spawning biomass. Another year class could be above average, the 1998 year class, although not as strong as the 1997 year class.

The Plan Teams have recommended recent ABCs less than the maximum permissible because sablefish abundance has been low. Abundance now has increased to a moderate level. Abundance increased due to conservative quotas in previous years and the strong 1997 year class. The maximum permissible yield from an adjusted $F_{40\%}$ strategy is 25,400 t for 2004 for the combined BS, AI, and Gulf of Alaska stock. However the maximum permissible 2004 ABC would represent a substantial increase (22%) while abundance is projected to decrease slightly (1%). The Plan Teams recommend a 2004 ABC less than the maximum permissible, 23,000 t for the combined stock. The 23,000 t ABC is a moderate increase (10%) compared with the 2003 ABC of 20,900 t and was computed as 0.9 of the adjusted $F_{40\%}$ value.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualifies for management under tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 211,000 t (combined across the EBS, AI, and GOA), 0.131, and 0.161, respectively. Projected spawning biomass (combined areas) for 2004 is 210,000 t, placing sablefish in sub-tier "b" of Tier 3. The maximum permissible value of F_{ABC} under Tier 3b is computed as follows:

$$F_{ABC} \leq F_{40\%} \times (B_{2004}/B_{40\%} - 0.05)/(1 - 0.05) = 0.131 \times (210,000/211,000 - 0.05)/0.95 = 0.13$$

A fishing mortality rate of 0.13 translates into a 2004 catch (combined areas) of 25,400 t, which would be the maximum permissible ABC under Amendment 56. The Plan Team’s recommended 2004 ABC is 23,000 t and corresponds to $F = 0.112$. A 5-year exponential weighting of longline survey relative abundance may be used to apportion the combined 2004 ABC among regions, resulting in the following values: EBS–3,010 t, AI–3,450 t, and GOA–16,550 t.

The OFL fishing mortality rate is computed under Tier 3b as follows:

$$F_{OFL} = F_{35\%} \times (B_{2004}/B_{35\%} - 0.05)/(1 - 0.05) = 0.161 \times (210,000/211,000 - 0.05)/0.95 = 0.16$$

A fishing mortality rate of 0.16 translates into a 2004 OFL (combined areas) of 30,800 t. Using the survey-based apportionment scheme described above, 2003 OFL also may be apportioned among regions and results in the following values: EBS–4,020 t, AI–4,620 t, and GOA–22,160 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Yellowfin Sole

Status and catch specifications (t) of **yellowfin sole** 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 are current through 11/08/03.

<u>Area</u>	<u>Year</u>	<u>Age 2+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	2002	1,600,000	136,000	115,000	86,000	74,711
	2003	1,550,000	136,000	114,000	83,750	78,738
	2004	1,560,000	135,000	114,000	n/a	n/a

The present assessment is a straightforward update of last year’s assessment, including incorporation of new catch and survey information. This year’s EBS bottom trawl survey resulted in a biomass estimate of 2,280,000 t, an increase of 14% from last year’s survey. As in last year’s assessment, the authors allowed their estimate of survey catchability to differ from 1.0 and included a temperature effect.

Reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, thereby qualifying yellowfin sole for management under tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 390,000 t, 0.12, and 0.14, respectively. Given that the projected 2004 spawning biomass of 446,000 t exceeds $B_{40\%}$, the Plan Team’s ABC and OFL recommendations for 2004 were calculated under sub-tier “a” of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.12) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2004 ABC of 114,000 t.

The Plan Team’s OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.14 gives a 2004 OFL of 135,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

The yellowfin sole stock had been declining since the mid-1980s, due to the low recruitment in the last decade. However, the stock may be more stable in the near future, due in part to a possibly above average 1995 year class.

In response to SSC recommendations, the authors analyzed stock-recruitment data to consider assessment of yellowfin sole under Tier 1. The authors fit a Ricker stock-recruitment curve using two different time-series of data (1954-1999 and 1978-1999) inside the model. However, the assessment authors had concerns about the reliability of the stock-recruitment fit due to changes in the Ricker stock-recruitment parameters when using different time-series. The Plan Team also had concerns about the current estimates of the stock-recruitment relationship. Unlike the stock-recruitment data for EBS walleye pollock, the stock-recruitment data for yellowfin sole do not bracket the model's estimate of B_{MSY} . The Plan Team therefore concluded that management of this stock under Tier 1 is not advisable at this time.

Greenland turbot

Status and catch specifications (t) of **Greenland turbot** 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 are current through 11/08/03.

<u>Year</u>	<u>Area</u>	<u>Age 1+ Bio.</u>	<u>OFL</u>	<u>Subarea</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
2002	BSAI	208,000	36,500				
				EBS	5,400	5,333	3,011
				AI	2,700	2,667	3,153
2003	BSAI	112,000	17,800				
				EBS	3,920	2,680	2,368
				AI	1,960	1,320	649
2004	BSAI	132,000	19,300				
				EBS	3,162	n/a	n/a
				AI	1,578	n/a	n/a

This year's model incorporated new catch and length frequency data from the fishery. It also included an aggregated longline survey index and updated trawl survey information on biomass and length frequency data. Biomass and size composition data were also included from the EBS slope survey. Reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock. Updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 58,800 t, 0.26, and 0.32, respectively. Projected spawning biomass for 2003 is 69,300 t. Greenland turbot therefore qualify for management under Tier 3a. The maximum permissible value of F_{ABC} under this tier translates into a 2004 catch of 15,700 t.

The Plan Team agrees with the authors' recommendation to set the 2004 ABC at a value less than the maximum permissible. Using $F_{ABC} = 5$ -year average results in a 2004 ABC of 4,740 t corresponding to a full selection fishing mortality rate of 0.07. The Plan Team agrees with the authors' recommendation to apportion the ABC by area on the basis of relative survey biomass, giving an EBS ABC of 3,162 t and an AI ABC of 1,578 t. The OFL fishing mortality rate is computed under Tier 3a, $F_{OFL} = F_{35\%} = 0.32$, and translates into a

2004 OFL of 19,300 t. The Team is concerned about further stock declines and the continued lack of recruitment.

Recommendations for next year's assessment:

The Plan Team and authors acknowledged large uncertainties in the assessment. Additional slope trawl surveys are needed to improve measurement of abundance trend and estimates of biomass. Furthermore, little is known about the early life history for this species. Research in this area should be supported and could add greatly to our understanding of Greenland turbot population dynamics.

Arrowtooth flounder

Status and catch specifications (t) of **arrowtooth flounder** 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 are current through 11/08/03.

<u>Area</u>	<u>Year</u>	<u>Age 1+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	2002	671,000	137,000	113,000	16,000	11,540
	2003	597,000	139,000	112,000	12,000	12,556
	2004	696,000	142,000	115,000	n/a	n/a

The present assessment introduced catchability as a function of average bottom temperature during the EBS shelf trawl survey and the use of EBS shelf trawl survey sex ratios as prior information to evaluate the estimate of male natural mortality. This year's EBS shelf bottom trawl survey resulted in a biomass estimate of 554,000 t, a 56% increase relative to last year's estimate, but only 26% larger than the 2001 EBS shelf bottom trawl survey.

More female arrowtooth flounder are caught than males. A model was developed this year in which a prior distribution was placed on the stock sex ratio, based on the sex ratio observed in the EBS shelf trawl survey. Alternative values for the male natural mortality rate were examined. The male natural mortality rate that provided the best fit was 0.32. As in past assessments, the female natural mortality rate was fixed at 0.2.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, thereby qualifying arrowtooth flounder for management under Tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 249,000 t, 0.28, and 0.36, respectively. Given that the projected 2004 spawning biomass of 503,000 t exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2004 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.28) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2004 ABC of 115,000 t.

The OFL fishing mortality rate under Tier 3a is $F_{35\%}$ (=0.36), translating into a 2004 OFL of 142,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Currently, the arrowtooth flounder fishery is not a directed fishery in the BSAI. It was noted by the authors that arrowtooth flounder has a fairly high discard rate (> 50%).

Rock sole

Status and catch specifications (t) of **rock sole** 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 are current through 11/08/03.

<u>Area</u>	<u>Year</u>	<u>Age 2+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	2002	1,850,000	268,000	225,000	54,000	41,621
	2003	877,000	132,000	110,000	44,000	35,832
	2004	1,160,000	166,000	139,000	n/a	n/a

Changes to the input data in this analysis include addition of 2002 fishery age composition, 2002 survey age composition, and 2003 trawl survey biomass point estimate and stand error. This year's bottom trawl survey resulted in a biomass estimate of 2,140,000 t, a 12% increase over last year's estimate of 1,900,000 t.

In 2002, the Plan Team recommended that the authors include experimental data pertaining to catchability in future analyses instead of relying solely on model fits. Therefore the authors continued the investigations of catchability (q) which they began in 2002. Prior to 2002, modeling assumed a catchability (q) of 1.0. Last year's assessment used a catchability (q) of 1.82 based on the fit of the age analysis. The result of increasing q was that the estimates of abundance were approximately half of the previously estimated values, as reflected in the table above (compare 2002 age 2+ biomass to 2003 age 2+ biomass). In this year's assessment, the authors used a value of 1.4 obtained from a trawl "herding" experiment as the mean of a prior distribution on q . The new assessment gives a q estimate of 1.45. This results in estimates of total and female spawning biomass that are higher than last year's estimates but still lower than previous estimates. Biomass of rock sole is expected to decline over the next few years.

Reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, meaning that this stock qualifies for management under Tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 203,000 t, 0.17, and 0.21, respectively. Given that the projected 2004 spawning biomass of 425,000 t exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2004 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.17) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2004 ABC of 139,000 t.

The Plan Team's OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.21 gives a 2004 OFL of 166,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

The authors responded to a request by the SSC to examine rock sole for possible management under Tier 1. In the case of rock sole, the time series of recruitment estimates from this assessment is 28 years. In the stock assessment model, a Ricker form of the stock-recruit relationship was fit to these data. Very different estimates of F_{MSY} and B_{MSY} were obtained depending on which years of data were included. Recent research indicates a decadal scale shift in atmospheric forcing, which affects the recruitment of rock sole. Given these concerns, the authors plan to perform a simulation study to determine the appropriateness of applying a harvest strategy resulting from fitting the full time series for a fish stock experiencing temporal changes in

reproductive potential due to changing oceanic conditions. Therefore, management under Tier 1 is not recommended at the present time.

Flathead Sole

Status and catch specifications (t) of **flathead sole** 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 are current through 11/08/03.

<u>Area</u>	<u>Year</u>	<u>Age 3+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	2002	695,000	101,000	83,000	25,000	15,419
	2003	550,000	81,000	66,000	20,000	14,053
	2004	505,000	75,200	61,900	n/a	n/a

For the most part, the present assessment is a straightforward update of last year's, incorporating new catch, discard, survey biomass, length composition, and age composition data. This year's survey biomass estimate of 530,000 t was about 8% lower than last year's survey biomass estimate of 575,000 t. Survey biomass has been relatively stable over the past three years compared to the decrease observed from 1998-2000. A change in methodology for this year's assessment investigated the relationship between temperature anomalies and survey biomass anomalies and the survey catchability coefficient was modeled as a function of temperature anomalies. This addition had an effect on survey biomass estimates since 1998, during which time temperature fluctuations were greater.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, thereby qualifying it for management under Tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 119,000, 0.30, and 0.37, respectively. Given that the projected 2004 spawning biomass of 205,000 t exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2004 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.30) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2004 ABC of 61,900 t. The Plan Team's OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.37 gives a 2004 OFL of 75,200 t.

Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Alaska plaice

Status and catch specifications (t) of **Alaska plaice** 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 are current through 11/08/03.

<u>Area</u>	<u>Year</u>	<u>Age 3+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	2002	1,110,000	172,000	143,000	30,000	12,291
	2003	1,080,000	165,000	137,000	10,000	9,896
	2004	1,050,000	258,000	203,000	n/a	n/a

Note: Biomass for 2002-2003 represents age 1+.

This is the second year in which Alaska plaice has been evaluated as a separate species as opposed to the principal component of the “other flatfish” species group. Minor changes in this year’s assessment include adjusting the initial year of the model from 1971 to 1975, changing the age of recruitment in the model from age 1 to age 3 because of limited ages-1 and -2 data, inclusion of the 2003 trawl survey biomass estimate and standard error, updating of the 2002 catch data, and inclusion of fishery catch through September 2003.

There was one major change in the assessment methodology and input data that affected this analysis. In the past, the model used age/length keys based on survey data and applied them to the fishery. The most significant change in the model was the construction of a matrix to convert modeled numbers at age to numbers at length, thus enabling the authors to use length-frequency data as input. This permitted inclusion of 12 years of survey length composition data and 19 years of length data from the fishery. The authors tested the stability of the age/length curve over time and validated the use of a single age/length key. The inclusion of the new age data affected the survey and fishery selectivity curves. There was little change in the survey selectivity, with an age at 50% selection of 9.7 years. However, there was a large change in the age at 50% selection in the fishery selectivity curve from 8.5 years to 10.3 years. The size of the fish (33 cm) at 50% selection is similar to the size at 50% selection for flathead sole (35 cm), implying that the gear is acting similarly on the two species. The change in fishery selectivity doubles the value of F_{40} from 0.28 in last year’s assessment to 0.57 in this year’s assessment. Additionally, the authors investigated the effect of bottom water temperature on the catchability of Alaska plaice. No correlation was found and survey catchability remained fixed at a value of 1.0.

Reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, therefore qualifying it for management under Tier 3. The updated point estimates are $B_{40\%} = 132,000$ t, $F_{40\%} = 0.57$, and $F_{35\%} = 0.78$. Given that the projected 2004 spawning biomass of 261,000 t exceeds $B_{40\%}$, the Plan Team’s ABC and OFL recommendations for 2004 were calculated under sub-tier “a” of Tier 3. Projected harvesting at the $F_{40\%}$ level gives a 2004 ABC of 203,000 t. The Plan Team’s OFL was determined from the Tier 3a formula, where projected harvesting at $F_{35\%}$ gives a 2004 OFL of 258,000 t. Though the newly calculated selectivity indices resulted in a 48% increase in ABC over 2003, the Plan Team concurred with the authors that this is not a matter of concern. The sensitivity of the spawning-per-recruit fishing reference points to the change in fishing selectivity is not unexpected, given that the age at 50% maturity is approximately 8.5 and the natural mortality rate (0.25) is relatively large compared to other flatfish. Because the age at 50% selection in the fishery is 10.3, Alaska plaice has the potential to spawn twice before it is recruited to the fishery. Additionally, the high

natural mortality of 0.25 indicates that the lifetime spawner per recruit potential is rapidly reducing at the ages of highest fishing selectivity. Recruitment has been stable from the late 1970s through present.

Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Other flatfish complex

Status and catch specifications (t) of **other flatfish** in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. Alaska plaice were removed from the other flatfish category and into its own category in 2002. Because previous analysis of other flatfish was based on Alaska plaice, only one year of prior history exists for the current species complex. The OFL and ABC for 2004 are those recommended by the Plan Team. Catch data are current through 11/08/03.

<u>Area</u>	<u>Year</u>	<u>Age 1+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	2003	107,000	21,400	16,000	3,000	2,818
	2004	90,300	18,100	13,500	n/a	n/a

With the removal of Alaska plaice from this category last year, the “other flatfish” complex consists of Dover sole, rex sole, longhead dab, Sakhalin sole, starry flounder, and butter sole in the EBS and Dover sole, rex sole, starry flounder, butter sole, and English sole in the AI. Starry flounder, rex sole, and butter sole comprise the vast majority of the species landed. For example, Starry flounder and rex sole comprised 85% of the “other flatfish” catch in 2003.

Because of insufficient information about these species, no model analyses are possible. The assessment incorporates 2002 total catch and discard, catch through 20 September 2003, and 2003 trawl survey information. The 2003 EBS bottom trawl survey resulted in biomass estimates of 90,300 t, an 8% decrease from the estimate of 97,900 t in the 2002 survey.

Prior to last year, “other flatfish” had been classified as Tier 4, using the $F_{35\%}$ and $F_{40\%}$ rates for flathead sole as proxies. In 2002, the Plan Team concluded that these fishing mortality reference points may not apply to the species in the “other flatfish” complex due to the variability in natural mortality and other life-history characteristics among flatfish species, and recommended reclassification of “other flatfish” as a Tier 5 species complex with an assumed natural mortality rate of 0.2.

The Plan Team recommends setting F_{ABC} at the 0.75 M level (=0.15), which is the maximum permissible level under Tier 5. Projected harvesting at the 0.75 M level gives a 2004 ABC of 13,500 t. The Plan Team recommends an F_{OFL} value of 0.20, giving a 2004 OFL of 18,100 t. It is not possible to determine whether the “other flatfish” complex is overfished or approaching an overfished condition because it is managed under Tier 5.

Pacific ocean perch (POP)

Status and catch specifications (t) of **Pacific ocean perch**. Biomass 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 are current through 11/08/03.

<u>Year</u>	<u>Area</u>	<u>Age 3 +</u>	<u>OFL</u>	<u>Subarea</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
2002	BSAI	377,000	17,500				
				EBS	2,620	2,620	639
				Eastern AI	3,460	3,460	2,570
				Central AI	3,060	3,060	2,966
				Western AI	5,660	5,660	5,039
2003	BSAI	375,000	17,900				
				EBS	2,410	1,410	1,196
				Eastern AI	3,500	3,500	3,934
				Central AI	3,340	3,340	3,120
				Western AI	5,850	5,850	6,395
2004	BSAI	349,000	15,800				
				EBS	2,128	n/a	n/a
				Eastern AI	3,059	n/a	n/a
				Central AI	2,926	n/a	n/a
				Western AI	5,187	n/a	n/a

The present assessment is a straightforward update of last year's assessment, including incorporation of revised 2002 harvest levels, 2002 survey age compositions, and Aleutian Islands fishery length compositions.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, thereby qualifying Pacific ocean perch for management under Tier 3. The current estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ are 130,000t, 0.048, and 0.057, respectively. Projected spawning biomass for 2004 is 123,000 t, placing POP in sub-tier "b" of Tier 3. The maximum F_{ABC} value allowed under Tier 3b is computed as follows:

$$F_{ABC} \leq F_{40\%} \times (B_{2004} / B_{40\%} - 0.05) / (1 - 0.05) = 0.048 \times (123,000 / 130,000 - 0.05) / 0.95 = 0.045$$

Projected harvesting at a fishing mortality rate of 0.045 gives a 2004 ABC of 13,300 t, which is the authors' and Plan Team's recommended ABC. The team concurs with the authors' recommendation that ABCs be set regionally based on the 2002 apportionment as follows: BS = 2,128 t, Eastern Aleutians (Area 541) = 3,059 t, Central Aleutians (Area 542) = 2,926 t, Western Aleutians (Area 543) = 5,187 t.

The OFL fishing mortality rate is computed under Tier 3b as follows:

$$F_{OFL} = F_{35\%} \times (B_{2004} / B_{40\%} - 0.05) / (1 - 0.05) = 0.057 \times (123,000 / 130,000 - 0.05) / 0.95 = 0.054$$

Projected harvesting at a fishing mortality rate of 0.054 gives a 2004 catch of 15,800 t, which is the authors' and Plan Team's recommended OFL for the BSAI. The OFL for BSAI is not regionally apportioned. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Northern Rockfish

Status and catch specifications (t) of **Northern rockfish**. 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 is reported through 11/08/03.

<u>Year</u>	<u>Area</u>	<u>Age 3+ Bio.</u>	<u>OFL</u>	<u>Subarea</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
2002	BSAI	150,000	9,020		6,760		
				BS		19	109
				AI		6,741	3,951
2003	BSAI	156,000	9,468		7,101		
				BS		121	74
				AI		5,879	4,828
2004	BSAI	142,000	8,140				
				BS	19	n/a	n/a
				AI	6,861	n/a	n/a

Note: Biomass for 2002-2003 represents survey biomass.

Through 2000, the other red rockfish complex was split into northern/sharpchin and rougheye/shortraker groups in the AI, with a combined “other red rockfish” group for the eastern Bering Sea. In 2002, sharpchin rockfish was moved into the other rockfish complex. In 2003, northern rockfish and shortraker/rougheye rockfishes were separated from the complex (which is no longer used).

The author used an age-structured model for BSAI northern rockfish for the first time, using age data from the Aleutian Island trawl survey. The Plan Team recommends that this stock, which has previously been managed under Tier 5, now be managed under Tier 3 due to the availability of reliable estimates for $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (26,900 t, 0.059, and 0.070 respectively). Since the female spawning biomass (43,700 t) is greater than $B_{40\%}$, sub-tier “a” would be applicable. Under Tier 3a, the maximum permissible ABC would be 6,880 t, which is the authors’ and Plan Team’s recommendation for the 2004 ABC. The Plan Team concurs with the authors’ recommendation to apportion this ABC between the EBS and AI, with 6,861 t in the Aleutian Islands and 19 t in the Eastern Bering Sea.

Under Tier 3a, the 2004 OFL would be 8,140 t for the Bering Sea/Aleutian Islands combined. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Shortraker/Rougheye Rockfish

Status and catch specifications (t) of **shortraker/rougheye** 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 are current through 11/08/03.

<u>Species or complex</u>	<u>Year</u>	<u>Area</u>	<u>Survey Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>Subarea</u>	<u>TAC</u>	<u>Catch</u>
shortraker/rougheye	2002	BSAI	48,000	1,000	1,000			
						EBS	116	99
						AI	912	474
shortraker/rougheye	2003	BSAI	45,200	1,290	967			
						EBS	137	112
						AI	830	298
shortraker	2004	BSAI	23,400	701	526		n/a	n/a
rougheye	2004	BSAI	10,400	259	195		n/a	n/a

Through 2000, the other red rockfish complex was split into northern/sharpchin and rougheye/shortraker groups in the AI, with a combined “other red rockfish” group for the eastern Bering Sea. In 2002, sharpchin rockfish was moved into the other rockfish complex. In 2003, northern rockfish and shortraker/rougheye rockfishes were separated from the complex (which is no longer used).

In 2001, the Plan Team, SSC, AP, and Council recommended separating shortraker and rougheye rockfish species and setting BSAI area-wide ABCs and TACs for 2002. However, NMFS was unable to implement those recommendations because of the difficulty of identifying shortraker and rougheye rockfishes to species. NMFS established separate BS and AI TACs for northern rockfishes and separate BS and AI TACs for the combined shortraker/rougheye rockfishes category.

Staff with the NMFS Regional Office and Observer Program have developed a catch accounting program that will be able to identify shortraker and rougheye rockfishes to species for the first time in 2004. The Plan Team continues to support single species management for this complex and recommends separate shortraker and rougheye OFLs and ABCs for 2004.

The SSC has previously determined that reliable estimates of biomass and natural mortality exist for the stocks in this complex, thereby qualifying shortraker rockfish and rougheye rockfish for management under Tier 5. This year’s chapter features an assessment model for the first time. At present, the model’s chief benefit is that it provides an improved estimate of biomass. In the future, it is possible that the new model will permit management of these stocks in a higher tier. At the present time, the Plan Team recommends that the SSC retain Tier 5 management for these stocks. The Plan Team recommends setting F_{ABC} at the maximum permissible level under Tier 5, which is 75% of M . Accepted values for M for these stocks are: rougheye rockfish--0.025, shortraker rockfish--0.030.

The Plan Team agrees with the authors' recommendations of a combined BSAI 2004 OFL and ABC for shortraker rockfish of 700 t and 526 t and a combined BSAI 2004 OFL and ABC for rougheye rockfish of 259 t and 195 t. The Team noted that management of these small OFLs will be challenging. These species are not targeted but are harvested incidentally in numerous target fisheries.

It is not possible to determine whether these species are overfished or whether they are approaching an overfished condition because they are managed under Tier 5.

Other Rockfish Complex

Status and catch specifications (t) of **other rockfish** (primarily thornyheads) 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 are current through 11/08/03.

<u>Area</u>	<u>Year</u>	<u>Survey Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
EBS	2002	6,880	482	361	361	398
	2003	18,300	1,280	960	960	314
	2004	18,300	1,280	960	n/a	n/a
AI	2002	12,900	901	676	676	547
	2003	12,100	846	634	634	393
	2004	12,100	846	634	n/a	n/a

The BSAI "Other Rockfish" complex formerly consisted of 28 *Sebastes* and *Sebastolobus* species, but now considers only the 8 species that have been caught at least once during AFSC research surveys or appeared in more than 1% of observed fishery hauls between 1990 and 2001. This year's assessment includes updated catches in the EBS and AI, updated length frequency data and analyses of growth of light dusky rockfish and shortspine thornyheads, and maps and analyses of light dusky rockfish catch in localized areas of the EBS and AI; *there are no new survey data for BSAI "Other Rockfish."* The authors recommend assigning a separate ABC and OFL to shortspine thornyheads and leaving the remaining 7 rockfish species within the other rockfish complex. This recommendation was based on the fact that shortspine thornyheads are the most abundant and valuable species in the complex and inhabit deeper regions of the shelf and slope than the others. The authors recommend using Tier 5 criteria to assign separate ABCs and OFLs in the EBS and AI for shortspine thornyheads (using the 5-year survey average for biomass and $M=0.07$), and using Tier 6 (average catch from 1998-2002) criteria for the remaining species in the "Other Rockfish" complex. While the Plan Team believes that this general approach has promise, the Plan Team did not endorse this method for recommending ABCs and OFLs for BSAI Other Rockfish in 2004 because of the lack of time for review and public comment on the proposal. The Plan Team recommends that the author propose essentially the same method in September 2004 for the 2005 specification process, but with the following changes: the Plan Team recommends that Tier 5 criteria be used to assign separate ABCs in the EBS and AI and a combined BSAI OFL for shortspine thornyhead, and that Tier 6 criteria be used to do the same for the remaining species in the complex; splitting ABCs between areas while assigning a BSAI-wide OFL would be consistent with the management of most other BSAI rockfish species.

For 2004 BSAI “Other Rockfish” ABC and OFLs, the Plan Team recommends that the method used last year be retained. The SSC has determined that a reliable estimate of the natural mortality rate exists for this complex, thereby qualifying “other rockfish” for management under Tier 5. The Plan Team recommends setting F_{ABC} at the maximum value allowable under Tier 5, which is 75% of M (0.07), or 0.053. Multiplying this rate by the best estimate of complex-wide biomass gives a 2004 ABC of 960 t in the EBS and 634 t in the Aleutian Islands.

The Plan Team’s recommended OFLs are based on the Tier 5 formula, giving a 2004 OFL of 1,280 t in the EBS and 846 t in the AI. It is not possible to determine whether the “other rockfish” complex is overfished or whether it is approaching an overfished condition because it is managed under Tier 5.

Atka mackerel

Status and catch specifications (t) of **Atka mackerel** 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 are current through 11/08/03.

<u>Area</u>	<u>Year</u>	<u>Age 3+ Bio.</u>	<u>OFL</u>	<u>Subarea</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	2002	440,000	82,300	EBS/541	5,500	5,500	4,925
				Area 542	23,800	23,800	22,291
				Area 543	19,700	19,700	18,077
	2003	358,000	99,700	EBS/541	10,650	10,650	11,425
				Area 542	29,360	29,360	28,112
				Area 543	22,990	19,990	18,938
	2004	286,000	78,500	EBS/541	11,240	n/a	n/a
				Area 542	31,100	n/a	n/a
				Area 543	24,360	n/a	n/a

The present assessment is an update of the assessment introduced in 2002 that utilized the NMFS “Stock Assessment Toolbox.” Additions of data relative to last year include catch updates as well as the 2002 fishery age composition. The author explored assumptions relative to survey catchability (q) and natural mortality (M) but results were problematic and a model with fixed values of q and M was used by the authors for stock assessment.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$ and $F_{35\%}$ exist for this stock, thereby qualifying Atka mackerel for management under Tier 3. The current estimates of $B_{40\%}$, $F_{40\%}$ and $F_{35\%}$ are 83,800 t, 0.67, and 0.83, respectively. Projected spawning biomass for 2004 is 86,000 t, placing Atka mackerel in sub-tier “a” of Tier 3. The assessment authors recommend setting F_{ABC} at the maximum permissible level, which would give a 2004 ABC of 66,700 t. The Plan Team agrees with the author’s recommendation.

The Plan Team also noted the “ABC Considerations” listed by the author. Some of these considerations are positive (the model is conservative relative to survey biomass estimates; 2002 age data reveal the presence

of a relatively strong 1999 year class along with the 1998 year class) while others are negative (spawning biomass is projected to be below $B_{40\%}$ by 2005; there is high uncertainty in the trawl survey biomass estimates and in the estimate of 2004 $F_{40\%}$ catch).

To apportion ABCs among areas, the authors used a weighted average of the 4 most recent survey estimates of the biomass distribution, where the greatest weight is assigned to the 2002 survey. When applied to the recommended ABC of 66,700 t, this formula gives the following subarea-specific ABCs: Eastern Bering Sea and Eastern Aleutians = 11,240 t (16.8%), Central Aleutians = 31,100 t (46.6%), Western Aleutians = 24,360 t (36.5%). The Plan Team concurs with this recommended apportionment.

The OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.83 gives a 2004 OFL of 78,500 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Recommendations for next year's assessment:

The Plan Team recommends that in future assessments, catch histories relative to Steller sea lion critical habitat be included along with the cumulative probability that projected female spawning biomass will drop below $B_{20\%}$ and $B_{40\%}$ reference points under the recommended harvest strategy.

Squid and Other Species Complex

Status and catch specifications (t) of **squid and other species** (sharks, skates, sculpins, octopus) 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 are current through 11/08/03.

Squid

<u>Area</u>	<u>Year</u>	<u>Biomass</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	2002	n/a	2,620	1,970	1,970	891
	2003	n/a	2,620	1,970	1,970	1,274
	2004	n/a	2,620	1,970	n/a	n/a

Other species

<u>Area</u>	<u>Year</u>	<u>Survey Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	2002	667,000	78,900	39,100	30,825	28,607
	2003	695,000	81,100	43,300	32,309	25,437
	2004: sharks	29,300	2,640	1,980	n/a	n/a
	2004: skates	484,000	48,400	36,300	n/a	n/a
	2004: sculpins	212,000	31,800	23,800	n/a	n/a
	2004: octopus	4,980	1,490	1,120	n/a	n/a

The SSC has determined that a reliable catch history from 1978 through 1995 exists for squid, thereby qualifying this stock complex for management under Tier 6. Under Tier 6, OFL is set equal to the average catch from 1978 through 1995 unless an alternative value is established by the SSC on the basis of the best available scientific information, and ABC is constrained to be no greater than 75% of OFL. The average squid catch from 1978 through 1995 was 2,620 t, which is the Plan Team's recommended OFL. The maximum

permissible value of ABC for 2004 therefore is 1,970 t, which is the Plan Team's recommended value. It is not possible to determine whether the squid complex is overfished or whether it is approaching an overfished condition because it is managed under Tier 6.

The SSC has determined that reliable estimates of the natural mortality rate and biomass exist for all major components of the "other species" complex, thereby qualifying this complex for management under Tier 5. The Plan Team agrees that Tier 5 is the appropriate classification for all four component species groups. The Plan Team recommends that the natural mortality rates for sharks, skates, sculpins and octopus be estimated at values of 0.09, 0.10, 0.15 and 0.30, respectively, and that biomass be estimated by summing the average biomass estimates from the last 10 years for the EBS shelf trawl survey, the EBS slope trawl survey (where only 1 survey has taken place in the last 10 years), and the AI trawl survey.

The Plan team agrees with the stock assessment author's recommendation for setting group-specific ABCs and the author's recommendation that use of the complex-level "other species" ABC be discontinued. The Plan Team's recommended 2004 ABCs for the four groups constituting the "other species" complex are: sharks-1,980 t, skates-36,300 t, sculpins-23,800 t, and octopus-1,120 t, which are the maximum permissible values under Tier 5. The Plan Team discussed whether there was a legal impediment to separating the complex into its group components and encourages the development of a plan amendment to do so, if needed. If it is not possible to set group-specific ABCs in 2004, the Plan Team recommends that the "other species" complex be placed on bycatch-only status.

The Plan team also agrees with the stock assessment author's recommendation for setting group-specific OFLs and the author's recommendation that use of the complex-level "other species" OFL be discontinued. The Plan Team's recommended 2004 OFLs for the four groups constituting the "other species" complex are: sharks-2,640 t, skates-48,400 t, sculpins-31,800 t, and octopus-1,490 t, which are the values under obtained under the Tier 5 formula. It is not possible to determine whether the "other species" complex is overfished or whether it is approaching an overfished condition because it is not managed under Tiers 1-3.

Appendix A: 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 (Appendix A).

The IPHC recommendations are included in the summary table below. 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 BSAI, six decreased, five increased, and four did not change.

The DMRs in a couple of fisheries demonstrated large changes, i.e., ≥ 5 percentage points. BSAI trawl rockfish increased from 69 to 74%, largely due to high DMRs in 1999-2001. BSAI longline rockfish declined

from 25% to 16% on the strength of lower DMRs since 2000. The fishery is fairly small, contributing to highly variable DMRs.

CDQ trawl effort in 2002 was focused on pollock, Atka mackerel, and yellowfin sole. For Atka mackerel and the two pollock targets, viability data have been collected for four and five years, respectively. We calculated the mean DMR for these targets, and recommend that the 2004 Atka mackerel and pollock CDQ trawl fisheries be managed using these mean DMRs. CDQ fishing for yellowfin sole fishery has been sporadic, occurring only twice in the past four years. In cases like this, we recommend that 2004 fishing be managed using the most recent data point until three years of DMR data have been collected, at which time an average would be used. Any remaining targets that occur in 2004 should be managed using the revised open access long-term means for 1993-2002.

Appendix B: Prohibited Species Catch in 2003

Appendix B contains information on the bycatch of prohibited species in the groundfish fisheries conducted in the Bering Sea/Aleutian Islands management area (BSAI). Based on the 2003 estimate of effective spawning biomass (60.7 million pounds), and the 3,000 crab reduction for Amendment 57, the PSC limit for 2004 will be 197,000 red king crabs. Based on 2003 abundance and the Amendment 57 adjustment, the PSC limit for *C. bairdi* in 2004 will be 980,000 crabs in Zone 1 and 2,970,000 crabs in Zone 2. Based on the 2003 survey estimate of 2.63 billion crabs, the 2004 *opilio* crab PSC limit will be 4,350,000 crabs. The halibut PSC amounts have been 3,775 mt for trawl and 900 mt for hook & line gear. As part of Amendment 57, the trawl PSC amount is reduced by 100 mt to reflect the prohibition on the use of bottom trawl gear in the pollock fishery. The herring PSC limit is set at 1% of stock biomass. The bycatch limit for 2004 fisheries will be set at 29,000 chinook salmon.

Recommended Pacific halibut discard mortality rates (DMRs) for calculating bycatch mortality in the 2004-2006 groundfish fisheries off Alaska.

Bering Sea/Aleutians			Gulf of Alaska		
Gear/Target	Used In 2001-2003	Recommendation for 2004-2006	Gear/Target	Used In 2001-2003	Recommendation for 2004-2006
<i>Trawl</i>			<i>Trawl</i>		
Atka mackerel	76	78	Atka mackerel	70	60
Bottom pollock	76	76	Bottom pollock	61	59
Pacific cod	68	68	Pacific cod	61	61
Other Flatfish	71	71	Deep wtr flats	60	57
Rockfish	69	74	Shallow wtr flats	69	68
Flathead sole	67	67	Rockfish	69	67
Pelagic pollock	84	85	Flathead sole	58	62
Rock sole	76	77	Pelagic pollock	72	75
Sablefish	50	49	Sablefish	66	62
Turbot	70	72	Arrowtooth fldr	62	69
Yellowfin sole	81	78	Rex sole	62	62
<i>Pot</i>			<i>Pot</i>		
Pacific cod	9	8	Pacific cod	14	17
<i>Longline</i>			<i>Longline</i>		
Pacific cod	12	11	Pacific cod	14	13
Rockfish	25	16	Rockfish	8	8
Turbot	16	15			
	Used in 2002	Recommendation for 2004			
<i>CDQ Trawl</i>					
Atka mackerel	80	85			
Bottom pollock	90	85			
Flathead sole	90	90			
Pelagic pollock	89	89			
Rockfish	90	90			
Yellowfin sole	81	82			
<i>CDQ Longline</i>					
Pacific cod	11	11			
Turbot	-	4			
<i>CDQ Pot</i>					
Pacific cod	2	2			
Sablefish	46	36			

Table 1-- Species categories established for management of the Bering Sea/Aleutian Islands groundfish fishery.

Prohibited Species ^a	Target Species ^b	Other Species ^c	Forage Fish
<u>FINFISHES</u>			
Salmon	Walleye pollock	Sculpins	Eulachon
Pacific halibut	Pacific cod	Sharks	Capelin
Pacific herring	Yellowfin sole	Skates	Sandlance
Steelhead trout	Greenland turbot		Myctophids
	Arrowtooth flounder		Bathylagids
	Rock sole		Sandfish
	Flathead sole		Pholids
	Other flatfish		Stichaeids
	Sablefish		Gonostomatids
	Pacific ocean perch		
	Other red rockfish		
	Other rockfish		
	Atka mackerel		
<u>INVERTEBRATES</u>			
King crab	Squid	Octopus	
Tanner crab			

a. Species which must be returned to the sea when caught.

b. Species for which an individual TAC is established.

c. Species for which an aggregate TAC is established.

A nonspecified species category is also established to cover all species not listed above.

Table 2. Groundfish and squid catches (metric tons) in the eastern Bering Sea, 1954-2002.

Year	Pollock	Pacific Cod	Sable Fish	Pacific Ocean Perch Complex	Other Rock Fish	Yellow Fin Sole	Greenland Turbot
1954						12,562	
1955						14,690	
1956						24,697	
1957						24,145	
1958	6,924	171	6			44,153	
1959	32,793	2,864	289			185,321	
1960			1,861	6,100		456,103	36,843
1961			15,627	47,000		553,742	57,348
1962			25,989	19,900		420,703	58,226
1963			13,706	24,500		85,810	31,565
1964	174,792	13,408	3,545	25,900		111,177	33,729
1965	230,551	14,719	4,838	16,800		53,810	9,747
1966	261,678	18,200	9,505	20,200		102,353	13,042
1967	550,362	32,064	11,698	19,600		162,228	23,869
1968	702,181	57,902	4,374	31,500		84,189	35,232
1969	862,789	50,351	16,009	14,500		167,134	36,029
1970	1,256,565	70,094	11,737	9,900		133,079	19,691
1971	1,743,763	43,054	15,106	9,800		160,399	40,464
1972	1,874,534	42,905	12,758	5,700		47,856	64,510
1973	1,758,919	53,386	5,957	3,700		78,240	55,280
1974	1,588,390	62,462	4,258	14,000		42,235	69,654
1975	1,356,736	51,551	2,766	8,600		64,690	64,819
1976	1,177,822	50,481	2,923	14,900		56,221	60,523
1977	978,370	33,335	2,718	2,654	311	58,373	27,708
1978	979,431	42,543	1,192	2,221	2,614	138,433	37,423
1979	913,881	33,761	1,376	1,723	2,108	99,017	34,998
1980	958,279	45,861	2,206	1,097	459	87,391	48,856
1981	973,505	51,996	2,604	1,222	356	97,301	52,921
1982	955,964	55,040	3,184	224	276	95,712	45,805
1983	982,363	83,212	2,695	221	220	108,385	43,443
1984	1,098,783	110,944	2,329	1,569	176	159,526	21,317
1985	1,179,759	132,736	2,348	784	92	227,107	14,698
1986	1,188,449	130,555	3,518	560	102	208,597	7,710
1987	1,237,597	144,539	4,178	930	474	181,429	6,533
1988	1,228,000	192,726	3,193	1,047	341	223,156	6,064
1989	1,230,000	164,800	1,252	2,017	192	153,165	4,061
1990	1,353,000	162,927	2,329	5,639	384	80,584	7,267
1991	1,268,360	165,444	1,128	4,744	396	94,755	3,704
1992	1,384,376	163,240	558	3,309	675	146,942	1,875
1993	1,301,574	133,156	669	3,763	190	105,809	6,330
1994	1,362,694	174,151	699	1,907	261	144,544	7,211
1995	1,264,578	228,496	929	1,210	629	124,746	5,855
1996	1,189,296	209,201	629	2,635	364	129,509	4,699
1997	1,115,268	209,475	547	1,060	161	166,681	6,589
1998	1,101,428	160,681	586	1,134	203	101,310	8,303
1999	889,589	134,647	646	609	135	67,307	5,205
2000	1,132,736	151,372	742	704	239	84,057	5,888
2001	1,387,452	142,452	863	1,148	296	63,563	4,252
2002	1,481,815	166,552	1,143	858	401	74,956	3,150
2003/d	1,488,837	151,597	942	1,370	313	77,975	2,354

Table 2. (continued)

Year	Arrow Tooth Flounder	Other Flat Fish	Rock Sole/c	Atka Mackerel	Squid	Other Species	Total (All Species)
1954							12,562
1955							14,690
1956							24,697
1957							24,145
1958						147	51,401
1959						380	221,647
1960	a						500,907
1961	a						673,717
1962	a						524,818
1963	a	35,643					191,224
1964	a	30,604				736	393,891
1965	a	11,686				2,218	344,369
1966	a	24,864				2,239	452,081
1967	a	32,109				4,378	836,308
1968	a	29,647				22,058	967,083
1969	a	34,749				10,459	1,192,020
1970	12,598	64,690				15,295	1,593,649
1971	18,792	92,452				13,496	2,137,326
1972	13,123	76,813				10,893	2,149,092
1973	9,217	43,919				55,826	2,064,444
1974	21,473	37,357				60,263	1,900,092
1975	20,832	20,393				54,845	1,645,232
1976	17,806	21,746				26,143	1,428,565
1977	9,454	14,393			4,926	35,902	1,168,144
1978	8,358	21,040		831	6,886	61,537	1,302,509
1979	7,921	19,724		1,985	4,286	38,767	1,159,547
1980	13,761	20,406		4,955	4,040	34,633	1,221,944
1981	13,473	23,428		3,027	4,182	35,651	1,259,666
1982	9,103	23,809		328	3,838	18,200	1,211,483
1983	10,216	30,454		141	3,470	15,465	1,280,285
1984	7,980	44,286		57	2,824	8,508	1,458,299
1985	7,288	71,179		4	1,611	11,503	1,649,109
1986	6,761	76,328		12	848	10,471	1,633,911
1987	4,380	50,372		12	108	8,569	1,639,121
1988	5,477	137,418		428	414	12,206	1,810,470
1989	3,024	63,452		3,126	300	4,993	1,630,382
1990	2,773	22,568		480	460	5,698	1,644,109
1991	12,748	30,401	46,681	2,265	544	16,285	1,647,455
1992	11,080	34,757	51,720	2,610	819	29,993	1,831,954
1993	7,950	28,812	63,942	201	597	21,413	1,674,406
1994	13,043	29,720	60,276	190	502	23,430	1,818,628
1995	8,282	34,861	54,672	340	364	20,928	1,745,890
1996	13,280	35,390	46,775	780	1,080	19,717	1,653,355
1997	8,580	42,374	67,249	171	1,438	20,997	1,640,590
1998	14,985	39,940	33,221	901	891	23,156	1,486,739
1999	9,827	33,042	39,934	2,008	393	17,045	1,200,387
2000	12,071	36,813	49,186	239	375	23,098	1,497,520
2001	12,836	27,693	28,949	264	1,761	23,148	1,694,677
2002	10,821	30,229	40,700	572	1,334	26,639	1,839,170
2003/d	11,702	26,519	34,864	5,093	1,239	23,243	1,826,048

a/ Arrowtooth flounder included in Greenland turbot catch statistics.

b/ Includes POP shortraker, rougheye, northern and sharpchin.

c/ Rocksole prior to 1991 is included in other flatfish catch statistics.

d/ Data through October 25, 2003.

Note: Numbers don't include fish taken for research.

Table 3. Groundfish and squid catches (metric tons) in the Aleutian Islands region, 1962-2003.

Year	Pollock	Pacific Cod	Sable Fish	Pacific Ocean	Other	Greenland Turbot	Yellow
				Perch Complex	Rock Fish		Fin Sole
1962				200			
1963			664	20,800		7	
1964		241	1,541	90,300		504	
1965		451	1,249	109,100		300	
1966		154	1,341	85,900		63	
1967		293	1,652	55,900		394	
1968		289	1,673	44,900		213	
1969		220	1,673	38,800		228	
1970		283	1,248	66,900		285	
1971		2,078	2,936	21,800		1,750	
1972		435	3,531	33,200		12,874	
1973		977	2,902	11,800		8,666	
1974		1,379	2,477	22,400		8,788	
1975		2,838	1,747	16,600		2,970	
1976		4,190	1,659	14,000		2,067	
1977	7,625	3,262	1,897	8,080	3,043	2,453	
1978	6,282	3,295	821	5,286	921	4,766	
1979	9,504	5,593	782	5,487	4,517	6,411	
1980	58,156	5,788	274	4,700	420	3,697	
1981	55,516	10,462	533	3,622	328	4,400	
1982	57,978	1,526	955	1,014	2,114	6,317	
1983	59,026	9,955	673	280	1,045	4,115	
1984	81,834	22,216	999	631	56	1,803	
1985	58,730	12,690	1,448	308	99	33	
1986	46,641	10,332	3,028	286	169	2,154	
1987	28,720	13,207	3,834	1,004	147	3,066	
1988	43,000	5,165	3,415	1,979	278	1,044	
1989	156,000	4,118	3,248	2,706	481	4,761	
1990	73,000	8,081	2,116	14,650	864	2,353	
1991	78,104	6,714	2,071	2,545	549	3,174	1,380
1992	54,036	42,889	1,546	10,277	3,689	895	4
1993	57,184	34,234	2,078	13,375	495	2,138	0
1994	58,708	22,421	1,771	16,959	301	3,168	0
1995	64,925	16,534	1,119	14,734	220	2,338	6
1996	28,933	31,389	720	20,443	278	1,677	654
1997	26,872	25,166	779	15,687	307	1,077	234
1998	23,821	34,964	595	13,729	385	821	5
1999	965	27,714	565	17,619	630	422	13
2000	1,244	39,684	1,048	14,893	601	1,086	13
2001	824	34,207	1,074	15,587	610	1,060	15
2002	1,177	30,801	1,118	14,996	551	485	29
2003/c	1,624	28,486	1,065	18,116	391	642	0

Table 3. (continued)

Year	Rock Sole	Other Flat Fish	Arrow Tooth Flounder	Atka Mackerel	Squid	Other Species	Total (All Species)
1962							200
1963			a				21,471
1964			a			66	92,652
1965			a			768	111,868
1966			a			131	87,589
1967			a			8,542	66,781
1968			a			8,948	56,023
1969			a			3,088	44,009
1970			274	949		10,671	80,610
1971			581			2,973	32,118
1972			1,323	5,907		22,447	79,717
1973			3,705	1,712		4,244	34,006
1974			3,195	1,377		9,724	49,340
1975			784	13,326		8,288	46,553
1976			1,370	13,126		7,053	43,465
1977			2,035	20,975	1,808	16,170	67,348
1978			1,782	23,418	2,085	12,436	61,092
1979			6,436	21,279	2,252	12,934	75,195
1980			4,603	15,533	2,332	13,028	108,531
1981			3,640	16,661	1,763	7,274	104,199
1982			2,415	19,546	1,201	5,167	98,233
1983			3,753	11,585	510	3,675	94,617
1984			1,472	35,998	343	1,670	147,022
1985			87	37,856	9	2,050	113,310
1986			142	31,978	20	1,509	96,259
1987			159	30,049	23	1,155	81,364
1988			406	21,656	3	437	77,383
1989			198	14,868	6	108	186,494
1990			1,459	21,725	11	627	124,886
1991	n/a	88	938	22,258	30	91	117,942
1992	236	68	900	46,831	61	3,081	164,513
1993	318	59	1,348	65,805	85	2,540	179,659
1994	308	55	1,334	69,401	86	1,102	175,614
1995	356	47	1,001	81,214	95	1,273	183,862
1996	371	61	1,330	103,087	87	1,720	190,750
1997	271	39	1,071	65,668	323	1,555	139,049
1998	446	54	694	56,195	25	2,448	134,182
1999	577	53	746	51,636	9	1,633	102,582
2000	480	113	1,157	46,990	8	3,010	110,327
2001	526	97	1,220	61,296	5	4,029	120,550
2002	1,165	150	1,032	44,722	10	1,980	98,216
2003/c	920	75	854	51,011	35	1,269	104,488

a/ Arrowtooth flounder included in Greenland turbot catch statistics.

b/ Includes POP shortraker, rougheye, northern and sharpchin rockfish.

c/ Data through October 25, 2003.

Note: Numbers don't include fish taken for research.

Table 4--Summary of stock abundance (biomass), overfishing level (OFL), acceptable biological catch (ABC), the fishing mortality rate corresponding to ABC (F_{OFL}), and the fishing mortality rate corresponding to OFL (F_{ABC}) for the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district as projected for 2004. "Biomass" corresponds to projected January 2004 abundance for the age+ range reported in the summary section. Stock-specific biomass, OFL, and ABC are in metric tons, reported to three significant digits (four significant digits are used when a stock-specific ABC is apportioned among areas on a percentage basis). Fishing mortality rates are reported to two significant digits.

Species or Complex	Area	Biomass	OFL	ABC	F_{OFL}	F_{ABC}
Walleye pollock	EBS	11,000,000	2,740,000	2,560,000	0.25	0.23
Walleye pollock	AI	175,000	52,600	39,400	0.30	0.23
Walleye pollock	Bogoslof	198,000	39,600	29,700	0.20	0.15
Pacific cod	BSAI	1,660,000	350,000	223,000	0.47	0.29
Sablefish	EBS	32,000	4,020	3,010	0.16	0.11
Sablefish	AI	39,000	4,620	3,450	0.16	0.11
Yellowfin sole	BSAI	1,560,000	135,000	114,000	0.14	0.12
Greenland turbot	BSAI	132,000	19,300	4,740	0.32	0.07
	EBS			3,162		
	AI			1,578		
Arrowtooth flounder	BSAI	696,000	142,000	115,000	0.36	0.28
Rock sole	BSAI	1,160,000	166,000	139,000	0.21	0.17
Flathead sole	BSAI	505,000	75,200	61,900	0.37	0.30
Alaska plaice	BSAI	1,050,000	258,000	203,000	0.78	0.57
Other flatfish	BSAI	90,300	18,100	13,500	0.20	0.15
Pacific ocean perch	BSAI	349,000	15,800	13,300	0.054	0.045
	EBS			2,128		
	Area 541			3,059		
	Area 542			2,926		
	Area 543			5,187		
Northern rockfish	BSAI	142,000	8,140	6,880	0.070	0.059 ^a
	EBS			19		^a
	AI			6,861		^a
Shortraker rockfish	BSAI	23,400	701	526	0.030	0.023 ^a
Rougheye rockfish	BSAI	10,400	259	195	0.025	0.019 ^a
Other rockfish	EBS	18,300	1,280	960	0.070 ^b	0.053 ^b
Other rockfish	AI	12,100	846	634	0.070 ^b	0.053 ^b
Atka mackerel	AI	286,000	78,500	66,700	0.83	0.67
	Area 541			11,240		
	Area 542			31,100		
	Area 543			24,360		
Squid	BSAI	n/a	2,620	1,970	n/a	n/a
Sharks	BSAI	29,300	2,640	1,980	0.09	0.068
Skates	BSAI	484,000	48,400	36,300	0.10	0.075
Sculpins	BSAI	212,000	31,800	23,800	0.15	0.11
Octopus	BSAI	4,980	1,490	1,120	0.30	0.23
TOTAL		19,868,780	4,196,916	3,664,065		

a/ previously combined into other red rockfish complex

b/ based on natural mortality rate for shortspine thornyhead

Table 5-- Summary of BSAI groundfish tier designations under Amendment 56, maximum permissible ABC fishing mortality rate ($\max F_{ABC}$), the Plan Team's recommended tier designation, ABC fishing mortality rate (F_{ABC}), the maximum permissible value of ABC ($\max ABC$), the Plan Team's recommended ABC, and the percentage reduction (% Red.) between $\max ABC$ and the Plan Team's recommended ABC. Stock-specific $\max ABC$ and ABC are in metric tons, reported to three significant digits (four significant digits are used when a stock-specific ABC is apportioned among areas on a percentage basis). Fishing mortality rates are reported to two significant digits. In cases where $\max ABC$ and the Plan Team's recommended ABC are equal, the percentage reduction is left blank. All values pertain to the 2004 fishing year.

Species or Complex	Area	Tier	$\max F_{ABC}$	F_{ABC}	$\max ABC$	ABC	% Red.
Walleye pollock	EBS	1a	0.23	0.23	2,560,000	2,560,000	
Walleye pollock	AI	5	0.23	0.23	39,400	39,400	
Walleye pollock	Bogoslof	5	0.15	0.15	29,700	29,700	
Pacific cod	BSAI	3a	0.39	0.29	297,000	223,000	25
Sablefish	BS	3b	0.13	0.11	3,320	3,010	9

Sablefish	AI	3b	0.13	0.11	3,810	3,450	9
Yellowfin sole	BSAI	3a	0.12	0.12	114,000	114,000	
Greenland turbot	BSAI	3a	0.26	0.07	15,700	4,740	70
	EBS					3,162	
	AI					1,578	
Arrowtooth flounder	BSAI	3a	0.28	0.28	115,000	115,000	
Rock sole	BSAI	3a	0.17	0.17	139,000	139,000	
Flathead sole	BSAI	3a	0.30	0.30	61,900	61,900	
Alaska plaice	BSAI	3a	0.57	0.57	203,000	203,000	
Other flatfish	BSAI	5	0.15	0.15	13,500	13,500	
Pacific ocean perch	BSAI	3b	0.045	0.045	13,300	13,300	
	EBS					2,128	
	Area 541					3,059	
	Area 542					2,926	
	Area 543					5,187	
Northern rockfish	BSAI	3a	0.059	0.059	6,880	6,880	
	EBS					19	
	AI					6,861	
Shortraker rockfish	BSAI	5	0.023	0.023	526	526	
Rougheye rockfish	BSAI	5	0.019	0.019	195	195	
Other rockfish	EBS	5	0.053	0.053	960	960	
Other rockfish	AI	5	0.053	0.053	634	634	
Atka mackerel	BSAI	3a	0.67	0.67	66,700	66,700	
	Area 541					11,240	
	Area 542					31,100	
	Area 543					24,360	
Squid	BSAI	6	n/a	n/a	1,970	1,970	
Sharks	BSAI	5	0.068	0.068	1,980	1,980	
Skates	BSAI	5	0.075	0.075	36,300	36,300	
Sculpins	BSAI	5	0.11	0.11	23,800	23,800	
Octopi	BSAI	5	0.23	0.23	1,120	1,120	
Total					3,749,995	3,664,065	

Figure 1

BSAI Statistical and Reporting Areas

