

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

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

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SUMMARY

by

The Plan Team for the Groundfish Fisheries
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 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 Bering Sea and Aleutian Islands (BSAI) groundfish fisheries is compiled by the Plan Team for the Groundfish Fisheries of the BSAI (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 October and December meetings of the Council. Because data from the current year's AFSC trawl survey of the eastern Bering Sea shelf are usually not available prior to the September Plan Team meeting, however, most stock assessments are not revised in the first draft. For the present (final) draft, however, each stock or stock complex is represented in the report by a revised chapter containing the latest stock assessment.

Members of the Plan Team who compiled this SAFE report were Loh-Lee Low (chair), David Witherell (plan coordinator), Brenda Norcross, Michael Sigler, Andrew Smoker, Grant Thompson, Ivan Vining, Farron Wallace, and Gregg Williams.

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 upon, and total catches rose to 2.2 million t in 1972. Catches have since varied from one to two million t as catch restrictions and other management measures were placed on the fishery.

Catches in the Aleutian region have always been much smaller than those in the EBS. Target species have also been different (Table 3): In the Aleutians, Pacific ocean perch (POP) was the initial target species. During the early years of exploitation, overall catches of Aleutian groundfish reached a peak of 112,000 t in 1965. As POP abundance declined, the fishery diversified to other species. Total catches from the Aleutians in recent years have been about 100,000 t annually.

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 total allowable catches established by the Council equals OY for the groundfish complex, which is currently constrained by the 2.0 million t cap. Fifteen percent (15%) of the total TAC is set aside as reserve, which may be released during the season by the NMFS Regional Director.

Definition of Acceptable Biological Catch and the Overfishing Level

Amendment 56 to the BSAI Groundfish FMP, approved by the Council in June 1998 and by the Secretary of Commerce in January 1999, defines ABC and OFL for the BSAI groundfish fisheries. The new definitions are shown below, where the fishing mortality rate is denoted F , stock biomass (or spawning stock biomass, as appropriate) is denoted B , and the F and B levels corresponding to MSY are denoted F_{MSY} and B_{MSY} respectively.

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

Overfishing is defined as any amount of fishing in excess of 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 \mathbf{a} 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: $B/B_{MSY} > 1$*

$$F_{OFL} = \mathbf{m}_A, \text{ the arithmetic mean of the pdf}$$

$$F_{ABC} = \mathbf{m}_H, \text{ the harmonic mean of the pdf}$$

1b) *Stock status: $\mathbf{a} < B/B_{MSY} - 1$*

$$F_{OFL} = \mathbf{m}_A \times (B/B_{MSY} - \mathbf{a}) / (1 - \mathbf{a})$$

$$F_{ABC} = \mathbf{m}_H \times (B/B_{MSY} - \mathbf{a}) / (1 - \mathbf{a})$$

1c) *Stock status: $B/B_{MSY} = \mathbf{a}$*

$$F_{OFL} = 0$$

$$F_{ABC} = 0$$

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

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

$$F_{OFL} = F_{MSY}$$

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

2b) *Stock status: $\mathbf{a} < B/B_{MSY} - 1$*

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

$$F_{ABC} = F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - \mathbf{a}) / (1 - \mathbf{a})$$

2c) *Stock status: $B/B_{MSY} = \mathbf{a}$*

$$F_{OFL} = 0$$

$$F_{ABC} = 0$$

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

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

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

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

3b) *Stock status: $\mathbf{a} < B/B_{40\%} - 1$*

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

$$F_{ABC} = F_{40\%} \times (B/B_{40\%} - \mathbf{a}) / (1 - \mathbf{a})$$

3c) *Stock status: $B/B_{40\%} = \mathbf{a}$*

$$F_{OFL} = 0$$

$$F_{ABC} = 0$$

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

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

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

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

$$F_{OFL} = M$$

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

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

OFL = the average catch from 1978 through 1995, unless an alternative value is established by the SSC on the basis of the best available scientific information

$$ABC = 0.75 \times OFL$$

OVERVIEW OF “STOCK ASSESSMENT” SECTION

Summary and Use of Terms

Plan Team recommendations for 2000 ABCs are summarized in Tables 4-7. The sum of the recommended ABCs for 2000 is 2,266,000 t, about 16,000 t above the 1999 Council-approved total of 2,250,000 t and about 266,000 t above the 2,000,000 t TAC cap. Overall, the status of the stocks continues to appear relatively favorable. 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. In the EBS walleye pollock assessment model, an “average” fishing mortality rate is calculated by constraining the age-specific selectivities so that the average selectivity is 1.0 (in other age- or length-structured models, the selectivities are constrained so that the *maximum* is 1.0). It is important to remember that a full-selection F should be interpreted in the context of the selectivity schedule to which it applies.
- 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. Fishing mortality rates are reported to two significant digits.
- 5) The figures listed as 1999 ABCs correspond to the values approved by the Council. The figures listed as 2000 ABCs correspond to the Plan Team's recommendations for next year.

Projection Scenarios and Status Determination

This year, 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 Protection Act, and the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA).

For each scenario, the projections begin with the vector of 1999 numbers at age estimated in the assessment. This vector is then projected forward to the beginning of 2000 using the schedules of natural mortality and selectivity described in the assessment and the best available estimate of total (year-end) catch for 1999. 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 2000, 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 2000 recommended in the assessment to the $max F_{ABC}$ for 2000. (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 1994-1998 average F . (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 2000 and 2001, 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 2000:

- (1) If spawning biomass for 2000 is estimated to be below $\frac{1}{2} B_{35\%}$, the stock is below its MSST.
- (2) If spawning biomass for 2000 is estimated to be above $B_{35\%}$, the stock is above its MSST.
- (3) If spawning biomass for 2000 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 2010 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 2002 is below $\frac{1}{2} B_{35\%}$, the stock is approaching an overfished condition.
- (2) If the mean spawning biomass for 2002 is above $B_{35\%}$, the stock is not approaching an overfished condition.
- (3) If the mean spawning biomass for 2002 is above $\frac{1}{2} B_{35\%}$ but below $B_{35\%}$, the determination depends on the mean spawning biomass for 2012. If the mean spawning biomass for 2012 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.

Environmental Conditions

The EBS bottom temperature during the 1999 trawl survey was the coldest temperature ever recorded for EBS trawl survey. The mean bottom temperature was 0.81°C versus the average of 2.54°C, from 1982-1998. The trawl survey biomass estimates changed, sometimes extensively, between the 1998 and 1999 survey, for several species. Pollock and Pacific cod trawl survey biomass estimates increased by 61% and 9%, respectively. Flatfish species estimates tended to decrease, with yellowfin sole decreasing by 44%, arrowtooth flounder by 29%, rock sole by 22%, flathead sole by 43% and other flatfish (not including Alaska plaice) by 6%. Alaska plaice was the only flatfish species to show an increase (21%). These changes in biomass estimates may have been due to changes in behavior and/or distribution of these groundfish species. The Plan Team believes monitoring for possible effects should be done during the 2000 EBS trawl survey.

Uncertainty and Ecosystem Considerations

The Plan Team attempted to prepare a summary table listing ecosystem considerations and an index of uncertainty for individual groundfish stock assessments. The Team was unable to complete this table, however. Uncertainty is dealt with in each individual assessment, and to some degree is addressed by the tiers used to establish ABCs. In some assessments (Pacific cod and sablefish), additional analysis of parameter uncertainty was undertaken, and the resulting ABC recommendations adjusted accordingly as part of the assessment. In other assessments (Greenland turbot, Atka mackerel, other species) uncertainty was dealt with by recommending a more precautionary ABC (below the maximum allowed under the tiers). The Plan Team could not agree on a way to present information on relative uncertainty for individual stock assessments.

Ecosystem considerations were included in individual stock assessments. All of our groundfish species are predators or prey at some life stage. The Team was unable to isolate individual cases where ABC adjustments needed to be made to address ecosystem concerns. A review of ecosystem status and trends is provided in the Ecosystem Considerations chapter.

Research Needs

The Teams discussed research needs, and agreed that the list developed by the Plan Teams and Scientific and Statistical Committee was fairly comprehensive. So only six new research needs were identified. They are as follows, in no priority order.

1. More research is needed to understand pollock movements within the GOA and BSAI.
2. Some of our stocks are disproportionally harvested across large areas of the GOA and BSAI due to area closures, other management actions, or fishery behavior. Additional analysis should be undertaken to examine potential effects of disproportional harvesting.
3. More information is needed on other species. Observer data should be collected and analyzed for individual species. Better estimates of abundance are needed. Lastly, life history data is limited for many of the species in this complex.
4. Mapping of benthic habitat (both bottom type and living substrate) is important for more precise density estimates for many species.
5. Better distribution and improved availability of information would be beneficial to public and scientists.
6. Data rescue. For example, it would be helpful for some assessments if existing logbook data were keypunched and available.

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 2000 are those recommended by the Plan Team. Catch data for 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

<u>Area</u>	<u>Year</u>	<u>Age 3+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
EBS	1998	5,820,000	2,060,000	1,110,000	1,110,000	1,101,165
	1999	7,040,000	1,720,000	992,000	992,000	978,301
	2000	7,700,000	1,680,000	1,100,000	n/a	n/a
AI	1998	106,000	31,700	23,800	23,800	23,822
	1999	106,000	31,700	23,800	2,000	1,019
	2000	106,000	31,700	23,800	n/a	n/a
Bogoslof	1998	280,000	8,750	6,410	1,000	136
	1999	403,000	21,000	15,300	1,000	21
	2000	475,000	95,000	71,300	n/a	n/a

Eastern Bering Sea:

This year's pollock chapter features new data from the 1999 fishery and bottom trawl and echo-integration trawl surveys. The 1999 bottom trawl survey estimated a biomass of 3,570,000 t, an increase of 61% relative to the 1998 estimate. The 1999 echo-integration trawl survey estimated a biomass of 3,290,000 t, an increase of 27% from the 1997 estimate, the last year an echo-integration trawl survey was conducted in this region. Eight alternative models are presented in the chapter, all of which follow the statistical age-structured approach that was used last year to set ABC for 1999. All but two of these eight models estimate 1999 age 3+ biomass to fall between 7,500,000 t and 8,300,000 t (the other two models give values ranging from 5,800,000 t to 6,600,000 t). Of the eight models presented, the Plan Team based its recommendations for 2000 on Model 2, which assumes a Ricker stock-recruitment relationship and uses the average commercial fishery selectivity pattern from the most recent three years to make projections of future catch and stock size. This is the same model used by the Plan Team last year to recommend the 1999 ABC, except that the recruitment distribution used for harvest projections was estimated from year classes spawned after 1976 only. Model 5 is similar, except that the recruitment distribution used for harvest projections was estimated from the entire time series of year classes (1963-1998). Under Model 5, the stock appears to be able to sustain much higher harvest rates than under Model 2. This is because the early portion of the time series, which is used in Model 5 but not in Model 2, shows relatively high recruitments occurring even at low stock sizes. For example, spawning biomass was lower during the period 1966-1968 than at any time during the 1977-1998 portion of the time series, but the 1966-1968 year classes were all above average in strength. The Plan Team's choice of Model 2 is based on its beliefs that the data in the later portion of the time series are the most reliable and that harvest recommendations should be most heavily influenced by current information and the stock's current productive capacity (i.e., since the 1977 regime shift). Model 2 estimates an increase of 26% in age 3+ biomass between 1998 and 1999, followed by a projected increase of 9% between 1999 and 2000. The large increase between 1998 and 1999 is fueled by the entry of the 1996 year class into the age 3+ stock, a year class which is currently estimated to be well above average in strength. This increase may have been accentuated by a change in the distribution of pollock in the Bering Sea due to very cold water temperatures in 1999. Projections of age

3+ biomass beyond 2000 are not available, but spawning biomass is projected to remain constant from 2000 to 2001, then decrease in 2002.

Last year, the SSC 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 qualified 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 estimates of B_{MSY} and the harmonic and arithmetic means for F_{MSY} from the present assessment are 1,790,000 t, 0.50, and 0.80, respectively. Projected spawning biomass for 2000 is 2,160,000 t, placing EBS walleye pollock in sub-tier “a” of Tier 1. The maximum permissible value of F_{MSY} under Tier 1a is 0.50, the harmonic mean of the probability density function for F_{MSY} . A fishing mortality rate of 0.50 translates into a 2000 catch of 1,200,000 t, which would be the maximum permissible ABC under Tier 1a. However, the senior assessment author recommends setting ABC at a lower value, specifically, the maximum permissible level that would be allowed under Tier 3. The Tier 3 reference points $B_{40\%}$ and $F_{40\%}$ are estimated at values of 2,340,000 t and 0.48, respectively. Because projected spawning biomass for 2000 is below $B_{40\%}$, the maximum permissible value of F_{ABC} that would be allowed under Tier 3 is the adjusted $F_{40\%}$ rate of 0.46. The 2000 catch associated with a fishing mortality rate of 0.46 is 1,100,000 t, an 8% reduction from the maximum permissible level under Tier 1. The Plan Team concurs with the senior assessment author that a 2000 ABC of 1,100,000 t is appropriate. The Plan Team wishes to emphasize that use of the Tier 3b formula to recommend a 2000 ABC is not intended to change EBS walleye pollock’s classification as a Tier 1 stock, but rather to maintain consistency with the existing harvest strategy pending further evaluation of three issues:

- 1) While the Plan Team feels that the Tier 1 reference points are reliably estimated given current model structure, it concurs with the senior assessment author that some issues surrounding model specification remain to be addressed. In other words, alternative model structures should be explored to determine if the current model structure adequately captures the degree of uncertainty surrounding reference points such as F_{MSY} . Some alternative model structures might focus on use of the stock-recruitment relationship and the effect of regime shifts thereupon. The Plan Team notes that the MSY estimate from Model 5 is 33% greater than the estimate from Model 2, and that the F_{MSY} estimate from Model 5 is 211% greater than the estimate from Model 2.
- 2) The data used in Model 2 included an estimate of the 1999 age composition from the EIT survey that was constructed by applying an age-length key from the bottom trawl survey to the EIT survey’s length composition. The data used in Model 0 did not include this estimate. The maximum permissible ABC for 2000 under Model 0 was 19% lower than under Model 2. Tests with data from prior years showed that application of the bottom trawl survey age-length key to the EIT survey’s length composition sometimes gives a good estimate of the EIT survey’s age composition, but not always.
- 3) The impacts of Russian pollock harvests in the western Bering Sea on future recruitment of the eastern Bering Sea stock are currently unknown but potentially significant.

The OFL fishing mortality rate under Tier 1a is 0.80, the arithmetic mean value of F_{MSY} . A fishing mortality rate of 0.80 translates into a 2000 OFL of 1,680,000 t. Model projections indicate that the EBS walleye pollock stock is not overfished. The projections necessary for a formal determination of whether this stock is *approaching* an overfished condition are not yet available. However, the senior assessment author anticipates that these projections will be completed soon, and all preliminary indications are that this stock is not approaching an overfished condition.

Aleutians:

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

Bogoslof:

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

The Plan Team's recommendations of 2000 ABC and OFL are based on the hydroacoustic survey estimate for the entire spawning aggregation (475,000 t), rather than the biomass observed in Area 518 alone (393,000 t). Because the hydroacoustic survey is attempting to measure the biomass of a discrete spawning aggregation, the Plan Team believes that it is appropriate to use the entire biomass estimate rather than the proportion of the estimate that happened to reside in Area 518 at the precise time of the survey. In previous SAFE reports, ABC calculations were made by projecting the hydroacoustic biomass estimate forward to account for natural mortality, but not growth or recruitment. In contrast, growth and recruitment have been assumed to balance natural mortality for all other BSAI stocks lacking an age- or length-structured assessment model. The Plan Team recommends that the assumptions of zero growth and zero recruitment be discontinued for Bogoslof pollock, and recommends instead that projected biomass be set equal to the most recent survey biomass estimate.

Anticipating that the SSC will concur with the Plan Team's recommendation to move the Bogoslof pollock stock to Tier 5, the maximum permissible 2000 ABC is 71,300 t ($= 475,000 \text{ t} \times M \times 0.75$), which is the Plan

Team's recommended ABC. Other alternatives include the following: 1) If Bogoslof pollock remains classified in Tier 3 and the age-structured model contained in the stock assessment is used, the maximum permissible value of F_{ABC} is 0.23, giving a maximum permissible 2000 ABC of 110,000 t. 2) If Bogoslof pollock remains classified in Tier 3 and last year's estimates of reference points are retained, the maximum permissible value of F_{ABC} is 0.053, giving an exploitation rate of 0.047 and a maximum permissible 2000 ABC of 22,300 t.

Similarly, anticipating that the SSC will concur with the Plan Team's recommendation to move the Bogoslof pollock stock to Tier 5, the 2000 OFL is 95,000 t (= 475,000 t \times M). As a Tier 5 stock, it is not possible to determine whether Bogoslof pollock is overfished or whether it is approaching an overfished condition. Other alternatives include the following: 1) If Bogoslof pollock remains classified in Tier 3 and the age-structured model contained in the stock assessment is used, F_{OFL} is 0.29, the 2000 OFL is 132,000 t, and Bogoslof pollock is neither overfished nor approaching an overfished condition. 2) If Bogoslof pollock remains classified in Tier 3 and last year's estimates of reference points are retained, F_{OFL} is 0.064, the 2000 OFL is 30,400 t, and the stock is overfished (because the projected 2000 biomass of 475,000 t is less than $\frac{1}{2}$ of $B_{35\%}$, where $B_{35\%}$ is computed as 2,000,000 t \times 7/8 = 1,750,000 t).

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 2000 are those recommended by the Plan Team. Catch data for 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

<u>Area</u>	<u>Year</u>	<u>Age 3+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	1998	1,340,000	336,000	210,000	210,000	195,648
	1999	1,210,000	264,000	177,000	177,000	160,084
	2000	1,300,000	240,000	193,000	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 583,000 t, a 9% increase relative to last year's estimate. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 379,000 t, 0.30, and 0.35, respectively. Fishing at a rate of 0.28 is projected to result in a 2000 spawning biomass of 357,000 t, and solves the equation for the maximum permissible value of F_{ABC} under tier 3. Because projected biomass for 2000 is less than $B_{40\%}$, Pacific cod qualify for management under sub-tier "b" of tier 3. Fishing at an instantaneous rate of 0.28 is projected to result in a 2000 catch of 206,000 t, which is the maximum permissible ABC under Amendment 56. However, the Plan Team concurs with the chapter authors' recommendation to set 2000 ABC at 193,000 t, about 6% below the maximum permissible level. This recommendation is based on a risk-averse optimization procedure which considers uncertainty in the estimates of the survey catchability coefficient and the natural mortality rate in the computation of an $F_{40\%}$ harvest level. The Plan Team feels that a 6% reduction from the maximum permissible ABC is justified not only on the basis of these decision-theoretic concerns, but also because estimated spawning biomass from the model has declined continuously since 1985 and because three of the last four year classes (assessed at age 3) appear to have been well below average. A 2000 catch of 193,000 t would represent an increase of 9% over the 1999 ABC of 177,000 t, matching the 9% increase in the trawl survey biomass estimate. However, the Plan Team notes that the assessment model projects a 2001 ABC (using the

same relative harvest rate) of 171,000 t with a continuing decline through 2003 (expected ABC = 138,000 t), meaning that the increase for 2000 is expected to be short-lived. A 2000 catch of 193,000 t corresponds to a fishing mortality rate of 0.26, below the value of 0.28 which constitutes the upper limit on F_{ABC} under tier 3b.

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

Recommendations for next year's assessment

The Plan Team is interested in the possibility of splitting the OFL, ABC, and TAC for this stock into separate EBS and AI components, and recommends that an analysis of this possibility be undertaken.

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 2000 are those recommended by the Plan Team. Catch data for 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

<u>Area</u>	<u>Year</u>	<u>Age 2+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	1998	3,010,000	314,000	220,000	220,000	101,201
	1999	3,180,000	308,000	212,000	207,980	67,885
	2000	2,820,000	226,000	191,000	n/a	n/a

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

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

Recommendations for next year's assessment

Water temperature may affect shelf trawl survey catchability (Figure 3.3). Average water temperature recorded on the 1999 shelf trawl survey is the coldest on record. Coincident with this drop, the estimated biomass fell about 1.1 mmt in the 1999 shelf trawl survey. Part of this drop may be due to a change in availability, due to spawning occurring later this year; spawning occurs inshore in an area outside the survey sampling frame. Part of this drop also may be due to a temperature effect on catchability. The temperature may make fish more lethargic, which do not “pop up” over the foot rope when encountered by the trawl. A small amount of video observation from research trawling supports this supposition. The Plan Team recommends that the authors allow survey catchability to vary annually in the population model and that this variability is tied to annual measurements of bottom temperature.

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 2000 are those recommended by the Plan Team. Catch data for 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

<u>Area</u>	<u>Year</u>	<u>Age 1+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	1998	164,000	22,300	15,000	15,000	9,124
	1999	177,000	29,700	14,200	9,000	5,937
	2000	233,000	42,000	9,300	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 19,797 t, a 30% decrease relative to last year's estimate. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 81,300 t, 0.26, and 0.32, respectively. Projected spawning biomass for 2000 is 165,000 t, placing Greenland turbot in sub-tier “a” of Tier 3. The Plan Team notes that the ratio of 1999 spawning biomass to $B_{40\%}$ has changed dramatically since last year's assessment: In last year's assessment, the ratio was 79%, whereas in the present assessment, the ratio is 203%. The main reason for this change is that the recruitments used to estimate $B_{40\%}$ in last year's assessment included year classes spawned prior to the regime shift of 1977, whereas the recruitments used to estimate $B_{40\%}$ in the present assessment include only year classes spawned during the current environmental regime. The maximum permissible value of F_{ABC} under Tier 3a is 0.26. A fishing mortality rate of 0.26 translates into a 2000 catch of 34,700 t, which would be the maximum permissible ABC under Amendment 56. The Plan Team concurs with the authors' recommendation to set the 2000 ABC at a value substantially less than the maximum permissible, using $F_{ABC} = 0.25 \times \max F_{ABC}$, which results in a 2000 ABC of 9,300 t. The Plan Team believes that a 2000 ABC well below the maximum permissible value is warranted for the following reasons: 1) estimated age 1+ biomass has trended downward continually since 1972; 2) the 7 most recent age 1 recruitments constitute 7 of the lowest 8 values in the entire time series; and 3) if the maximum permissible ABC of 34,700 t were actually caught, this would constitute the highest catch since 1983, even though spawning biomass in 2000 is projected to be less than half of what it was in 1983.

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

Recommendations for next year's assessment

1) Longline catches have represented an increasing share of the reported Greenland turbot catches in recent years. Because killer whales can remove substantial amounts of catch from longlines, the Plan Team recommends that the authors analyze observer data to estimate how much unreported mortality occurs due to killer whale depredation, and include this estimate of unreported mortality in the assessment model. 2) Shelf and slope trawl surveys and longline surveys are currently used to index Greenland turbot abundance in the assessment model. The Plan Team recommends that the authors weight the survey likelihood components by the respective annual sampling variances. The Plan Team also recommends that the authors include longline survey data from all available years in the model.

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 2000 are those recommended by the Plan Team. Catch data for 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

<u>Area</u>	<u>Year</u>	<u>Age 1+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	1998	869,000	230,000	147,000	16,000	15,241
	1999	819,000	219,000	140,000	134,354	10,679
	2000	785,000	160,000	131,000	n/a	n/a

The present assessment includes significant changes from last year's assessment, including a return to the method of weighting sex-specific size composition data that had been used prior to last year's assessment and incorporation of new catch and survey information. This year's EBS bottom trawl survey resulted in a biomass estimate of 244,000 t, a 29% decrease relative to last year's estimate. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 195,000 t, 0.22 and 0.27, respectively. Given that the projected 2000 spawning biomass of 496,000 t exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2000 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.22) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2000 ABC of 131,000 t.

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

Recommendations for next year's assessment

Survey data indicates that more than half of each year's sample consists of females (yearly estimates range between 55% and 75%), which is consistent with findings for this species in the Gulf of Alaska. However, attempts to reflect this in last year's stock assessment proved unsuccessful due to constraints of the modeling software used. For next year's assessment, the authors plan on using more flexible software to develop a model that reflects the unequal sex ratio observed by the survey. The Plan Team encourages this development.

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 2000 are those recommended by the Plan Team. Catch data for 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

<u>Area</u>	<u>Year</u>	<u>Age 2+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	1998	2,360,000	449,000	312,000	100,000	33,645
	1999	2,320,000	444,000	309,000	120,000	40,362
	2000	2,070,000	273,000	230,000	n/a	n/a

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

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

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 2000 are those recommended by the Plan Team. Catch data for 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

<u>Area</u>	<u>Year</u>	<u>Age 3+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	1998	824,000	190,000	132,000	100,000	24,228
	1999	636,000	118,000	77,300	77,300	17,777
	2000	611,000	90,000	73,500	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 395,000 t, a 43% decrease relative to last year's estimate. It should be noted that 1998 estimate was a 14% decrease relative to that of 1997, which in turn was a 31% increase relative to the 1996 estimate. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 134,000 t, 0.28, and 0.35, respectively. Given that the projected 2000 spawning biomass of 261,000 t exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2000 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.28) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2000 ABC of 73,500 t.

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

Other flatfish 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 (age 1+ biomass is shown for 1998 and 1999, age 2+ for 2000). The OFL and ABC for 2000 are those recommended by the Plan Team. Catch data for 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

	<u>Year</u>	<u>Age 2+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	1998	789,000	253,000	164,000	89,434	15,338
	1999	618,000	248,000	154,000	154,000	15,184
	2000	829,000	141,000	117,000	n/a	n/a

The present assessment includes significant changes from last year's assessment, including use of AD Model Builder as a modeling platform for the first time (Alaska plaice only) and incorporation of new catch and survey information. This year's EBS bottom trawl survey resulted in biomass estimates of 547,000 t for Alaska plaice and 69,700 t for the remaining species in the "other flatfish" complex, representing an increase of 21% and a decrease of 6% relative to last year's estimates, respectively. The Plan Team notes that Alaska plaice was the only major flatfish species that showed increased abundance in the 1999 bottom trawl survey. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock complex, and that this stock complex therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 100,000 t (Alaska plaice only), 0.28, and 0.35, respectively. Given that the projected 2000 spawning biomass (Alaska plaice only) of 187,000 t exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2000 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ level (=0.28 for all species), which is the maximum allowable under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2000 ABC of 117,000 t for the complex.

The Plan Team's OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value (=0.35 for all species) gives a 2000 OFL of 141,000 t for the complex. Model projections indicate that this stock complex is neither overfished nor approaching an overfished condition.

Recommendations for next year's assessment

Trawl survey estimates of rock sole, flathead sole, and Alaska plaice abundance all spiked in 1994 and 1997. These three species also show similar abundance and recruitment trends (except for Alaska plaice in the case of the 1999 bottom trawl survey estimate). The Plan Team recommends that the assessment authors attempt to determine the reasons for these similarities. One hypothesis might be that trawl survey catchability is related to water temperature in a similar fashion for all three species, leading to survey biomass estimates that reflect not only changes in abundance of the individual species but also short-term changes in environmental conditions that are common to all three.

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 2000 are those recommended by the Plan Team. Catch data for 1997 and 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99

<u>Area</u>	<u>Year</u>	<u>Age 4+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
EBS	1998	18,200	2,160	1,300	1,300	614
	1999	17,000	2,090	1,340	1,340	628
	2000	18,000	1,750	1,410	n/a	n/a
AI	1998	21,000	2,230	1,380	1,380	734
	1999	26,000	2,890	1,860	1,380	629
	2000	33,000	3,090	2,490	n/a	n/a

The sablefish assessment has been revised substantially since last year's assessment. The revision consisted mainly of the addition of about twenty years of historical data, the addition of contemporary fishery catch rate

data, and the addition of Bayes and decision analyses to recommend 2000 ABC. Last year's assessment model estimated abundance for the years 1979-1998. By adding the historical data, the assessment model was extended to estimate abundance back to 1960. The revised assessment indicates that 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. The population recovered due to exceptional year classes from the late 1970s; spawning abundance peaked again in 1987. The population then decreased because these exceptional year classes are dying off. The survey abundance index increased 10% in numbers and 5% in weight and the fishery abundance index increased 11% in weight from 1998 to 1999. Projected 2000 exploitable biomass for the Aleutian Islands, eastern Bering Sea, and Gulf of Alaska combined is about 175,000 t, which is also the projected value of spawning biomass (combined sexes) for 2000. These values represent increases of 3 and 1% from the respective estimates for 1999. Projected spawning biomass for 2000 is 32% of the unfished level. Alaska sablefish abundance now appears low and stable. This is a change from previous assessments where abundance appeared low and slowly decreasing. However, further years' data are needed to confirm that abundance has stabilized.

A simple Bayesian analysis was completed by examining the effect of uncertainty in natural mortality and survey catchability on parameter estimation. A decision analysis was completed using the posterior probability from the Bayesian analysis to determine which catch levels would be likely to decrease abundance. The decision analysis indicates that a yield of about 17,000 t will most likely keep spawning biomass the same and has only a 20% probability of reducing 2004 spawning biomass to less than 90% of 2000 spawning biomass.

Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 217,000 t (combined across the EBS, AI, and GOA), 0.14, and 0.17, respectively. Projected spawning biomass (combined areas) for 2000 is 175,000 t, placing sablefish in sub-tier "b" of Tier 3. The maximum permissible value of F_{ABC} under Tier 3b is computed as follows:

$$F_{ABC} = F_{40\%} \times (B_{2000}/B_{40\%} - 0.05)/(1 - 0.05) = 0.14 \times (175,000/217,000 - 0.05)/0.95 = 0.11$$

A fishing mortality rate of 0.11 translates into a 2000 catch (combined areas) of 17,300 t, which would be the maximum permissible ABC under Amendment 56, and is the Plan Team's recommended 2000 ABC. A 5-year exponential weighting of longline survey relative abundance may be used to apportion the combined 2000 ABC among regions, resulting in the following values: EBS--1,410 t, AI--2,490 t, and GOA--13,400 t.

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

$$F_{OFL} = F_{35\%} \times (B_{2000}/B_{35\%} - 0.05)/(1 - 0.05) = 0.17 \times (175,000/217,000 - 0.05)/0.95 = 0.14$$

A fishing mortality rate of 0.14 translates into a 2000 OFL (combined areas) of 21,500 t. Using the survey-based apportionment scheme described above, 2000 OFL also may be apportioned among regions and results in the following values: EBS--1,750 t, AI--3,090 t, and GOA--16,660 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Pacific ocean perch (POP) complex

Status and catch specifications (t) of **Pacific ocean perch and other red rockfish** 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 2000 are those recommended by the Plan Team. Catch data for 1999 are as listed in this year's stock assessment. Catch data for 2000 are from the NMFS Regional Office, and are current through 10/30/99.

Pacific Ocean Perch

<u>Area</u>	<u>Year</u>	<u>Age 9+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
EBS	1998	41,300	3,300	1,400	1,400	1,017
	1999	45,500	3,600	1,900	1,400	376
	2000	47,700	3,100	2,600	n/a	n/a
AI	1998	258,000	20,700	12,100	12,100	9,051
	1999	236,000	19,100	13,500	13,500	11,776
	2000	192,000	14,400	12,300	n/a	n/a

Other Red Rockfish (Sharpchin, Northern, Shortraker, Rougheye)

<u>Area</u>	<u>Year</u>	<u>Age 9+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
EBS	1998	11,600	356	267	267	111
	1999	11,600	356	267	267	217
	2000	8,200	259	194	n/a	n/a

Sharpchin/Northern Rockfish

<u>Area</u>	<u>Year</u>	<u>Age 9+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
AI	1998	94,000	5,640	4,230	4,230	3,675
	1999	94,000	5,640	4,230	4,230	5,181
	2000	115,000	6,870	5,150	n/a	n/a

Shortraker/Rougheye Rockfish

<u>Area</u>	<u>Year</u>	<u>Age 9+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
AI	1998	46,500	1,290	965	965	678
	1999	46,500	1,290	965	965	474
	2000	41,500	1,180	885	n/a	n/a

True POP (Sebastes alutus), Eastern Bering Sea

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

$$F_{ABC} = F_{40\%} \times (B_{2000}/B_{40\%} - 0.05)/(1 - 0.05) = 0.057 \times (24,900/26,200 - 0.05)/0.95 = 0.054$$

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

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

$$F_{OFL} = F_{35\%} \times (B_{2000}/B_{40\%} - 0.05)/(1 - 0.05) = 0.069 \times (24,900/26,200 - 0.05)/0.95 = 0.065$$

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

True POP, Aleutians:

The present assessment is a straightforward update of last year's assessment, incorporating new catch information and age composition data. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 100,000 t, 0.072, and 0.085, respectively. Projected spawning biomass for 2000 is 97,800 t, placing true POP in the Aleutians in sub-tier "b" of Tier 3. The maximum F_{ABC} value allowed under Tier 3b is computed as follows:

$$F_{ABC} = F_{40\%} \times (B_{2000}/B_{40\%} - 0.05)/(1 - 0.05) = 0.072 \times (97,800/100,000 - 0.05)/0.95 = 0.070$$

Projected harvesting at a fishing mortality rate of 0.070 gives a 2000 catch of 12,300 t, which is the Plan Team's recommended ABC (last year's ABC was set based on Tier 3a, so no adjustment of the $F_{40\%}$ rate was required). The ABC is apportioned among AI subareas based on survey distribution as follows: Western AI = 46.1%, Central AI = 28.5% , and Eastern = 25.4%.

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

$$F_{OFL} = F_{35\%} \times (B_{2000}/B_{40\%} - 0.05)/(1 - 0.05) = 0.085 \times (97,800/100,000 - 0.05)/0.95 = 0.083$$

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

Other Members of the POP Complex, Eastern Bering Sea:

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

Last year, the SSC determined that reliable estimates of the natural mortality rate (M) existed for the species in this complex, and that non-*alutus* members of the POP complex in the EBS therefore qualified for management under Tier 5 of the BSAI Groundfish FMP. The accepted estimates of M for these species in the EBS are as follows: rougheye rockfish--0.025, shortraker rockfish--0.030, and northern rockfish--0.060. The Plan Team recommends setting F_{ABC} at the maximum value allowable under Tier 5, which is 75% of M . On a species-specific basis, this translates into the following F_{ABC} values: rougheye rockfish--0.019, shortraker rockfish--0.023, and northern rockfish--0.045. Multiplying these rates by the best estimates of species-specific biomass and summing across species gives a 2000 ABC of 194 t. The assessment authors recommend separate ABCs for the SR/RE and NO/SC complexes in the Bering Sea, as is done in the Aleutian Islands. Their reasons are as follow: 1) these species occupy different depth ranges and can thus be differentially targeted, 2) there is an economic incentive to target SR/RE because they command a higher price, and 3) a combined quota could allow for higher fishing mortality of the SR/RE component than is desired. No catch information by species was provided to evaluate the biological and management implications, of this recommendation, however. Therefore, the Plan Team recommends continuing with a combined 2000 ABC for EBS “other red rockfish.”

The Plan Team’s OFL was determined from the Tier 5 formula, where setting $F_{OFL}=M$ for each species gives a combined 2000 OFL of 259 t. As a Tier 5 stock complex, it is not possible to determine whether the EBS “other red rockfish” complex is overfished or whether it is approaching an overfished condition.

Sharpchin and Northern Rockfish, Aleutians:

Because sharpchin rockfish are found only rarely in the Aleutians, northern rockfish are for all practical purposes the only species in this complex. Traditionally, the biomass estimates from all Aleutian bottom trawl surveys have been averaged over all years to obtain the best estimate of northern rockfish biomass. In the current assessment, however, biomass was estimated from the domestic trawl surveys only (1988-1997). Last year, the SSC determined that a reliable estimate of the natural mortality rate (M) existed for this stock, and that northern rockfish in the Aleutians therefore qualified for management under Tier 5 of the BSAI Groundfish FMP. The accepted estimate of M for northern rockfish in the Aleutians is 0.06. The Plan Team recommends setting F_{ABC} at the maximum value allowable under Tier 5, which is 75% of M , or 0.045. Multiplying this rate by the best estimate of biomass gives a 2000 ABC of 5,150 t.

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

Shortraker and Rougheye Rockfish, Aleutians:

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

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

Recommendations for next year's assessment

1) The Plan Team recommends that separate chapters be prepared for *S. alutus* and the combined "other red rockfish" in future SAFE Reports, which would improve the clarity of the assessment and facilitate better understanding of the methodology used and the results obtained. 2) The Plan Team recommends that fishery size compositions from 1995-1998 in the Bering Sea and from 1996-1998 in the Aleutian Islands be included in the respective *S. alutus* assessment models. 3) For the non-*alutus* species, the Plan Team recommends examining the possibility of specifying area-specific OFLs, ABCs, and TACs for the shortraker/rougheye complex and a combined-area OFL, ABC, and TAC for the northern/sharpchin complex. 4) For the non-*alutus* species, the Plan Team recommends that future assessments include catch and survey data by individual species to determine if differential harvest rates exist.

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 2000 are those recommended by the Plan Team. Catch data for 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

<u>Area</u>	<u>Year</u>	<u>Age 9+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
EBS	1998	7,030	492	369	369	199
	1999	7,030	492	369	369	137
	2000	7,030	492	369	n/a	n/a
AI	1998	13,000	913	685	685	380
	1999	13,000	913	685	685	632
	2000	13,000	913	685	n/a	n/a

The present assessment is basically identical to last year's assessment. Traditionally, the biomass estimates (split according to management area) from all bottom trawl surveys (EBS shelf/slope and Aleutians) are averaged over all years to obtain the best estimates of biomass for the species in this complex. Summed over the species in the complex, this procedure produces a biomass estimate of 7,030 t in the EBS and a biomass estimate of 13,000 t in the Aleutians. The great majority of this biomass is comprised of thornyhead rockfish. Last year, the SSC determined that a reliable estimate of the natural mortality rate (M) existed for the species in this subcomplex, and that "other rockfish" in the EBS and Aleutians therefore qualified for management under Tier 5 of the BSAI Groundfish FMP. The accepted estimate of M for these species in both areas is 0.07. The Plan Team recommends setting F_{ABC} at the maximum value allowable under Tier 5, which is 75% of M , or 0.053. Multiplying this rate by the best estimate of complex-wide biomass gives a 2000 ABC of 369 t in the EBS and 685 t in the Aleutians.

The Plan Team's OFLs were determined from the Tier 5 formula, where setting $F_{OFL}=M$ gives a 2000 OFL of 492 t in the EBS and 913 t in the Aleutians. As a Tier 5 stock complex, it is not possible to determine whether the "other rockfish" complex is overfished or whether it is approaching an overfished condition.

Recommendations for next year's assessment

During the meeting, the assessment authors provided catch and survey data for individual species within this complex. Notably, about 90% of this complex is composed of shortspine thornyheads according to survey data. However, the commercial fishery takes as much dusky rockfish and other rockfish as thornyheads. The Plan Team recommends that future assessments include further analysis of data by individual species within this complex to determine if differential harvest rates exist. The Plan Team also recommends that the authors examine longline survey data for additional information on "other rockfish."

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 2000 are those recommended by the Plan Team. Catch data for 1998 are as listed in this year's stock assessment. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

<u>Area</u>	<u>Year</u>	<u>Age 3+ Bio.</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
AI	1998	536,000	134,000	64,300	64,300	57,177
	1999	595,000	148,000	73,300	66,400	52,962
	2000	565,000	119,000	70,800	n/a	n/a

The present assessment is a straightforward update of last year's assessment, incorporating new catch data only. Last year, the SSC determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{30\%}$ existed for this stock, and that this stock therefore qualified for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ (which replaces $F_{30\%}$ under Amendment 56) from the present assessment are 154,000 t, 0.35, and 0.42, respectively. Projected spawning biomass for 2000 is 163,000 t, placing Atka mackerel in sub-tier "a" of Tier 3. The maximum F_{ABC} value allowable under Tier 3a is $F_{40\%}$ (0.35). Projected harvesting at a fishing mortality rate of 0.35 gives a 2000 catch of 103,000 t, which is the maximum permissible value of ABC under Tier 3a. The current F_{ABC} rate of 0.23 would give a 2000 catch of 70,800 t, about 31% below the maximum permissible value. The assessment authors recommend setting F_{ABC} at a value of 0.26, slightly higher than the current F_{ABC} rate but still substantially below the maximum permissible rate. They derive their F_{ABC} value as follows: First, compute the lower limit of the 50% confidence interval for each survey biomass estimate since 1986. Second, compute the ratio of this lower limit to the survey biomass point estimate for each survey since 1986. Third, compute the average value of this ratio (0.74). Finally, multiply this average by $F_{40\%}$ ($0.74 \times 0.35 = 0.26$). A fishing mortality rate of 0.26 would give a 2000 catch of 78,500 t.

The Plan Team agrees with the assessment authors that there are at least three reasons for setting 2000 ABC well below the maximum permissible level: 1) Stock size has declined by approximately 60% since 1991, 2) the 1997 Aleutian trawl survey biomass estimate was about 50% lower than the 1991 and 1994 survey estimates, and 3) simply applying the model's estimate of $F_{40\%}$ to the model's estimate of next year's biomass does not explicitly address the substantial uncertainty surrounding these estimates for a difficult-to-survey species such as Atka mackerel. However, the Plan Team notes that the assessment authors' recommended 2000 ABC would constitute a 7% increase over the 1999 ABC. While encouraged by the authors' development of a target harvest rate that varies directly with the level of certainty surrounding a key element of the stock assessment, the Plan Team recommends retaining the existing F_{ABC} rate of 0.23 to compute the 2000 ABC for

the following reasons: 1) Insufficient justification has been presented for an increase in ABC, given that the present assessment's estimates of $F_{40\%}$ and age 3+ biomass for 1999 and 2000 have all remained the same or decreased since last year's assessment; 2) the optimality properties of the authors' method for computing F_{ABC} have not been examined; 3) the sampling variances from the trawl survey biomass estimates most likely underestimate the total uncertainty associated with key reference points; and 4) the assessment authors plan on using AD Model Builder to conduct future assessments, which should enable more direct estimates of the uncertainty associated with key reference points. The Plan Team concurs with the existing formula for allocating ABC between subareas. When applied to the Plan Team's recommended ABC of 70,800 t, this formula gives the following subarea-specific ABCs: Eastern (541)–23.2% = 16,400 t, Central (542)–34.9% = 24,700 t, Western (543)– 41.9% = 29,700 t.

The Plan Team's OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.42 gives a 2000 OFL of 119,000 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 testing and development of trawl survey gear specialized for Atka mackerel be continued.

Squid and Other Species Complex

Status and catch specifications (t) of **squid and other species** (sharks, skates, sculpins, etc.) in recent years. The OFL and ABC for 2000 are those recommended by the Plan Team. Catch data for 1999 are from the NMFS Regional Office, and are current through 10/30/99.

Squid

<u>Area</u>	<u>Year</u>	<u>Biomass</u>	<u>OFL</u>	<u>ABC</u>	<u>TAC</u>	<u>Catch</u>
BSAI	1998	n/a	2,620	1,970	1,970	915
	1999	n/a	2,620	1,970	1,970	413
	2000	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	1998	669,000	134,000	25,800	25,800	25,531
	1999	643,000	122,100	25,800	32,860	18,396
	2000	611,000	71,500	26,800	n/a	n/a

The present squid assessment is a straightforward update of last year's assessment incorporating new catch information. Last year, the SSC determined that a reliable catch history existed for this stock complex, and that squid therefore qualified for management under Tier 6 of the BSAI Groundfish FMP. Under Tier 6, OFL is set equal to the average catch from 1978 through 1995 (unless an alternative value is established by the SSC on the basis of the best available scientific information), and ABC is constrained to be no greater than 75% of OFL. The average catch from 1978 through 1995 was 2,620 t. Given a 2000 OFL of 2,620 t, the maximum permissible value of ABC for 2000 would be 1,970 t, which is the Plan Team's recommended value. As a Tier

6 stock complex, it is not possible to determine whether the squid complex is overfished or whether it is approaching an overfished condition.

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

The assessment author, however, has noted that sculpins and skates, which tend to have M values substantially below 0.20, make up the majority of the survey biomass of the "other species" complex, meaning that an M of 0.20 might not be appropriate on average. As an alternative, M for the complex could be computed as the biomass-weighted estimates of the main component species, giving the following values:

	Sculpins	Skates	Sharks	Octopus	Total
Current Biomass (B)	200,267	403,400	5,450	2,033	611,000
M	0.15	0.10	0.09	0.30	0.12
$OFL = M H B$	30,040	40,340	491	610	71,500
$max\ ABC = 0.75 H OFL$	22,530	30,255	368	458	53,600

Using the above method, the maximum permissible ABC for 2000 would be 53,600 t. However, a catch of this magnitude would be twice the average catch since 1977. Given the large number of species in this complex, the Plan Team feels that it would be unwise to increase harvests until more information is available regarding the status of the complex's individual components. Therefore, the Plan Team recommends a 2000 ABC equal to the average catch, which is 26,800 t.

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

Table 1-- 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	Smelt	Myctophids
	Arrowtooth flounder		Bathylagids
	Rock sole		Sandfish
	Flathead sole		Pholids
	Other flatfish		Stichaeids
	Sablefish		Gonostomatids
	Pacific ocean perch		
	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.

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/d	1,101,428	160,681	586	1,134	203	101,310	8,303
1999/e	884,153	132,509	629	593	137	67,379	5,315

Table 2. (continued)							
Year	Arrow Tooth Flounder	Other Flat Fish	Rock Sole/b	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	9,954	32,910	39,781	1,930	405	16,785	1,192,480

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 December 31, 1998.

e/ Data through October 30, 1999. Does not include CDQ.

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

Year	Pollock	Pacific Cod	Sable Fish	Pacific Ocean Perch Complex	Other Rock Fish	Greenland Turbot	Yellow 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/c	23,821	34,964	595	13,729	385	821	5
1999/d	1,002	27,575	529	17,430	632	461	13

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	580	52	725	51,033	9	1,611	101,652

a/ Arrowtooth flounder included in Greenland turbot catch statistics.

b/ Includes POP shorttraker, roughey, northern and sharpchin rockfish.

c/ Data through December 31, 1998.

c/ Data through October 30, 1999. Does not include CDQ.

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 2000. "Biomass" corresponds to projected January 2000 abundance for the age+ range reported in the summary section. Biomass, OFL, and ABC are in metric tons, reported to three significant digits. F s are reported to two significant digits.

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

a/ Alaska plaice rate shown as an example.

b/ Sharpchin, northern, shortraker, and rougheye rockfish.

c/ Weighted average of species-specific rates.

d/ Sharpchin and northern rockfish.

e/ Shortraker and rougheye rockfish.

f/ Shortspine thornyhead rate shown as an example.

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

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

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

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

a/ Adjusted on the basis of the relationship between projected spawning biomass and $B_{40\%}$.

b/ Species-specific harvest strategy used only for Pacific cod

c/ Proxy values used for some species.

d/ Species-specific harvest strategy used only for Atka mackerel.

e/ Fishing mortality rate implied by setting ABC equal to historic average catch.

Table 7-- Summary of BSAI groundfish tier designations under Amendment 56, maximum permissible ABC fishing mortality rate ($max F_{ABC}$), the Plan Team's recommended 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. Insofar as the SSC has final authority for tier designations, the designations shown here represent Plan Team recommendations only. Biomass and ABC are in metric tons, reported to three significant digits. 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 2000 harvest season.

Species or Species Complex	Area	Tier	$max F_{ABC}$	F_{ABC}	$max ABC$	ABC	% Red.
Walleye pollock	EBS	1a	0.50	0.46	1,200,000	1,100,000	8
Walleye pollock	AI	5	0.23	0.23	23,800	23,800	
Walleye pollock	Bogoslof	5	0.15	0.15	71,300	71,300	
Pacific cod	BSAI	3b	0.28	0.26	206,000	193,000	6
Yellowfin sole	BSAI	3a	0.11	0.11	191,000	191,000	
Greenland turbot	BSAI	3a	0.26	0.064	34,700	9,300	73
Arrowtooth flounder	BSAI	3a	0.22	0.22	131,000	131,000	
Rock sole	BSAI	3a	0.15	0.15	230,000	230,000	
Flathead sole	BSAI	3a	0.28	0.28	73,500	73,500	
Other flatfish	BSAI	3a	0.28	0.28	117,000	117,000	
Sablefish	EBS	3b	0.11	0.11	1,410	1,410	
Sablefish	AI	3b	0.11	0.11	2,490	2,490	
Pacific ocean perch	EBS	3b	0.054	0.054	2,600	2,600	
Pacific ocean perch	AI	3b	0.070	0.070	12,300	12,300	
Other red rockfish	EBS	5	0.024	0.024	194	194	
Sharpchin/northern	AI	5	0.045	0.045	5,150	5,150	
Shortraker/rougheye	AI	5	0.021	0.021	885	885	
Other rockfish	EBS	5	0.053	0.053	369	369	
Other rockfish	AI	5	0.053	0.053	685	685	
Atka mackerel	BSAI	3a	0.35	0.23	103,000	70,800	31
Squid	BSAI	6	n/a	n/a	1,970	1,970	
Other species	BSAI	5	0.088	0.044	53,600	26,800	50
Total					2,462,953	2,265,553	8

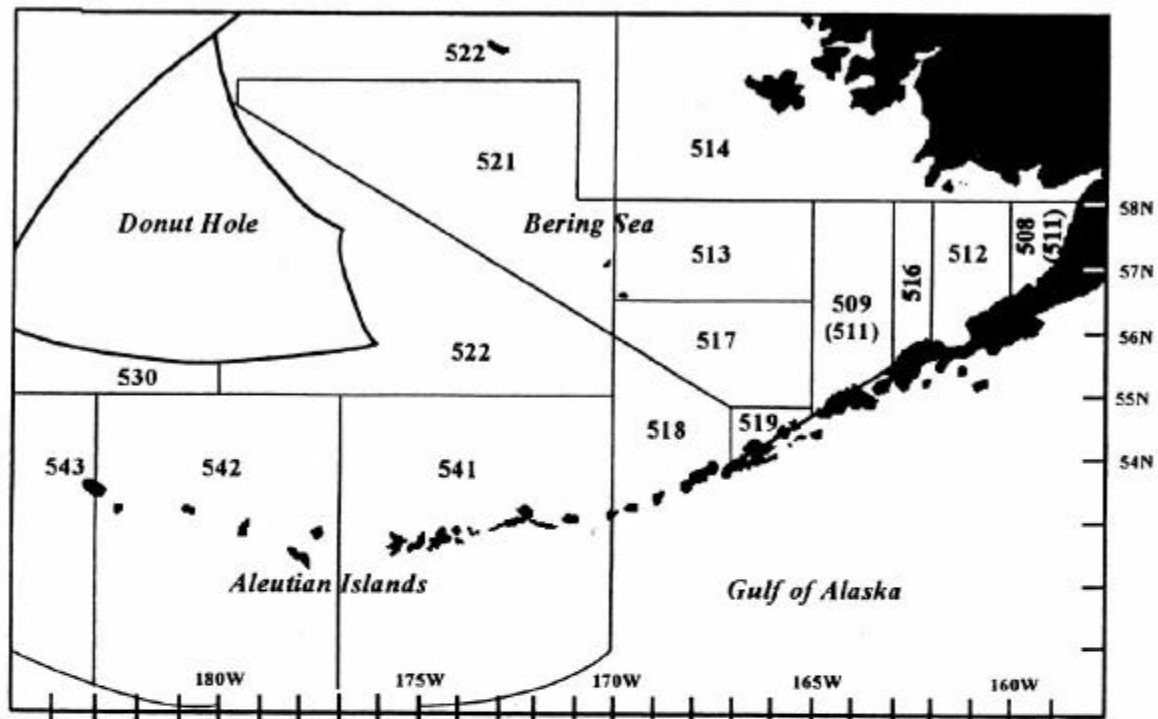


Figure 1

Statistical Reporting and Regulatory Areas

Rationale for Closure: Statistical Areas allow for small scale management of the Bering Sea and Aleutian Islands groundfish fisheries.

Origin: Part of original plan. Areas and numbering have been modified several times, however.

Description of Area: Although generally used as reporting purposes, these areas can be closed to fishing by regulations. In the Aleutian Islands area, the three statistical areas (541, 542, and 543) are defined for the purpose of allocating TACs. Area 518 has been used to specify pollock TACs in the Bogoslof Area.