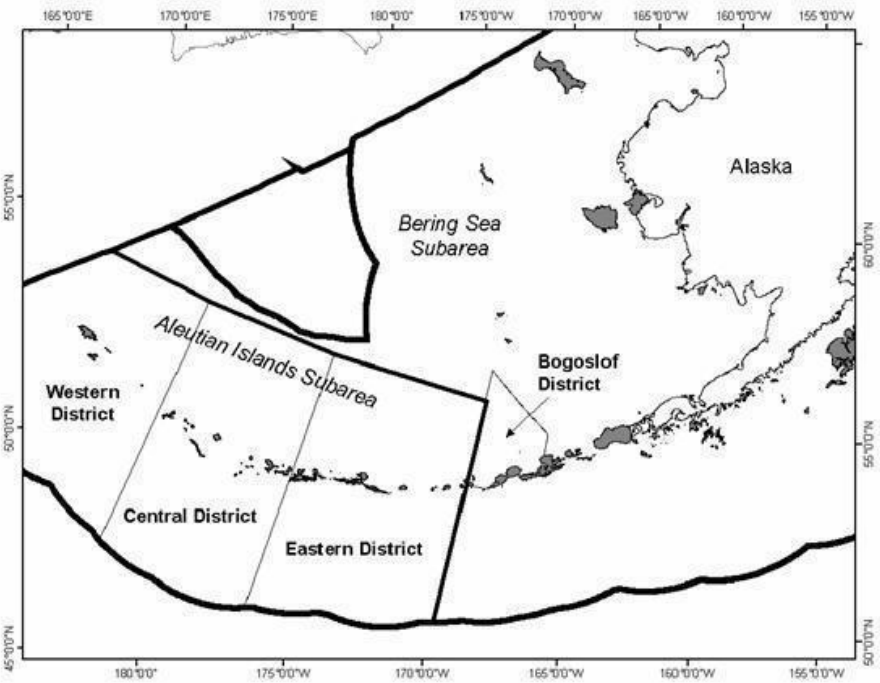
STOCK ASSESSMENT AND FISHERY EVALUATION REPORT

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 *National Standard Guidelines for Fishery Management Plans* published by the National Marine Fisheries Service (NMFS) require that a stock assessment and fishery evaluation (SAFE) report be prepared and reviewed annually for each fishery management plan (FMP). The SAFE 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 this 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 North Pacific Fishery Management 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 usually previewed at the September Plan Team meeting, and considered again by the Team at its November meeting for recommending final specifications for the following two fishing years. This process is repeated annually.

Normally, full stock assessments are required for walleye pollock, Pacific cod, Atka mackerel, sablefish, and some flatfish stocks every year; while all rockfishes, some flatfishes, sharks, skates, octopus, squid, and sculpins require full stock assessment only during years in which the Aleutian Island bottom trawl survey is conducted (typically even-numbered 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 for the next two fishing years. This introductory section includes the recommendations of the Team (Table 1), along with a summary of each chapter, including the Ecosystems Considerations chapter and the Economic SAFE Report.

The OFL and ABC recommendations by the Plan Team are reviewed by the Scientific and Statistical Committee (SSC), which may confirm the Team recommendations or develop its own. The Team and SSC recommendations, together with social and economic factors, are considered by the Council in determining total allowable catches (TACs) and other measures used to manage the fisheries. Neither the author(s), Team, nor SSC typically recommends TACs.

Members of the BSAI Groundfish Plan Team who compiled this SAFE report were: Mike Sigler (co-chair), Grant Thompson (co- chair), Diana Stram (BSAI Groundfish FMP coordinator), Kerim Aydin, David Barnard, Liz Chilton, Bill Clark, Lowell Fritz, Mary Furuness, Dana Hanselman, Alan Haynie, Brenda Norcross, and Chris Siddon.

Background Information

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.

Amendment 95 to the BSAI Groundfish FMP, which was implemented in 2010 for the start of the 2011 fishing year, defined three categories of species or species groups that are likely to be taken in the groundfish fishery. Species may be split or combined within the "target species" category according to procedures set forth in the FMP. The three categories of finfishes and invertebrates that have been designated for management purposes under two management classifications are listed below.

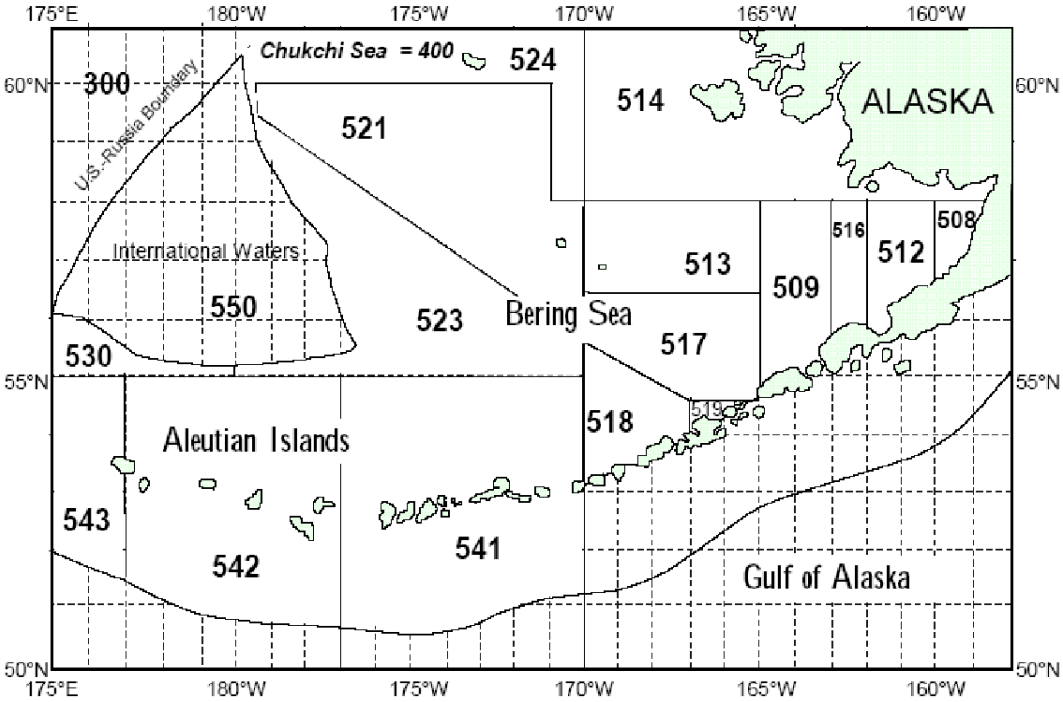

Figure 1 Bering Sea/Aleutian Islands statistical and reporting areas.

In the Fishery:

Target species–are those species that support either a single species or mixed species target fishery, are commercially important, and for which a sufficient data base exists that allows each to be managed on its own biological merits. Accordingly, a specific TAC is established annually for each target species or species assemblage. Catch of each species must be recorded and reported. Stocks/assemblages in the target category are listed below.

Ecosystem Component:

Prohibited Species–are those species and species groups the catch of which must be avoided while fishing for groundfish, and which must be immediately returned to sea with a minimum of injury except when their retention is authorized by other applicable law. Groundfish species and species groups under the FMP for which the ABCs have been achieved shall be treated in the same manner as prohibited species.

Forage fish species–are those species listed below, which are a critical food source for many marine mammal, seabird and fish species. The forage fish species category is established to allow for the

management of these species in a manner that prevents the development of a commercial directed fishery for forage fish. Management measures for this species category will be specified in regulations and may include such measures as prohibitions on directed fishing, limitations on allowable bycatch retention amounts, or limitations on the sale, barter, trade or any other commercial exchange, as well as the processing of forage fish in a commercial processing facility.

In the fishery	**Ecosystem component**	
Target species[1]	**Prohibited species**[2]	**Forage fish species**[3]
Walleye Pollock	Pacific halibut	Osmeridae family (eulachon, capelin,and other smelts)
Pacific cod	Pacific herring	Myctophidae family (laternfishes)
Sablefish	Pacific salmon	Bathylagidae (deep-sea smelts)
Yellowfin sole	Steelhead trout	Ammodytidae family (Pacific sandlance)
Greenland turbot	King crab	Trichodontidae family (Pacific sand fish)
Arrowtooth flounder	Tanner crab	Pholidae family (gunnels)
Kamchatka flounder		Stichaeidae family (pricklebacks warbonnets, eelblennys, cockscombs, shannys)
Northern rock sole		Gonostomatidae family (bristlemouths, lightfishes and anglemouths)
Flathead sole		Other euphausiacea (krill)
Alaska plaice		
Other flatfish		
Pacific Ocean perch		
Northern rockfish		
Blackspotted/Rougheye		
Shortraker rockfish		
Other rockfish*		
Atka mackerel		
Skates		
Sculpins		
Sharks		
Squids		
Octopus		

[1] TAC for each listing. Species and species groups may or may not be targets of directed fisheries.
[2] Must be immediately returned to the sea, except when retention is required or authorized.
[3] Management measures for forage fish are established in regulations implementing the FMP.

Historical Catch Statistics

Catch statistics since 1954 are shown for the Eastern Bering Sea (EBS) subarea in Table 2. The initial target species in the BSAI commercial fisheries was yellowfin sole. During this period, total catches of groundfish peaked at 674,000 t in 1961. Following a decline in abundance of yellowfin sole, other species (principally walleye pollock) were targeted, and total catches peaked at 2.2 million t in 1972. Pollock is now the principal fishery, with catches peaking at approximately 1.4-1.5 million t due to years of high recruitment. 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 total groundfish catches have since varied from one to two million t. In 2005, Congress implemented a statutory cap on TACs for BSAI groundfish of 2 million t, which had previously been a policy adopted by the Council. Total groundfish catches generally are well below the 2 million t optimal yield (OY) cap. Total groundfish catches in the EBS in 2013 totaled 1,829,931 t; catches through November 8, 2014 totaled 1,794,998 t. Pollock catches in the EBS totaled 1,270,723 t in 2013; catches through November 8, 2014 totaled 1,294,703 t.

Catches in the Aleutian Islands (AI) subarea always are much less than in the EBS (Table 3). Total AI catches peaked at 190,750 t in 1996. Total AI catches were 144,684 t in 2010, and dropped to 98,601 t in 2012 and to 84,616 in 2013. Total catch of 7,629 t through November 8, 2014 is the lowest since 1988.

The predominance of target species in the AI has changed over the years. Pacific ocean perch (POP) was the initial target species. As POP abundance declined, the fishery diversified to target different species. POP was the second largest fishery at 18,554 t in 2012 and 26,342 t in 2013; catch totaled 29,944 t through November 8, 2014. Pacific ocean perch displaced Pacific cod as the second largest fishery beginning in 2011, as Pacific cod catch dropped from 29,001 t in 2010 to 13,572 t in 2013 as a result of Steller sea lion protection measures; catch is 6,145 t through November 8, 2014. Atka mackerel was the largest fishery in the AI at 50,600 t in 2011 and 46,859 t in 2012 (down from 68,496 t in 2010); catch was 23,034 t in 2013 and catch in 2014 was 30,812 t as of November 8, 2014. Atka mackerel harvest also dropped as a result of Steller sea lion protection measures and a shift in its biomass distribution; the 2013 catch of 23,034 t was less than 50% of 2012 catch of 46,859 t.

Total catches since 1954 for the BSAI, combined, are shown in Table 4. Total BSAI catches were 1,351,354 t in 2010 (81 percent of the total TAC and 68 percent of the OY). Combined BSAI catches rose to 1,817,947 t in 2011 (91 percent of total TACs (which equaled the OY)) and 1,829,931 t (91 percent of OY) in 2013. BSAI catches through November 8, 2014 totaled 1,794,998 t, which equaled 90% of OY. The relationship of the various biological reference points (biomass, OFL, ABC, TAC, and catch) is depicted in Figure 2.

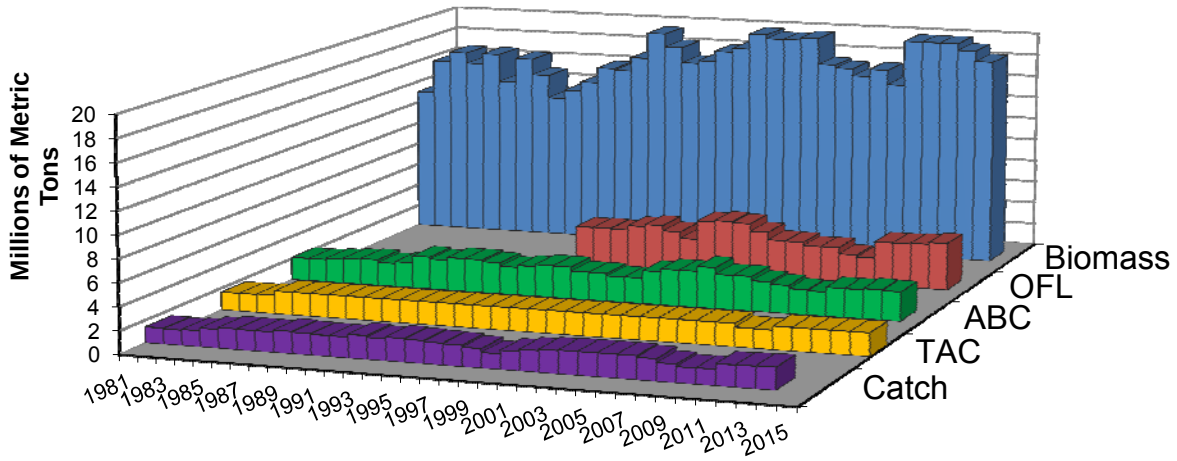

Figure 2 Biomass, Overfishing Level, Acceptable Biological Catch, and Total Allowable Catch for 1981-2015* and Catch, 1981-2014.
*2015, Biomass, ABC and OFLs as recommended by the Plan Team and assuming total TACs = OY

Recent Total Allowable Catches

Amendment 1 to the BSAI Groundfish FMP provided the framework to manage the groundfish resources as a complex. Maximum sustainable yield (MSY) for the BSAI groundfish complex was estimated at 1.8 to 2.4 million t. The OY range was set at 85 percent of the MSY range, or 1.4 to 2.0 million t. The sum of the TACs equals OY for the groundfish complex, which is constrained by the 2.0 million t cap on OY. Recent total TACs have been set equal to the OY cap.

Establishment of the Western Alaska Community Development Quota (CDQ) Program annual groundfish reserves is concurrent with the annual BSAI groundfish harvest specifications. Once annual BSAI groundfish TACs are established, the CDQ Program is allocated set portions of the TACs for certain species and species assemblages. This includes 10 percent of the BS and AI pollock TACs, 20 percent of the fixed gear sablefish TAC, and 7.5 percent of the sablefish trawl gear allocation. It also receives 10.7 percent of the TACs for Pacific cod, yellowfin sole, rock sole, flathead sole, Atka mackerel, AI Pacific

ocean perch, arrowtooth flounder, and BS Greenland turbot. The program also receives allocations of PSC limits.

The TAC specifications for the primary allocated species, and PSC limit specifications, are recommended by the Council at its December meetings. The State of Alaska (State) manages separate Pacific cod guideline harvest level (GHL) fisheries in the Bering Sea subarea (starting in 2006) and Aleutian Islands subarea (starting in 2014). The State's Pacific cod GHL fisheries are conducted independently of the Federal groundfish fisheries under direct regulation of the State. The GHL amounts for each subarea are derived as 3 percent of the combined Pacific cod Bering Sea subarea ABC and Aleutian Islands subarea ABC. The Council is expected to set the TAC for each subarea to account for the two State GHL fisheries. This is necessary to prevent harvest levels, GHL plus TAC, from exceeding the ABCs.

For the BSAI reserves, 15 percent of the TAC for each target species, except for pollock, the hook-and-line and pot gear allocation of sablefish, and the Amendment 80 species (Pacific cod, Atka mackerel, flathead sole, rock sole, yellowfin sole, and Aleutian Islands Pacific ocean perch), are automatically apportioned to a non-specified reserve. Apportionments to the non-specified reserve range from 4.3 to 15 percent of each species or species group's TAC. The non-specified reserve is used to (1) correct operational problems in the fishing fleets, (2) promote full and efficient use of groundfish resources, (3) adjust species TACs according to changing conditions of stocks during the fishing year, and (4) make apportionments and Community Development Quota allocations. The initial TAC (ITAC) for each species is the remainder of the TAC after the subtraction of the reserve.

Definition of Acceptable Biological Catch and the Overfishing Level

Amendment 56 to the BSAI Groundfish FMP, which was implemented in 1999, defines 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.

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

<u>Overfishing</u> is defined as any amount of fishing in excess of a prescribed maximum allowable rate. This maximum allowable rate is prescribed through a set of six tiers which are listed below in descending order of preference, corresponding to descending order of information availability. The SSC will have final authority for determining whether a given item of information is reliable for the purpose of this definition, and may use either objective or subjective criteria in making such determinations. For Tier (1), a pdf refers to a probability density function. For Tiers (1-2), if a reliable pdf of B_{MSY} is available, the preferred point estimate of B_{MSY} is the geometric mean of its pdf. For Tiers (1-5), if a reliable pdf of B is available, the preferred point estimate is the geometric mean of its pdf. For Tiers (1-3), the coefficient 'α' is set at a default value of 0.05, with the understanding that the SSC may establish a different value for a specific stock or stock complex as merited by the best available scientific information. For Tiers (2-4), a designation of the form "$F_{X\%}$" refers to the F associated with an equilibrium level of spawning per recruit (SPR) equal to X percent of the equilibrium level of spawning per recruit in the absence of any fishing. If reliable information sufficient to characterize the entire maturity schedule of a species is not available, the SSC may choose to view SPR calculations based on a knife-edge maturity assumption as reliable. For Tier (3), the term $B_{40\%}$ refers to the long-term average biomass that would be expected under average recruitment and $F=F_{40\%}$.

<u>Overfished or approaching an overfished condition</u> is determined for all age-structured stock assessments by comparison of the stock level in relation to its MSY level according to harvest scenarios 6 and 7

described in the next section (for Tier 3 stocks, the MSY level is defined as $B_{35\%}$). For stocks in Tiers 4-6, no determination can be made of overfished status or approaching an overfished condition as information is insufficient to estimate the MSY stock level.

Standard Harvest and Recruitment Scenarios and Projection Methodology

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 an estimated vector of 2014 or 2015 numbers at age. 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 an inverse Gaussian distribution whose parameters consist of maximum likelihood estimates determined from recruitments estimated in the assessment. 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, except that in the first two years of the projection, a lower catch may be specified for stocks where catch is typically below ABC. This projection scheme is run 1000 times to obtain distributions of possible future stock sizes, fishing mortality rates, and catches.

Five of the seven standard scenarios are designed to provide a range of harvest alternatives that are likely to bracket the final TACs for 2015 and 2016, 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 2015 recommended in the assessment to the *max* F_{ABC} for 2015. (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 the 2009-2013 average F. (Rationale: For some stocks, TAC can be well below ABC, and recent average F may provide a better indicator of F_{TAC} than F_{ABC}.)
>
> *Scenario 4*: In all future years, the upper bound on F_{ABC} is set at $F_{60\%}$. (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 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}. (Rationale: This scenario determines whether a stock is overfished. If the stock is 1) above its MSY level in 2014 or 2) above 1/2 of its MSY level in 2014 and expected to be above its MSY level in 2024 under this scenario, then the stock is not overfished.)
>
> *Scenario 7*: In 2015 and 2016, F is set equal to *max* F_{ABC}, and in all subsequent years, F is set equal to F_{OFL}. (Rationale: This scenario determines whether a stock is approaching an overfished condition. If the stock is 1) above its MSY level in 2016 or 2) above 1/2 of its MSY level in 2016

and expected to be above its MSY level in 2026 under this scenario, then the stock is not approaching an overfished condition.)

Overview of "Stock Assessment" Section

The current status of individual groundfish stocks managed under the FMP is summarized in this section. Plan Team recommendations for 2014 and 2015 ABCs and OFLs are summarized in Tables 1, 5, and 6.

The sum of the recommended ABCs for 2015 and 2016 are 2,842,543 t and 2,728,127 t, respectively. These compare with the sums of the 2014 ABCs (2,572,819 t) and 2013 ABCS (2,639,317 t), indicating relative stability. The Team recommended maximum permissible ABCs for all stocks, except for EBS pollock, EBS Pacific cod, and BSAI skates (Table 6).

Overall, the status of the stocks continues to appear favorable. Nearly all stocks are above B_{MSY} or the B_{MSY} proxy of $B_{35\%}$. The abundances of EBS pollock, EBS Pacific cod, all rockfishes managed under Tier 3, and all flatfishes except Greenland turbot managed under Tiers 1 or 3 are projected to be above B_{MSY} or the B_{MSY} proxy of $B_{35\%}$ in 2015. The abundances of three stocks are projected to be below $B_{35\%}$ for 2015: AI pollock by about 1 percent, sablefish by about 0.2%, and Greenland turbot by about 11 percent.

The sum of the biomasses for 2015 listed in Table 5 represents a 7% increase from 2014. The 2014 value, in turn, was nearly the same as reported for 2013, following declines of 5 percent from 2012 to 2013 and 6 percent from 2011 to 2012.

Summary and Use of Terms

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 cases of stocks managed under Tier 1 (EBS pollock, yellowfin sole, and northern rock sole). For these stocks, the fishing mortality rate consists of the ratio between catch (in biomass) and biomass at the start of the year. EBS pollock uses "fishable biomass" whereas yellowfin sole and northern rock sole use age 6+ biomass for this calculation.

"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 assumed to correspond 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.

The reported ABCs and OFLs for past years correspond to the values approved by the Council. Projected ABCs and OFLs listed for the next two years are the Team's recommendations.

Reported catches are as of November 8, 2014.

Two-Year OFL and ABC Projections

Proposed and final harvest specifications are adopted annually for a two year period. This requires the Team to provide OFLs and ABCs for the next two years in this cycle (Table 1). The 2015 harvest specifications (from Council recommendations in December 2013) are in place to start the fishery on January 1, 2015, but these will be replaced by final harvest specifications that will be recommended by the Council in December 2014. The final 2015 and 2016 harvest specifications will become effective when final rulemaking occurs in February or March 2015.This process allows the Council to use the most

current survey and fishery data in stock assessment models for setting quotas for the next two years, while having no gap in harvest specifications.

The 2016 ABC and OFL values recommended in next year's SAFE report are likely to differ from this year's projections for 2016 because of new (e.g., survey) information that is incorporated into the assessments. In the case of stocks managed under Tier 3, ABC and OFL projections for the second year in the cycle are typically based on the output for Scenarios 1 or 2 from the standard projection model using assumed (best estimates) of actual catch levels. For stocks managed under Tiers 4-6, projections for the second year in the cycle are set equal to the Plan Team's recommended values for the first year in the cycle.

Tier

1) Information available: *Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.*
   - 1a) Stock status: $B/B_{MSY} > 1$
     - $F_{OFL} = \mu_A$, *the arithmetic mean of the pdf*
     - $F_{ABC} \le \mu_H$, *the harmonic mean of the pdf*
   - 1b) Stock status: $\alpha < B/B_{MSY} \le 1$
     - $F_{OFL} = \mu_A \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
     - $F_{ABC} \le \mu_H \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
   - 1c) Stock status: $B/B_{MSY} \le \alpha$
     - $F_{OFL} = 0$
     - $F_{ABC} = 0$
2) Information available: *Reliable point estimates of B, B_{MSY}, F_{MSY}, $F_{35\%}$, and $F_{40\%}$.*
   - 2a) Stock status: $B/B_{MSY} > 1$
     - $F_{OFL} = F_{MSY}$
     - $F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%})$
   - 2b) Stock status: $\alpha < B/B_{MSY} \le 1$
     - $F_{OFL} = F_{MSY} \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
     - $F_{ABC} \le F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - \alpha)/(1 - \alpha)$
   - 2c) Stock status: $B/B_{MSY} \le \alpha$
     - $F_{OFL} = 0$
     - $F_{ABC} = 0$
3) Information available: *Reliable point estimates of B, $B_{40\%}$, $F_{35\%}$, and $F_{40\%}$.*
   - *3a) Stock status: $B/B_{40\%} > 1$*
     - $F_{OFL} = F_{35\%}$
     - $F_{ABC} \le F_{40\%}$
   - *3b) Stock status: $\alpha < B/B_{40\%} \le 1$*
     - $F_{OFL} = F_{35\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$
     - $F_{ABC} \le F_{40\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$
   - *3c) Stock status: $B/B_{40\%} \le \alpha$*
     - $F_{OFL} = 0$
     - $F_{ABC} = 0$
4) Information available: *Reliable point estimates of B, $F_{35\%}$, and $F_{40\%}$.*
   - $F_{OFL} = F_{35\%}$
   - $F_{ABC} \le F_{40\%}$
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*
   - $ABC \le 0.75 \times OFL$

Ecosystem Considerations

The Ecosystem Assessment provided streamlined Report Cards for both the Bering Sea and Aleutian Islands. Overall, 50 indices were updated, and 6 new indices were presented.

Eastern Bering Sea

Recap/update of data on 2013 conditions: Overall, there were mixed ecosystem signals in 2013. Some indicators suggest increased productivity, some lower. The environment remained cold, similar to 2007. Jellyfish were abundant, and groundfish length-weight residuals were positive, indicating that foraging conditions and ecosystem productivity were positive for groundfish. There was below-median recruitment of age-1 pollock, influenced by the extreme cold of 2012. Coho and some chum runs were above average; chinook and sockeye were below. Seabirds bred earlier, but kittiwakes did poorly in terms of reproduction.

Data on 2014 conditions: Conditions were changed in 2014, with warm temperatures, a small cold pool, and high apparent productivity. Guild trends (benthic foragers, motile epifauna, benthic foragers, pelagic foragers, and apex predators) were all stable or increasing. The mutivariate seabird index was above its long-term mean, indicating favorable conditions for piscivorous seabirds.

2015 forecast: Last year, the authors presented a 2013 9-month prediction for 2014 based on Regional Oceanographic Modeling forced by NCEP climate predictions. The predicted warming of the Bering Sea was confirmed by field data. For 2015, the model predicts similar levels of warmth, although it should be emphasized that the model has undergone only limited testing.

Aleutian Islands

The Aleutians Islands survey showed that 2014 had the warmest water temperatures on record, whereas 2012 was the coldest year. Report Card indicators showed a mix of effects. In the eastern Aleutians, conditions were good for seabirds. Guild biomass tracking showed increases in all regions and guilds except for Apex Predators in the western Aleutians. Fish condition was better in the eastern Aleutians/SE Bering Sea and worst in the western Aleutians.

Economic Summary of the BSAI commercial groundfish fisheries in 2012-13

The real ex-vessel value of all Alaska domestic fish and shellfish catch, including the estimated value of fish caught almost exclusively by catcher/processors, decreased from $2150.5 million in 2012 to $1924.2 million in 2013. The first wholesale value of 2013 groundfish catch was $2169.9 million. The 2013 total groundfish catch increased by 2.3% while the total first-wholesale value decreased by 14.6% relative to 2012.

In terms of ex-vessel value, the groundfish fisheries accounted for the largest share (45.7%) of the ex-vessel value of all commercial fisheries off Alaska, while the Pacific salmon (*Oncorhynchus spp*.) fishery was second with $679.5 million or 35.3% of the total Alaska ex-vessel value. The value of the shellfish fishery amounted to $238.4 million or 12.4% of the total for Alaska and exceeded the value of Pacific halibut (*Hippoglossus stenolepis*) with $111.5 million or 5.8% of the total for Alaska.

The Economic SAFE report (bound separately) contains detailed information about economic aspects of the groundfish fisheries, including figures and tables, catch share fishery indicators, product price forecasts, a summary of the Alaskan community participation in fisheries, an Amendment 80 fishery economic data report (EDR) summary, market profiles for the most commercially valuable species, a summary of the relevant research being undertaken by the Economic and Social Sciences Research Program (ESSRP) at the Alaska Fisheries Science Center (AFSC) and a list of recent publications by ESSRP analysts. The figures and tables in the report provide estimates of total groundfish catch, groundfish discards and discard rates, prohibited species catch (PSC) and PSC rates, the ex-vessel value of the groundfish catch, the ex-vessel value of the catch in other Alaska fisheries, the gross product value of the resulting groundfish seafood products, the number and sizes of vessels that participated in the

groundfish fisheries off Alaska, vessel activity, and employment on at-sea processors. Generally, the data presented in this report cover the years 2009 through 2013, but limited catch and ex-vessel value data are reported for earlier years in order to illustrate the rapid development of the domestic groundfish fishery in the 1980s and to provide a more complete historical perspective on catch. Several series have been discontinued and new price/revenue tables from an alternative source are presented in Appendix A: Ex-vessel Economic Data Tables: alternative pricing based on CFEC fish tickets.

The Economic SAFE report updates the data associated with the market profiles for pollock, Pacific cod, sablefish, and yellowfin sole that display the markets for these species in terms of pricing, volume, supply and demand, and trade. In addition, the Economic SAFE contains links to data on some of the external factors that impact the economic status of the fisheries. Such factors include foreign exchange rates, the prices and price indices of products that compete with products from these fisheries, domestic per capita consumption of seafood products, and fishery imports.

The Economic SAFE report also updates a section that analyzes economic performance of the groundfish fisheries using indices. These indices are created for different sectors of the North Pacific, and relate changes in value, price, and quantity across species, product and gear types to aggregate changes in the market.

The data behind the tables from this and past Economic SAFE reports are available online at

http://www.afsc.noaa.gov/refm/Socioeconomics/SAFE/default.php

Decomposition of the change in first-wholesale revenues from 2012-13 in the BSAI

The following brief analysis summarizes the overall changes that occurred between 2012-13 in the quantity produced and revenue generated from BSAI groundfish. According to data reported in the 2014 Economic SAFE report, the ex-vessel value of BSAI groundfish dropped from $814.0 million in 2012 to $690.9 million in 2013 (Figure 3), and first-wholesale revenues from the processing and production of groundfish in the BSAI fell from $2168.7 million in 2012 to $1840.9 million in 2013, a decrease of 15.1% (Figure 4).

The total quantity of groundfish products from the BSAI increased from 802.7 thousand metric tons in 2012 to 818.2 thousand metric tons in 2013, a difference of 15.5 thousand metric tons. These changes in the BSAI account for part of the change in first-wholesale revenues from Alaska groundfish fisheries overall which decreased by $372.8 million, a relative difference of -14.7% in 2013 compared to 2012 levels.

By species group, a negative price effect of $226.8 million for pollock was the largest change in first-wholesale revenues from the BSAI for 2012-13 (Figure 5). This enormous price effect was partially offset by a positive quantity effect of $82.6 million for pollock. A negative price effect of $88.8 million for cod was also important. By product group, a positive quantity effect occurred for fillets, and negative price effects were concentrated in the surimi and whole head & gut categories in the BSAI first-wholesale revenue decomposition for 2012-13.

In summary, first-wholesale revenues from the BSAI groundfish fisheries decreased by $327.8 million from 2012-13. A major driver was an enormous negative price effect for pollock concentrated in the surimi and whole head & gut product groups. In comparison, first-wholesale revenues decreased by $44.9 million from 2012-13 in the GOA, due to a strong negative quantity effect for cod, and negative price effects for rockfish and sablefish.

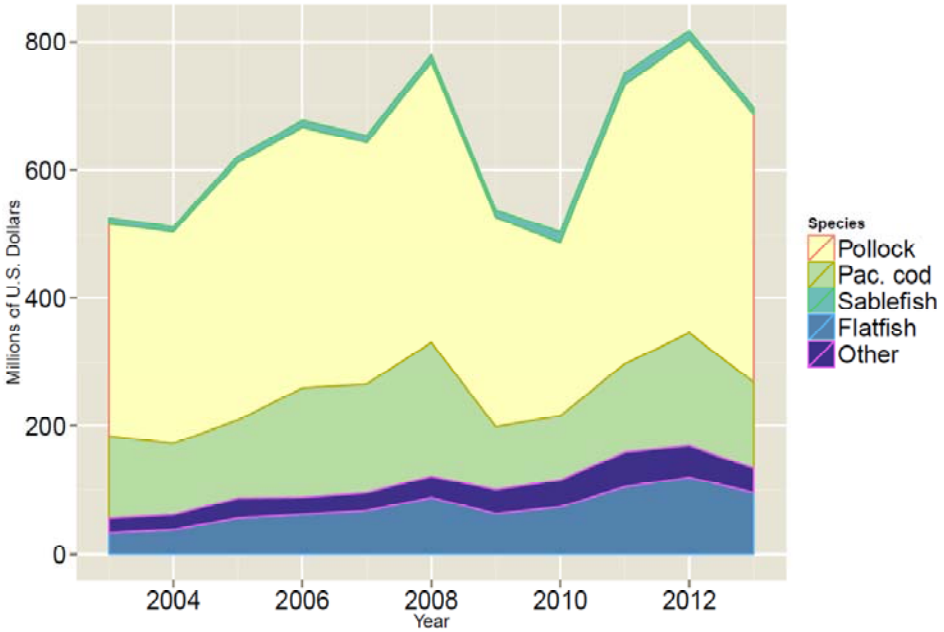

Figure 3 Real ex-vessel value of the groundfish catch in the domestic commercial fisheries in the BSAI area by species, 2003-2013 (base year = 2013).

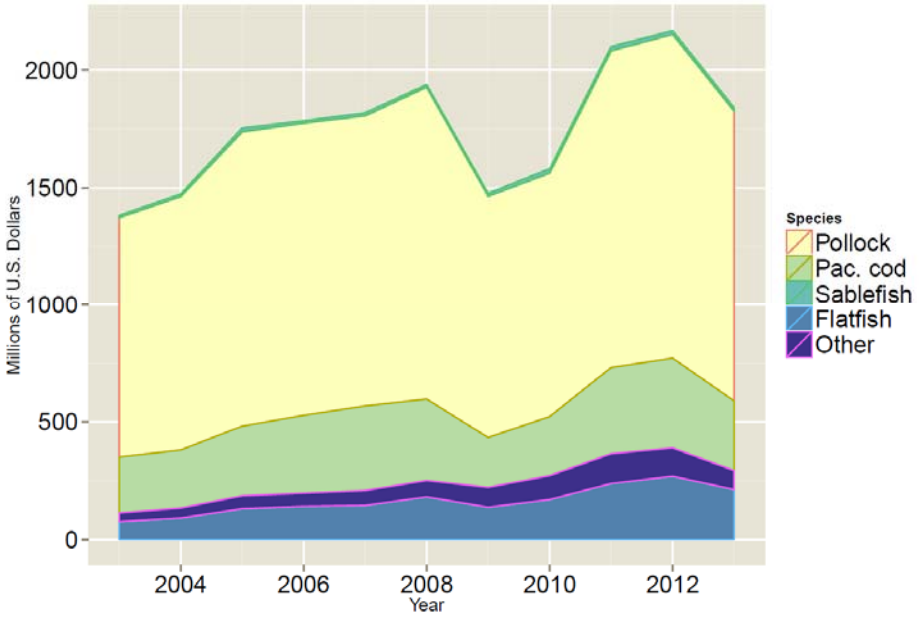

Figure 4 Real gross product value of the groundfish catch in the BSAI area by species, 2003-2013 (base year = 2013).

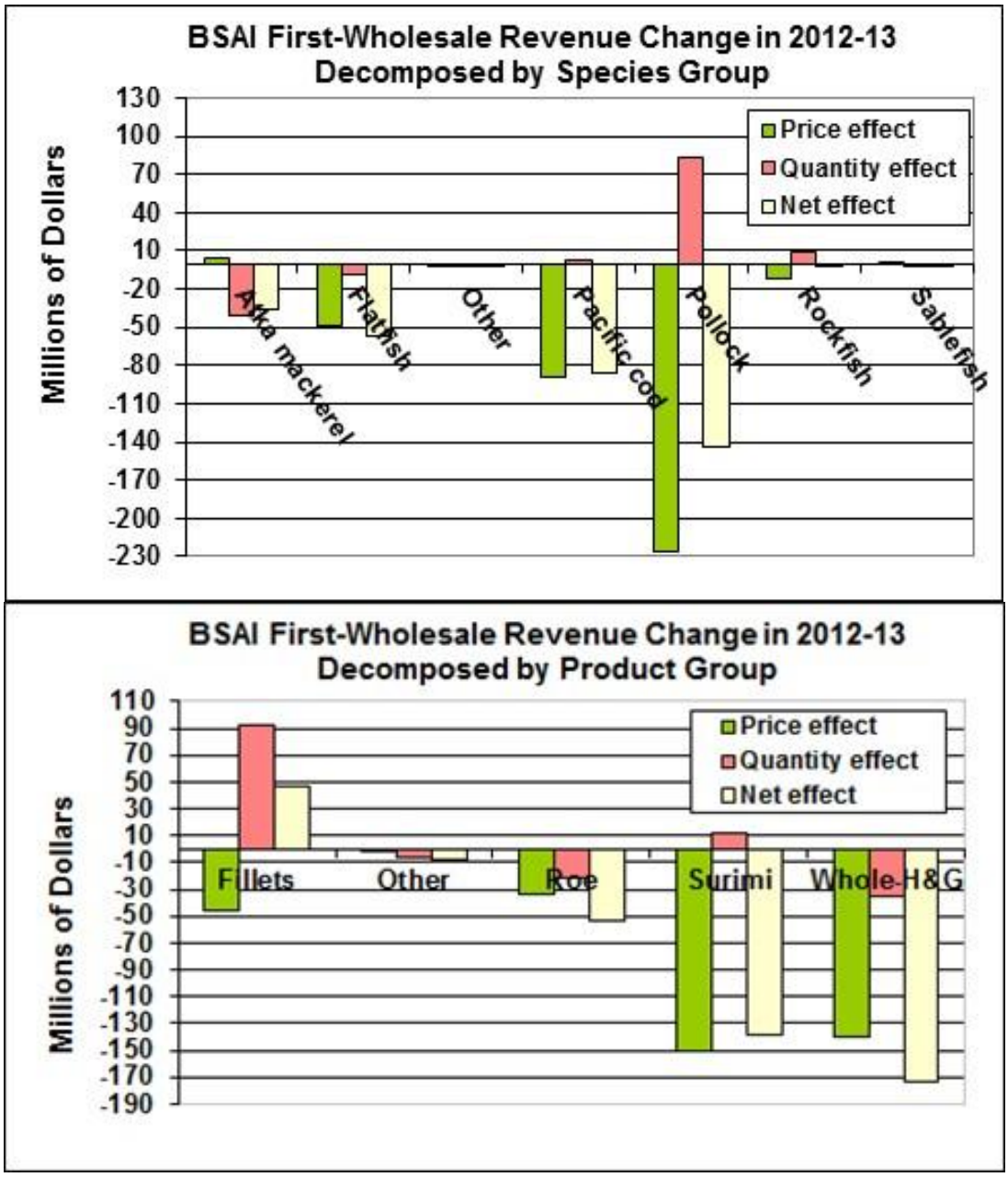

Figure 5 Decomposition of the change in first-wholesale revenues from 2012-13 in the BSAI area. The first decomposition is by the species groups used in the Economic SAFE report, and the second decomposition is by product group. The price effect refers to the change in revenues due to the change in the first-wholesale price index (current dollars per metric ton) for each group. The quantity effect refers to the change in revenues due to the change in production (in metric tons) for each group. The net effect is the sum of price and quantity effects. Year to year changes in the total quantity of first-wholesale groundfish products include changes in total catch and the mix of product types (e.g., fillet vs. surimi).

Stock Status Summaries

Except as otherwise noted, the Team's recommended ABCs are set at the maximum permissible levels under their respective tiers.

1. Walleye Pollock

Status and catch specifications (t) of walleye pollock in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The age grouping is 3+ for eastern Bering Sea, 2+ for the Aleutian Islands and the survey biomass for Bogoslof, as reported in the respective assessments. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Biomass	OFL	ABC	TAC	Catch
Eastern Bering Sea	2013	8,140,000	2,550,000	1,375,000	1,247,000	1,270,723
	2014	8,045,000	2,795,000	1,369,000	1,267,000	1,294,703
	2015	9,203,000	3,330,000	1,637,000	n/a	n/a
	2016	9,063,000	3,319,000	1,554,000	n/a	n/a
Aleutian Islands	2013	266,000	45,600	37,300	19,000	2,964
	2014	259,525	42,811	35,048	19,000	2,375
	2015	228,102	36,005	29,659	n/a	n/a
	2016	249,523	38,699	31,900	n/a	n/a
Bogoslof	2013	67,100	13,400	10,100	100	57
	2014	67,063	13,413	10,059	75	427
	2015	106,000	21,200	15,900	n/a	n/a
	2016	106,000	21,200	15,900	n/a	n/a

*In 2013, NMFS reallocated 14,900 t of pollock TAC from the Aleutian Islands to the Bering Sea which increased the Bering Sea TAC to 1,212,400 t and decreased the Aleutian Islands TAC to 4,100 t. In 2014, NMFS reallocated 13,650 t of pollock TAC from the Aleutian Islands to the Bering Sea, which increased the Bering Sea TAC to 1,280,650 t and decreased the Aleutian Islands TAC to 5,350 t.

Eastern Bering Sea pollock

Changes from previous assessment

New data in this year's assessment include the following:

- 2014 summer bottom trawl survey abundance at age
- 2014 summer acoustic-trawl survey abundance at age
- updated 2013 summer acoustic-trawl survey abundance at age (data using an age-length key from that survey replaced those in last year's assessment that were based on an age-length key from the bottom trawl survey)
- updated catch at age and average weight at age from the 2013 fishery
- updated total catch, including a preliminary value for 2014.

There were no changes in the authors' recommended assessment model.

Spawning biomass and stock trends

Spawning biomass in 2008 was at the lowest level since 1980, but has increased by 75% since then, with a 3% decrease projected for next year. The 2008 low was the result of extremely poor recruitments from the 2002-2005 year classes. Recent and projected increases are fueled by above average recruitment from the 2006 year class and very strong recruitment from the 2008 year class, along with reductions in average fishing mortality (ages 3-8) from 2009-2010. Spawning biomass is projected to be 39% and 32% above B_{MSY} in 2015 and 2016, respectively.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that EBS pollock qualifies for management under Tier 1 because there are reliable estimates of B_{MSY} and the probability density function for F_{MSY}. The Team concurred with the SSC's conclusion that the Tier 1 reference points continue to be reliably estimated.

The updated estimate of B_{MSY} from the present assessment is 1.948 million t, down 8% from last year's estimate of 2.122 million t. Projected spawning biomass for 2015 is 2.714 million t, placing EBS walleye pollock in sub-tier "a" of Tier 1. As in recent assessments, the maximum permissible ABC harvest rate was based on the ratio between MSY and the equilibrium biomass corresponding to MSY. The harmonic mean of this ratio from the present assessment is 0.512, up 9% from last year's value of 0.469. The harvest ratio of 0.512 is multiplied by the geometric mean of the projected fishable biomass for 2015 (5.669 million t) to obtain the maximum permissible ABC for 2015, which is 2.9 million t, up 15% and 19% from the maximum permissible ABCs for 2014 and 2015 projected in last year's assessment.

However, as with other recent EBS pollock assessments, the authors recommend setting ABCs well below the maximum permissible levels. They list three reasons for doing so in the SAFE chapter:

- A single year class (2008) accounts for more than half of the spawning biomass
- In 2014, the fleet achieved good catch rates and low salmon bycatch with an ABC far below the maximum permissible level
- Current low roe recovery rates may be indicative of reduced reproductive potential.

During the period 2010-2013, the Team and SSC based ABC recommendations on the most recent 5-year average fishing mortality rate. This year, the authors instead based their 2015 and 2016 ABC recommendations on a "replacement yield" strategy, giving a value of 1.35 million t for both years. The Team agrees that an ABC well below the maximum permissible value continues to be appropriate, but felt that stock conditions had improved sufficiently that an increase in the ABC harvest rate was appropriate. Specifically, the Team recommends basing the 2015 and 2016 ABCs on the harvest rate associated with Tier 3, the stock's Tier 1 classification notwithstanding, giving values of 1.637 million t and 1.554 million t, respectively.

The OFL harvest ratio under Tier 1a is 0.587, the arithmetic mean of the ratio between MSY and the equilibrium fishable biomass corresponding to MSY. The product of this ratio and the geometric mean of the projected fishable biomass for 2015 determines the OFL for 2015, which is 3.33 million t. The current projection for OFL in 2016 given a 2015 catch equal to the Team's recommended ABC is 3.319 million t.

Status determination

The walleye pollock stock in the EBS is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

Aleutian Islands pollock

Changes from previous assessment

The new data in the model consist of updated catch information and the addition of 2014 Aleutian Islands survey data. There was one minor change in the assessment methodology, the inclusion of age one pollock in the model.

Spawning biomass and stock trends

This year's assessment estimates that spawning biomass reached a minimum level of about $B_{29\%}$ in 1999 and then has generally increased, with a projected value of $B_{34\%}$ for 2015. The increase in spawning biomass since 1999 has resulted more from a dramatic decrease in harvest than from good recruitment, as there have been no above-average year classes spawned since 1989. Spawning biomass for 2015 is projected to be 70,012 t.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that this stock qualifies for management under Tier 3. The Team concurred and supported continued use of last year's model for evaluating stock status and recommending ABC. The model estimates $B_{40\%}$ at a value of 83,042 t, placing the AI pollock stock in sub-tier "b" of Tier 3. The model estimates the values of $F_{35\%}$ as 0.40 and $F_{40\%}$ as 0.31. Under Tier 3b, with the adjusted value of $F_{40\%}$=0.25, the maximum permissible ABC is 29,659 t for 2015. The Team recommends setting the 2015 ABC at this level. Following the Tier 3b formula with the adjusted value of $F_{35\%}$=0.32, OFL for 2015 is 36,005 t. If the 2015 catch is 1,237 t (i.e., equal to the five year average for 2009-2013), the 2016 maximum permissible ABC would be 31,900 t and the 2016 OFL would be 38,699 t. The Team recommends setting 2016 the ABC and OFL at the latter levels.

Status determination

The walleye pollock stock in the Aleutian Islands is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

Bogoslof pollock

Changes from previous assessment

A Bogoslof pollock acoustic-trawl survey was conducted in 2014. The 2014 Bogoslof pollock acoustic-trawl survey resulted in a biomass estimate of 112,070 t, which was an increase from the 2012 estimate of 67,100 t. The 2012 estimate was the lowest since the survey began in 1988.

Spawning biomass and stock trends

Survey biomass estimates since 2000 have all been lower than estimates prior to 2000, ranging from a low of 67,063 t in 2012 to a high of 301,000 t in 2000.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that this stock qualifies for management under Tier 5. The maximum permissible ABC value for 2014 would be 15,900 t (assuming M = 0.2 and F_{ABC} = 0.75 x M = 0.15): ABC = B_{2014} x M x 0.75 = 106,000 x 0.2 x 0.75 = 15,900 t. The projected ABC for 2016 is the same.

Following the Tier 5 formula with M=0.20, OFL for 2015 is 21,200 t. The OFL for 2016 is the same.

Status determination

The walleye pollock stock in the Bogoslof district is not being subjected to overfishing. It is not possible to determine whether this stock is overfished or whether it is approaching an overfished condition because it is managed under Tier 5.

2. Pacific cod

This is the second year in which separate assessments and OFL/ABC specifications have been made for the EBS and Aleutians

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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Age 0+ biomass	OFL	ABC	TAC*	Catch
Eastern Bering Sea	2014	1,570,000	299,000	255,000	246,897	208,053
	2015	1,680,000	346,000	255,000	n/a	n/a
	2016	1,770,000	389,000	255,000	n/a	n/a
Aleutian Islands	2014	59,000**	20,100	15,100	6,997	6,145
	2015	68,900**	23,400	17,600	n/a	n/a
	2016	68,900**	23,400	17,600	n/a	n/a

*The Council sets the Federal TAC to account for the State of Alaska Aleutian Islands Guideline Harvest Level fishery that is set equal to 3 percent of the BSAI ABC. Catch includes only that which accrues to the Federal TAC.

**Biomass shown for AI cod is survey biomass (Tier 5) not Age 0+ biomass.

Eastern Bering Sea Pacific cod

Changes from previous assessment

All survey and commercial data series on CPUE, catch at age, and catch at length were updated. The 2015 specifications were based on the same model used in 2011-2013, but the Team expressed serious reservations about this model's poor retrospective performance and continued reliance on a fixed value of survey catchability that is no longer very credible. A different model was requested for next year.

Spawning biomass and stock trends

Survey biomass was higher again in 2014, continuing an upward trend that began around 2006 and has been sustained by several good year classes. Spawning stock biomass is now estimated to be in the vicinity of $B_{40\%}$.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

$B_{40\%}$ for this stock is estimated to be 330,000 t and projected spawning biomass in 2015 is 409,000 t, so this stock is assigned to Tier 3a. The maximum 2015 ABC in this tier is 295,000 t, but the author and Team recommend that ABC be held at the 2014 level of 255,000 t to compensate for the poor retrospective behavior of the standard model. The Team recommends the same value for the preliminary 2016 ABC. The corresponding OFLs are 346,000 t and 389,000 t.

Status determination

EBS Pacific cod is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

Aleutian Islands Pacific cod

Changes from previous assessment

For some years there has been concern that a disproportionate share of the BSAI TAC was being taken from the Aleutians. The separate specification of EBS and AI OFL/ABC for the AI region, begun last year, is a response to that concern. Both age-structured (Tier 3) and survey-based (Tier 5) assessments have been considered for this area, but the working assessment was and is Tier 5.

Spawning biomass and stock trends

The survey biomass index has been flat and below the long-term average for the last ten years.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The Team reviewed the present Tier 5 assessment and two age-structured alternatives, both of which displayed poor retrospective performance and estimated biomass on the order of three times the trawl survey swept-area values, which is very high. The author and Team recommend using the Tier 5 assessment again for 2015 (ABC=17,600 t, OFL=23,400 t) while continuing work on the age-structured models with the aim of moving this assessment up to Tier 3.

Status determination

This stock is not being subjected to overfishing.

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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Age 4+ Biomass	OFL	ABC	TAC	Catch
Bering Sea	2013	19,000	1,870	1,580	1,580	634
	2014	21,000	1,584	1,339	1,339	315
	2015	34,000	1,575	1,333	n/a	n/a
	2016	33,000	1,431	1,211	n/a	n/a
Aleutian Islands	2013	28,000	2,530	2,140	2,140	1,062
	2014	28,000	2,141	1,811	1,811	817
	2015	24,000	2,128	1,802	n/a	n/a
	2016	23,000	1,934	1,637	n/a	n/a

Changes from previous assessment

The assessment model incorporates the following new data into the model:

- relative abundance and length data from the 2014 longline survey
- relative abundance and length data from the 2014 longline fisheries
- length data from the 2013 trawl fisheries
- age data from the 2013 longline survey and 2013 fixed gear fishery
- updated historical catches from 2006-2013 and projected 2014-2016 catches.

There were no model changes.

Spawning biomass and stock trends

The longline survey abundance index increased 15% from 2013 to 2014 following a 25% decrease from 2011 to 2013. The fishery abundance index has been trending down since 2007 and reached its lowest value in 2013 (2014 data are not available yet). The 2013 IPHC GOA sablefish index was not used in the model, but also declined 21% from 2012. The 2008 year class showed potential to be above average in previous assessments based on patterns in the age and length compositions. However, the estimate in this year's assessment is only average because it is heavily influenced by the recent large overall decrease in the longline survey and trawl indices. The 1997 year class has been an important contributor to the population; however, it has been reduced and is predicted to comprise less than 7% of the 2015 spawning biomass. The 2000 year class is still the largest contributor, with 16% of the spawning biomass in 2015. The 2008 year class is average and will comprise 10% of spawning biomass in 2015 even though it is

only 60% mature. Spawning biomass has increased from a low of 32% of unfished biomass in 2002 to 35% of unfished biomass projected for 2015, but is trending downward in projections for the near future.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Sablefish are managed under Tier 3 of the NPFMC harvest rules. Reference points are calculated using recruitments from 1979-2012. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from this assessment are 104,908 t (combined across the EBS, AI, and GOA), 0.095, and 0.112, respectively. Projected female spawning biomass (combined areas) for 2015 is 91,183 t (88% of $B_{40\%}$), placing sablefish in sub-tier "b" of Tier 3. The maximum permissible value of F_{ABC} under Tier 3b is 0.082, which translates into a 2015 ABC (combined areas) of 13,657 t. This value is very similar to the 2014 ABC of 13,722 t. In contrast, the 2013 assessment had projected a 10% decrease in ABC for 2015 from 2014. The more optimistic outlook from this year's assessment is supported by the increase in this year's domestic longline survey index noted above. ABCs are projected to decrease in 2016 to 12,406 t and 12,292 t in 2017. The OFL fishing mortality rate is 0.098 which translates into a 2015 OFL (combined areas) of 16,128 t.

Area apportionment

In December 1999, the Council apportioned the 2000 ABC and OFL based on a 5-year exponential weighting of the survey and fishery abundance indices. The same algorithm was used to apportion the ABC and OFL from 2000 specifications to 2013 specifications. Starting with the 2014 ABC and OFL, the Teams' recommended apportionments have been fixed at the2013 values. As described in last year's SAFE, the objective to reduce variability in apportionment was not being achieved under the previous formula. A Ph.D. student with the University of Alaska-Fairbanks began a project in 2012 with the objectives of re-examining the apportionment strategy and conducting management strategy evaluations. A spatial sablefish model has been developed, but management strategy evaluations have not begun yet. Meanwhile, it seems imprudent to move to an interim apportionment or return to the former scheme until more satisfactory methods have been identified and evaluated. Therefore, for 2015, the Teams recommend keeping the apportionment fixed at the proportions used in 2013 and 2014.

Status determination

Sablefish is not being subjected to overfishing, is not overfished, and is not 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 2014 and 2015 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Age 6+ Biomass	OFL	ABC	TAC	Catch
BSAI	2013	1,960,000	220,000	206,000	198,000	164,943
	2014	2,113,000	259,700	239,800	184,000	143,805
	2015	2,127,800	266,400	248,800	n/a	n/a
	2016	2,100,000	262,900	245,500	n/a	n/a

Changes from previous assessment

There were no changes to the assessment methodology. Changes to the input data include:

- 2013 fishery age composition
- 2013 survey age composition
- 2014 trawl survey biomass point estimate and standard error
- estimate of the discarded and retained portions of the 2013 catch
- estimate of total catch made through the end of 2014.

Spawning biomass and stock trends

The projected female spawning biomass estimate for 2015 is 644,200 t, which is an 8% increase from the 2014 estimate (594,800 t). The increase in projected spawning biomass for 2015 and beyond suggests a transition from the generally monotonic decline in spawning biomass that has prevailed since 1994. The total stock biomass has been quite stable throughout the 2000s.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that reliable estimates of B_{MSY} and the probability density function for F_{MSY} exist for this stock. The estimate of B_{MSY} from the present assessment is 391,000 t, and projected spawning biomass for 2015 is 644,200 t, meaning that yellowfin sole qualify for management under Tier 1a. Corresponding to the approach used in recent years, the 1978-2006 stock-recruitment data were used this year to determine the Tier 1 harvest recommendation. This provided a maximum permissible ABC harvest ratio (the harmonic mean of the F_{MSY} harvest ratio) of 0.117. The current value of the OFL harvest ratio (the arithmetic mean of the F_{MSY} ratio) is 0.125. The product of the maximum permissible ABC harvest ratio and the geometric mean of the 2015 biomass estimate produced the 2015 ABC of 248,800 t recommended by the author and Team, and the corresponding product using the OFL harvest ratio produces the 2015 OFL of 266,400 t. For 2016, the corresponding quantities are 245,500 t and 262,900 t, respectively.

Status determination

Yellowfin sole is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

Ecosystem considerations

As in previous years, this assessment contains an ecosystem feature that represents catchability of the EBS shelf trawl survey as an exponential function of average annual bottom temperature.

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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Age 1+ Biomass	OFL	ABC	TAC	Catch
BSAI	2013	81,000	2,540	2,060	2,060	1,746
	2014	84,546	2,647	2,124	2,124	1,653
	2015	122,298	3,903	3,172	n/a	n/a
	2016	132,666	6,453	5,248	n/a	n/a
Eastern Bering Sea	2013			1,610	1,610	1,450
	2014			1,659	1,659	1,476
	2015			2,448	n/a	n/a
	2016			4,050	n/a	n/a
Aleutian Islands	2013			450	450	296
	2014			465	465	177
	2015			724	n/a	n/a
	2016			1,198	n/a	n/a

Changes from previous assessment

This year's Greenland turbot assessment model included:

- updated 2014 catch data, including a 433t decrease in the catch estimate for 2003 from last year
- 2014 EBS shelf survey biomass
- 2014 ABL longline survey RPN
- 2014 EBS shelf survey and ABL longline age and length composition estimates
- Shelf survey age and length composition data now include the expanded northern strata from 1987 onward
- Updated fishery catch-at-length data for longline and trawl gear from 2014
- For Model 2 (see below), the 2006 and 2007 trawl fishery length composition data were removed; the sample sizes were deemed too small
- Updated fishery catch-at-length data for longline and trawl gear from 2014.
- Length of females at 50% mature was changed from 55 to 60 cm per D'yakov (1982).

Two models (Models 1 and 2) were presented for review and Model 2 was accepted for use by the Team. Model 1 was identical to Model 1 from 2013 except for the addition of new female maturity parameters. Model 2 differed from Model 1 (from 2014) by the addition of a recruitment autocorrelation parameter; fixing of catchability for shelf and slope surveys at 0.62 and 0.57, respectively; and inclusion of an additional selectivity bin (2010 - 2014) for the longline fishery length composition data.

Spawning biomass and stock trends

The projected 2015 female spawning biomass is 30,853 t. This is a 12% increase from the 2015 spawning biomass of 27,624 t projected in last year's assessment. Spawning biomass is projected to increase to 38,848 t in 2016. While spawning biomass continues to be near historic lows, increases have been estimated or are projected for the years following 2013, and large 2008 and 2009 year classes are being observed in both the survey and fishery size composition data. These year classes are both estimated to be stronger than any other year class spawned since the 1970s.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock. Greenland turbot therefore qualifies for management under Tier 3. Updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from the present assessment are 52,049 t, 0.176, and 0.218, respectively. The stock remains in Tier 3b. The maximum permissible value of F_{ABC} under this tier translates into a maximum permissible ABC of 3,172 t for 2015 and 5,248 t for 2016, and an OFL of 3,903 t for 2015 and 6,453 t for 2016. These are the authors' and Team's ABC and OFL recommendations.

Area apportionment

The authors' and Team's recommended 2015 and 2016 ABCs in the EBS are 2,448 t and 4,050 t, respectively. The authors' and Team's recommended 2015 and 2016 ABCs in the AI are 724 t and 1,198 t, respectively. Area apportionment of OFL is not recommended.

Status determination

Greenland turbot is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

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, except that the 2013 value was held constant at the 2012 value. The OFL and ABC for 2015 and 2016 are those recommended

by the Plan Team and are taken from the 2011 assessment. Catch data are current through November 8, 2014.

Area	Year	Age 1+ Bio	OFL	ABC	TAC	Catch
BSAI	2013	1,130,000	186,000	152,000	25,000	20,507
	2014	1,023,440	125,642	106,599	25,000	18,697
	2015	908,379	93,856	80,547	n/a	n/a
	2016	911,652	91,663	78,661	n/a	n/a

Changes from previous assessment

The following new data was included in the model:

- Survey size compositions from the 2013 and 2014 Eastern Bering Sea shelf surveys and the 2014 Aleutian Islands survey
- Biomass point estimates and standard errors from the 2013 and 2014 Eastern Bering Sea shelf surveys and the 2014 Aleutian Islands survey
- Fishery size compositions for 2012, 2013, and 2014. Fishery size composition data were also added for 1992-1999, which were not previously included
- Estimates of catch through October 10, 2014
- Age data from the 2010 Bering Sea shelf and 2010 Aleutian Islands surveys, as well as the 2004 shelf survey, which was not previously included

Summary of changes to the assessment model methodology:

The age-structured assessment model is similar to the model used for the 2012 and 2013 assessments. The 2014 model implemented the following changes based on Plan Team and SSC comments:

- Fishery selectivity is estimated non-parametrically rather than using a 2-parameter logistic function
- An additional likelihood component was added to incorporate theAleutian Islands age data.

Spawning biomass and stock trends

The projected age 1+ total biomass for 2015 is 908,379 t, a decrease from the value of 995,494 t projected for 2015 in last year's assessment. The projected female spawning biomass for 2015 is 533,731 t which is also a decrease from the previous estimate of 632,319 t. The recommended 2015 ABC is 80,547 t based on a $F_{40\%}$=0.153 harvest rate and the 2015 overfishing level is 93,856 t based on a F_{OFL}=0.180 harvest rate.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock. Arrowtooth flounder therefore qualifies for management under Tier 3. The point estimates of $B_{40\%}$ and $F_{40\%}$, from last year's assessment were 231,015 t and 0.156, respectively; from this year's assessment, they are 222,019 t, 0.153, respectively. The projected 2015 spawning biomass is far above $B_{40\%}$ in both last year's and this year's assessments, so ABC and OFL recommendations for 2015 were calculated under sub-tier "a" of Tier 3. The authors and Team recommend setting F_{ABC} at the $F_{40\%}$ level, which is the maximum permissible level under Tier 3a, which results in 2015 and 2016 ABCs of 80,547 t and 78,661 t, respectively, and 2015 and 2016 OFLs of 93,856 t and 91,663 t.

Status determination

Arrowtooth flounder is a largely unexploited stock in the BSAI. Arrowtooth flounder is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

Ecosystem Considerations

In contrast to the Gulf of Alaska, arrowtooth flounder is not at the top of the food chain on the EBS shelf. Arrowtooth flounder in the EBS is an occasional prey in the diets of groundfish, being eaten by Pacific cod, walleye pollock, Alaska skates, and sleeper sharks. However, given the large biomass of most of the predator species in the EBS, these occasionally recorded events translate into considerable total mortality for the arrowtooth flounder population in the EBS ecosystem.

7. Kamchatka flounder

Status and catch specifications (t) of Kamchatka 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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014

Area	Year	Age 1+ Bio	OFL	ABC	TAC	Catch
BSAI	2013	125,000	16,300	12,200	10,000	7,766
	2014	136,600	8,270	7,100	7,100	6,395
	2015	174,500	10,500	9,000	n/a	n/a
	2016	181,000	11,000	9,500	n/a	n/a

Changes from previous assessment

This assessment is a full update of the 2012 stock assessment. The 2013 assessment was an off-cycle assessment that did not re-run an updated assessment model, but instead the projection model was run with updated catch information only to provide estimates of 2014 and 2015 ABC and OFL without re-estimating the stock assessment model parameters and biological reference points.

Summary of changes in assessment input:

- Estimate of catch for 2012-2014
- 2012 and 2013 fishery length composition
- 2013 and 2014 shelf survey length composition
- 2013 and 2014 shelf survey biomass and standard error estimates
- 2014 Aleutian Islands survey biomass and standard error
- 2014 Aleutian Islands survey length composition
- 2012 slope survey age composition.

No changes were made to the assessment methodology.

Spawning biomass and stock trends

Kamchatka flounder has a widespread distribution along the deeper waters of the BSAI region. Spawning biomass increased continuously, at an average rate of about 5% per year, from the start of the model time series in 1991 to a peak of 62,963 t in 2009. Spawning biomasses from 2006 through 2014 have all been within 10% of the peak value. The 2000-2002, 2008-2010, and 2012 year classes are all estimated to be well above average, with the 2002, 2008, and 2010 year classes estimated to be at least twice average. Projected 2015 female spawning biomass is estimated at 60,100 t, above the $B_{40\%}$ level of 53,000 t, and is projected to remain above $B_{40\%}$.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

This stock was managed under Tier 3 for the first time in 2014. As noted above, projected spawning biomass for 2015 is above $B_{40\%}$, placing Kamchatka flounder in sub-tier "a" of Tier 3. For the 2015 fishery, the authors and Team recommend setting 2015 ABC at the maximum permissible value of 9,000 t from the projection model. This value is an increase of 1,900 t over the 2014 ABC (7,100 t). The 2015 OFL from the projection model is 10,500 t, up from 8,270 t for 2014.

Status Determination

Kamchatka flounder is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

8. Northern rock sole

Status and catch specifications (t) of northern 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 2014 and 2015 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Age 6+ Biomass	OFL	ABC	TAC	Catch
BSAI	2013	1,470,000	241,000	214,000	92,380	59,806
	2014	1,393,200	228,700	203,800	85,000	51,549
	2015	1,233,400	187,600	181,700	n/a	n/a
	2016	1,118,700	170,100	164,800	n/a	n/a

Changes from previous assessment

The last full assessment was in November 2012, therefore changes to input data in this analysis include:

- 2012 and 2013 fishery age composition
- 2012 and 2013 survey age composition
- 2013 and 2014 trawl survey biomass point estimates and standard errors
- Estimate of catch and discards for 2013 and 2014
- Estimate of retained and discarded portions of the 2013 catch

The assessment methodology was unchanged.

Spawning biomass and stock trends

Spawning biomass increased almost continuously from a low of 54,981 t at the beginning of the model time series in 1975 to a peak of 758,648 t in 2001. Spawning biomass then declined to 491,611 t in 2009, but has increased continuously since then, reaching 632,502 t in 2014. The 1996-2001 year classes are all estimated to be above average, with the 1998 year class estimated to be at least twice average. The stock assessment model projects a 2015 spawning biomass of 622,300 t. This was slightly less than the 2015 value projected in last year's assessment. The projected spawning biomass for 2016 is 589,800 t.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that northern rock sole qualifies for management under Tier 1. Spawning biomass for 2015 is projected to be well above the B_{MSY} estimate of 260,000, placing northern rock sole in sub-tier "a" of Tier 1. The Tier 1 2015 ABC harvest recommendation is 181,700 t (F_{ABC} = 0.143) and the 2015 OFL is 187,600 t (F_{OFL} = 0.152). The 2016 ABC and OFL values are 164,800 t and 170,100 t, respectively. Recommended ABCs correspond to the maximum permissible levels.

This is a stable fishery that lightly exploits the stock because it is constrained by PSC limits and the BSAI optimum yield cap. Usually the average catch/biomass ratio is about 3.5 percent of the northern rock sole stock.

Status determination

Northern rock sole is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

9. 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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Age 3+ Biomass	OFL	ABC	TAC	Catch
BSAI	2013	748,454	81,500	67,900	22,699	17,358
	2014	745,237	79,633	66,293	24,500	16,102
	2015	736,947	79,419	66,130	n/a	n/a
	2016	741,446	76,504	63,711	n/a	n/a

Changes from previous assessment

- 2014 catch biomass was added to the model
- 2013 catch biomass was updated to reflect October – December 2013 catches
- 2012 fishery age composition data were added and 2011 fishery age composition data were updated to reflect changes made to the observer database
- 2013-2014 fishery length composition data were added to the model
- 2013-2014 Eastern Bering Sea (EBS) shelf survey biomass and 2014 Aleutian Islands (AI) survey biomass were added to the linear regression used to determine estimates of AI survey biomass in years when no AI survey occurred, which resulted in updating the entire time series;
- 2013-2014 survey bottom temperatures were added to the model
- 2013 survey age composition data were added to the model
- 2014 survey length composition data were added to the model
- Minor changes in the historical survey catch were made to the eastern Bering Sea shelf bottom trawl survey database, as a result of Pacific halibut data reconciliation between RACE and the IPHC. The most common error was an incorrect application of an expansion factor to the Pacific halibut catch sample. In hauls where the catch was subsampled, this change in expansion for halibut affected the catch proportion of the other species in the catch to a minor degree.

No changes were made to the assessment methodology.

Spawning biomass and stock trends

Spawning biomass increased continuously from a low of 17,654 t in 1979 to a high of 319,400 t in 1997, and has been quite stable since 2005, with biomasses ranging between 234,130 t and 252,320 t. The 1998, 2001-2003, and 2011 year classes are all estimated to be well above average. The projected spawning stock biomass for 2015 is 233,736 t. Flathead sole are abundant and only lightly exploited.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, thereby qualifying flathead sole for management under Tier 3. The current values of these reference points are $B_{40\%}$=127,682 t, $F_{40\%}$=0.28, and $F_{35\%}$=0.35. Because projected spawning biomass for 2015 (233,736 t) is above $B_{40\%}$, flathead sole is in sub-tier "a" of Tier 3. The authors and Team recommend setting ABCs for 2015 and 2016 at the maximum permissible values under Tier 3a, which are 66,130 t and 63,711 t, respectively. The 2015 and 2016 OFLs under Tier 3a are 79,419 t and 76,504 t, respectively.

Status determination

Flathead sole is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

10. 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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Age 3 + Bio	OFL	ABC	TAC	Catch
BSAI	2013	589,000	67,000	55,200	20,000	23,523
	2014	576,300	66,800	55,100	24,500	18,808
	2015	471,500	54,000	44,900	n/a	n/a
	2016	462,600	51,600	42,900	n/a	n/a

Changes from previous assessment

The last full assessment was in November 2012, therefore changes to input data in this analysis include:

- Estimated 2014 fishery catch and updated 2013 fishery catch
- 2013 and 2014 trawl survey biomass estimate and standard error
- 2014 survey length composition
- 2012 and 2013 survey age composition
- 2013 fishery length composition
- 1975 and 1979-1981 survey biomass data were excluded
- New maturity schedule estimated from histological analysis of samples collected in 2012.

The assessment methodology was unchanged.

Spawning biomass and stock trends

The stock assessment model estimates a 2015 spawning biomass of 215,300. This was slightly less than the 2015 value of 246,300 projected in last year's assessment. The projected spawning biomass for 2016 is 201,300. Above average recruitment strength in 1998 and exceptionally strong recruitment in 2001 and 2002 have contributed to recent highs level of female spawning biomass.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Reliable estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ exist for this stock, therefore qualifying it for management under Tier 3. The updated point estimates are $B_{40\%}$ = 142,100 t, $F_{40\%}$ = 0.143, and $F_{35\%}$ = 0.175. Given that the projected 2015 spawning biomass of 215,300 t exceeds $B_{40\%}$, the ABC and OFL recommendations for 2015 were calculated under sub-tier "a" of Tier 3. Projected harvesting at the $F_{40\%}$

level gives a 2015 ABC of 44,900 t and a 2016 ABC of 42,900 t. The OFL was determined from the Tier 3a formula, which gives a 2015 value of 54,000 t and a 2016 value of 51,600 t.

Status determination

Alaska plaice is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

11. 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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Total Bio.	OFL	ABC	TAC	Catch
BSAI	2013	114,000	17,800	13,300	3,500	1,535
	2014	107,500	16,700	12,400	2,650	4,388
	2015	143,000	17,700	13,250	n/a	n/a
	2016	143,000	17,700	13,250	n/a	n/a

In 2014, the other flatfish TAC increased to 4,500 t after a reallocation of 1,850 t from the non-specified reserves.

Changes from previous assessment

The assessment incorporates 2014 total and discarded catch and 2014 EBS shelf and slope and Aleutian Islands trawl survey biomass. The assessment methodology was changed such that biomass values that are the basis for recommending ABC and OFL were computed by a random effects model.

Spawning biomass and stock trends

EBS survey biomass estimates for this complex were all below 100,000 t from 1983-2005, and reached a high of 133,502 t in 2007. The 2014 EBS estimate for 2014 (129,025 t) is within 3% of the time series high. The 2014 AI survey biomass estimate (13,936 t) is in the vicinity of the estimates from 2004-2012. All of the AI survey estimates since 2004 are higher than any of the estimates prior to 2004. Starry flounder, rex sole, and butter sole comprise the majority of the fishery catch with a negligible amount of other species caught in recent years. Starry flounder continues to dominate the shelf survey biomass in the EBS, while rex sole is the most abundant "other" flatfish in the Aleutian Islands.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has classified "other flatfish" as a Tier 5 species complex with harvest recommendations calculated from estimates of biomass and natural mortality. Natural mortality rates for rex (0.17) and Dover sole (0.085) in the GOA SAFE document are used, along with a value of 0.15 for all other species in the complex. Projected harvesting at the 0.75 *M* level (average F_{ABC} = 0.093) gives a 2015 ABC of 13,250 t for the "other flatfish" complex. The corresponding 2015 OFL (average F_{OFL} = 0.124) is 17,700 t.

Status determination

This assemblage is not being subjected to overfishing. It is not possible to determine whether this assemblage is overfished or whether it is approaching an overfished condition because it is managed under Tier 5.

12. Pacific ocean perch

Status and catch specifications (t) of Pacific ocean perch in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Team. Catch data are current through November 8, 2014.

Area	Year	Age 3+ Bio	OFL	ABC	TAC	Catch
BSAI	2013	663,000	41,900	35,100	35,100	28,049
	2014	639,505	39,585	33,122	33,122	32,373
	2015	577,967	42,558	34,988	n/a	n/a
	2016	561,090	40,809	33,550	n/a	n/a
Eastern Bering Sea	2013	n/a	n/a	8,130	8,130	5,050
	2014	n/a	n/a	7,684	7,684	7,429
	2015	n/a	n/a	8,771	n/a	n/a
	2016	n/a	n/a	8,441	n/a	n/a
Eastern Aleutian Islands	2013	n/a	n/a	9,790	9,790	9,530
	2014	n/a	n/a	9,246	9,246	9,021
	2015	n/a	n/a	8,312	n/a	n/a
	2016	n/a	n/a	7,970	n/a	n/a
Central Aleutian Islands	2013			6,980	6,980	6,747
	2014			6,594	6,594	6,439
	2015			7,723	n/a	n/a
	2016			7,406	n/a	n/a
Western Aleutian Islands	2013			10,200	10,200	10,065
	2014			9,598	9,598	9,485
	2015			10,182	n/a	n/a
	2016			9,763	n/a	n/a

Changes from previous assessment

The 2014 BSAI POP assessment was a full assessment. The survey biomass estimates and age composition data from the U.S.-Japan cooperative survey in 1980, 1983, and 1986 were removed from the assessment. The 2014 AI survey biomass estimate and length composition was included in the assessment. The 2012 AI survey and 2013 fishery age compositions were included in the assessment. The 2012 fishery length composition was included in the assessment. The length-at-age, weights-at-age, and age-to-length conversion matrix were updated based on data from the NMFS AI trawl survey beginning in 1991.

A bicubic spline model was used to estimate fishery selectivity as a function of year and age. The multinomial input sample sizes for the age and length composition data were changed using an iterative reweighting procedure that ensures that the standard deviation of the normalized residuals for each composition data type is 1.

Spawning biomass and stock trends

The 2014 AI survey biomass is large and consistent with the survey biomass estimates in 2010 and 2012, and the size composition data continue to show relatively strong cohorts from 1994 to 2000. Spawning biomass is well above the $B_{40\%}$ reference point and projected to be 234,426 t in 2015 and to decline to 223,744 t in 2016. Large recruitments in the late 1990s have driven up recent estimates of stock abundance.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The Plan Team accepted the author's recommended changes to the model. 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 169,203 t, 0.089, and 0.0109 respectively. Spawning biomass for 2015 (234,426 t) is projected to exceed $B_{40\%}$, thereby placing POP in sub-tier "a" of Tier 3. The 2015 and 2016 catches associated with the $F_{40\%}$ level of 0.089 are 34,988 t and 33,550 t, respectively, and are the authors' and Team's recommended ABCs. The 2015 and 2016 OFLs are 42,558 t and 40,809 t.

Area apportionment

The Team agreed with the author's recommendation for adopting the random effects model so that ABCs would be set regionally based on the proportions of model-based estimates of ending year survey biomass which for 2015 are: BS = 8,771 t, Eastern Aleutians (Area 541) =8,312 t, Central Aleutians (Area 542) = 7,723 t, and Western Aleutians (Area 543) = 10,182 t. The recommended OFL for 2015 and 2016 is not regionally apportioned.

Status determination

Pacific ocean perch is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

13. Northern rockfish

Status and catch specifications (t) of northern rockfish in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Age 3+ Biomass	OFL	ABC	TAC	Catch
BSAI	2013	195,000	12,200	9,850	3,000	2,038
	2014	197,541	12,077	9,761	2,594	2,339
	2015	218,901	15,337	12,488	n/a	n/a
	2016	218,898	15,100	12,295	n/a	n/a

Changes from previous assessment

Catch was updated through October 11, 2014. The survey biomass estimates and age composition data from the U.S.-Japan cooperative surveys in 1980, 1983, and 1986 were removed from the assessment. The 2014 AI survey biomass estimate and length composition were included in the assessment. The 2012 AI survey age composition was included in the assessment. The 2012 and 2013 fishery length compositions were included in the assessment. The length-at-age, weights-at-age, and age-to-length conversion matrix were updated based on data from the NMFS AI trawl survey beginning in 1991.

The multinomial input sample sizes for the age and length composition data were obtained by an iterative reweighting procedure that ensures that the standard deviation of the normalized residuals for each composition data type is 1.

Spawning biomass and stock trends

The 1980s cooperative surveys had low biomass estimates relative to the remainder of the time series, and removal of these data increased the estimated population size. Spawning biomass has been increasing slowly and almost continuously since 1977 until recent years, where it appears to be leveling off. Female spawning biomass is projected to be 94,873 t and 93,540 t in 2015 and 2016 which are well above $B_{40\%}$.. Recent recruitment has generally been below average.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The Plan Team agreed with the author's recommended changes to the model. The SSC has determined that this stock qualifies for management under Tier 3 due to the availability of reliable estimates for $B_{40\%}$ (57,768 t), $F_{40\%}$ (0.070), and $F_{35\%}$ (0.088). Because the projected female spawning biomass of 94,873 t is greater than $B_{40\%}$, sub-tier "a" is applicable, with maximum permissible $F_{ABC} = F_{40\%}$ and $F_{OFL} = F_{35\%}$. Under Tier 3a, the maximum permissible ABC for 2015 is 12,488 t, which is the authors' and Team's recommendation for the 2015 ABC. Under Tier 3a, the 2014 OFL is 15,337 t for the Bering Sea/Aleutian Islands combined. The Team continues to recommend setting a combined BSAI OFL and ABC. The Team recommendation for 2016 ABC is 12,295 t and the 2016 OFL is 15,100 t.

Status determination

Northern rockfish is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

14. Blackspotted and rougheye rockfish

Area/subarea	Year	Total Biomass (t)	OFL	ABC	TAC	Catch
BSAI	2013	29,800	462	378	378	341
	2014	30,400	505	416	416	196
	2015	41,666	799	648	n/a	n/a
	2016	43,633	865	702	n/a	n/a
Western/Central Aleutian Islands	2013			209	209	146
	2014			239	239	98
	2015			445	n/a	n/a
	2016			484	n/a	n/a
Eastern AI/ Eastern Bering Sea	2013			169	169	177
	2014			177	177	98
	2015			203	n/a	n/a
	2016			218	n/a	n/a

[1] Total biomass from AI age-structured projection model and survey biomass estimates from EBS.

Changes from previous assessment

This year was a full assessment, the first full assessment since 2012. New data in this assessment included:

- updated catch for 2013 and catch for 2014 through October 11, 2014
- fishery length composition data were included for 2012 and 2013
- the 2014 AI survey biomass estimate and length composition was included
- the 2012 AI survey age composition was included

The survey biomass estimates and age composition data from the U.S.-Japan cooperative survey in 1980, 1983, and 1986 were removed from the assessment.

The length-at-age, weights-at-age, and age-to-length conversion matrices were updated based on data from the NMFS AI trawl survey beginning in 1991.

Two major changes were made in the age-structured model for the AI component of this stock complex:

- After evaluating several alternative methods of parameterizing selectivity, the recommended model uses a double logistic curve to model fishery selectivity.

- Multinomial input sample sizes for the age and length composition data were obtained by an iterative reweighting procedure that ensures that the standard deviation of the normalized residuals for each composition data type is 1.

A simple random effects model was used to estimate current biomass for the EBS component of this stock complex.

Spawning biomass and stock trends

Total biomass for the AI component of the stock in 2015 is projected to be 40,327 t which is an increase from last year's projected 2014 value of 29,087 t. For the period 1977-2014, the current (2014) estimate of female spawning biomass is the all-time high. Female spawning biomass is projected to increase further to 7,921 t in 2015 and 8,993 t in 2016. These projected increases are fueled by extremely large year classes spawned in 1998, 2002, and 2006.

Application of the random effects model produces an estimated biomass for the SBS area of 1,339 t for 2015, a small decrease from last year's estimate of 1,389 t.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

As was the case with the two most recent full assessments in 2010 and 2012, the authors and the Team both expressed concerns about the appropriate range of year classes from which to estimate average recruitment. This year, the authors recommended using year classes up through 1998, but the Team recommends using year classes up through 1996 only, as this would correspond to the result of the formula recommended by the recruitment working group. The difference in the recommended range of year classes causes the Team's $B_{40\%}$ estimate to differ from that of the authors, which in turn affects the recommended ABCs. The values listed in this summary correspond to the Team's estimate of $B_{40\%}$.

For the Aleutian Islands, this stock qualifies for management under Tier 3 due to the availability of reliable estimates for $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$. Because the projected female spawning biomass for 2015 of 7,921 t is greater than $B_{40\%}$, (5,535 t) the stock qualifies as Tier 3a and the adjusted $F_{ABC} = F_{40\%}$values for 2015 and 2016 are 0.047 and 0.058, respectively. The maximum permissible ABC for the Aleutian Islands is 615 t, which is the authors' and Team's recommendation for the AI portion of the 2015 ABC. Under Tier 3a, the 2015 OFL is 799 t for the combined BSAI region. The apportionment of 2015 ABC to subareas is 445 t for the Western and Central Aleutian Islands and 203 t for the Eastern Aleutian Islands and Eastern Bering Sea. The Team recommends an overall 2016 ABC of 702 t and a 2016 OFL of 865 t.

Area apportionment

Given on-going concerns about fishing pressure relative to biomass in the Western Aleutians, the SSC requested that the potential apportionment by sub-area be calculated and presented. The maximum area-specific catch levels within the WAI/CAI, based on the random effects (RE) model, are as follows:

	WAI	**CAI**	**WAI-CAI**
ABC (2015, RE model)	68	377	455
ABC (2016, RE model)	74	410	484

Status determination

The blackspotted and rougheye rockfish complex is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

15. Shortraker rockfish

Area	Year	Survey Biomass	OFL	ABC	TAC	Catch
BSAI	2013	16,450	493	370	370	372
	2014	16,447	493	370	370	194
	2015	23,009	690	518	n/a	n/a
	2016	23,009	690	518	n/a	n/a

Changes from previous assessment

The 2014 biomass estimate is based on the Aleutian Island survey data through 2014 as well as the 2002-2012 eastern Bering Sea slope survey data. The EBS slope survey data had not been included in previous biomass estimates for this species. Catch data have been revised and updated through October 31, 2014.

For estimation of biomass, the assessment methodology was changed from a Kalman filter version of the Gompertz-Fox surplus production model to a simple random effects model.

Spawning biomass and stock trends

The 2015 estimated shortraker rockfish biomass is 23,009 t, increasing from the previous estimate of 16,447 t primarily due to the inclusion of the 2002-2012 EBS slope survey biomass estimates.

The modern EBS slope survey time series began in 2002. For the period 2002-2014, EBS slope survey biomass estimates ranged from a low of 2,570 t in 2004 to a high of 9,299 in 2012 (which was the year of the most recent EBS slope survey). For the period 1991-2014, the AI survey biomass estimates ranged from a low of 12,961 t in 2006 to a high of 38,497 t in 1997. According to the random effects model, total biomass (AI and EBS slope combined) from 2002-2014 has been very stable, ranging from a low of 20,896 t in 2006 to a high of 23,938 t in 2002. The time series from the random effects model is much smoother than the time series for the raw data, due to large standard errors associated with the data.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has previously determined that reliable estimates of only biomass and natural mortality exist for shortraker rockfish, qualifying the species for management under Tier 5. The Team recommends basing the biomass estimate on the random effects model. The Team recommended setting F_{ABC} at the maximum permissible level under Tier 5, which is 75 percent of M. The accepted value of M for this stock is 0.03 for shortraker rockfish, resulting in a $maxF_{ABC}$ value of 0.0225. The ABC is 518 t for 2015 and 2016 and the OFL is 690 t for 2015 and 2016.

Status determination

Shortraker rockfish is not being subjected to overfishing. It is not possible to determine whether this stock is overfished or whether it is approaching an overfished condition because it is managed under Tier 5.

16. Other Rockfish complex

Status and catch specifications (t) of other rockfish in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Survey Biomass	OFL	ABC	TAC	Catch
BSAI	2013	47,700	1,540	1,159	873	814
	2014	47,767	1,550	1,163	773	931
	2015	49,630	1,667	1,251	n/a	n/a
	2016	49,630	1,667	1,251	n/a	n/a
Eastern Bering Sea	2013	29,800	n/a	686	400	191
	2014	29,885	n/a	690	300	316
	2015	n/a	n/a	695	n/a	n/a
	2016	n/a	n/a	695	n/a	n/a
Aleutian Islands	2013	17,900	n/a	473	473	623
	2014	17,878	n/a	473	473	615
	2015	n/a	n/a	555	n/a	n/a
	2016	n/a	n/a	555	n/a	n/a

For 2014, NMFS increased the Bering Sea TAC to 400 t with a reallocation of 100 t from the non-specified reserves,

Changes from previous assessment

New data in the 2014 assessment included updated catch and fishery lengths for 2014. Biomass estimates, CPUE, and length frequency compositions were also included from the 2014 Aleutian Island trawl survey, and the 2013 and 2014 eastern Bering Sea shelf survey. There was no Bering Sea slope survey in 2014. Of the new data, only the survey biomass estimate is used in computing recommended ABCs and OFLs.

In previous assessments, a 4-6-9 weighted average of three most recent surveys for each region (Aleutian Islands, Bering Sea shelf, and Bering Sea slope) had been used to calculate the BSAI other rockfish biomass estimate. To remain consistent with other Tier 5 assessments, the Team recommends using a random effects model for each region to calculate the biomass estimate for the entire BSAI area.

Spawning biomass and stock trends

Trends in spawning biomass are unknown. The 2014 assessment reported that biomass of other rockfish was at an all-time high in both the most recent EBS slope survey (2012) and this year's AI survey.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The Team agrees with the approach recommended by the author of setting F_{ABC} at the maximum allowable under Tier 5 ($F_{ABC} = 0.75M$). The accepted values of M for species in this complex are 0.03 for shortspine thornyheads and 0.09 for all other species. Multiplying these rates by the best biomass estimates of shortspine thornyhead and other rockfish species in the "other rockfish" complex yields 2015 and 2016 ABCs of 695 t in the EBS and 555 t in the AI. The 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 natural mortality values and adding the results, which yields an OFL of 1,667 t for 2015 and 2016.

Status determination

The "other rockfish" complex is not being subjected to overfishing. It is not possible to determine whether this complex is overfished or whether it is approaching an overfished condition because it is managed under Tier 5.

17. 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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Age 1+ Biomass	OFL	ABC	TAC	Catch
BSAI	2013	447,189	57,700	50,000	25,920	23,180
	2014	456,620	74,492	64,131	32,322	30,947
	2015	694,421	125,297	106,000	n/a	n/a
	2016	673,327	115,908	98,137	n/a	n/a
E Aleutian Islands / EBS	2013	n/a	n/a	16,900	16,900	15,776
	2014	n/a	n/a	21,652	21,652	21,185
	2015	n/a	n/a	38,493	n/a	n/a
	2016	n/a	n/a	35,637	n/a	n/a
Central Aleutian Islands	2013	n/a	n/a	16,000	7,520	7,284
	2014	n/a	n/a	20,574	9,670	9,520
	2015	n/a	n/a	33,108	n/a	n/a
	2016	n/a	n/a	30,652	n/a	n/a
Western Aleutian Islands	2013	n/a	n/a	17,100	1,500	120
	2014	n/a	n/a	21,905	1,000	242
	2015	n/a	n/a	34,400	n/a	n/a
	2016	n/a	n/a	31,848	n/a	n/a

Changes from previous assessment

The following new data were included in this year's assessment:

- Fishery catch data were updated.
- The 2013 fishery age composition data were added.
- Total 2014 year end catch was estimated at 31,670 t based on the observation that an average of 25% of the catch has occurred after Oct. 1 in recent years.
- The 2014 survey biomass estimates were included.
- The estimated average selectivity for 2010-2014 was used for projections.
- It was assumed that 80% of the BSAI-wide ABC is likely to be taken under the revised Steller Sea Lion Reasonable and Prudent Alternatives (SSL RPAs) to be implemented in 2015. This percentage was applied to the 2015 maximum permissible ABC, and that amount was assumed to be caught in order to estimate the 2016 ABCs and OFL values.

There were no changes to the assessment methodology.

Spawning biomass and stock trends

Spawning biomass reached an all-time high in 2005, then decreased by 56% from 2005-2013, and now appears to have stabilized. The only above-average year class since 2001 is the 2006 cohort, which is 23% above average. The projected female spawning biomass for 2015 is 167,136 t, which is above $B_{40\%}$ (133,295 t). The stock is projected to remain above $B_{40\%}$ through 2016 at the recommended harvest levels.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The projected female spawning biomass under the recommended harvest strategy is estimated to be above $B_{40\%}$, thereby placing BSAI Atka mackerel in Tier 3a**.** The projected 2015 yield (ABC) at $F_{40\%}$= 0.403 is 106,000 t, up 65% from the 2014 ABC. The projected 2015 overfishing level at $F_{35\%}$ = 0.489 is 125,297 t, up 68% from last year's estimate for 2014. The increase in yield is due primarily to a large increase in survey biomass in 2014 and the addition of the 2013 fishery age composition, which increased the estimated magnitudes of the 1999-2001 year classes by 12-15% and the magnitude of the 2006 year class by 17% relative to last year's assessment.

Area apportionment

A 4-survey weighted average is used to apportion the ABC among areas. The last 4 surveys were conducted in 2006, 2010, 2012, and 2014. The recommended ABC apportionments by subarea for 2015 are 38,493 t for Area 541 and the southern Bering Sea region, 33,108 t for Area 542, and 34,400 t for Area 543.

Status determination

Atka mackerel is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

Ecosystem Considerations

Atka mackerel is the most common prey item of the endangered western Steller sea lion throughout the year in the Aleutian Islands. Analysis of historic fishery CPUE revealed that the fishery may create temporary localized depletions of Atka mackerel, and fishery harvest rates in localized areas may have been high enough to affect prey availability for Steller sea lions. The objectives of having areas closed to Atka mackerel fishing around Steller sea lion haulouts and rookeries, and time-area ABC/TAC allocations, are to maintain sufficient prey for the recovery of Steller sea lions in the Aleutian Islands while also providing opportunities to harvest Atka mackerel. Steller sea lion surveys indicate that counts of adults, juveniles, and pups continue to decline in the Aleutian Islands, particularly in the western Aleutians (area 543) where counts of pups and non-pups declined 9%/year and 7%/year, respectively, between 2000 and 2013. This contrasts with Steller sea lion counts in the eastern Aleutian Islands and southern Bering Sea (between Samalga and False Passes), which are increasing. New regulations proposed for 2015 remove the closure of area 543 to directed fishing for Atka mackerel (but with a maximum TAC of 65% of the area ABC), remove the TAC reduction in area 542, and re-open areas in 541 and 542 that were previously closed to directed Atka mackerel fishing.

18. Skates

Status and catch specifications (t) of skates 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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Age 0+ Biomass	OFL	ABC	TAC	Catch
BSAI	2013	745,000	45,800	38,800	24,000	27,038
	2014	726,561	41,849	35,383	26,000	24,695
	2015	625,314	49,575	35,551	n/a	n/a
	2016	595,880	47,035	35,551	n/a	n/a

For 2013, NMFS increased the TAC to 25,500 t with a reallocation of 1,500 t from the non-specified reserves, For 2014, NMFS increased the TAC to 26,600 t with a reallocation of 600 t from the non-specified reserves,

Changes from previous assessment

This chapter was a full assessment. The following new data were included in this year's assessment:

- updated 2013 and preliminary 2014 catch
- 2014 EBS shelf and Aleutian Islands survey data
- 1982-1991 EBS shelf survey biomass estimates
- Reconstructed historical catch data back to 1954
- Length-at-age data from 2003, 2007, 2008, and 2009
- Weight-at-length data from the 2008-2010 EBS shelf surveys

Four assessment models for Alaska skate were presented, including last year's model. The Team recommended the author's preferred Model 2. All of the new models included the following changes:

- For all Alaska skate models, growth parameters are estimated within the model.
- The "embryonic stage" (ages 0-3 in previous models) was eliminated from the model, so that in the model age-0 skates are free-swimming individuals in their first year outside of the eggcase.
- The recruitment function was returned to the original formulation, a Beverton-Holt curve with steepness fixed at 1.0; this effectively defines an average level of recruitment at all stock sizes.
- The maximum age was returned to its original value of 25 (from 30 in the 2012 model).
- Age selectivity was removed from the model the model.

For the "other skates" assessment, the author recommended a random effects model to replace the model based on the 3-survey average.

Spawning biomass and stock trends

The 2014 biomass estimates from the shelf survey increased slightly from 2013. In the case of Alaska skates, survey biomass estimates, though variable, are basically trendless since species identification began in 1999. Model estimates of spawning biomass are also basically trendless over the 1992-2013 period covered by the model. As would be expected from the lack of trend in spawning biomass, estimated recruitments have also been fairly constant, with a CV of 31% for the post-1976 portion of the time series.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Since 2011, the Alaska skate portions of the ABC and OFL have been specified under Tier 3, while the "other skates" portions have been specified under Tier 5.

Because projected spawning biomass for 2015 (115,490 t) exceeds $B_{40\%}$ (74,769 t), Alaska skates are managed in sub-tier "a" of Tier 3. Other reference points are $maxF_{ABC} = F_{40\%} = 0.077$ and $F_{OFL} = F_{35\%} = 0.090$. The Team accepted the author's preferred model. The maximum permissible ABCs for 2015 and 2016 are 34,389 t and 32,199 t, respectively; up 30% and 22% from the current 2015 specification. In contrast, projected spawning biomasses for 2015 and 2016 are down 35% and 37% from last year's projected value for 2015. The Team felt it was unwise to be recommending such large increases in ABC in the face of commensurately large decreases in spawning biomass, and instead recommended holding 2015 and 2016 ABC constant at the 2014 level. The Alaska skate portions of the 2015 and 2016 ABCs are 28,282 t for both years, and the Alaska skate portions of the 2014 and 2015 OFLs are 39,883 t and 37,343 t. The "other skates" component is assessed under Tier 5, based on a natural mortality rate of 0.10 and a biomass estimated using the random effects model. The "other skates" portion of the 2015 and 2016 ABCs is 7,269 t for both years and the "other skates" portion of the 2015 and 2016 OFLs is 9,692 t for both years.

For the skate complex as a whole, OFLs for 2015 and 2016 total 49,575 t and 47,035 t, respectively, and ABCs for 2015 and 2016 total 35,551 t for both years.

Status determination

Alaska skate, which may be viewed as an indicator stock for the complex, is not overfished and is not approaching an overfished condition. The skate complex was not subjected to overfishing. It is not possible to determine whether the other skates complex is overfished or approaching an overfished condition because it is managed under Tier 5.

19. Sculpins

Status and catch specifications (t) of sculpins 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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Biomass	OFL	ABC	TAC	Catch
BSAI	2013	215,713	56,400	42,300	5,600	5,829
	2014	215,713	56,424	42,318	5,750	4,570
	2015	180,570	52,365	39,725	n/a	n/a
	2016	180,570	52,365	39,725	n/a	n/a

In 2013, the sculpins TAC increased to 5,900 t after a reallocation of 300 t from the non-specified reserves.

Changes from previous assessment

Biomass estimates and length compositions were included from the 2014 Aleutian Island trawl survey, and the 2013 and 2014 eastern Bering Sea shelf survey. Of these, only the survey biomass estimates have an impact on ABC and OFL.

In previous assessments, the average of the three most recent survey estimates for each region (Aleutian Islands, Bering Sea shelf and Bering Sea slope) had been used to calculate the BSAI sculpin complex biomass estimate. To remain consistent with other Tier 5 assessments, the Team recommends using the random effects model for each region to calculate the biomass estimate for the entire BSAI area.

Spawning biomass and stock trends

Biomass estimates for 6 of the most abundant sculpin species on the EBS shelf seem to be relatively stable and comprise 95% of the total sculpin biomass. EBS slope trawl surveys, conducted since 2002, show a different sculpin community than seen on the EBS shelf and AI.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The Plan team supported the authors' recommendation to use an average *M* rate using a biomass-weighted average of the instantaneous natural mortality rates for the six most abundant sculpin species in the BSAI. The complex mortality rate may change as new survey data become available. The Team recommended using the random effects model to estimate the biomass for the entire BSAI area. The total (Tier 5) sculpin recommended ABCs and OFLs for 2015 and 2016 are 39,725 t and 52,365 t, respectively.

Status determination

The sculpin complex is not being subjected to overfishing. It is not possible to determine whether the sculpin complex is overfished or whether it is approaching an overfished condition because it is managed under Tier 5.

20. Sharks

Status and catch specifications (t) of sharks 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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Biomass	OFL	ABC	TAC	Catch
BSAI	2013	n/a	1,360	1,020	100	116
	2014	n/a	1,363	1,022	125	122
	2015	n/a	1,363	1,022	n/a	n/a
	2016	n/a	1,363	1,022	n/a	n/a

For 2014, NMFS increased the BSAI TAC to 225 t with a reallocation of 100 t from the non-specified reserves,

Changes from previous assessment

OFL and ABC are based on historical catches, so there are no new data that would impact ABC or OFL. The authors recommended changing the formula for computing ABC and OFL to one based on average rather than maximum catch over the 1997-2007 period, but the Team recommends retaining the existing formula.

Spawning biomass and stock trends

The main species taken in the BSAI fisheries (mainly pollock and cod) are Pacific sleeper sharks and salmon sharks. Beginning around 2000, catch rates of sleeper sharks in both the IPHC longline survey and the bycatch fisheries declined steeply for several years, causing possible concern about depletion. On the other hand, all sleeper sharks taken in the survey and fisheries are juveniles, so it is impossible to know what effect those catches have on spawning stock biomass. Recent catch levels have been well below ABC.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has placed sharks in Tier 6, where OFL and ABC are typically based on historical catches. Consistent with past policy, the Team recommended setting OFL at the maximum catch during the period 1997-2007 (1,363 t, taken in 2002), and ABC at 75 percent of OFL, which continues to be 1,022 t. (The small changes in the above table between 2013 and 2014-2016 result from different rounding practices.)

Status determination

The shark complex is not being subjected to overfishing. It is not possible to determine whether this species complex is overfished or whether it is approaching an overfished condition because it is managed under Tier 6.

21. Squids

Status and catch specifications (t) of squid 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 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Biomass	OFL	ABC	TAC	Catch
BSAI	2013	n/a	2,620	1,970	700	300
	2014	n/a	2,624	1,970	310	1,678
	2015	n/a	2,624	1,970	n/a	n/a
	2016	n/a	2,624	1,970	n/a	n/a

In 2014, the squids TAC increased to 1,764 t after a reallocation of 1,454 t from the non-specified reserves.

Changes from previous assessment

While no methodological changes were made to this assessment, the authors provided new information on length distribution on fisheries catch which suggests that, in some years, fishing occurred on two cohorts, while in other years, only one cohort was evident. This information does not impact ABC or OFL.

Spawning biomass and stock trends

Survey biomass is not considered a reliable indicator of stock trends for squid.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Squids are managed under Tier 6 because the groundfish bottom trawl surveys do not provide reliable biomass estimates. The Team concurred with the author's ABC and OFL recommendations for 2015 and 2016, which are unchanged from last year. The recommended ABCs for 2015 and 2016 are the maximum permissible level, calculated as 0.75 times the average catch from the reference period of 1978-1995, or 1,970 t. The recommended OFLs in 2015 and 2016 are calculated as the average catch from 1978-1995, or 2,624 t. (The small change in the above table between 2013 and 2014-2016 result from different rounding practices.)

Status determination

The squid complex is not being subjected to overfishing. It is not possible to determine whether this species complex is overfished or whether it is approaching an overfished condition because it is managed under Tier 6.

22. Octopus

Status and catch specifications (t) of octopus in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2015 and 2016 are those recommended by the Plan Team. Catch data are current through November 8, 2014.

Area	Year	Biomass	OFL	ABC	TAC	Catch
BSAI	2013	n/a	3,450	2,590	500	224
	2014	n/a	3,450	2,590	225	351
	2015	n/a	3,452	2,589	n/a	n/a
	2016	n/a	3,452	2,589	n/a	n/a

For 2014, NMFS increased the TAC to 425 t with a reallocation of 200 t from the non-specified reserves,

Changes from previous assessment

This chapter was presented as a full assessment. No changes were made in the methodology for assessing octopus based on consumption of octopus by Pacific cod. The consumption estimate using Pacific cod predation of octopus as an estimator of biomass lost due to natural mortality first was accepted in 2011; the authors recommended that this calculation be revisited once every five years.

The following new data were included in this year's assessment:

- updated 2013 and preliminary 2014 catch
- 2014 EBS shelf and Aleutian Islands survey data

These data do not impact ABC or OFL.

Spawning biomass and stock trends

Estimated survey biomass was higher in 2014 than in the survey in 2013 for the Bering Sea shelf and in 2012 for the Aleutian Islands. Species composition and size frequencies from the surveys were similar to previous years.

On the EBS shelf and in the commercial catch, giant Pacific octopus is the most abundant of at least seven octopus species found in the BSAI. Octopuses are commonly caught in pot and trawl fisheries, especially in the Pacific cod pot fishery. Trawl surveys sample octopus poorly, and biomass estimates from trawl surveys are not considered reliable.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The ABC and OFL values were determined under Tier 6. Usually, Tier 6 specifications are based on average catch, but starting in 2012, the assessment authors recommended setting harvest specifications using an alternative mortality estimate based on species composition of Bering Sea Pacific cod diet from 1984-2008 survey data and weight-at-age data. This method is also recommended for 2015 and 2016. The recommended ABCs and OFLs for 2015 and 2016 are unchanged from the 2014 values.

Status determination

The octopus complex is not being subjected to overfishing. It is not possible to determine whether the octopus complex is overfished or whether it is approaching an overfished condition because it is managed under Tier 6.

Appendix 1: Grenadiers

An abbreviated grenadier assessment is provided in Appendix 1; while not required, it is provided to assist the Council in tracking abundance of the assemblage in the groundfish FMPs.

The Secretary of Commerce approved Amendments 100/91 on August 6, 2014, which added the grenadier complex into both FMPs as Ecosystem Components. Under this rule, they are not allowed to be targeted but there is an 8% Maximum Retainable Allowance (MRA) (Federal Register, Proposed Rules, Vol. 79, No. 93). The final rule will publish before the end of the year and so it may be effective for the start of the 2015 fishing year.

As an Ecosystem Component, a stock assessment is not required and there is no ABC or OFL.

Seven species of grenadiers are known to occur in Alaska. The giant grenadier is the most abundant and has the shallowest depth distribution on the continental slope. The assessment focused on the giant grenadier as it is the most common grenadier caught in both the commercial fishery and longline and trawl surveys. Pacific grenadiers and popeye grenadiers are occasionally caught.

Overall, the estimate of total catch of grenadier in 2013 (15,504 mt) was almost the same as in 2012 (15,119 t) (Table 1). Catch in 2013 was up 13% from the 2003-2012 average. Even though the great majority of grenadier catch occurs by Oct. 1, the catch estimate in 2014 is only 7,863 t. For example, by Oct. of 2013 95% of the catch was taken. Thus, the assessment authors expect that the final catch estimate for 2014 will be much lower than average. It is possible that this is related to observer restructuring. Highest catches have consistently been in the GOA. By region, annual catches have ranged between 5,400-14,700 t in the GOA, 1,600-5,000 t in the EBS, and 1,300-4,600 t in the AI. Most of the catch occurs in longline and pot fisheries.

Changes in the input data

New data inputs include: 1) updated catch data for 2003-2014; 2) updated 2000-2014 Aleutian Island (AI) biomass from 1-1,000 m using the estimation method presented in the 2012 SAFE; 3) NMFS longline survey results for 2013 and 2014; 4) updated GOA biomass using a random effects model. There was no EBS slope trawl survey in 2014.

Changes in assessment methodology

This year the authors used a random effects model (a similar method, a Kalman filter, was presented in the 2012 SAFE report (Rodgveller et al. 2012)), that utilizes trawl survey data from 1984-2013 to estimate the exploitable biomass in 2013. Since there was no trawl survey in the GOA in 2014, the estimate for 2013 is used as the most recent value of exploitable biomass.

If the complex had been included in the fishery under the FMPs in 2014, Tier 5 determinations would have resulted in the following OFLs and ABCs. For 2015, the maximum allowable ABC for the BSAI is 75,274 t and for the GOA is 30,691 t. This ABC is a 12% increase for the BSAI and a 12% decrease for the GOA. The corresponding reference values for grenadier are summarized in the following tables, with the recommended ABC and OFL values in bold. Overfishing is not occurring in either the BSAI or GOA.

Table 1. BSAI Groundfish Plan Team Recommended OFLs, and ABCs for 2015 and 2016; OFL, ABC, TAC and catch through November 8, 2014

		2014			2014 Catch	2015		2016	
Species	**Area**	**OFL**	**ABC**	**TAC**	**as of 11/8/14**	**OFL**	**ABC**	**OFL**	**ABC**
Pollock	EBS	2,795,000	1,369,000	1,267,000	1,294,703	3,330,000	1,637,000	3,319,000	1,554,000
	AI	42,811	35,048	19,000	2,375	36,005	29,659	38,699	31,900
	Bogoslof	13,413	10,059	75	427	21,200	15,900	21,200	15,900
Pacific cod	BS	299,000	255,000	246,897	208,053	346,000	255,000	389,000	255,000
	AI	20,100	15,100	6,997	6,145	23,400	17,600	23,400	17,600
Sablefish	BS	1,584	1,339	1,339	315	1,575	1,333	1,431	1,211
	AI	2,141	1,811	1,811	817	2,128	1,802	1,934	1,637
Yellowfin sole	BSAI	259,700	239,800	184,000	143,805	266,400	248,800	262,900	245,500
Greenland turbot	BSAI	2,647	2,124	2,124	1,653	3,903	3,172	6,453	5,284
	BS	n/a	1,659	1,659	1,476	n/a	2,448	n/a	4,050
	AI	n/a	465	465	177	n/a	724	n/a	1,198
Arrowtooth flounder	BSAI	125,642	106,599	25,000	18,697	93,856	80,547	91,663	78,661
Kamchatka flounder	BSAI	8,270	7,100	7,100	6,395	10,500	9,000	11,000	9,500
Northern rock sole	BSAI	228,700	203,800	85,000	51,549	187,600	181,700	170,100	164,800
Flathead sole	BSAI	79,633	66,293	24,500	16,102	79,419	66,130	76,504	63,711
Alaska plaice	BSAI	66,800	55,100	24,500	18,808	54,000	44,900	51,600	42,900
Other flatfish	BSAI	16,700	12,400	2,650	4,388	17,700	13,250	17,700	13,250
Pacific Ocean perch	BSAI	39,585	33,122	33,122	32,373	42,558	34,988	40,809	33,550
	BS	n/a	7,684	7,684	7,429	n/a	8,771	n/a	8,411
	EAI	n/a	9,246	9,246	9,021	n/a	8,312	n/a	7,970
	CAI	n/a	6,594	6,594	6,439	n/a	7,723	n/a	7,406
	WAI	n/a	9,598	9,598	9,485	n/a	10,182	n/a	9,763
Northern rockfish	BSAI	12,077	9,761	2,594	2,339	15,337	12,488	15,100	12,295
Blackspotted/Rougheye	BSAI	505	416	416	196	799	648	865	702
Rockfish	EBS/EAI	n/a	177	177	98	n/a	203	n/a	218
	CAI/WAI	n/a	239	239	98	n/a	445	n/a	484
Shortraker rockfish	BSAI	493	370	370	194	690	518	690	518
Other rockfish	BSAI	1,550	1,163	773	931	1,667	1,251	1,667	1,251
	BS	n/a	690	300	316	n/a	695	n/a	695
	AI	n/a	473	473	615	n/a	555	n/a	555
Atka mackerel	BSAI	74,492	64,131	32,322	30,947	125,297	106,000	115,908	98,137
	EAI/BS	n/a	21,652	21,652	21,185	n/a	38,493	n/a	35,637
	CAI	n/a	20,574	9,670	9,520	n/a	33,108	n/a	30,652
	WAI	n/a	21,905	1,000	242	n/a	34,400	n/a	31,848
Skates	BSAI	41,849	35,383	26,000	24,695	49,575	35,551	47,035	35,551
Sculpins	BSAI	56,424	42,318	5,750	4,570	52,365	39,725	52,365	39,725
Sharks	BSAI	1,363	1,022	125	122	1,363	1,022	1,363	1,022
Squids	BSAI	2,624	1,970	310	1,678	2,624	1,970	2,624	1,970
Octopuses	BSAI	3,450	2,590	225	351	3,452	2,589	3,452	2,589
Total	BSAI	4,196,553	2,572,819	2,000,000	1,872,627	4,769,413	2,842,543	4,764,462	2,728,127

Table 2. Groundfish catches (metric tons) in the eastern Bering Sea, 1954-2014.

Year	Pollock	Pacific Cod	Sable Fish	Yellowfin Sole	Greenland Turbot	Arrowtooth Flounder/a	Kamchatka Flounder/d	Rock Sole/c	Flathead sole	Alaska Plaice	Other Flatfish
1954				12,562							
1955				14,690							
1956				24,697							
1957				24,145							
1958	6,924	171	6	44,153							
1959	32,793	2,864	289	185,321							
1960			1,861	456,103	36,843						
1961			15,627	553,742	57,348						
1962			25,989	420,703	58,226						
1963			13,706	85,810	31,565						35,643
1964	174,792	13,408	3,545	111,177	33,729						30,604
1965	230,551	14,719	4,838	53,810	9,747						11,686
1966	261,678	18,200	9,505	102,353	13,042						24,864
1967	550,362	32,064	11,698	162,228	23,869						32,109
1968	702,181	57,902	4,374	84,189	35,232						29,647
1969	862,789	50,351	16,009	167,134	36,029						34,749
1970	1,256,565	70,094	11,737	133,079	19,691	12,598					64,690
1971	1,743,763	43,054	15,106	160,399	40,464	18,792					92,452
1972	1,874,534	42,905	12,758	47,856	64,510	13,123					76,813
1973	1,758,919	53,386	5,957	78,240	55,280	9,217					43,919
1974	1,588,390	62,462	4,258	42,235	69,654	21,473					37,357
1975	1,356,736	51,551	2,766	64,690	64,819	20,832					20,393
1976	1,177,822	50,481	2,923	56,221	60,523	17,806					21,746
1977	978,370	33,335	2,718	58,373	27,708	9,454					14,393
1978	979,431	42,543	1,192	138,433	37,423	8,358					21,040
1979	913,881	33,761	1,376	99,017	34,998	7,921					19,724
1980	958,279	45,861	2,206	87,391	48,856	13,761					20,406
1981	973,505	51,996	2,604	97,301	52,921	13,473					23,428
1982	955,964	55,040	3,184	95,712	45,805	9,103					23,809
1983	982,363	83,212	2,695	108,385	43,443	10,216					30,454
1984	1,098,783	110,944	2,329	159,526	21,317	7,980					44,286
1985	1,179,759	132,736	2,348	227,107	14,698	7,288					71,179
1986	1,188,449	130,555	3,518	208,597	7,710	6,761					76,328
1987	1,237,597	144,539	4,178	181,429	6,533	4,380					50,372
1988	1,228,000	192,726	3,193	223,156	6,064	5,477					137,418
1989	1,230,000	164,800	1,252	153,165	4,061	3,024					63,452
1990	1,353,000	162,927	2,329	80,584	7,267	2,773					22,568
1991	1,268,360	165,444	1,128	94,755	3,704	12,748		46,681			30,401
1992	1,384,376	163,240	558	146,942	1,875	11,080		51,720			34,757
1993	1,301,574	133,156	669	105,809	6,330	7,950		63,942			28,812
1994	1,362,694	174,151	699	144,544	7,211	13,043		60,276			29,720
1995	1,264,578	228,496	929	124,746	5,855	8,282		54,672	14,699		20,165
1996	1,189,296	209,201	629	129,509	4,699	13,280		46,775	17,334		18,529
1997	1,115,268	209,475	547	166,681	6,589	8,580		67,249	20,656		22,957
1998	1,101,428	160,681	586	101,310	8,303	14,985		33,221	24,550		15,355
1999	988,703	146,738	678	69,275	5,401	10,585		40,505	18,534		15,515
2000	1,132,736	151,372	742	84,057	5,888	12,071		49,186	20,342		16,453
2001	1,387,452	142,452	863	63,563	4,252	12,836		28,949	17,757		9,930
2002	1,481,815	166,552	1,143	74,956	3,150	10,821		40,700	15,464		2,588
2003	1,492,039	174,687	1,039	81,050	2,565	13,667		36,375	14,132	10,118	2,922
2004	1,480,552	183,745	1,041	75,502	1,825	17,367		47,862	17,361	7,888	4,755
2005	1,483,022	182,936	1,070	94,383	2,140	13,409		36,814	16,074	11,194	4,566
2006	1,488,031	168,814	1,079	99,156	1,453	11,966		35,878	17,942	17,318	3,123
2007	1,354,502	140,129	1,182	120,962	1,481	11,082		36,364	18,929	19,522	5,699
2008	990,587	139,802	1,141	148,893	2,089	18,897		50,934	24,521	17,377	3,578
2009	810,857	147,174	916	107,512	2,252	19,212		48,145	19,535	13,944	2,133
2010	810,392	142,875	755	118,625	2,273	14,784		52,645	20,097	16,165	2,158
2011	1,199,242	209,250	705	151,166	3,120	16,927	4,478	60,353	13,548	23,656	3,122
2012	1,205,276	232,676	743	147,186	3,062	18,979	2,511	75,776	11,355	16,612	3,501
2013	1,270,802	236,702	634	164,943	1,449	14,022	2,109	59,596	17,348	23,523	1,501
2014/e	*1,295,130*	*208,053*	*315*	*143,805*	*1,476*	*14,517*	*3,205*	*51,394*	*16,093*	*18,808*	*4,337*

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69.
b/ Includes POP shortraker, rougheye, northern, and sharpchin.
c/ Rock sole prior to 1991 and flathead sole prior to 1995 are included in other flatfish catch statistics.

Table 2. (continued) Groundfish catches (metric tons) in the eastern Bering Sea, 1954-2014.

Year	POP Complx/b	POP	N Rockfish	BS/RE Rockfish	Shortrkr Rockfish	Other Rockfish	Atka Mackerel	Other	Skates	Sculpins	Sharks	Squids	Octopus	Total (All Species)
1954														12,562
1955														14,690
1956														24,697
1957														24,145
1958								147						51,401
1959								380						221,647
1960	6,100													500,907
1961	47,000													673,717
1962	19,900													524,818
1963	24,500													191,224
1964	25,900							736						393,891
1965	16,800							2,218						344,369
1966	20,200							2,239						452,081
1967	19,600							4,378						836,308
1968	31,500							22,058						967,083
1969	14,500							10,459						1,192,020
1970	9,900							15,295						1,593,649
1971	9,800							13,496						2,137,326
1972	5,700							10,893						2,149,092
1973	3,700							55,826						2,064,444
1974	14,000							60,263						1,900,092
1975	8,600							54,845						1,645,232
1976	14,900							26,143						1,428,565
1977	2,654					311		35,902				4,926		1,168,144
1978	2,221					2,614	831	61,537				6,886		1,302,509
1979	1,723					2,108	1,985	38,767				4,286		1,159,547
1980	1,097					459	4,955	34,633				4,040		1,221,944
1981	1,222					356	3,027	35,651				4,182		1,259,666
1982	224					276	328	18,200				3,838		1,211,483
1983	221					220	141	15,465				3,470		1,280,285
1984	1,569					176	57	8,508				2,824		1,458,299
1985	784					92	4	11,503				1,611		1,649,109
1986	560					102	12	10,471				848		1,633,911
1987	930					474	12	8,569				108		1,639,121
1988	1,047					341	428	12,206				414		1,810,470
1989	2,017					192	3,126	4,993				300		1,630,382
1990	5,639					384	480	5,698				460		1,644,109
1991	4,744					396	2,265	16,285				544		1,647,455
1992	3,309					675	2,610	29,993				819		1,831,954
1993	3,763					190	201	21,413				597		1,674,406
1994	1,907					261	190	23,430				502		1,818,628
1995	1,210					629	340	20,928				364		1,745,893
1996	2,635					364	780	19,717				1,080		1,653,828
1997	1,060					161	171	20,997				1,438		1,641,829
1998	1,134					203	901	23,156				891		1,486,704
1999	654					141	2,267	18,916				392		1,318,304
2000	704					239	239	23,098				375		1,497,502
2001	1,148					296	264	23,148				1,761		1,694,671
2002	858					401	572	26,639				1,334		1,826,993
2003	1,391					336	6,362	26,986				1,246		1,864,915
2004		731	116	24	119	318	7,159	27,588				1,000		1,874,953
2005		879	112	12	108	178	3,540	28,066				1,170		1,879,673
2006		1,041	246	7	47	157	3,176	25,077				1,403		1,875,914
2007		870	70	10	114	220	3,005	24,746				1,175		1,740,061
2008		513	22	22	41	222	392	27,152				1,494		1,427,678
2009		623	48	13	69	208	244	25,369				269		1,198,523
2010		3,547	299	30	161	268	150	20,700				305		1,206,229
2011		5,601	198	36	106	328	1,210		22,429	4,874	103	237	576	1,721,266
2012		5,589	91	17	117	211	966		23,746	4,991	94	560	127	1,754,186
2013		5,050	137	27	105	191	147		25,980	5,222	98	158	185	1,829,931
2014/e		*7,429*	*137*	*23*	*93*	*316*	*135*		*23,516*	*4,197*	*119*	*1,568*	*333*	*1,794,998*

d/ Kamchatka flounder included in Arrowtooth flounder prior to 2011.
e/ Data through November 8, 2014.
f/ Octopus, sculpin, sharks, skates included in Other species prior to 2011.
Note: Numbers don't include fish taken for research.

Table 3. Groundfish catches (metric tons) in the Aleutian Islands, 1954-2014.

Year	Pollock	Pacific Cod	Sable Fish	Yellowfin Sole	Greenland Turbot	Arrowtooth Flounder/a	Kamchatka Flounder/d	Rock Sole/c	Flathead sole	Alaska Plaice	Other Flatfish
1954											
1955											
1956											
1957											
1958											
1959											
1960											
1961											
1962											
1963			664		7						
1964		241	1,541		504						
1965		451	1,249		300						
1966		154	1,341		63						
1967		293	1,652		394						
1968		289	1,673		213						
1969		220	1,673		228						
1970		283	1,248		285	274					
1971		2,078	2,936		1,750	581					
1972		435	3,531		12,874	1,323					
1973		977	2,902		8,666	3,705					
1974		1,379	2,477		8,788	3,195					
1975		2,838	1,747		2,970	784					
1976		4,190	1,659		2,067	1,370					
1977	7,625	3,262	1,897		2,453	2,035					
1978	6,282	3,295	821		4,766	1,782					
1979	9,504	5,593	782		6,411	6,436					
1980	58,156	5,788	274		3,697	4,603					
1981	55,516	10,462	533		4,400	3,640					
1982	57,978	1,526	955		6,317	2,415					
1983	59,026	9,955	673		4,115	3,753					
1984	81,834	22,216	999		1,803	1,472					
1985	58,730	12,690	1,448		33	87					
1986	46,641	10,332	3,028		2,154	142					
1987	28,720	13,207	3,834		3,066	159					
1988	43,000	5,165	3,415		1,044	406					
1989	156,000	4,118	3,248		4,761	198					
1990	73,000	8,081	2,116		2,353	1,459					
1991	78,104	6,714	2,071	1,380	3,174	938					88
1992	54,036	42,889	1546	4	895	900		236			68
1993	57,184	34,234	2078		2,138	1,348		318			59
1994	58,708	22,421	1771		3,168	1,334		308			55
1995	64,925	16,534	1119	6	2,338	1,001		356	16		31
1996	28,933	31,389	720	654	1,677	1,330		371	10		51
1997	26,872	25,166	779	234	1,077	1,071		271	32		7
1998	23,821	34,964	595	5	821	694		446	19		35
1999	981	28,117	671	13	460	774		580	34		20
2000	1,244	39,684	1070	13	1,086	1,157		480	80		32
2001	824	34,207	1074	15	1,060	1,220		526	54		43
2002	1,177	30,801	1,118	29	485	1,032		1,165	111		39
2003	1,653	32,459	1,009	0	965	913		964	49		32
2004	1,158	28,873	955	9	434	818		818	38	0	33
2005	1,621	22,699	1,481	2	468	834		549	34	0	26
2006	1,745	24,211	1,151	4	537	1,476		578	39	0	36
2007	2,519	34,356	1,168	2	523	834		762	29	0	25
2008	1,278	31,229	899	0	822	2,473		342	18	0	46
2009	1,662	28,582	1099.775	1	2,263	10,688		570	23	0	45
2010	1,285	29,001	1093.969	0	1,872	24,098		577	29		41
2011	1,208	10,858	1024.415	1	532	3,269	5,493	279	7		56
2012	975	18,223	1204.958	1	1,658	3,400	6,995	322	12	0	42
2013	2,964	13,572	1062.27	0	296	6,484	5,657	210	10	0	35
2014/e	*2,375*	*6,145*	*816.996*	*0*	*177*	*4,180*	*3,190*	*155*	*9*	*0*	*51*

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69.
b/ Includes POP shortraker, rougheye, northern, and sharpchin.
c/ Rock sole prior to 1991 and flathead sole prior to 1995 are included in other flatfish catch statistics.

Table 3. (continued) Groundfish catches (metric tons) in the Aleutian Islands, 1954-2014.

Year	POP Complx/b	POP	N Rockfish	BS/RE Rockfish	Shortrkr Rockfish	Other Rockfish	Atka Mackerel	Other	Skates	Sculpins	Sharks	Squids	Octopus	Total (All Species)
1954														
1955														
1956														
1957														
1958														
1959														
1960														
1961														
1962	200													200
1963	20,800													21,471
1964	90,300							66						92,652
1965	109,100							768						111,868
1966	85,900							131						87,589
1967	55,900							8,542						66,781
1968	44,900							8,948						56,023
1969	38,800							3,088						44,009
1970	66,900						949	10,671						80,610
1971	21,800							2,973						32,118
1972	33,200						5,907	22,447						79,717
1973	11,800						1,712	4,244						34,006
1974	22,400						1,377	9,724						49,340
1975	16,600						13,326	8,288						46,553
1976	14,000						13,126	7,053						43,465
1977	8,080					3,043	20,975	16,170				1,808		67,348
1978	5,286					921	23,418	12,436				2,085		61,092
1979	5,487					4,517	21,279	12,934				2,252		75,195
1980	4,700					420	15,533	13,028				2,332		108,531
1981	3,622					328	16,661	7,274				1,763		104,199
1982	1,014					2,114	19,546	5,167				1,201		98,233
1983	280					1,045	11,585	3,675				510		94,617
1984	631					56	35,998	1,670				343		147,022
1985	308					99	37,856	2,050				9		113,310
1986	286					169	31,978	1,509				20		96,259
1987	1,004					147	30,049	1,155				23		81,364
1988	1,979					278	21,656	437				3		77,383
1989	2,706					481	14,868	108				6		186,494
1990	14,650					864	21,725	627				11		124,886
1991	2,545					549	22,258	91				30		117,942
1992	10,277					3,689	46,831	3,081				61		164,513
1993	13,375					495	65,805	2,540				85		179,659
1994	16,959					301	69,401	1,102				86		175,614
1995	14,734					220	81,214	1,273				95		183,862
1996	20,443					278	103,087	1,720				87		190,750
1997	15,687					307	65,668	1,555				323		139,049
1998	13,729					385	56,195	2,448				25		134,182
1999	18,501					657	53,966	1,670				9		106,453
2000	14,893					601	46,990	3,010				8		110,348
2001	15,587					610	61,296	4,029				5		120,550
2002	14,996					551	44,722	1,980				10		98,216
2003	18,765					401	52,988	1,326				36		111,560
2004		11,165	4,567	185	123	337	53,405	1,866				14		104,798
2005		9,548	3,852	78	62	286	58,474	1,417				17		101,446
2006		11,826	3,582	196	165	426	58,719	1,943				15		106,650
2007		17,581	3,946	157	210	435	55,742	2,053				13		120,357
2008		16,923	3,265	171	91	390	57,690	2,322				49		118,010
2009		14,725	3,064	184	116	403	72,563	2,514				91		138,594
2010		14,304	4,033	202	139	503	68,496	2,713				105		148,493
2011		18,403	2,566	129	227	616	50,600		732	502	4	99	11	96,616
2012		18,554	2,388	174	227	736	46,859		1,084	808	2	128	11	103,805
2013		26,342	1,900	296	268	623	23,034		1,058	607	17	141	39	84,616
2014/e		*24,944*	*2,202*	*173*	*101*	*615*	*30,812*		*1,179*	*373*	*3*	*110*	*18*	*77,629*

d/ Kamchatka flounder included in Arrowtooth flounder prior to 2011.
e/ Data through November 8, 2014.
f/ Octopus, sculpin, sharks, skates included in Other species prior to 2011.
Note: Numbers don't include fish taken for research.

Table 4. Groundfish catches (metric tons) in the Bering Sea and Aleutian Islands, 1954-2014.

Year	Pollock	Pacific Cod	Sable Fish	Yellowfin Sole	Greenland Turbot	Arrowtooth Flounder/a	Kamchatka Flounder/d	Rock Sole/c	Flathead sole	Alaska Plaice	Other Flatfish
1954				12,562							
1955				14,690							
1956				24,697							
1957				24,145							
1958	6,924	171	6	44,153							
1959	32,793	2,864	289	185,321							
1960			1,861	456,103	36,843						
1961			15,627	553,742	57,348						
1962			25,989	420,703	58,226						
1963			14,370	85,810	31,572						35,643
1964	174,792	13,649	5,086	111,177	34,233						30,604
1965	230,551	15,170	6,087	53,810	10,047						11,686
1966	261,678	18,354	10,846	102,353	13,105						24,864
1967	550,362	32,357	13,350	162,228	24,263						32,109
1968	702,181	58,191	6,047	84,189	35,445						29,647
1969	862,789	50,571	17,682	167,134	36,257						34,749
1970	1,256,565	70,377	12,985	133,079	19,976	12,872					64,690
1971	1,743,763	45,132	18,042	160,399	42,214	19,373					92,452
1972	1,874,534	43,340	16,289	47,856	77,384	14,446					76,813
1973	1,758,919	54,363	8,859	78,240	63,946	12,922					43,919
1974	1,588,390	63,841	6,735	42,235	78,442	24,668					37,357
1975	1,356,736	54,389	4,513	64,690	67,789	21,616					20,393
1976	1,177,822	54,671	4,582	56,221	62,590	19,176					21,746
1977	985,995	36,597	4,615	58,373	30,161	11,489					14,393
1978	985,713	45,838	2,013	138,433	42,189	10,140					21,040
1979	923,385	39,354	2,158	99,017	41,409	14,357					19,724
1980	1,016,435	51,649	2,480	87,391	52,553	18,364					20,406
1981	1,029,021	62,458	3,137	97,301	57,321	17,113					23,428
1982	1,013,942	56,566	4,139	95,712	52,122	11,518					23,809
1983	1,041,389	93,167	3,368	108,385	47,558	13,969					30,454
1984	1,180,617	133,160	3,328	159,526	23,120	9,452					44,286
1985	1,238,489	145,426	3,796	227,107	14,731	7,375					71,179
1986	1,235,090	140,887	6,546	208,597	9,864	6,903					76,328
1987	1,266,317	157,746	8,012	181,429	9,599	4,539					50,372
1988	1,271,000	197,891	6,608	223,156	7,108	5,883					137,418
1989	1,386,000	168,918	4,500	153,165	8,822	3,222					63,452
1990	1,426,000	171,008	4,445	80,584	9,620	4,232					22,568
1991	1,346,464	172,158	3,199	96,135	6,878	13,686		46,681			30,489
1992	1,438,412	206,129	2104	146,946	2,770	11,980		51,956			34,825
1993	1,358,758	167,390	2747	105,809	8,468	9,298		64,260			28,871
1994	1,421,402	196,572	2470	144,544	10,379	14,377		60,584			29,775
1995	1,329,503	245,030	2048	124,752	8,193	9,283		55,028	14,715		20,196
1996	1,218,229	240,590	1349	130,163	6,376	14,610		47,146	17,344		18,580
1997	1,142,140	234,641	1326	166,915	7,666	9,651		67,520	20,688		22,964
1998	1,125,249	195,645	1181	101,315	9,124	15,679		33,667	24,569		15,390
1999	989,684	174,855	1349	69,288	5,861	11,359		41,085	18,568		15,535
2000	1,133,980	191,056	1812	84,070	6,974	13,228		49,666	20,422		16,485
2001	1,388,276	176,659	1937	63,578	5,312	14,056		29,475	17,811		9,973
2002	1,482,992	197,353	2,261	74,985	3,635	11,853		41,865	15,575		2,627
2003	1,493,692	207,146	2,048	81,050	3,530	14,580		37,339	14,181	10,118	2,954
2004	1,481,710	212,618	1,996	75,511	2,259	18,185		48,681	17,398	7,888	4,788
2005	1,484,643	205,635	2,551	94,385	2,608	14,243		37,362	16,108	11,194	4,592
2006	1,489,776	193,025	2,229	99,160	1,989	13,442		36,456	17,981	17,318	3,160
2007	1,357,021	174,485	2,350	120,964	2,004	11,916		37,126	18,958	19,522	5,724
2008	991,865	171,030	2,040	148,894	2,911	21,370		51,276	24,540	17,377	3,624
2009	812,520	175,756	2015.793	107,513	4,515	29,900		48,716	19,558	13,944	2,178
2010	811,677	171,875	1849.357	118,625	4,145	38,881		53,221	20,127	16,165	2,199
2011	1,200,450	220,109	1729.516	151,168	3,652	20,195	9,971	60,632	13,555	23,656	3,178
2012	1,206,252	250,899	1947.999	147,187	4,720	22,379	9,506	76,098	11,366	16,612	3,543
2013	1,273,766	250,274	1696.713	164,944	1,745	20,507	7,766	59,807	17,358	23,523	1,535
2014/e	*1,297,505*	*214,198*	*1131.552*	*143,805*	*1,653*	*18,697*	*6,395*	*51,549*	*16,102*	*18,808*	*4,388*

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69.
b/ Includes POP shortraker, rougheye, northern, and sharpchin.
c/ Rock sole prior to 1991 and flathead sole prior to 1995 are included in other flatfish catch statistics.

Table 4. (continued) Groundfish catches in the Bering Sea and Aleutian Islands, 1954-2014.

Year	POP Complx/b	POP	N Rockfish	BS/RE Rockfish	Shortrkr Rockfish	Other Rockfish	Atka Mackerel	Other	Skates	Sculpins	Sharks	Squids	Octopus	Total (All Species)
1954														12,562
1955														14,690
1956														24,697
1957														24,145
1958								147						51,401
1959								380						221,647
1960	6,100													500,907
1961	47,000													673,717
1962	20,100													525,018
1963	45,300													212,695
1964	116,200							802						486,543
1965	125,900							2,986						456,237
1966	106,100							2,370						539,670
1967	75,500							12,920						903,089
1968	76,400							31,006						1,023,106
1969	53,300							13,547						1,236,029
1970	76,800						949	25,966						1,674,259
1971	31,600							16,469						2,169,444
1972	38,900						5,907	33,340						2,228,809
1973	15,500						1,712	60,070						2,098,450
1974	36,400						1,377	69,987						1,949,432
1975	25,200						13,326	63,133						1,691,785
1976	28,900						13,126	33,196						1,472,030
1977	10,734					3,354	20,975	52,072				6,734		1,235,492
1978	7,507					3,535	24,249	73,973				8,971		1,363,601
1979	7,210					6,625	23,264	51,701				6,538		1,234,742
1980	5,797					879	20,488	47,661				6,372		1,330,475
1981	4,844					684	19,688	42,925				5,945		1,363,865
1982	1,238					2,390	19,874	23,367				5,039		1,309,716
1983	501					1,265	11,726	19,140				3,980		1,374,902
1984	2,200					232	36,055	10,178				3,167		1,605,321
1985	1,092					191	37,860	13,553				1,620		1,762,419
1986	846					271	31,990	11,980				868		1,730,170
1987	1,934					621	30,061	9,724				131		1,720,485
1988	3,026					619	22,084	12,643				417		1,887,853
1989	4,723					673	17,994	5,101				306		1,816,876
1990	20,289					1,248	22,205	6,325				471		1,768,995
1991	7,289					945	24,523	16,376				574		1,765,397
1992	13,586					4,364	49,441	33,074				880		1,996,467
1993	17,138					685	66,006	23,953				682		1,854,065
1994	18,866					562	69,591	24,532				588		1,994,242
1995	15,944					849	81,554	22,201				459		1,929,755
1996	23,078					642	103,867	21,437				1,167		1,844,578
1997	16,747					468	65,839	22,552				1,761		1,780,878
1998	14,863					588	57,096	25,604				916		1,620,886
1999	19,155					798	56,233	20,586				401		1,424,757
2000	15,597					840	47,229	26,108				383		1,607,850
2001	16,735					906	61,560	27,177				1,766		1,815,221
2002	15,854					952	45,294	28,619				1,344		1,925,209
2003	20,156					737	59,350	28,312				1,282		1,976,475
2004		11,896	4,684	209	242	656	60,564	29,454				1,014		1,979,752
2005		10,427	3,964	90	170	465	62,014	29,482				1,186		1,981,119
2006		12,867	3,828	203	212	583	61,895	27,021				1,418		1,982,564
2007		18,451	4,016	168	323	655	58,747	26,799				1,188		1,860,418
2008		17,436	3,287	193	133	612	58,082	29,474				1,542		1,545,687
2009		15,347	3,111	197	184	611	72,807	27,883				360		1,337,116
2010		17,852	4,332	232	300	771	68,647	23,413				410		1,354,721
2011		24,004	2,764	165	333	944	51,810		23,161	5,375	107	336	587	1,817,882
2012		24,143	2,479	191	344	947	47,825		24,830	5,799	96	688	138	1,857,991
2013		31,393	2,038	323	372	815	23,181		27,038	5,829	116	300	224	1,914,548
2014/e		32,373	2,339	196	194	931	30,946		24,695	4,570	122	1,678	351	1,872,627

d/ Kamchatka flounder included in Arrowtooth flounder prior to 2011.
e/ Data through November 8, 2014.
f/ Octopus, sculpin, sharks, skates included in Other species prior to 2011.
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 (FABC), and the fishing mortality rate corresponding to OFL (FOFL) for the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district as projected for 2015 and 2016. "Biomass" corresponds to projected January abundance for the age+ range reported in the summary. Stock-specific biomass, OFL, and ABC are in metric tons.

Species or Complex	Tier	Area	2015					2016			
			Biomass	OFL	ABC	FOFL	FABC	OFL	ABC	FOFL	FABC
Pollock	1a	EBS	9,203,000	3,330,000	1,637,000		0.392	3,319,000	1,554,000	0.587	0.392
	3b	Aleutian Islands	228,102	36,005	29,659	0.32	0.25	38,699	31,900	0.33	0.27
	5	Bogoslof District	106,000	21,200	15,900	0.2	0.15	21,200	15,900	0.2	0.15
Pacific cod	3a	BS	1,680,000	346,000	255,000	0.35	0.21	389,000	255,000	0.35	0.21
	5	AI	68,900	23,400	17,900	0.34	0.26	23,400	17,900	0.34	0.26
Sablefish	3b	BS	34,000	1,575	1,333	0.098	0.082	1,431	1,211	0.091	0.078
	3b	AI	24,000	2,128	1,802	0.098	0.082	1,934	1,637	0.091	0.078
Yellowfin sole	1a	BSAI	2,127,800	266,400	248,800	0.125	0.117	262,900	245,500	0.125	0.117
Greenland turbot	3b	Total	122,298	3,903	3,172	0.12	0.1	6,453	5,248	0.18	0.15
Arrowtooth flounder	3a	BSAI	908,379	93,856	80,547	0.18	0.153	91,663	78,661	0.18	0.153
Kamchatka flounder	3a	BSAI	174,500	10,500	9,000	0.076	0.065	11,000	9,500	0.076	0.065
Northern rock sole	1a	BSAI	1,233,400	187,600	181,700	0.152	0.143	171,100	164,800	0.152	0.143
Flathead sole	3a	BSAI	736,947	79,419	66,130	0.35	0.28	79,419	66,130	0.35	0.28
Alaska plaice	3a	BSAI	471,500	54,000	44,900	0.175	0.143	51,600	42,900	0.175	0.143
Other flatfish	5	BSAI	143,000	17,700	13,250	0.17/.085/.15	.113/.064/.113	17,700	13,250	0.17/.085/.15	.113/.064/.113
Pacific ocean perch	3a	BSAI	577,967	42,558	34,988	0.109	0.089	40,809	33,550	0.109	0.089
Northern rockfish	3a	BSAI	218,901	15,337	12,488	0.088	0.07	15,100	12,295	0.088	0.07
Shortraker rockfish	5	BSAI	23,009	690	518	0.03	0.0225	690	518	0.03	0.0225
Blackspotted /Rougheye	3a	BSAI	40,327	799	648	0.058	0.047	865	702	0.058	0.047
Other rockfish	5	BSAI	49,630	1,667	1,251	.03/.09	0.0225/.0675	1,667	1,251	.03/.09	0.0225/.0675
Atka mackerel	3a	Total	694,421	125,297	106,000	0.489	0.403	115,908	98,137	0.489	0.403
Skate	3a/5	BSAI	625,314	49,575	35,551	0.09/.100	0.077/.075	47,035	35,551	0.09/.100	0.077/.075
Sculpin	5	BSAI	194,783	52,365	39,725	0.29	0.22	52,365	39,725	0.29	0.22
Shark	6	BSAI	n/a	1,363	1,022	n/a	n/a	1,363	1,022	n/a	n/a
Squid	6	BSAI	n/a	2,624	1,970	n/a	n/a	2,624	1,970	n/a	n/a
Octopus	6	BSAI	n/a	3,452	2,589	n/a	n/a	3,452	2,589	n/a	n/a
Total		BSAI	18,294,178	4,769,433	2,842,843			4,768,377	2,730,847		

Table 6. Summary of groundfish tier designations under Amendment 56, maximum permissible ABC fishing mortality rate (max FABC), the Plan Team's recommended tier designation, ABC fishing mortality rate (FABC), 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 for 2015-2016. Stock-specific max ABC and ABC are in metric tons, reported to three significant digits. Fishing mortality rates are reported to two significant digits.

		2014					
Species or Complex	**Area**	**Tier**	**max F_{ABC}**	**F_{ABC}**	**max ABC**	**ABC**	**% Red.**
Pollock	EBS	1a	0.512	0.392	2,900,000	1,637,000	44%
Pacific cod	EBS	3a	0.29	0.21	295,000	255,000	14%
Skates	BSAI	3a/5	0.077/0.075	0.063	41,658	35,551	15%

		2015					
Species or Complex	**Area**	**Tier**	**max F_{ABC}**	**F_{ABC}**	**max ABC**	**ABC**	**% Red.**
Pollock	EBS	1a	0.512	0.392	3,040,000	1,554,000	49%
Pacific cod	EBS	3a	0.29	0.18	316,000	255,000	19%
Skates	BSAI	3a/5	0.077/0.075	0.068	41,658	35,551	15%

Table 7. Species included in assessments for the 2014 BSAI SAFE Report (extends over several pages).

Chapter	Common name	Scientific name	Count
1	**Walleye Pollock**	*Gadus chalcogrammus*	1
2	**Pacific cod**	*Gadus macrocephalus*	1
3	**Sablefish**	*Anoplopoma fimbria*	1
4	**Yellowfin sole**	*Limanda aspera*	1
5	**Greenland turbot**	*Reinhardtius hippoglossoides*	1
6	**Arrowtooth flounder**	*Atherestes stomias*	2
7	**Kamchatka flounder**	*Atherestes evermanni*	
8	**Northern rock sole**	*Lepidopsetta polyxystra n. sp.*	2
	Southern rock sole	*Lepidopsetta bilineata*	
9	**Flathead sole**	*Hippoglossoides classodon*	2
	Bering flounder	*Hippoglossoides robustus*	
10	**Alaska plaice**	*Pleuronectes quadrituberculatus*	1
11	**Other flatfish**		15
	Arctic flounder	*Liopsetta glacialis*	
	butter sole	*Isopsetta isolepis*	
	curlfin sole	*Pleuronectes decurrens*	
	deepsea sole	*Embassichths bathybius*	
	Dover sole	*Microstomus pacificus*	
	English sole	*Parophrys vetulus*	
	longhead dab	*Limanda proboscidea*	
	Pacific sanddab	*Citharichthys sordidus*	
	petrale sole	*Eopsetta jordani*	
	rex sole	*Glyptocephalus zachirus*	
	roughscale sole	*Clidodoerma asperrimum*	
	sand sole	*Psettichthys melanostictus*	
	slender sole	*Lyopsetta exilis*	
	starry flounder	*Platichthys stellatus*	
	Sakhalin sole	*Pleuronectes sakhalinensis*	
12	**Pacific Ocean perch**	*Sebastes alutus*	1
13	**Northern rockfish**	*Sebastes polyspinus*	1
14	**Blackspotted/Rougheye**		2
	Blackspotted rockfish	*Sebastes melanostictus*	
	Rougheye rockfish	*Sebastes aleutianus*	

Table 7. Species included in assessments for the 2014 BSAI SAFE Report (extends over several pages).

Chapter	Common name	Scientific name	Count
15	**Shortraker rockfish**	*Sebastes borealis*	1
16	**Other rockfish***		
	Shortspine thornyhead	*Sebastolobus alascanus*	7
	Dusky rockfish	*Sebastes variabilis*	
	Red banded rockfish	*Sebastes babcocki*	
	Redstripe rockfish	*Sebastes proriger*	
	Harlequin rockfish	*Sebastes variegatus*	
	Sharpchin rockfish	*Sebastes zacentrus*	
	Yelloweye rockfish	*Sebastes ruberrimus*	
17	**Atka mackerel**	*Pleurogrammus monopterygius*	1
18	**Skates**		15
	deepsea skate	*Bathyraja abyssicola*	
	Aleutian skate	*Bathyraja aleutica*	
	Bering skate (complex?)	*Bathyraja interrupta*	
	Commander skate	*Bathyraja lindbergi*	
	whiteblotched skate	*Bathyraja maculata*	
	butterfly skate	*Bathyraja mariposa*	
	whitebrow skate	*Bathyraja minispinosa*	
	Alaska skate	*Bathyraja parmifera*	
	"Leopard" parmifera	*Bathyraja sp. cf. parmifera*	
	mud skate	*Bathyraja taranetzi*	
	roughtail skate	*Bathyraja trachura*	
	Okhotsk skate	*Bathyraja violacea*	
	big skate	*Raja binoculata*	
	roughshoulder skate	*Amblyraja badia*	
	longnose skate	*Raja rhina*	
19	**Sculpins**		48
	Scaled sculpin	*Archistes biseriatus*	
	Bride sculpin	*Artediellus miacanthus*	
	Pacific hookear sculpin	*Artediellus pacificus*	
	Broadfin sculpin	*Bolinia euryptera*	
	Antlered sculpin	*Enophrys diceraus*	
	Leister sculpin	*Enophrys lucasi*	
	Purplegray sculpin	*Gymnocanthus detrisus*	
	Armorhead sculpin	*Gymnocanthus galeatus*	
	threaded sculpin	*Gymnocanthus pistilliger*	
	Arctic staghorn sculpin	*Gymnocanthus tricuspis*	
	Banded Irish lord	*Hemilepidotus gilberti*	
	Red Irish Lord	*Hemilepidotus hemilepidotus*	
	Yellow Irish Lord	*Hemilepidotus jordani*	
	Butterfly sculpin	*Hemilepidotus papilio*	
	Longfin Irish lord	*Hemilepidotus zapus*	
	Northern sculpin	*Icelinus borealis*	
	Blacknose sculpin	*Icelus canaliculatus*	
	Wide-eye sculpin	*Icelus euryops*	
	Spatulate sculpin	*Icelus spatula*	
	thorny sculpin	*Icelus spiniger*	
	Uncinate sculpin	*Icelus uncinalis*	
	Longfin sculpin	*Jordania zonope*	
	Pacific staghorn sculpin	*Leptocottus armatus*	
	Plain sculpin	*Myoxocephalus jaok*	
	Great sculpin	*Myoxocephalus polyacanthocephalus*	
	Fourhorn sculpin	*Myoxocephalus quadricornis*	
	Warty sculpin	*Myoxocephalus verrucocus*	
	Slim sculpin	*Radulinus asprellus*	
	Roughskin sculpin	*Rastrinus scutiger*	
	Sponge sculpin	*thyriscus anoplus*	
	Scissortail sculpin	*Triglops forficatus*	
	Roughspine sculpin	*Triglops macellus*	

Table 7. Species included in assessments for the 2014 BSAI SAFE Report (extends over several pages).

Chapter	Common name	Scientific name	Count
	Crescent-tail sculpin	*Triglops metopias*	
	Ribbed sculpin	*Triglops pingelii*	
	Spectacled sculpin	*Triglops septicus*	
	Scalybreasted sculpin	*Triglops xenostethus*	
	Flabby sculpin	*Zesticelus profundorum*	
	Crested sculpin	*Blepsias bilobus*	
	Bigmouth sculpin	*Hemitripterus bolini*	
	Sailfin sculpin	*Nautichthys oculofasciatus*	
	Eyeshade sculpin	*Nautichthys pribilovius*	
	Spinyhead sculpin	*Dasycottus setiger*	
	Smoothcheek sculpin	*Eurymen gyrinus*	
	Darkfin sculpin	*Malacoccottus zonurus*	
	Blackfin sculpin	*Malacocottus kincaidi*	
	Tadpole sculpin	*Psychrolutes paradoxus*	
	Blob sculpin	*Psychrolutes phrictus*	
	Grunt sculpin	*Rhamphocottus richardsoni*	
20	**Sharks**		8
	brown cat shark	*Apristurus brunneus*	
	White shark	*Carcharodon carcharias*	
	basking shark	*Cetorhinus maximus*	
	sixgill shark	*Hexanchus griseus*	
	salmon shark	*Lamna ditropis*	
	blue shark	*Prionace glauca*	
	Pacific sleeper shark	*Somniosus pacificus*	
	Spiny dogfish	*Squalus acanthias*	
21	**Squids**		14
		Chiroteuthis calyx	
	"glass squids"	*Belonella borealis*	
		Galiteuthis phyllura	
	minimal armhook squid	*Berryteuthis anonychus*	
	magistrate armhook squid	*Berryteuthis magister*	
		Eogonatus tinro	
	boreopacific armhook squid	*Gonatopsis borealis*	
	Berry armhook squid	*Gonatus berryi*	
		Gonatus madokai	
		Gonatus middendorffi	
	clawed armhook squid	*Gonatus onyx*	
	robust clubhook squid	*Moroteuthis robusta*	
	boreal clubhook squid	*Onychoteuthis borealijaponicus*	
	North Pacific bobtail squid	*Rossia pacifica*	
22	**Octopus**		8
	flapjack devilfish	*Opisthoteuthis cf californiana*	
	pelagic octopus	*Japetella diaphana*	
	smooth octopus	*Benthoctopus leioderma*	
		Benthoctopus oregonensis	
		Benthoctopus salebrosus	
	giant octopus	*Enteroctopus dofleini*	
		Granelodone boreopacifica	
	stubby octopus	*Sasakiopus salebrosus*	
Total number of species			**133**

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