APPENDIX A

STOCK ASSESSMENT AND FISHERY EVALUATION REPORT

FOR THE GROUNDFISH 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 for the Groundfish Resources 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 report summarizes the best available scientific information concerning the past, present, and possible future condition of the stocks, marine ecosystems, and fisheries that are managed under Federal regulation. It provides 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. For the FMP for the Groundfish Fishery of the Bering Sea and Aleutian Islands (BSAI) Area, the SAFE report is published in three sections: a "Stock Assessment" section, which comprises the bulk of the present document, and "Economic Status of Groundfish Fisheries off Alaska" and "Ecosystem Considerations" sections, which are bound separately.

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

This Stock Assessment section of the SAFE report for the BSAI groundfish fisheries is compiled by the BSAI Groundfish Plan Team from chapters contributed by scientists at NMFS Alaska Fisheries Science Center (AFSC). These chapters include a recommendation by the author(s) for overfishing level (OFL) and acceptable biological catch (ABC) for each stock and stock complex managed under the FMP. This introductory section includes the recommendations of the Plan Team. 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. Neither the author(s), Plan Team, nor SSC recommends TACs.

Members of the Plan Team who compiled this SAFE report were Loh-lee Low (chair), Jane DiCosimo (BSAI FMP coordinator), Kerim Aydin, David Carlile, William Clark, Kathy Kuletz, Dan Lew, Brenda Norcross, Michael Sigler (vice chair), Andrew Smoker, Grant Thompson, Theresa Tsou, and Ivan Vining.

BACKGROUND INFORMATION

Management Areas and Species

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

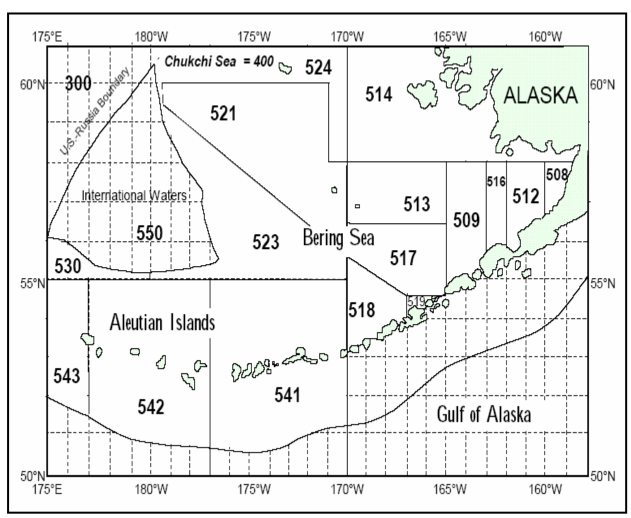

Figure 1. Bering Sea and Aleutian Islands statistical and reporting Areas

Five categories of finfishes and invertebrates have been designated for management purposes (see below). They are prohibited species (species which must be returned to the sea when caught), target species (species for which an individual TAC is established), other species (species for which an aggregate TAC is established), forage fish, and non-specified species (all species not included in one of the other categories). This SAFE report describes the status of the stocks in the target species and "other species" categories only. For finfish, the species categories other than non-specified species are populated as follow:

Prohibited Species	Target Species	Other Species	Forage Fish
Salmon	Walleye pollock	Sculpins	Eulachon
Pacific halibut	Pacific cod	Sharks	Capelin
Pacific herring	Sablefish	Skates	Sandlance
Steelhead trout	Yellowfin sole		Myctophids
	Greenland turbot		Bathylagids
	Arrowtooth flounder		Sandfish
	Northern rock sole		Pholids
	Flathead Sole		Stichaeids
	Alaska plaice		Gonostomatids
	Other flatfish		
	Pacific Ocean perch		
	Northern rockfish		
	Shortraker rockfish		
	Rougheye rockfish		
	Other rockfish		
	Atka mackerel		

For invertebrates, the species categories other than non-specified species are populated as follow:

Prohibited Species	Target Species	Other Species	Forage Fish
King crab		Squid	
Tanner crab		Octopus	

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 t in 1961. Following a decline in abundance of yellowfin sole, other species (principally walleye pollock) were targeted, and total catches rose to 2.2 million t in 1972. Walleye pollock is now the principal fishery, with recent catches approximately 1.4-1.5 million t. After the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) was adopted in 1976, catch restrictions and other management measures were placed on the fishery and all-species catches have since varied from one to two million t.

Catches in the Aleutian Islands subarea have always been much smaller than in the EBS. Target species have also been different (Table 3). Pacific ocean perch (POP) was the initial target species. As POP abundance declined, the fishery diversified to other species. During the early years of exploitation, overall catches of Aleutian groundfish reached a peak of 112,000 t in 1965. Atka mackerel is the largest fishery (58,400 t in 2006) in the AI, followed by Pacific cod (20,300 t in 2006). Total catches in recent years have been about 100,000 t annually, after peaking at 191,000 t in 1996.

In 2005, Congress implemented a statutory cap on TACs of 2 million t. Catches generally come in at just under that cap. Total 2005 BSAI catches were 1.98 million t. Table 4 provides total EBS and AI catches, 1954 through November 4, 2006.

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 the BSAI groundfish complex was originally estimated at 1.8 to 2.4 million t. The optimum yield (OY) range was set at 85% of the MSY range, or 1.4 to 2.0 million t. The sum of the TACs equals OY for the complex, which is constrained by the 2.0 million t cap.

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

Definition of Acceptable Biological Catch and the Overfishing Level

Amendment 56 defined ABC and OFL for the BSAI groundfish fisheries. The definitions are shown below, where the fishing mortality rate is denoted F, stock biomass (or spawning stock biomass, as appropriate) is denoted B, and the F and B levels corresponding to MSY are denoted F_{MSY} and B_{MSY} respectively.

Acceptable Biological Catch describes the acceptable harvest (or range of harvests) for a given stock or stock complex. Its derivation focuses on the status and dynamics of the stock, environmental conditions, other ecological factors, and prevailing technological characteristics of the fishery. The fishing mortality rate used to calculate ABC is described following the next paragraph.

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 has final authority for determining whether a given item of information is "reliable" for the purpose of this definition, and may use either objective or subjective criteria in making such determinations. For Tier 1, a "pdf" refers to a probability density function. For Tiers 1-2, if a reliable pdf of B_{MSY} is available, the preferred point estimate of B_{MSY} is the geometric mean of its pdf. For Tiers 1-5, if a reliable pdf of B is available, the preferred point estimate is the geometric mean of its pdf. For Tiers 1-3, the coefficient α is set at a default value of 0.05, with the understanding that the SSC may establish a different value for a specific stock or stock complex as merited by the best available scientific information. For Tiers 2-4, a designation of the form "$F_{X\%}$" refers to the F associated with an equilibrium level of spawning per recruit (SPR) equal to X% of the equilibrium level of spawning per recruit in the absence of any fishing. If reliable information sufficient to characterize the entire maturity schedule of a species is not available, the SSC may choose to view SPR

Tiers used to determine ABC and OFL for BSAI groundfish stocks.

(1) Information available: Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.

- *1a)* *Stock status:* $B/B_{MSY} > 1$
  - $F_{OFL} = m_A$, the arithmetic mean of the pdf
  - $F_{ABC} \le m_H$, the harmonic mean of the pdf
- *1b)* *Stock status:* $a < B/B_{MSY} \le 1$
  - $F_{OFL} = m_A \times (B/B_{MSY} - a)/(1 - a)$
  - $F_{ABC} \le m_H \times (B/B_{MSY} - a)/(1 - a)$
- *1c)* *Stock status:* $B/B_{MSY} \le a$
  - $F_{OFL} = 0$
  - $F_{ABC} = 0$

(2) Information available: Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{30\%}$, and $F_{40\%}$.

- *2a)* *Stock status:* $B/B_{MSY} > 1$
  - $F_{OFL} = F_{MSY} \times (F_{30\%}/F_{40\%})$
  - $F_{ABC} \le F_{MSY}$
- *2b)* *Stock status:* $a < B/B_{MSY} \le 1$
  - $F_{OFL} = F_{MSY} \times (F_{30\%}/F_{40\%}) \times (B/B_{MSY} - a)/(1 - a)$
  - $F_{ABC} \le F_{MSY} \times (B/B_{MSY} - a)/(1 - a)$
- *2c)* *Stock status:* $B/B_{MSY} \le a$
  - $F_{OFL} = 0$
  - $F_{ABC} = 0$

(3) Information available: Reliable point estimates of B, $B_{40\%}$, $F_{30\%}$, and $F_{40\%}$.

- *3a)* *Stock status:* $B/B_{40\%} > 1$
  - $F_{OFL} = F_{30\%}$
  - $F_{ABC} \le F_{40\%}$
- *3b)* *Stock status:* $a < B/B_{40\%} \le 1$
  - $F_{OFL} = F_{30\%} \times (B/B_{40\%} - a)/(1 - a)$
  - $F_{ABC} \le F_{40\%} \times (B/B_{40\%} - a)/(1 - a)$
- *3c)* *Stock status:* $B/B_{40\%} \le a$
  - $F_{OFL} = 0$
  - $F_{ABC} = 0$

(4) Information available: Reliable point estimates of B, $F_{30\%}$, and $F_{40\%}$.

  - $F_{OFL} = F_{30\%}$
  - $F_{ABC} \le F_{40\%}$

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

  - $F_{OFL} = M$
  - $F_{ABC} \le 0.75 \times M$

(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

$ABC \le 0.75 \times OFL$

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 $F=F_{40\%}$.

OVERVIEW OF "STOCK ASSESSMENT" SECTION

Summary and Use of Terms

Plan Team recommendations for 2007 and 2008 ABCs are summarized in Tables 1, 5 and 6. The sum of the recommended ABCs for 2007 and 2008 are 2,391,435 t and 2,351,755 t, respectively. These are approximately 666,000 t and 705,000 t below the sum of the 2006 ABCs. However, these values still exceed the the 2 million t cap employed by the Council as a conservation measure in setting TACs. Overall, the status of the stocks continues to appear relatively favorable, although some stocks are declining due to poor recruitment in recent years. Total biomass for 2007 and 2008 (17.3 million t) is roughly equal to last year's estimate. Stock status is summarized and OFL and ABC recommendations are presented on a stock-by-stock basis in the remainder of this section, with the following conventions observed:

- "Fishing mortality rate" refers to the full-selection F (i.e., the rate that applies to fish of fully selected sizes or ages), except in the case of the EBS walleye pollock assessment. For EBS walleye pollock, the fishing mortality rate consists of the ratio between catch (in biomass) and age 3+ biomass at the start of the year.

- "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, or to some other early age traditionally used for a particular species. 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.

- "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.

- Projected ABC, OFL, and biomass levels are reported to three significant digits, except when quoting a Council-approved value with more than three significant digits or when a stock-specific ABC is apportioned among areas on a percentage basis, in which case four significant digits may be used if necessary to avoid rounding error. Fishing mortality rates are reported to two significant digits.

- The figures listed as last year's ABCs correspond to the values approved by the Council. The figures listed as future ABCs correspond to the Plan Team's recommendations.

- Reported catches are as of November 4, 2006.

Projection Scenarios and Status Determination

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

For each scenario, the projections begin with the vector of 2005 numbers at age estimated in the assessment. This vector is then projected forward to the beginning of 2006 using the schedules of natural mortality and selectivity described in the assessment and the best available estimate of total (year-end) catch for 2005. 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 1,000 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 SAFE report. These five scenarios, which are designed to provide a range of harvest alternatives that are likely to bracket the final TACs for 2006 and 2007, 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 2006 recommended in the assessment to the max F_{ABC} for 2006. (Rationale: When F_{ABC} is set at a value below max F_{ABC}, it is often set at the value recommended in the stock assessment.)

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

- Scenario 4: In all future years, F is set equal to the average F from the period 2000-2004. (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 2006 and 2007, 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 2006:

(1) If spawning biomass for 2006 is estimated to be below ½ $B_{35\%}$, the stock is below its MSST.
If spawning biomass for 2006 is estimated to be above $B_{35\%}$, the stock is above its MSST.

(2) If spawning biomass for 2006 is estimated to be above ½ $B_{35\%}$ 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 2016 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 2008 is below ½ $B_{35\%}$, the stock is approaching an overfished condition.

(2) If the mean spawning biomass for 2008 is above $B_{35\%}$, the stock is not approaching an overfished condition.

(3) If the mean spawning biomass for 2008 is above ½ $B_{35\%}$ but below $B_{35\%}$, the determination depends on the mean spawning biomass for 2018. If the mean spawning biomass for 2018 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 reference stock levels (such as MSST) cannot be estimated reliably.

Two-Year OFL and ABC Projections

Amendment 48 to the BSAI Groundfish FMP made two significant changes to the stock assessment process. The first significant change has to do with assessments of BSAI rockfish. Because these assessments are dependent largely on data from the EBS slope survey and the Aleutian Islands shelf survey and because these surveys are currently conducted only in even-numbered years, few new data for the BSAI rockfish assessments become available during odd-numbered years. Therefore, SAFE chapters pertaining to BSAI rockfish will not include full updates during odd-numbered years.

The second significant change is that recommendations for ABC and OFL are required for each of the next two years. In September of this year, preliminary projections of ABC and OFL for 2007 and 2008 were made on the basis of last year's stock assessments. In this SAFE report, the Plan Team has revised most of those projections (Table 1) based on revised stock assessments. Such revisions are typically due to the development of new models; collection of new catch, survey, age composition, or size composition data; or use of new methodology for recommending ABC.

In the case of stocks managed under Tier 3, 2007 and 2008 ABC projections are typically based on the output for Scenarios 1 or 2 from the standard projection model. Projections for 2007 OFLs are based on the output for Scenario 6 from the standard projection model. Accurate projections for 2008 OFLs, however, require a modification of Scenario 6 because that scenario assumes that catch in each year of the projection will equal OFL. Because it is very likely that the actual catch in 2007 (or any year, for that matter) will be substantially less than OFL, projections of 2008 OFL were based on a modification of Scenario 6 in which projected catch for 2007 is fixed at the chapter author's best estimate. For example, if the actual catch for a particular species is typically close to the ABC, the author might set 2007 catch equal to the recommended ABC. Alternatively, if the actual catch for a particular species is typically much less than ABC, the author might set the 2007 catch equal to the recent average catch.

For the one stock managed under Tier 1, EBS walleye pollock, the Plan Team's recommended 2007-2008 ABCs and OFLs appear in Table 1.23. Note that this table includes 2008 ABCs and OFLs under different levels of assumed 2007 catches (including the Plan Team's recommendation of 1.3 million t for 2007). Both Tier 1 and Tier 3 values are included in this table. In the case of stocks managed under Tiers 4-6, 2008 projections are set equal to the Plan Team's recommended values for 2007.

The 2008 ABC and OFL values recommended in next year's SAFE report are likely to differ from this year's projections for 2008, for the same reasons that the 2007 projections in this SAFE report differ from those made in September.

Uncertainty / Ecosystem Considerations / Research

Statistical uncertainty is addressed in the individual assessments, and to some degree, by the tiers used to establish ABCs. In one case, statistical uncertainty or natural variability in the stock led the Plan Team to recommend 2007 and 2008 ABC values lower than the maximum permissible level. For Greenland turbot, the Plan Team's recommended ABC is 81 percent below the maximum permissible level.

Ecosystem considerations are also addressed in the stock assessment chapters. Similar to past years, several assessments (walleye pollock, Pacific cod, yellowfin sole, arrowtooth flounder, northern rock sole, flathead sole), included attempts to estimate relationships between bottom trawl survey catchability and bottom temperature. In some assessments (rock sole, flathead sole, Alaska plaice), potential effects of a possible 1989 regime shift on the stock-recruitment relationship are investigated (the yellowfin sole included a similar analysis for the 1978 regime shift). The EBS walleye pollock assessment, AI walleye pollock assessment, BSAI cod assessment, and the Atka mackerel assessment incorporated results from ecosystem models. Ecosystem model results were also included in the Squid and Other species sections for squids, skates, sculpins, and octopus. Linkages between BSAI arrowtooth and EBS pollock were reviewed this year, and recent data indicate that arrowtooth are an increasingly important predator of pollock in the EBS (although not at the scale observed in the GOA). BSAI cod ecosystem considerations reviewed the role of cod as a predator in the EBS and AI ecosystems. These results indicate that fishing mortality is the dominant source of explained cod mortality in both ecosystems, and that changing cod mortality in each ecosystem affects a different set of species with different magnitudes. The preliminary suggestion was that separate specifications for cod in the AI and EBS might be considered as an ecosystem consideration in the future. A full ecosystem analyses for the EBS presented in the Ecosystem Assessment section of the Ecosystem Considerations chapter suggested that there may have been a decrease in forage species biomass in 1999-2005 relative to the 1980s-90s. In general, the EBS was colder this year, with a fuller ice extent and later ice retreat compared with recent years; it was remarked that this more "normal" condition was localized to the EBS, and that in general the Arctic continued its trend of warmer temperatures and lower ice coverage. Although the Team was unable to identify any cases where these or other ecosystem considerations suggested an immediate need to adjust ABC, the Team encourages further development of ecosystem considerations. A full review of ecosystem status and trends is provided in the Ecosystem Considerations chapter.

1. 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 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/2006.

Area	Year	Age 3+ Bio.	OFL	ABC	TAC	Catch
EBS	2004	11,000,000	2,740,000	2,560,000	1,492,000	1,480,550
	2005	8,410,000	2,100,000	1,960,000	1,478,500	1,483,279
	2006	8,050,000	2,090,000	1,930,000	1,485,000	1,486,004
	2007	6,360,000	1,640,000	1,300,000	n/a	n/a
	2008	n/a	1,500,000	1,300,000	n/a	n/a
AI	2004	175,000	52,600	39,400	1,000	1,158
	2005	344,000	39,100	29,400	19,000	1,621
	2006	130,000	39,100	29,400	19,000	1,742
	2007	95,000	21,400	16,800	n/a	n/a
	2008	n/a	21,400	16,800	n/a	n/a
Bogoslof*	2004	198,000	39,600	2,570	50	0
	2005	198,000	39,600	2,570	10	0
	2006	253,000	50,600	38,000	10	0
	2007	240,000	48,000	5,220	n/a	n/a
	2008	n/a	48,000	5,220		

*The approach used by the Plan Team for recommending Bogoslof ABC in 2007-2008 differs from the approach used by the SSC and Council in previous years.

Eastern Bering Sea:

The present assessment is a straightforward update of last year's assessment, incorporating new data from the 2006 bottom trawl survey, the 2006 EIT survey, and the 2005 fishery. The 2006 bottom trawl survey estimated a biomass of 2,850,000 t, down 45% from the 2005 estimate. The 2006 EIT survey estimated a biomass of 1,560,000 t, down 53% from the 2004 estimate.

Three alternative models are presented, all of which follow the statistical age-structured approach that has been used for the last several years. All of these models give point estimates of 2007 age 3+ biomass in the range 6,100,000 t to 6,360,000 t (Table 1.16, Models 1 and 2 only). The author recommends Model 2, which differs from last year's base model (Model 1) by the addition of data from the northwest area of the bottom trawl survey (strata 8 and 9). This increases coverage of the current range of pollock. The Plan Team concurred with the authors and based its recommendations for 2007 on Model 2. The current assessment provides estimates of age-3+ biomass that are very close to those provided in last year's assessment (Figure 1.39). While the 2000 year class appears much stronger than average, most other year classes spawned after 1996 appear weaker than average, with the exception of the 1999 and 2005 year classes, which appear average (Figure 1.43).

The SSC has determined that reliable estimates of B_{MSY} and the probability density function for F_{MSY} exist for this stock. Therefore, EBS walleye pollock qualify for management under Tier 1. The Plan Team concurs with the assessment authors' conclusion that the Tier 1 reference points are reliably estimated given the structure of the model. The updated estimate of B_{MSY} from the present assessment is 2,060,000 t, compared to 2,120,000 t from last year's assessment. The projected spawning biomass for 2007 is 2,170,000 t, placing EBS walleye pollock in sub-tier "a" of Tier 1. As in the last three assessments, the maximum permissible ABC harvest rate was based on the ratio between MSY and the equilibrium age 3+ biomass corresponding to MSY. The harmonic mean of this ratio from the present assessment is 0.243, virtually identical to the value obtained in last year's assessment. This ratio is multiplied by the geometric mean of the projected age 3+ biomass for 2007 (6,220,000

t) to obtain the maximum permissible ABC for 2007, which is 1,510,000 t. This ABC is about 8% higher than the 2007 yield corresponding to an $F_{40\%}$ strategy, which is 1,390,000 t. For the last five years, ABC for this stock has been set at the maximum permissible value. This year, the assessment authors recommend setting ABC at 1,300,000 t, rather than at the maximum permissible value.

A range of ABC values from 1,200,000 – 1,510,000 t was discussed by Plan Team, with arguments offered in support of candidate values spanning the full range. Several reasons were cited for recommending an ABC less than the maximum permissible value of 1,510,000 t. In 2006, fishing vessels needed to travel farther to catch pollock, lower abundances of pollock than expected were observed for both the bottom trawl survey and the EIT survey, some evidence exists for recently lowered Bering Sea productivity (reduced zooplankton and forage fish abundance as shown in this year's Ecosystem Considerations Chapter), and arrowtooth flounder, which is an important predator of pollock, is increasing. A catch of 1,300,000 t would maintain the spawning exploitation rate at the current level. In contrast, the $F_{40\%}$ ABC recommendation of 1,390,000 t and the maximum permissible value of 1,510,000 t would increase spawning exploitation rate to the highest values since 1980. On the other hand, an ABC of 1,300,000 t does not preserve markedly more spawning biomass compared to the $F_{40\%}$ ABC recommendation of 1,390,000 t (Figure 1.45). One reason was cited for recommending an ABC equal the maximum permissible value; the 2007 female spawning biomass is near B_{msy}, which is the target spawning biomass. The Plan Team chose to accept the senior author's recommendation of 1,300,000 t for an ABC less than the maximum permissible value and to maintain the spawning exploitation rate at the current level. However, there was not consensus on this recommendation, as the effect of projected fixed annual catches of 1.2, 1.3, and 1.4 million t on female spawning biomass, are relatively close when projected two years forward.

The OFL harvest ratio under Tier 1a is 0.26, the arithmetic mean of the ratio between MSY and the equilibrium age 3+ biomass corresponding to MSY. The product of this ratio and the geometric mean of the projected age 3+ biomass for 2007 (6,361,000 t) gives the OFL for 2007, which is 1,641,000 t. The walleye pollock stock in the EBS is not overfished and is not approaching an overfished condition.

This year's assessment includes an "Ecosystems Considerations" section. Results of ecosystem models indicate that the pollock stock exhibits a high level of cannibalism, which tends to stabilize the stock, but this cannibalism has dropped since 2000, according to diet data. The Plan Team expressed some concern that arrowtooth flounder, which preys on juvenile pollock, is increasing rapidly and ultimately may prey on more pollock and reduce its abundance. Pollock also prey on juvenile arrowtooth flounder, but fishing mortality is much less for arrowtooth flounder than pollock, so pollock may be differentially affected, especially if pollock recruitment declines.
Aleutian Islands:

For many years, the Aleutian Islands pollock stock has lacked an age-structured model and the SSC has determined that the stock qualified for management under Tier 5. Following preliminary exploration of some age-structured models in the 2003 assessment, several models were presented for potential management use in recent years' assessments. However, the SSC concluded that adoption of a model was precluded until such time as additional field research results in greater confidence in the stock structure and spatial distribution of pollock in the Aleutian Islands. An experimental survey (AICASS) conducted by the senior assessment author provides research to help resolve the ambiguities in pollock stock structure and may also facilitate exploration of alternative management systems based on finer spatial-temporal scales. The Plan Team supports continuation of these studies as well as genetic studies to resolve pollock stock structure.

In this year's assessment, two models from last year's assessment are presented. Model 1 uses data only from the portion of the stock to the west of 174°W and Model 2A includes survey data from the entire Aleutian Islands management area. As before, the Plan Team commends the authors for exploring the available data, but the same ambiguities of stock structures and dynamics present in last year's assessment remain. As a result, the Plan Team does not support using the models to estimate Aleutian Islands pollock abundance.

A third model (Model 2B) was presented that also estimates natural mortality within Model 2. The senior author’s preferred model is Model 2B. The estimate of $M = 0.235$ appears more credible than the value of 0.3 assumed for previous assessments. The posterior distribution of M is relatively narrow, implying that the estimate of M is precise. In addition, ecosystem modeling indicates that pollock natural mortality is less in the Aleutians than in the Bering Sea. The Plan Team recommends using the estimated value for Tier 5 calculations of ABC.

The SSC has determined that the Aleutian pollock stock qualifies for management under Tier 5. The Plan Team recommends computing the maximum permissible ABC for 2007 as the product of the most recent (2006) survey biomass estimate (95,000 t) and 75% of the natural mortality rate (0.24), giving a value of 16,800 t. The corresponding 2007 OFL would be 21,400 t. As a Tier 5 stock, it is not possible to determine whether Aleutian pollock is overfished or whether it is approaching an overfished condition.

Bogoslof:

The 2006 hydroacoustic survey of the Bogoslof region resulted in a biomass estimate of 240,000 t, a decrease of about 5% from the 2005 estimate. The SSC has determined that Bogoslof pollock qualified for management under Tier 5. The maximum permissible ABC under Tier 5 is 75% of the product of the natural mortality rate (0.20) and biomass, giving a value of 36,000 t. For several years, the SSC has used a much more conservative approach. The SSC formula uses a biomass-adjusted harvest rate rule (with 2,000,000 t estimate as a reference stock size) and an estimate of F_{ABC} based on growth, natural mortality, and maturation rate. If the formula used by the SSC is applied, the resulting fishing mortality rate is 0.022, giving a 2007 ABC of 5,220 t. The Plan Team concurs with the SSC choice of harvest formula, so the Plan Team recommended ABC for 2007 is 5,220 t.

The overfishing level under Tier 5 is the product of the natural mortality rate and biomass, giving an OFL of 48,000 t for 2007. As a Tier 5 stock, it is not possible to determine whether Bogoslof pollock is overfished or whether it is approaching an overfished condition.

Two age-structured models were presented in this year’s assessment. Survey catchability was assumed equal to 1.0 in both models. The two models differed in whether a portion of Donut Hole catches were excluded (Model 1) or included (Model 2). Both models imply that age 5+ biomass peaked in 1983 supported largely by an enormous 1978 year class. The 1978 year class appears to have been more than 5 times larger than any subsequent year class. Following a decline from the 1983 peak, biomass appears to have been fairly stable since about 1992. The authors have made an excellent start on age-structured modeling of this stock and provide some useful insights into the history of the stock; however, adoption of any of the models would be premature. In part, the portion of the catch data from the “Donut Hole” area to include in the model is uncertain. In addition, whether pollock in the Bogoslof region can be usefully modeled as a closed stock is uncertain as the amount of interchange with pollock in the Bering Sea is unknown.

2. 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 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/2006.

Area	Year	Age 3+ Bio.	OFL	ABC	TAC	Catch
BSAI	2005	1,290,000	265,000	206,000	206,000	205,434
	2006	922,000	230,000	194,000	190,000	186,882
	2007	960,000	207,000	176,000	n/a	n/a
	2008	n/a	154,000	131,000	n/a	n/a

The present assessment is a substantial revision of last year's assessment, exploring several model configurations. Model 0 is last year’s preferred model, where catchability was fixed ($Q = 1.0$). Eight alternative models were tested (Models A1, A2, B1, B2, C1, C2, D1, D2) with some features in common including estimation of shelf trawl survey catchability (*Q*; prior mean = 1.0, CV = 0.3) and separate estimation of Q for the pre-1982 and 1982-and-later trawl surveys. The eight alternative models differed in whether longline surveys were included, the functional form of selectivity, and whether priors were given full (1.0) or partial (0.5) weight. The two selectivity functions were the double-logistic (8 parameters) and the double-normal (4 parameters). The combinations of these eight models form a factorial design.

The Plan Team agrees with the criteria the senior author proposed for selecting the preferred model: 1) reasonable selectivity for a trawl survey (no pronounced "kink" in the shape); 2) data are validated and ready for use (e.g. longline survey data); 3) model converges well and is not strongly dependent on initial values; and 4) the model is not strongly dependent on prior distributions. The model fits were similar regardless of the model configuration. All models converged successfully, but models with partial weights on priors had to be started from the converged parameter from runs with full weight on priors.

The Plan Team agrees with the senior author's preferred model, B1, to represent the Bering Sea cod population. For many years, cod was challenging to assess because age data were limited. In this year's assessment, three more years of age data were added to total 11 years of age data. This addition provides for an age data set of reasonable duration to support an age-structured assessment. In addition, catchability is estimated and natural mortality is fixed in this year's assessment, as recommended by the Plan Team last year. A simplified selectivity function with four (double-normal) rather than eight (double-logistic) parameters was successfully applied and improved model performance. The results for Model B1 are presented below.

This year's EBS shelf bottom trawl survey resulted in a biomass estimate of 518,000 t, down about 14% from the 2005 estimate and close to the previous minimum for the time series (517,000 t in 1991). Model estimates of abundance are higher than last year's assessment. Estimated 2007 spawning biomass for the BSAI stock is 307,000 t, up about 10% from last year's estimate for 2006 and up about 25% from last year's $F_{40\%}$ projection for 2007. Abundance is projected to continue to decrease during 2007-2009 because recent (2000-2004) recruitments are below average.
The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, and that this stock therefore qualifies for management under Tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 320,000 t, 0.34 and 0.42, respectively. Pacific cod qualify for management under sub-tier "b" of Tier 3 because projected biomass for 2007 (307,000 t) is about 4% below $B_{40\%}$. Fishing at an instantaneous rate of 0.33 is projected to result in a 2007 catch of 176,000 t, which is the maximum permissible ABC under Amendment 56.

The Plan Team recommends setting 2007 ABC at the maximum permissible value of 176,000 t, 9% below the 2006 ABC of 194,000 t. ABC is projected to continue to decline; the current estimate of the maximum permissible ABC for 2008 is 131,000 t. The Plan Team's recommended OFL was determined from the Tier 3b formula, where fishing at a rate of 0.39 gives a 2006 value of 207,000 t, down 10% from the 2005 OFL of 230,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

Last year, the Plan Team made two recommendations for continued research on cod maturity. First, AFSC scientists should continue an existing study of measures of egg viability as a method for determining whether spawning potential per unit body weight is less for smaller fish. This is a concern because, for example, egg diameters in small Atlantic cod are smaller and contain less yolk than egg diameters of large Atlantic cod. Second, AFSC scientists should broaden the geographic coverage of the Bering Sea samples, which were collected from a small (4 X 8 nmi) area near Cape Sarichef during January and March. The limited sampling may not be representative of the population if, for example, only precocious, small cod enter the spawning area. The senior author stated that a three-year maturity study started this year, in part to expand spatial coverage as recommended by the Plan Team last year. The Plan Team commends the AFSC for this effort.

One model improvement in this year's assessment was testing of an additional selectivity function (double-normal), which improved model performance and improved the biological reasonableness of the shape of the estimated selectivity function. The Plan Team recommends that other selectivity functions be tested in next year's assessment to determine if further improvements in model performance can be obtained. Through the continued addition of age data in this year's assessment, plus the additional flexibility of the selectivity functions in this year's assessment, the authors have significantly improved the Pacific cod assessment these last three years.

3. 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 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/06.

Area	Year	Age 4+ Bio.	OFL	ABC	TAC	Catch
EBS	2005	34,000	2,950	2,440	2,440	1,075
	2006	31,000	3,680	3,060	2,820	1,027
	2007	33,200	3,520	2,980	n/a	n/a
	2008	n/a	3,290	2,970	n/a	n/a
AI	2005	34,000	3,170	2,620	2,620	1,476
	2006	33,000	3,740	3,100	3,000	1,033
	2007	31,300	3,320	2,810	n/a	n/a
	2008	n/a	3,100	2,800	n/a	n/a

Sablefish are assessed as a single stock in the BSAI and GOA. The present assessment departs from previous years' assessments by using a split-sex age-structured model and incorporating Gulf of Alaska trawl survey lengths and biomass estimates for depths of 500 meters or less. The split-sex model approach is appropriate given the differences in growth and maturity between males and females. Data from the trawl survey were included to improve estimates of recruitment, as trawl surveys tend to catch smaller fish than the longline survey. In addition, the assessment model incorporates the following data into the model: relative abundance and length data from the 2006 longline survey, relative abundance and length data from the 2005 longline fishery, and age data from the 2005 longline survey and longline fisheries. Fishery CPUE data from observer data and logbooks were used in the catch rate analysis. The commercial CPUE observer data were screened for killer whale depredation and targeting on other species. Logbook data were similarly screened to account for multiple gear configurations. The final dataset showed a good agreement between observer and logbook fishery CPUE.

The survey abundance index increased 8% from 2005 to 2006, following a 2.5% decrease from 2004 to 2005. Relative abundance in 2006 is 16% higher than in 2000. The fishery abundance index decreased 4% from 2004 to 2005 (2006 data are not available yet).

Spawning biomass is projected to remain stable from 2006 to 2007. Sablefish abundance is moderate; projected 2007 spawning biomass is 38% of unfished biomass. Abundance has increased from a low of 33% of unfished biomass during 1998 to 2000. The 1997 and 2000 year classes appear to be important parts of the total biomass and together are projected to account for 26% of 2007 spawning biomass, with each contributing 13% to the 2007 spawning biomass.

The SSC has determined that this stock qualifies for management under Tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from this assessment are 124,000 t (combined across the EBS, AI, and GOA), 0.092, and 0.11, respectively. Projected spawning biomass (combined areas) for 2007 is 119,000 t (95% of $B_{40\%}$), placing sablefish in sub-tier "b" of Tier 3. The maximum permissible value of F_{ABC} under Tier 3b is 0.088, which translates into a 2007 catch (combined areas) of 20,100 t and is the Plan Team's recommended combined 2006 ABC. The recommended 2007 ABC is slightly lower than the 2006 ABC of 21,000 t. Spawning biomass is projected to remain stable through 2010. A 5-year exponential weighting of longline survey relative abundance may be used to apportion the combined 2007 ABC among regions, resulting in the following values for 2007: 2,980 t for EBS, 2,810 t for AI. Relative to 2006, apportionments to EBS and AI increased.

The risk that maximum permissible ABC will reduce spawning biomass below the replacement level is low. During the next three years, the probability of spawning biomass falling below the estimated threshold of $B_{18\%}$ is near zero. The long-term probability depends on future recruitment, but will be updated each year as new data become available.

The OFL fishing mortality rate under Tier 3b is 0.10. This fishing mortality rate translates into a 2007 OFL (combined areas) of 23,750 t. Using the survey-based apportionment scheme described above, 2007 OFL also may be apportioned among regions and results in the following values for 2007: 3,520 t for EBS and 3,320 t for AI. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

4. 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 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/06.

Area	Year	Age 2+ Bio.	OFL	ABC	TAC	Catch
BSAI	2005	1,560,000	148,000	124,000	90,686	94,374
	2006	1,680,000	144,000	121,000	95,701	97,648
	2007	2,000,000	160,000	136,000	n/a	n/a
	2008	n/a	158,000	134,000	n/a	n/a

This year's EBS bottom trawl survey resulted in a biomass estimate of 2,130,000 t, an approximate decrease of 25% from last year's survey. This decrease could be due in part to the lower than normal bottom temperatures encountered on the survey. The assessment contains an ecosystem component by representing catchability of the EBS shelf trawl survey as an exponential function of average annual bottom temperature during the EBS shelf trawl survey.

A change in age data was made this year. In past years, the authors truncated the age at 17+ years, and during this assessment age was truncated at 20+ years. Several models were analyzed for this assessment, the models differed by changing whether natural mortality (*M*) or catchability (*Q*) were estimated in the model at varying errors on the priors for these parameters.

The assessment authors once again considered moving the assessment to Tier 1. The robustness of the Ricker spawner-recruit model was tested by estimating a single spawner-recruit model then using Tier 1 management on simulated stock production from multiple productivity regimes. The productivity regimes were based on observed productivity in the Bering Sea. Though the results indicated that the Tier 1 assessment was robust, the authors still felt that a move to Tier 1 may not be appropriate due to the non-stationarity of the stock-recruitment relationships for Bering Sea yellowfin sole. The Plan Team agreed with the authors and felt that the recovery from low abundance had only occurred once, during a fairly short time period and the spawner-recruit estimate from the most recent regime predicted a B_{MSY} lower than any spawning biomass during the time period. For these reasons the Plan Team decided to use Tier 3.

Reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, thereby qualifying yellowfin sole for management under Tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 460,000 t, 0.11, and 0.13, respectively. Given that the projected 2007 spawning biomass of 585,000 t exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2007 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 2007 ABC of 136,000 t.

The Plan Team's OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.13 gives a 2007 OFL of 160,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

This stock is predicted to be fairly stable or decrease slightly in the near future due to below average recruitment in the last 5 years.

5. 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 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/06.

Year	Area	Age 1+ Bio.	OFL	Subarea	ABC	TAC	Catch
2005	BSAI	98,300	19,200		3,930	3,500	2,560
				EBS	2,720	2,700	2,120
				AI	1,210	800	440
2006	BSAI	74,200	14,200		2,740	2,740	1,935
				EBS	1,890	1,890	1,433
				AI	850	850	502
2007	BSAI	119,000	15,600		2,440		
				EBS	1,680	n/a	n/a
				AI	760	n/a	n/a
2008	BSAI	n/a	16,000		2,490		
				EBS	1,720	n/a	n/a
				AI	770	n/a	n/a

This year's Greenland turbot assessment model included updated 2003-2006 catch data, recompiled fishery catch-at-length data by gear type for all post-1988 domestic fisheries, and biomass and length composition estimates from the 2006 The EBS shelf survey. Also included were new age data from 1994 and 1998 surveys, from recent research on age and growth of Greenland turbot, and an updated, aggregated longline survey data index for the EBS and Aleutian Islands.

The newer implementation of Stock Synthesis 2 was used for modeling. The current implementation of the model retains the key assumption of former models that the slope trawl survey is an absolute index representing 75% of the Greenland turbot stock in US waters. An updated mortality estimate of 0.112 supersedes the 0.18 used in the past. Compared to previous models, selectivity was allowed to change more over time for some surveys and fisheries, resulting in improvements of some residual patterns.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock. Updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 41,800 t, 0.51, and 0.67, respectively. Projected spawning biomass for 2007 is 60,400 t. Greenland turbot therefore qualify for management under Tier 3a. The maximum permissible value of F_{ABC} under this tier translates into a 2007 ABC of 12,680 t.

Because this was the first implementation of the model under SS2, and because of the lack of a slope survey, the author recommended setting the 2007 ABC at a value less than the maximum permissible. The Plan Team agrees with the authors' recommendation to use F_{ABC} = 5-year average catch, which results in a 2007 ABC of 2,440 t corresponding to a full selection fishing mortality rate of 0.09. The OFL fishing mortality rate is computed under Tier 3a, $F_{OFL} = F_{35\%} = 0.67$, and translates into a 2007 OFL of 15,600 t.

6. 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 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/06.

Area	Year	Age 1+ Bio.	OFL	ABC	TAC	Catch
BSAI	2005	684,000	132,000	108,000	12,000	14,233
	2006	964,000	166,000	136,000	13,000	12,794
	2007	1,280,000	193,000	158,000	n/a	n/a
	2008	n/a	208,000	171,000	n/a	n/a

The present assessment is a straightforward update of last year's assessment, incorporating new data from the EBS shelf trawl survey in 2006, and the 2005 and 2006 fisheries. The assessment contains an ecosystem component by representing catchability of the EBS shelf trawl survey as an exponential function of average annual bottom temperature during the EBS shelf trawl survey. This year's EBS shelf bottom trawl survey resulted in a biomass estimate of 670,000 t, which is second only to last year's survey as the largest estimate observed for this stock. This year's AI bottom trawl survey resulted in a biomass estimate of 229,000 t, the largest AI biomass estimate for this stock.

More female arrowtooth flounder are caught than males during the fisheries and the surveys. As in recent assessments, the model was evaluated using a range of male natural mortality rates between 0.27 and 0.34. The male natural mortality rate used 0.33 provides a good fit to the data components and is consistent with the hypothesis that differences in sex ratios are due to sex-specific natural mortality and not availability. As in past assessments, the female natural mortality rate was fixed at 0.20.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, thereby qualifying arrowtooth flounder for management under Tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 340,000 t, 0.24, and 0.30, respectively. Given that the projected 2007 spawning biomass of 824,000 t exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2007 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (0.24) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2006 ABC of 158,000 t.

The OFL fishing mortality rate under Tier 3a is $F_{35\%}$ (0.30), which translates to a 2006 OFL of 193,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

The authors also noted that the ABC recommendation is for the combined harvest of arrowtooth flounder and Kamchatka flounder, which are difficult to distinguish and had similar biomass trends from the EBS trawl survey since 1991.

Ecosystem considerations of predator-prey dynamics of arrowtooth flounder in the Bering Sea indicated that the top prey species of arrowtooth flounders are juvenile pollock. However, juvenile arrowtooth flounder in the Bering Sea are an important prey for adult pollock. The ramification of increases of one of these species, with decreases of the other, has unknown consequences due to this duality of the predator-prey relationship.

7. Northern 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 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/06.

Area	Year	Age 2+ Bio	OFL	ABC	TAC	Catch
BSAI	2005	1,380,000	157,000	132,000	41,500	37,361
	2006	1,490,000	150,000	126,000	41,500	36,430
	2007	1,670,000	144,000	121,000	n/a	n/a
	2008	n/a	152,000	128,000	n/a	n/a

The present assessment is a straightforward update of last year's assessment. Northern rock sole (*Lepidopsetta polyxystra*) is the dominant rock sole species in the Bering Sea. Only 2% of the commercial catch is estimated to be southern rock sole (*Lepidopsetta bilineata*). Therefore this assessment for 2007 is for northern rock sole only. No attempt was made to correct past catch or survey data by species.

Changes to input data in this analysis include addition of 2005 rock sole fishery age composition, 2005 northern rock sole survey age composition, and 2006 northern rock sole trawl survey biomass point estimate and standard error. Only Bering Sea survey data (no Aleutian Islands data, 3% of total rock sole) were used in calculations. Another change to the input data was inclusion of an estimate of retained and discarded portions of the 2005 rock sole catches. Analysis was conducted with fishery catch and discards through 6 September 2006.

As in recent assessments this analysis included an estimate of natural mortality; an M of 0.156 was used, corresponding to M of 0.16 used in 2005. As last year, this value produced the best model fit to the observed data. As explained in 2003 and affirmed in 2004, the authors investigated catchability (Q) and concluded that temperature does not affect survey catchability. A Q of 1.52 together with M of 0.156 provided the best model fit to the observed data.

The stock assessment model, as configured above, (2006 EBS bottom trawl survey) resulted in a biomass estimate of 1,670,000 t. The reduced estimate of mortality and constrained estimate of q resulted in an increased biomass estimate compared to the 2005 estimate of 1,490,000 t. This is an increase of 12% over the biomass estimate in 2005. Despite this increase, as for several other flatfish stocks, the rock sole stock is expected to decline due to low recruitment in the last decade. However, good recruitment in 2001 and 2002 should increase the stock biomass at the beginning of the next decade.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, and therefore it qualifies for management under Tier 3 of the BSAI Groundfish FMP. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 222,000 t, 0.14, and 0.17, respectively. Given that the projected 2007 spawning biomass of 392,000 t exceeds $B_{40\%}$, the Plan Team's ABC and OFL recommendations for 2006 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (=0.14) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2007 ABC of 121,000 t.

OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.17 gives a 2007 OFL of 144,000 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

This is a stable fishery that lightly exploits the stock because it is constrained by prohibited species catch limits and the BSAI optimum yield limit. In 2005, the total catch was 10% less than the total TAC.

The SSC requested a management strategy evaluation (MSE) exploring the consequences of a non-stationary spawner-recruit relationship. An analysis of Tier 1 spawner-recruit considerations yields unrealistic and unreliable estimates of F_{MSY}, B_{MSY}, and MSY. Rock sole recruitment appears to relate to environmental fluctuations of a relatively short time scale. A stronger relationship exists between cross-shelf advection of larvae and recruitment of rock sole (Wilderbuer et al. 2002) than between spawners and recruits. Field assessment to develop an index rock sole larvae and juveniles would allow the cross-shelf transport mechanism to be proven. Therefore, a Tier 1 analysis is not recommended and is not used in this analysis.

8. 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 2007 and 2008 are those recommended by the Plan Team. Catch data are current through November 4, 2006.

Area	Year	Age 3+ Bio.	OFL	ABC	TAC	Catch
BSAI	2005	560,000	70,200	58,500	19,500	15,818
	2006	636,000	71,800	59,800	19,500	17,871
	2007	875,000	95,300	79,200	n/a	n/a
	2008	876,000	92,800	77,200	n/a	n/a

The present assessment is a straightforward update of last year's assessment. The present assessment includes updated catch, survey biomass, length composition, and age composition data. This year's survey biomass was 645,000, a 4% increase from 2005. The author undertook an examination of the lumping of youngest and oldest age classes in previous assessments, disaggregating these age classes in the current assessment may have led in part to the 35% increase in assessed biomass over last year; the Plan Team felt that this new model was an improvement and recommended its use.

In response to SSC comments, the author examined the distribution of Bering flounder with respect to the fishery. The northerly distribution of the species did not seem to overlap the spatial distribution of the fishery, although mismatch in seasonal timing of the survey versus the fishery means that this is not conclusive.

The SSC has determined that reliable estimates of $B_{40\%}$(145,000 t) $F_{40\%}$, (0.31) and $F_{35\%}$ (0.37) exist for this stock, thereby qualifying the stock for management under Tier 3. Given that the projected 2007 spawning biomass of 274,000 t exceeds $B_{40\%}$, the ABC and OFL recommendations for 2007 were calculated under sub-tier "a" of Tier 3. The Plan Team recommends setting F_{ABC} at the $F_{40\%}$ (0.31) level, which is the maximum permissible level under Tier 3a. Projected harvesting at the $F_{40\%}$ level gives a 2007 ABC of 79,200 t. The OFL was determined from the Tier 3a formula, where an $F_{35\%}$ value of 0.37 gives a 2007 OFL of 95,300 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

9. Alaska plaice

Status and catch specifications (t) of Alaska plaice in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/06

Area	Year	Age 3 + Bio.	OFL	ABC	TAC	Catch
BSAI	2005	913,000	237,000	189,000	8,000	11,175
	2006	1,008,000	237,000	188,000	8,000	17,263
	2007	1,340,000	241,000	190,000	n/a	n/a
	2008	n/a	252,000	199,000	n/a	n/a

The present assessment is a straightforward update of last year's assessment. Input data were updated with 2006 catch data and inclusion of fishery catch through 6 September 2006. The 2006 trawl survey biomass estimate and standard error, and 2006 length composition of survey catch also were added to the model. In response to a Plan Team request, the 2005 survey ages were read from otoliths and the 2005 survey age composition was added to the assessment.

No relationship between survey catchability and bottom temperature was found for Alaska plaice.

Reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, therefore qualifying it for management under Tier 3a of the BSAI Groundfish FMP. The updated point estimates are $B_{40\%}$ = 138,000 t, $F_{40\%}$ = 0.61, $F_{35\%}$ = 0.83. These are high values for flatfishes, but these values are the consequence of Alaska plaice maturing before recruiting to the fishery. Given that the projected 2007 spawning biomass of 295,000 t exceeds $B_{40\%}$, the ABC and OFL recommendations for 2007 were calculated under sub-tier "a" of Tier 3. Projected harvesting at the $F_{40\%}$ level gives a 2007 ABC of 190,000 t. The OFL was determined from the Tier 3a formula, which gives a 2007 OFL of 241,000 t. Model projections indicate that this species is neither overfished nor approaching an overfished condition.

Reference fishing mortality rates are lower than in previous years due to a shift in the model's estimate of fishery selectivity. The sensitivity of the spawning-per-recruit fishing reference point to the change in fishing selectivity is not unexpected, given that the age at 50% maturity is approximately 8.5 and the natural mortality rate (0.25) is relatively high compared to other flatfishes. Because the age at 50% selection in the fishery is 10.4, Alaska plaice has the potential to spawn twice before it recruits to the fishery. Additionally, the high natural mortality of 0.25 indicates that the lifetime spawning/recruit potential is rapidly reducing at the ages of highest fishing selectivity. There continues to be relatively stable recruitment of Alaska plaice from the late 1970s through the present, with an apparently large 2002 year class.

10. 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. The OFL and ABC for 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/06.

	Year	Total Bio.	OFL	ABC	TAC	Catch
BSAI	2005	143,000	28,500	21,400	3,500	20,701
	2006	121,000	24,200	18,100	3,500	21,339
	2007	149,000	28,500	21,400	n/a	n/a
	2008	n/a	28,500	21,400	n/a	n/a

With the removal of Alaska plaice from this category in 2002, the species currently collected in the "other flatfish" category in the Eastern Bering Sea survey are Arctic flounder, butter sole, curlfin sole, deepsea sole, Dover sole, English sole, longhead dab, Pacific sand dab, petrale sole, rex sole, roughscale sole, sand sole, slender sole, starry flounder, and Sakhalin sole. The species currently collected in the "other flatfish" category in the Aleutian Islands survey are Dover sole, rex sole, starry flounder, butter sole and English sole. Starry flounder, rex sole and butter sole comprise the majority of the species caught with a negligible amount of other species. Of those, starry flounder and rex sole comprised 91% of the other flatfish catch in 2006.

The present assessment is a straightforward update of last year's assessment. The assessment incorporates 2005 total catch and discard; catch through 6 September 2006 and 2006 trawl survey information. The 2006 EBS and AI bottom trawl surveys resulted in a biomass estimate of 149,000 t, an increase from 121,000 t of the 2005 survey.

With the removal of Alaska plaice from this category in 2002 the SSC reclassified "other flatfish" as a Tier 5 species complex with an assumed natural mortality rate of 0.20. Projected harvesting at the 0.75 M level (F_{ABC} = 0.15), gives a 2007 ABC of 21,400 t for the "other flatfish" species. The corresponding 2007 OFL (=0.20) is 28,500 t. It is not possible to determine whether the "other flatfish" complex is overfished or approaching an overfished condition because it is Tier 5 and not managed under Tiers 1-3. Insufficient information about these species makes model analysis impossible.

This group of fisheries is usually closed prior to attainment of TAC because of the bycatch of Pacific halibut, a prohibited species. In 2005 the catch of the "other flatfish" complex (20,701) exceeded the TAC (3,500) by 500%, and was almost equal to the ABC (21,400). Thus far in 2006, the catch (21,339) again not only exceeds the TAC (3,500) by over 500%, but it also exceeds the ABC (18,100) by 18%.

The SSC requested an evaluation of species-specific natural mortality rates for the species in this complex. Therefore species-specific natural mortality rates are used for the species for which they are available. Estimates of *M* for the GOA were used for Dover sole (a minor component of the complex) and rex sole (a major component of the complex). Starry flounder natural mortality estimates were examined, but not used as they are only available for San Francisco Bay for data collected in the 1950s. There is no indication that these estimates are valid for starry flounder in the Bering Sea at this time.

Proportionally more butter sole are caught in the fishery than in the trawl survey. In response to the SSC's concern about this high exploitation rate, the authors note that this species is at the northern extent of its range, is at times captured in large quantities in a few trawl hauls, and thus the CV's are quite large. Therefore this is probably not an issue of concern.

11. Pacific Ocean Perch (POP)

Status and catch specifications (t) of Pacific ocean perch. Biomass corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/06.

Year	Area	Age 3+ Bio	OFL	Subarea	ABC	TAC	Catch
2005	BSAI	379,000	17,300		14,600	12,600	10,426
				EBS	2,920	1,400	879
				Eastern AI	3,210	3,080	2,586
				Central AI	3,170	3,030	2,235
				Western AI	5,300	5,090	4,727
2006	BSAI	385,000	17,600		14,800	12,600	12,784
				EBS	2,960	1,400	1,036
				Eastern AI	3,260	3,080	3,069
				Central AI	3,210	3,035	3,184
				Western AI	5,370	5,085	5,495
2007	BSAI	457,000	26,100		21,900	n/a	n/a
				EBS	4,160	n/a	n/a
				Eastern AI	4,970	n/a	n/a
				Central AI	5,050	n/a	n/a
				Western AI	7,720	n/a	n/a
2008	BSAI	451,000	25,600		21,600		
				EBS	4,080	n/a	n/a
				Eastern AI	4,900	n/a	n/a
				Central AI	5,000	n/a	n/a
				Western AI	7,620	n/a	n/a

Beginning in 2005, POP assessments are being conducted on a 2-year cycle. This is a year for a new assessment. Changes to input data this year include an update and revision of the harvest time series through August 5, 2006, and inclusion of the 2006 AI survey biomass and length composition, the 2004 AI survey age composition and the 2004 and 2005 AI fishery age compositions.

Changes in assessment methodology include estimation of the natural mortality rate *M,* AI trawl survey catchability in the model using prior distributions and the assumption that numbers at age prior to the first year of the model are in equilibrium with an unfished population. In previous assessments, the numbers at age prior to the first year of the model were not assumed to be in equilibrium and reflected variation in recruitment strength for each cohort. In addition, model runs were made to evaluate the utility of dropping the CPUE survey index and to evaluate the utility of modeling time-varying fishery selectivity. These changes were investigated in a series of five models (Models 1-5).

The Plan Team concurs with the author's selection of Model 3 as the preferred model. This model is similar to that used for POP in the GOA – including model estimates of *M* - but also adds estimation of time varying selectivity. The author provided rationale for including time-varying selectivity based on documented changes over time in catch by area and depth, which could contribute to varying selectivity over time.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, thereby qualifying Pacific ocean perch for management under Tier 3. The current estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ are 133,000 t, 0.059, and 0.070 respectively. There are reliable estimates of the 2006 spawning biomass (*B*), $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ and $B>B_{40\%}$ (155,000 t > 133,000 t). Therefore the POP reference fishing mortality is defined in tier 3a. For this tier, F_{ABC} is constrained to be $\leqq F_{40\%}$, and F_{OFL} is constrained to be equal to $F_{35\%}$. The ABC associated with the $F_{40\%}$ level of 0.059 is 21,900 t. This ABC is approximately 7,320 t higher than last year's recommendation of 14,800 t. The change in ABC reflects the increase in $F_{40\%}$ from the 2005 update, which was caused by an estimated M (0.06) higher than the fixed level (0.05) used in previous assessments. The recommended ABC (21,900 t) is a marked increase over last year's ABC. However this increase is consistent with increases in trawl survey biomass. The increases in model- and survey-estimated biomasses suggest a successful re-building trajectory for this population.

The Team agrees with the author's recommendation that ABCs be set regionally based on the proportions in combined survey biomass as follows: BS = 4,160 t, Eastern Aleutians (Area 541) = 4,970 t, Central Aleutians (Area 542) = 5,050 t, Western Aleutians (Area 543) = 7,720 t. The OFL fishing mortality rate is computed under Tier 3a as 26,100 t, which is the author's and Plan Team's recommended OFL for the BSAI. The OFL for BSAI is not regionally apportioned. For 2007, the recommended ABC is 21,900 t, and the OFL is 26,100 t.

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

12. Northern Rockfish

Status and catch specifications (t) of Northern rockfish. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2007 and 2008 are those recommended by the Plan Team. Catch is reported through November 4, 2006.

Area	Year	Age 3+ Bio.	OFL	ABC	TAC	Catch
BSAI	2005	200,000	9,810	8,260	5,000	3,964
	2006	204,000	10,100	8,530	4,500	3,761
	2007	212,000	9,750	8,190	n/a	n/a
	2008	211,000	9,700	8,150	n/a	n/a

The methodology in this year's assessment was the same as last year, with updated catch data, survey data, and an addition of substantially more aging data. Despite this, uncertainty about selectivity led to the authors' and Plan Team's recommendation to use a model with constrained selectivity (Model 2 in the assessment). The SSC has determined that this stock qualifies for management under Tier 3 due to the availability of reliable estimates for $B_{40\%}$ (52,000 t), $F_{40\%}$ (0.045), and $F_{35\%}$ (0.053). Because the female spawning biomass of 72,800 t is greater than $B_{40\%}$, sub-tier "a" would be applicable, with $F_{ABC} = F_{40\%}$ and $F_{OFL} = F_{35\%}$. Under Tier 3a, the maximum permissible ABC is 8,190 t, which is the authors' and Plan Team's recommendation for the 2007 ABC. Under Tier 3a, the 2007 OFL is 9,750 t for the Bering Sea/Aleutian Islands combined. The Plan Team continues to recommend setting a combined BSAI OFL and ABC , As the TAC has routinely been lower than the ABC, the TAC of the previous year was assumed as the 2007 catch, in order to make projections to 2008.

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

13. Shortraker/Rougheye Rockfish

Status and catch specifications (t) of shortraker/rougheye in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2007 and 2008 are those recommended by the Plan Team. Catch data are current through November 4, 2006.

Species	Area	Year	Survey Bio.	OFL	ABC	TAC	Catch
shortraker	BSAI	2005	26,500	794	596	596	169
		2006	20,500	774	580	580	202
		2007	18,900	564	424	n/a	n/a
		2008	n/a	564	424	n/a	n/a
rougheye	BSAI	2005	11,900	298	223	223	90
		2006	11,200	299	224	224	202
		2007	10,800	269	202	n/a	n/a
		2008	n/a	269	202	n/a	n/a

The assessment methodology used is a straightforward update of last year's assessment, adding new catch data and biomass estimates from the 2006 Aleutian Islands survey, which showed a decline for both species. The SSC has previously determined that reliable estimates of biomass and natural mortality exist for shortraker and rougheye rockfish, qualifying the species for management under Tier 5. At the present time, the Plan Team recommends that the SSC retain Tier 5 management for these stocks. The Plan Team recommends setting F_{ABC} at the maximum permissible level under Tier 5, which is 75% of *M*. Accepted values for *M* for these stocks 0.025 for rougheye rockfish and 0.030 for shortraker rockfish, resulting in F_{ABC} values of 0.019 and 0.023 for rougheye and shortraker, respectively.

In 2001, the Plan Team, SSC, AP, and Council recommended separating shortraker and rougheye rockfish species and setting BSAI area-wide ABCs and TACs for 2002. However, NMFS was unable to implement those recommendations because of the difficulty of species identification, and instead set separate BS and AI TACs for the combined shortraker/rougheye rockfishes category. In 2004, the NMFS Regional Office and Observer Program developed a catch accounting program that separates shortraker and rougheye rockfishes. With this improvement, concerns over management of small OFLs led to recombining regions into a BSAI-wide quota for each species. The author presented comparisons of length compositions, age compositions, and size compositions for the two species between regions, showing several significant differences between regions for rougheye and fewer for shortraker. In previous years, the author has recommended an area split; this year, this recommendation was deferred pending a new model for next year, although he noted several biological factors which might justify such a split.

The biomass estimates for 2007 are 18,900 t for shortraker rockfish and 10,800 t for rougheye rockfish, leading to BSAI OFLs of 564 t for shortraker and 269 t for rougheye, and ABCs of 424 t for shortraker and 202 t for rougheye. It is not possible to determine whether these species are overfished or whether they are approaching an overfished condition because they are managed under Tier 5.

14. 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 2007 and 2008 are those recommended by the Plan Team. Catch data are current through 11/4/06.

Year	Area	Subarea	Survey Bio.	OFL	ABC	TAC	Catch
2005	BSAI		26,600	1,870			
		BS	15,400		810	460	178
		AI	11,200		590	590	286
2006	BSAI		26,600	1,870			
		BS	15,400		810	460	153
		AI	11,200		590	590	417
2007	BSAI		36,700	1,330			
		BS	18,100		414	n/a	n/a
		AI	18,600		585	n/a	n/a
2008	BSAI		n/a	1,330			
		BS	n/a		414	n/a	n/a
		AI	n/a		585	n/a	n/a

The BSAI "other rockfish" assessment considers the 8 species that have been caught at least once during AFSC research surveys or appeared in more than 1% of observed fishery hauls between 1990 and 2001. There are new survey data from the Aleutian Islands for 2006. Beginning in 2005, assessments for "other rockfish" will be conducted on a 2-year cycle; therefore, this assessment makes ABC recommendations for 2007 and 2008. Updated catch data for 2004, 2005, and 2006 are included in the assessment.

The Plan Team agrees with the approach recommended by the author of setting F_{ABC} at the maximum allowable under Tier 5 (F_{ABC} = 0.75*M). For 2007-08, the authors recommend using separate estimates of natural mortality (M) and biomass for shortspine thornyheads (SST), the most common species in the other rockfish complex, and the remaining species in the complex. In past assessments, an M=0.07 was used for the entire complex. For 2007, the authors recommend an M=0.03 for SST and an M=0.09 (based on dusky rockfish) for the remaining species. Multiplying these rates by 0.75 and the best estimates of SST and other "other rockfish" biomass yields 2007 and 2008 ABCs of 414 t in the EBS and 585 t in the AI. The Plan Team recommends that OFL be set for the entire BSAI area, which under Tier 5 is calculated by multiplying the best estimates of total biomass for the area by the separate Ms and adding the results, which yields an OFL of 1,330 t.

15. 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 2007 and 2008 are those recommended by the Plan Team. Catch data for 2006 are current through 11/4/06.

Area	Year	Age 3+ Bio.	OFL	ABC	TAC	Catch
BSAI	2005	486,000	147,000	124,000	63,000	62,027
	2006	446,000	130,000	110,000	63,000	61,117
	2007	364,000	86,900	74,000	n/a	n/a
	2008	n/a	64,200	54,900	n/a	n/a

The present assessment is a straightforward update of last year's assessment that utilized the AMAK program in the NMFS Stock Assessment Toolbox. New data include: catch updates, 2005 fishery age composition, year-specific fishery and survey weight-at-age values, updated population weight-at-age values, and the biomass and length composition from the 2006 Aleutian Islands survey.

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, thereby qualifying Atka mackerel for management under Tier 3. The current estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ are 95,000 t, 0.34, and 0.41, respectively. Projected spawning biomass for 2007 is 130,000 t (down 17% from last year's estimate for 2006), placing Atka mackerel in sub-tier "a" of Tier 3. The assessment authors recommend setting F_{ABC} at the maximum permissible level, which yields a 2007 ABC of 74,000 t. The Plan Team agrees with the authors' recommendation. The OFL was determined from the Tier 3a formula; an $F_{35\%}$ value of 0.41 gives a 2007 OFL of 86,900 t. Model projections indicate that this stock is neither overfished nor approaching an overfished condition.

To apportion ABCs among areas, the authors used a weighted average of the 4 most recent survey estimates of the biomass distribution, where the greatest weight is assigned to the most recent (2006) survey. When applied to the recommended ABC of 74,000 t, this formula gives the following subarea-specific ABCs: Eastern Bering Sea and Eastern Aleutians = 23,800 t (32.2%), Central Aleutians = 29,600 t (40.0%) and Western Aleutians = 20,600 t (27.8%).

The Plan Team and authors noted that since 2001, year-class size is forecast to be below average. This led to a greater decrease in biomass (and ABC) as projected for 2007 than in last year's assessment. In addition, the Plan Team discussed the continued decline of Steller sea lions (SSLs) in the western Aleutian Islands and its concern that fishing effort for Atka mackerel, one of the principal prey species for SSLs, continue to be spatially distributed. Spatial allocation of ABC, along with other management measures (e.g., two seasonal apportionments, SSL critical habitat catch limits, rookery and haul-out trawl exclusion zones, 'platoon' fishing arrangements) are designed to minimize the likelihood of localized depletion of SSL prey resources.

16 – 20. Squid and Other Species Complex

Status and catch specifications (t) of squid and other species 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 2006 and 2007 are those recommended by the Plan Team. Catch data are current through 11/4/06.

Squid	**Area**	**Year**		**Biomass**	**OFL**	**ABC**	**TAC**	**Catch**
	BSAI	2005		n/a	2,620	1,970	1,970	1,185
		2006		n/a	2,620	1,970	1,084	1,414
		2007		n/a	2,620	1,970	n/a	n/a
		2008		n/a	2,620	1,970	n/a	n/a

Other species	**Area**	**Year**		**Survey Bio.**	**OFL**	**ABC**	**TAC**	**Catch**
BSAI	Council Approved	2005		708,000	87,900	53,900	29,000	29,438
		2006		724,000	93,800	70,400	29,000	26,469
Plan Team Recommendation:		**2007:**	sharks	18,000	1,700	1,300	n/a	n/a
			skates	492,000	49,200	36,900	n/a	n/a
			sculpins	217,000	41,200	30,900	n/a	n/a
			octopus	7,000	3,800	2,900	n/a	n/a
			Total	**734,000**	**95,900**	**71,900**	**n/a**	**n/a**
		2008:	sharks	18,000	1,700	1,300	n/a	n/a
			skates	492,000	49,200	36,900	n/a	n/a
			sculpins	217,000	41,200	30,900	n/a	n/a
			octopus	7,000	3,800	2,900	n/a	n/a
			Total	**734,000**	**95,900**	**71,900**	**n/a**	**n/a**

The Plan Team recommends a squid 2007 OFL equal to 2,620 t, based on average catch from 1978 through 1995 and an ABC equal to 1,970 t, the maximum permissible. It is not possible to determine whether the squid complex is overfished or whether it is approaching an overfished condition because it is managed under Tier 6.

The Plan Team recommends Tier 5 for each of the four component groups in the ‘other species’ complex. The Team recommends that the natural mortality rates for sharks, skates, sculpins and octopus be estimated at values of 0.09, 0.10, 0.19, and 0.53, respectively.

A six-year average biomass for sculpins was used for ABC and OFL calculations. Authors had concerns about the high variability of octopus and shark biomass estimates based on trawl surveys and provided alternative Tier 6 approaches. The Plan Team considers the average survey biomass as likely minimum estimates of sharks and octopus, given that the majority of catch consists of smaller individuals. Therefore, Tier 5 ABC and OFL are recommended. It was noted that the SSC did not adopt all Tier 5 recommendations for 2006. SSC considered that the biomass estimates used in Tier 5 should be reliable and accurate.

The Plan Team’s recommended 2007 and 2008 OFLs for the four groups constituting the “other species” complex are: sharks–1,700 t, skates–49,200 t, sculpins–41,200 t, and octopus–3,800 t, which are the values obtained under the Tier 5 formula. The recommended 2007 and 2008 ABCs are: 1,300 t for sharks, 36,900 t for skates, 30,900 t for sculpins, and 2,900 t for octopus, which are the maximum permissible values under Tier 5. However, the Plan Team recognizes that the FMP does not allow group-specific ABCs to be set for 2007. The Plan Team agrees with the authors’ recommendation to discontinue setting a complex-level “other species” ABC as soon as possible and supports the Council decision to review a plan amendment in 2007 to do so.

It is not possible to determine whether the “other species” complex is overfished or whether it is approaching an overfished condition because this complex is not managed under Tiers 1-3.

Appendix A: Pacific Halibut Discard Mortality Rates

Halibut discard mortality rates (DMRs) are set by the Council on a 3-year cycle for non-CDQ fisheries based on an average of the past 10 years and annually for CDQ fisheries based on available data. Rates for 2006 were presented with recommended rates for use in 2007-2009. International Pacific Halibut Commission staff recommendations for DMRs for the BSAI CDQ fisheries for 2007 and BSAI non-CDQ fisheries for 2007-2009 are were reviewed by the BSAI Plan Team during its September meeting. The Team endorsed the IPHC recommendations for revised halibut DMRs for the non-CDQ and CDQ fisheries. These recommendations are shown in the summary tables below. Mean annual rates were calculated for each target fishery and used as the recommendations for 2007-2009. The new mean rates differ very little from rates used in 2004-2006. The analysis recommends monitoring bycatch mortality in other CDQ targets using the open access DMRs.

Recommended Pacific halibut discard mortality rates (DMRs) for 2007-2009 BSAI non-CDQ fisheries.	
Gear/Target	**Recommendation for 2007-2009**
Trawl	
Atka mackerel	76
Bottom pollock	74
Pacific cod	70
Other Flatfish	74
Rockfish	76
Flathead sole	70
Pelagic pollock	88
Rock sole	80
Sablefish	75
Turbot	70
Arrowtooth fldr	75
Yellowfin sole	80
Pot	
Pacific cod	7
Longline	
Pacific cod	11
Rockfish	17
Turbot	13

Recommended Pacific halibut discard mortality rates (DMRs) for 2007 BSAI CDQ Fisheries	
Gear/Target	**Recommendation for 2007**
Trawl	
Atka mackerel	86
Bottom pollock	85
Flathead sole	70[1]
Pelagic pollock	90
Rockfish	76[1]
Yellowfin sole	86
Pot	
Pacific cod	7[1]
Sablefish	34
Longline	
Pacific cod	10
Turbot	13[1]

[1] Open access DMRs

Table 1. Bering Sea Aleutian Islands Groundfish Plan Team OFL, ABC, and TAC Recommendations for the 2007-2008 Fisheries

Species	Area	2006 OFL	2006 ABC	2006 TAC	2006 Catch**	2007 OFL	2007 ABC	2008 OFL	2008 ABC
Pollock	EBS	2,090,000	1,930,000	1,478,500	1,486,004	1,640,000	1,300,000	1,500,000	1,300,000
	Aleutian Islands	39,100	29,400	19,000	1,742	21,400	16,800	21,400	16,800
	Bogoslof District	50,600	38,000	10	0	48,000	5,220	48,000	5,220
Pacific cod	BSAI	230,000	194,000	206,000	186,882	207,000	176,000	154,000	131,000
Sablefish	BS	3,680	3,060	2,440	1,027	3,520	2,980	3,290	2,970
	AI	3,740	3,100	2,620	1,033	3,320	2,810	3,100	2,800
Yellowfin sole	BSAI	144,000	121,000	90,686	97,648	160,000	136,000	158,000	134,000
Greenland turbot	Total	14,200	2,740	3,500	1,935	15,600	2,440	16,000	2,490
	BS		1,890	2,700	1,433		1,680		1,720
	AI		850	800	502		760		770
Arrowtooth flounder	BSAI	166,000	136,000	12,000	12,794	193,000	158,000	208,000	171,000
Northern rock sole	BSAI	150,000	126,000	41,500	36,430	144,000	121,000	152,000	128,000
Flathead sole	BSAI	71,800	59,800	19,500	17,871	95,300	79,200	92,800	77,200
Alaska plaice	BSAI	237,000	188,000	8,000	17,263	241,000	190,000	252,000	199,000
Other flatfish	BSAI	24,200	18,100	3,500	21,339	28,500	21,400	28,500	21,400
Pacific Ocean perch	BSAI	17,600	14,800	12,600	12,784	26,100	21,900	25,600	21,600
	BS		2,960	1,400	1,036		4,160		4,080
	AI total		11,840	11,200	11,748		17,740		17,520
	WAI		5,372	5,085	5,495		7,720		7,620
	CAI		3,212	3,035	3,184		5,050		5,000
	EAI		3,256	3,080	3,069		4,970		4,900
Northern rockfish	BSAI	10,100	8,530	5,000	3,761	9,750	8,190	9,700	8,150
Shortraker	BSAI	774	580	596	202	564	424	564	424
Rougheye	BSAI	299	224	223	202	269	202	269	202
Other rockfish	BSAI	1,870	1,400	1,050	570	1,330	999	1,330	999
	BS		810	460	153		414		414
	AI		590	590	417		585		585
Atka mackerel	Total	130,000	110,000	63,000	61,117	86,900	74,000	64,200	54,900
	WAI		41,360	20,000	14,563		20,600		15,300
	CAI		46,860	35,500	39,230		29,600		22,000
	EAI/BS		21,780	7,500	7,324		23,800		17,600
Squid	BSAI	2,620	1,970	1,275	1,414	2,620	1,970	2,620	1,970
Other species	BSAI	93,800	70,400	29,000	26,469	95,900	71,900	95,900	71,900
Sharks						1,700	1,200	1,700	1,200
Skates						49,200	36,900	49,200	36,900
Sculpins						41,200	30,900	41,200	30,900
Octopus						3,800	2,900	3,800	2,900
Total	BSAI	3,481,383	3,057,104	2,000,000	1,988,487	3,024,073	2,391,435	2,837,273	2,352,025

**catch is through November 4, 2006 (includes CDQ).

Table 2. Groundfish catches (metric tons) in the eastern Bering Sea, 1954-2006.

Year	Pollock	Pacific Cod	Sable Fish	Yellow Fin Sole	Greenland Turbot	Arrow Tooth Flounder/a	Rock Sole/c	Other Flat Fish	Alaska Plaice	Pacific Ocean Perch Complex/b	Pacific Ocean Perch	Northern Rockfish	Shortraker Rockfish	Rougheye Rockfish	Other Rock Fish	Atka Mackerel	Squid	Other Species	Total (All Species)
1954				12,562															12,562
1955				14,690															14,690
1956				24,697															24,697
1957				24,145															24,145
1958	6,924	171	6	44,153														147	51,401
1959	32,793	2,864	289	185,321														380	221,647
1960			1,861	456,103	36,843					6,100									500,907
1961			15,627	553,742	57,348					47,000									673,717
1962			25,989	420,703	58,226					19,900									524,818
1963			13,706	85,810	31,565			35,643		24,500									191,224
1964	174,792	13,408	3,545	111,177	33,729			30,604		25,900								736	393,891
1965	230,551	14,719	4,838	53,810	9,747			11,686		16,800								2,218	344,369
1966	261,678	18,200	9,505	102,353	13,042			24,864		20,200								2,239	452,081
1967	550,362	32,064	11,698	162,228	23,869			32,109		19,600								4,378	836,308
1968	702,181	57,902	4,374	84,189	35,232			29,647		31,500								22,058	967,083
1969	862,789	50,351	16,009	167,134	36,029			34,749		14,500								10,459	1,192,020
1970	1,256,565	70,094	11,737	133,079	19,691	12,598		64,690		9,900								15,295	1,593,649
1971	1,743,763	43,054	15,106	160,399	40,464	18,792		92,452		9,800								13,496	2,137,326
1972	1,874,534	42,905	12,758	47,856	64,510	13,123		76,813		5,700								10,893	2,149,092
1973	1,758,919	53,386	5,957	78,240	55,280	9,217		43,919		3,700								55,826	2,064,444
1974	1,588,390	62,462	4,258	42,235	69,654	21,473		37,357		14,000								60,263	1,900,092
1975	1,356,736	51,551	2,766	64,690	64,819	20,832		20,393		8,600								54,845	1,645,232
1976	1,177,822	50,481	2,923	56,221	60,523	17,806		21,746		14,900								26,143	1,428,565
1977	978,370	33,335	2,718	58,373	27,708	9,454		14,393		2,654					311		4,926	35,902	1,168,144
1978	979,431	42,543	1,192	138,433	37,423	8,358		21,040		2,221					2,614	831	6,886	61,537	1,302,509
1979	913,881	33,761	1,376	99,017	34,998	7,921		19,724		1,723					2,108	1,985	4,286	38,767	1,159,547
1980	958,279	45,861	2,206	87,391	48,856	13,761		20,406		1,097					459	4,955	4,040	34,633	1,221,944
1981	973,505	51,996	2,604	97,301	52,921	13,473		23,428		1,222					356	3,027	4,182	35,651	1,259,666
1982	955,964	55,040	3,184	95,712	45,805	9,103		23,809		224					276	328	3,838	18,200	1,211,483
1983	982,363	83,212	2,695	108,385	43,443	10,216		30,454		221					220	141	3,470	15,465	1,280,285
1984	1,098,783	110,944	2,329	159,526	21,317	7,980		44,286		1,569					176	57	2,824	8,508	1,458,299
1985	1,179,759	132,736	2,348	227,107	14,698	7,288		71,179		784					92	4	1,611	11,503	1,649,109
1986	1,188,449	130,555	3,518	208,597	7,710	6,761		76,328		560					102	12	848	10,471	1,633,911
1987	1,237,597	144,539	4,178	181,429	6,533	4,380		50,372		930					474	12	108	8,569	1,639,121
1988	1,228,000	192,726	3,193	223,156	6,064	5,477		137,418		1,047					341	428	414	12,206	1,810,470
1989	1,230,000	164,800	1,252	153,165	4,061	3,024		63,452		2,017					192	3,126	300	4,993	1,630,382
1990	1,353,000	162,927	2,329	80,584	7,267	2,773		22,568		5,639					384	480	460	5,698	1,644,109
1991	1,268,360	165,444	1,128	94,755	3,704	12,748	46,681	30,401		4,744					396	2,265	544	16,285	1,647,455
1992	1,384,376	163,240	558	146,942	1,875	11,080	51,720	34,757		3,309					675	2,610	819	29,993	1,831,954
1993	1,301,574	133,156	669	105,809	6,330	7,950	63,942	28,812		3,763					190	201	597	21,413	1,674,406
1994	1,362,694	174,151	699	144,544	7,211	13,043	60,276	29,720		1,907					261	190	502	23,430	1,818,628
1995	1,264,578	228,496	929	124,746	5,855	8,282	54,672	34,861		1,210					629	340	364	20,928	1,745,890
1996	1,189,296	209,201	629	129,509	4,699	13,280	46,775	35,390		2,635					364	780	1,080	19,717	1,653,355
1997	1,115,268	209,475	547	166,681	6,589	8,580	67,249	42,374		1,060					161	171	1,438	20,997	1,640,590
1998	1,101,428	160,681	586	101,310	8,303	14,985	33,221	39,940		1,134					203	901	891	23,156	1,486,739
1999	889,589	134,647	646	67,307	5,205	9,827	39,934	33,042		609					135	2,008	393	17,045	1,200,387
2000	1,132,736	151,372	742	84,057	5,888	12,071	49,186	36,813		704					239	239	375	23,098	1,497,520
2001	1,387,452	142,452	863	63,563	4,252	12,836	28,949	27,693		1,148					296	264	1,761	23,148	1,694,677
2002	1,481,815	166,552	1,143	74,956	3,150	10,821	40,700	30,229		858					401	572	1,334	26,639	1,839,170
2003	1,492,039	180,592	1,039	81,050	2,565	13,667	36,375	17,507	10,118	1,391					336	6,362	1,246	26,986	1,871,273
2004	1,480,550	183,283	1,038	75,501	1,805	17,430	47,864	22,321	7,874		731	116	120	24	318	7,157	1,000	27,498	1,874,630
2005	1,483,279	182,807	1,075	94,372	2,120	13,405	36,814	20,642	11,175		879	112	108	12	178	3,553	1,168	28,034	1,879,733
2006/d	1,486,004	166,608	1,027	97,644	1,433	11,687	35,851	20,929	17,263		1,036	242	45	7	153	3,079	1,400	24,574	1,868,983

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69.
b/ Includes POP shortraker, rougheye, northern and sharpchi
c/ Rocksole prior to 1991 is included in other flatfish catch statistics.
d/ Data through November 4, 2006.
Note: Numbers don't include fish taken for research.

Table 3. Groundfish catches (metric tons) in the Aleutian Islands, 1954-2006.

Year	Pollock	Pacific Cod	Sable Fish	Yellow Fin Sole	Greenland Turbot	Arrow Tooth Flounder/a	Rock Sole/c	Other Flat Fish	Alaska Plaice	Pacific Ocean Perch Complex/b	Pacific Ocean Perch	Northern Rockfish	Shortraker Rockfish	Rougheye Rockfish	Other Rock Fish	Atka Mackerel	Squid	Other Species	Total (All Species)
1954																			0
1955																			0
1956																			0
1957																			0
1958																			0
1959																			0
1960																			0
1961																			0
1962										200									200
1963			664		7					20,800									21,471
1964		241	1,541		504					90,300								66	92,652
1965		451	1,249		300					109,100								768	111,868
1966		154	1,341		63					85,900								131	87,589
1967		293	1,652		394					55,900								8,542	66,781
1968		289	1,673		213					44,900								8,948	56,023
1969		220	1,673		228					38,800								3,088	44,009
1970		283	1,248		285	274				66,900						949		10,671	80,610
1971		2,078	2,936		1,750	581				21,800								2,973	32,118
1972		435	3,531		12,874	1,323				33,200						5,907		22,447	79,717
1973		977	2,902		8,666	3,705				11,800						1,712		4,244	34,006
1974		1,379	2,477		8,788	3,195				22,400						1,377		9,724	49,340
1975		2,838	1,747		2,970	784				16,600						13,326		8,288	46,553
1976		4,190	1,659		2,067	1,370				14,000						13,126		7,053	43,465
1977	7,625	3,262	1,897		2,453	2,035				8,080					3,043	20,975	1,808	16,170	67,348
1978	6,282	3,295	821		4,766	1,782				5,286					921	23,418	2,085	12,436	61,092
1979	9,504	5,593	782		6,411	6,436				5,487					4,517	21,279	2,252	12,934	75,195
1980	58,156	5,788	274		3,697	4,603				4,700					420	15,533	2,332	13,028	108,531
1981	55,516	10,462	533		4,400	3,640				3,622					328	16,661	1,763	7,274	104,199
1982	57,978	1,526	955		6,317	2,415				1,014					2,114	19,546	1,201	5,167	98,233
1983	59,026	9,955	673		4,115	3,753				280					1,045	11,585	510	3,675	94,617
1984	81,834	22,216	999		1,803	1,472				631					56	35,998	343	1,670	147,022
1985	58,730	12,690	1,448		33	87				308					99	37,856	9	2,050	113,310
1986	46,641	10,332	3,028		2,154	142				286					169	31,978	20	1,509	96,259
1987	28,720	13,207	3,834		3,066	159				1,004					147	30,049	23	1,155	81,364
1988	43,000	5,165	3,415		1,044	406				1,979					278	21,656	3	437	77,383
1989	156,000	4,118	3,248		4,761	198				2,706					481	14,868	6	108	186,494
1990	73,000	8,081	2,116		2,353	1,459				14,650					864	21,725	11	627	124,886
1991	78,104	6,714	2,071	1,380	3,174	938		88		2,545					549	22,258	30	91	117,942
1992	54,036	42,889	1,546	4	895	900	236	68		10,277					3,689	46,831	61	3,081	164,513
1993	57,184	34,234	2,078	0	2,138	1,348	318	59		13,375					495	65,805	85	2,540	179,659
1994	58,708	22,421	1,771	0	3,168	1,334	308	55		16,959					301	69,401	86	1,102	175,614
1995	64,925	16,534	1,119	6	2,338	1,001	356	47		14,734					220	81,214	95	1,273	183,862
1996	28,933	31,389	720	654	1,677	1,330	371	61		20,443					278	103,087	87	1,720	190,750
1997	26,872	25,166	779	234	1,077	1,071	271	39		15,687					307	65,668	323	1,555	139,049
1998	23,821	34,964	595	5	821	694	446	54		13,729					385	56,195	25	2,448	134,182
1999	965	27,714	565	13	422	746	577	53		17,619					630	51,636	9	1,633	102,582
2000	1,244	39,684	1,048	13	1,086	1,157	480	113		14,893					601	46,990	8	3,010	110,327
2001	824	34,207	1,074	15	1,060	1,220	526	97		15,587					610	61,296	5	4,029	120,550
2002	1,177	30,801	1,118	29	485	1,032	1,165	150		14,996					551	44,722	10	1,980	98,216
2003	1,653	32,193	1,009	0	965	913	964	76		18,765					401	52,988	36	1,326	111,289
2004	1,158	28,869	955	9	415	806	818	71	0		11,165	4,567	121	184	337	53,405	14	1,852	104,745
2005	1,621	22,627	1,476	2	440	828	548	59	0		9,548	3,852	61	78	286	58,474	17	1,403	101,318
2006/c	1,742	20,274	1,033	4	502	1,107	579	410	0		11,748	3,519	157	194	417	58,038	15	1,895	101,635

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1964-69.
b/ Includes POP shortraker, rougheye, northern and sharpchin rockfish until 2004.
c/ Data through November 4, 2006.
Note: Numbers don't include fish taken for research.

Table 4. Groundfish catches (metric tons) in the Bering Sea and Aleutian Islands, 1954-2006.

Year	Pollock	Pacific Cod	Sable Fish	Yellow Fin Sole	Greenland Turbot	Arrow Tooth Flounder/a	Rock Sole/c	Other Flat Fish	Alaska Plaice	Pacific Ocean Perch Complex/b	Pacific Ocean Perch	Northern Rockfish	Shortraker Rockfish	Rougheye Rockfish	Other Rock Fish	Atka Mackerel	Squid	Other Species	Total (All Species)
1954	0	0	0	12,562	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12,562
1955	0	0	0	14,690	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14,690
1956	0	0	0	24,697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24,697
1957	0	0	0	24,145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24,145
1958	6,924	171	6	44,153	0	0	0	0	0	0	0	0	0	0	0	0	0	147	51,401
1959	32,793	2,864	289	185,321	0	0	0	0	0	0	0	0	0	0	0	0	0	380	221,647
1960	0	0	1,861	456,103	36,843	0	0	0	0	6,100	0	0	0	0	0	0	0	0	500,907
1961	0	0	15,627	553,742	57,348	0	0	0	0	47,000	0	0	0	0	0	0	0	0	673,717
1962	0	0	25,989	420,703	58,226	0	0	0	0	20,100	0	0	0	0	0	0	0	0	525,018
1963	0	0	14,370	85,810	31,572	0	0	35,643	0	45,300	0	0	0	0	0	0	0	0	212,695
1964	174,792	13,649	5,086	111,177	34,233	0	0	30,604	0	116,200	0	0	0	0	0	0	0	802	486,543
1965	230,551	15,170	6,087	53,810	10,047	0	0	11,686	0	125,900	0	0	0	0	0	0	0	2,986	456,237
1966	261,678	18,354	10,846	102,353	13,105	0	0	24,864	0	106,100	0	0	0	0	0	0	0	2,370	539,670
1967	550,362	32,357	13,350	162,228	24,263	0	0	32,109	0	75,500	0	0	0	0	0	0	0	12,920	903,089
1968	702,181	58,191	6,047	84,189	35,445	0	0	29,647	0	76,400	0	0	0	0	0	0	0	31,006	1,023,106
1969	862,789	50,571	17,682	167,134	36,257	0	0	34,749	0	53,300	0	0	0	0	0	0	0	13,547	1,236,029
1970	1,256,565	70,377	12,985	133,079	19,976	12,872	0	64,690	0	76,800	0	0	0	0	0	949	0	25,966	1,674,259
1971	1,743,763	45,132	18,042	160,399	42,214	19,373	0	92,452	0	31,600	0	0	0	0	0	0	0	16,469	2,169,444
1972	1,874,534	43,340	16,289	47,856	77,384	14,446	0	76,813	0	38,900	0	0	0	0	0	5,907	0	33,340	2,228,809
1973	1,758,919	54,363	8,859	78,240	63,946	12,922	0	43,919	0	15,500	0	0	0	0	0	1,712	0	60,070	2,098,450
1974	1,588,390	63,841	6,735	42,235	78,442	24,668	0	37,357	0	36,400	0	0	0	0	0	1,377	0	69,987	1,949,432
1975	1,356,736	54,389	4,513	64,690	67,789	21,616	0	20,393	0	25,200	0	0	0	0	0	13,326	0	63,133	1,691,785
1976	1,177,822	54,671	4,582	56,221	62,590	19,176	0	21,746	0	28,900	0	0	0	0	0	13,126	0	33,196	1,472,030
1977	985,995	36,597	4,615	58,373	30,161	11,489	0	14,393	0	10,734	0	0	0	0	3,354	20,975	6,734	52,072	1,235,492
1978	985,713	45,838	2,013	138,433	42,189	10,140	0	21,040	0	7,507	0	0	0	0	3,535	24,249	8,971	73,973	1,363,601
1979	923,385	39,354	2,158	99,017	41,409	14,357	0	19,724	0	7,210	0	0	0	0	6,625	23,264	6,538	51,701	1,234,742
1980	1,016,435	51,649	2,480	87,391	52,553	18,364	0	20,406	0	5,797	0	0	0	0	879	20,488	6,372	47,661	1,330,475
1981	1,029,021	62,458	3,137	97,301	57,321	17,113	0	23,428	0	4,844	0	0	0	0	684	19,688	5,945	42,925	1,363,865
1982	1,013,942	56,566	4,139	95,712	52,122	11,518	0	23,809	0	1,238	0	0	0	0	2,390	19,874	5,039	23,367	1,309,716
1983	1,041,389	93,167	3,368	108,385	47,558	13,969	0	30,454	0	501	0	0	0	0	1,265	11,726	3,980	19,140	1,374,902
1984	1,180,617	133,160	3,328	159,526	23,120	9,452	0	44,286	0	2,200	0	0	0	0	232	36,055	3,167	10,178	1,605,321
1985	1,238,489	145,426	3,796	227,107	14,731	7,375	0	71,179	0	1,092	0	0	0	0	191	37,860	1,620	13,553	1,762,419
1986	1,235,090	140,887	6,546	208,597	9,864	6,903	0	76,328	0	846	0	0	0	0	271	31,990	868	11,980	1,730,170
1987	1,266,317	157,746	8,012	181,429	9,599	4,539	0	50,372	0	1,934	0	0	0	0	621	30,061	131	9,724	1,720,485
1988	1,271,000	197,891	6,608	223,156	7,108	5,883	0	137,418	0	3,026	0	0	0	0	619	22,084	417	12,643	1,887,853
1989	1,386,000	168,918	4,500	153,165	8,822	3,222	0	63,452	0	4,723	0	0	0	0	673	17,994	306	5,101	1,816,876
1990	1,426,000	171,008	4,445	80,584	9,620	4,232	0	22,568	0	20,289	0	0	0	0	1,248	22,205	471	6,325	1,768,995
1991	1,346,464	172,158	3,199	96,135	6,878	13,686	46,681	30,489	0	7,289	0	0	0	0	945	24,523	574	16,376	1,765,397
1992	1,438,412	206,129	2,104	146,946	2,770	11,980	51,956	34,825	0	13,586	0	0	0	0	4,364	49,441	880	33,074	1,996,467
1993	1,358,758	167,390	2,747	105,809	8,468	9,298	64,260	28,871	0	17,138	0	0	0	0	685	66,006	682	23,953	1,854,065
1994	1,421,402	196,572	2,470	144,544	10,379	14,377	60,584	29,775	0	18,866	0	0	0	0	562	69,591	588	24,532	1,994,242
1995	1,329,503	245,030	2,048	124,752	8,193	9,283	55,028	34,908	0	15,944	0	0	0	0	849	81,554	459	22,201	1,929,752
1996	1,218,229	240,590	1,349	130,163	6,376	14,610	47,146	35,451	0	23,078	0	0	0	0	642	103,867	1,167	21,437	1,844,105
1997	1,142,140	234,641	1,326	166,915	7,666	9,651	67,520	42,413	0	16,747	0	0	0	0	468	65,839	1,761	22,552	1,779,639
1998	1,125,249	195,645	1,181	101,315	9,124	15,679	33,667	39,994	0	14,863	0	0	0	0	588	57,096	916	25,604	1,620,921
1999	890,554	162,361	1,211	67,320	5,627	10,573	40,511	33,095	0	18,228	0	0	0	0	765	53,644	402	18,678	1,302,969
2000	1,133,980	191,056	1,790	84,070	6,974	13,228	49,666	36,926	0	15,597	0	0	0	0	840	47,229	383	26,108	1,607,847
2001	1,388,276	176,659	1,937	63,578	5,312	14,056	29,475	27,790	0	16,735	0	0	0	0	906	61,560	1,766	27,177	1,815,227
2002	1,482,992	197,353	2,261	74,985	3,635	11,853	41,865	30,379	0	15,854	0	0	0	0	952	45,294	1,344	28,619	1,937,386
2003	1,493,692	212,785	2,048	81,050	3,530	14,580	37,339	17,583	10,118	20,156	0	0	0	0	737	59,350	1,282	28,312	1,982,562
2004	1,481,708	212,152	1,993	75,510	2,220	18,235	48,683	22,392	7,874		11,896	4,684	241	208	655	60,562	1,014	29,349	1,979,375
2005	1,484,900	205,434	2,551	94,374	2,560	14,233	37,361	20,701	11,175		10,426	3,964	169	90	464	62,027	1,185	29,438	1,981,052
2006/d	1,487,746	186,882	2,060	97,648	1,935	12,794	36,430	21,339	17,263		12,784	3,761	202	202	570	61,117	1,414	26,469	1,970,618

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69.
b/ Includes POP shortraker, rougheye, northern and sharpchi
c/ Rock sole prior to 1991 is included in other flatfish catch statistics.
d/ Data through November 4, 2006.
Note: Numbers don't include fish taken for research.

Table 5. Summary of stock abundance (biomass), overfishing level (OFL), acceptable biological catch (ABC), the fishing mortality rate corresponding to ABC (F_{ABC}), and the fishing mortality rate corresponding to OFL (F_{OFL}) for the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district as projected for 2007 and 2008. "Biomass" corresponds to projected January abundance for the age+ range reported in the summary. Stock-specific biomass, OFL, and ABC are in metric tons, reported to three significant digits (four digits are used when a stock-specific ABC is apportioned among areas on a percentage basis). Fishing mortality rates are reported to two.

		2007					2008			
Species or Complex	Area	Biomass	OFL	ABC	F_{OFL}	F_{ABC}	OFL	ABC	F_{OFL}	F_{ABC}
Pollock	EBS	6,360,000	1,640,000	1,300,000	0.26	0.24	1,500,000	1,300,000	0.26	0.24
	Aleutian Islands	95,000	21,400	16,800	0.24	0.18	21,400	16,800	0.24	0.18
	Bogoslof District	240,000	48,000	5,220	0.20	0.022	48,000	5,220	0.20	0.022
Pacific cod	BSAI	960,000	207,000	176,000	0.39	0.33	154,000	131,000	0.34	0.28
Sablefish	BS	33,200	3,520	2,980	0.1	0.088	3,290	2,970	0.1	0.088
	AI	31,300	3,320	2,810	0.1	0.088	3,100	2,800	0.1	0.088
Yellowfin sole	BSAI	2,000,000	160,000	136,000	0.13	0.11	158,000	134,000	0.13	0.11
Greenland turbot	Total	119,000	15,600	2,440	0.67	0.09	16,000	2,490	0.67	0.09
	BS			1,680				1,720		
	AI			760				770		
Arrowtooth flounder	BSAI	1,280,000	193,000	158,000	0.3	0.24	208,000	171,000	0.3	0.24
Northern rock sole	BSAI	1,670,000	144,000	121,000	0.17	0.14	152,000	128,000	0.17	0.14
Flathead sole	BSAI	875,000	95,300	79,200	0.37	0.31	92,800	77,200	0.37	0.31
Alaska plaice	BSAI	1,340,000	241,000	190,000	0.83	0.61	252,000	199,000	0.83	0.61
Other flatfish	BSAI	149,000	28,500	21,400	.17/.09/.15	.13/.64/.2	28,500	21,400	.17/.09/.15	.13/.64/.2
Pacific Ocean perch	BSAI	457,000	26,100	21,900	0.07	0.059	25,600	21,600	0.07	0.059
	BS			4,160				4,080		
	AI total			17,740				17,520		
	WAI			7,720				7,620		
	CAI			5,050				5,000		
	EAI			4,970				4,900		
Northern rockfish	BSAI	212,000	9,750	8,190	0.053	0.045	9,700	8,150	0.053	0.045
Shortraker	BSAI	18,900	564	424	0.030	0.023	564	424	0.030	0.023
Rougheye	BSAI	10,800	269	202	0.025	0.019	269	202	0.025	0.019
Other rockfish	BSAI	36,700	1,330	999	.03/.09	.023/.068	1,330	999	.03/.09	.023/.068
	BS	18,100		414				414		
	AI	18,600		585				585		
Atka mackerel	Total	364,000	86,900	74,000	0.41	0.34	64,200	54,900	0.41	0.34
	WAI			20,600				15,300		
	CAI			29,600				22,000		
	EAI/BS			23,800				17,600		
Squid	BSAI	n/a	2,620	1,970	n/a	n/a	2,620	1,970	n/a	n/a
Other species	BSAI	734,000	95,900	71,900			95,900	71,900		
Sharks	BSAI	18,000	1,700	1,200	0.090	0.068	1,700	1,200	0.090	0.068
Skates	BSAI	492,000	49,200	36,900	0.10	0.075	49,200	36,900	0.10	0.075
Sculpins	BSAI	217,000	41,200	30,900	0.19	0.14	41,200	30,900	0.19	0.14
Octopus	BSAI	7,000	3,800	2,900	n/a	n/a	3,800	2,900	n/a	n/a
Total	BSAI	16,949,200	3,024,073	2,391,435			2,837,273	2,352,025		

Table 6. Summary of groundfish tier designations under Amendment 56, maximum permissible ABC fishing mortality rate (max F_{ABC}), the Plan Team's recommended tier designation, ABC fishing mortality rate (F_{ABC}), the maximum permissible value of ABC (max ABC), the Plan Team's recommended ABC, and the percentage reduction (% Red.) between max ABC and the Plan Team's recommended ABC. Stock-specific max ABC and ABC are in metric tons, reported to three significant digits (four significant digits are used when a stock-specific ABC is apportioned among areas on a percentage basis). Fishing mortality rates are reported to two significant digits.

		2007						2008					
Species or Complex	Area	**Tier**	max F_{ABC}	F_{ABC}	max ABC	ABC	% Red.	Tier	max F_{ABC}	F_{ABC}	max ABC	ABC	% Red.
Pollock	EBS	1a	0.24	0.24	1,510,000	1,300,000	14%	1b	0.24	0.24	1,380,000	1,300,000	6%
	Aleutian Islands	5	0.18	0.18	16,800	16,800		5	0.18	0.18	16,800	16,800	
	Bogoslof District	5	0.022	0.022	5,220	5,220		5	0.022	0.022	5,220	5,220	
Pacific cod	BSAI	3b	0.33	0.33	176,000	176,000		3b	0.28	0.28	131,000	131,000	
Sablefish	BS	3b	0.088	0.088	2,980	2,980		3b	0.088	0.088	2,970	2,970	
	AI	3b	0.11	0.11	2,810	2,810		3b	0.11	0.11	2,800	2,800	
Yellowfin sole	BSAI	3a	0.11	0.11	136,000	136,000		3a	0.11	0.11	134,000	134,000	
Greenland turbot	Total	3a	0.51	0.09	12,700	2,440	81%	3a	0.51	0.09	13,010	2,490	81%
	BS		0.51	0.09	8,740	1,680			0.51	0.09	1,720	1,720	
	AI		0.51	0.09	3,960	760			0.51	0.09	770	770	
Arrowtooth flounder	BSAI	3a	0.24	0.24	158,000	158,000		3a	0.24	0.24	171,000	171,000	
Northern rock sole	BSAI	3a	0.14	0.14	121,000	121,000		3a	0.14	0.14	128,000	128,000	
Flathead sole	BSAI	3a	0.31	0.31	79,200	79,200		3a	0.31	0.31	77,200	77,200	
Alaska plaice	BSAI	3a	0.61	0.61	190,000	190,000		3a	0.61	0.61	199,000	199,000	
Other flatfish	BSAI	5	.13/.64/.2	.13/.64/.2	21,400	21,400		5	.13/.64/.2	.13/.64/.2	21,400	21,400	
Pacific Ocean perch	BSAI	3a	0.059	0.059	21,900	21,900		3a	0.059	0.059	21,600	21,600	
	BS		0.059	0.059	4,160	4,160			0.059	0.059	4,080	4,080	
	AI total		0.059	0.059	17,740	17,740			0.059	0.059	17,520	17,520	
	WAI		0.059	0.059	7,720	7,720			0.059	0.059	7,620	7,620	
	CAI		0.059	0.059	5,050	5,050			0.059	0.059	5,000	5,000	
	EAI		0.059	0.059	4,970	4,970			0.059	0.059	4,900	4,900	
Northern rockfish	BSAI	3a	0.045	0.045	8,190	8,190		3a	0.045	0.045	8,150	8,150	
Shortraker	BSAI	5	0.023	0.023	424	424		5	0.023	0.023	424	424	
Rougheye	BSAI	5	0.019	0.019	202	202		5	0.019	0.019	202	202	
Other rockfish	BSAI	5	.023/.068	.023/.068	999	999		5	.023/.068	.023/.068	999	999	
	BS		0	0	414	414			0	0	414	414	
	AI		0	0	585	585			0	0	585	585	
Atka mackerel	Total	3a	0.34	0.34	74,000	74,000		3a	0.34	0.34	54,900	54,900	
	WAI		0.34	0.34	20,600	20,600			0.34	0.34	15,300	15,300	
	CAI		0.34	0.34	29,600	29,600			0.34	0.34	22,000	22,000	
	EAI/BS		0.34	0.34	23,800	23,800			0.34	0.34	17,600	17,600	
Squid	BSAI	6	n/a	n/a	1,970	1,970		6	n/a	n/a	1,970	1,970	
Other Species		5	n/a	n/a	71,900	71,900		5	n/a	n/a	71,900	71,900	
Sharks	BSAI	5	0.068	0.068	1,200	1,200		5	0.068	0.068	1,200	1,200	
Skates	BSAI	5	0.075	0.075	36,900	36,900		5	0.075	0.075	36,900	36,900	
Sculpins	BSAI	5	0.14	0.14	30,900	30,900		5	0.14	0.14	30,900	30,900	
Octopus	BSAI	6	n/a	n/a	2,900	2,900		5	n/a	n/a	2,900	2,900	
Total	BSAI				2,611,695	2,391,435					2,442,545	2,352,025	