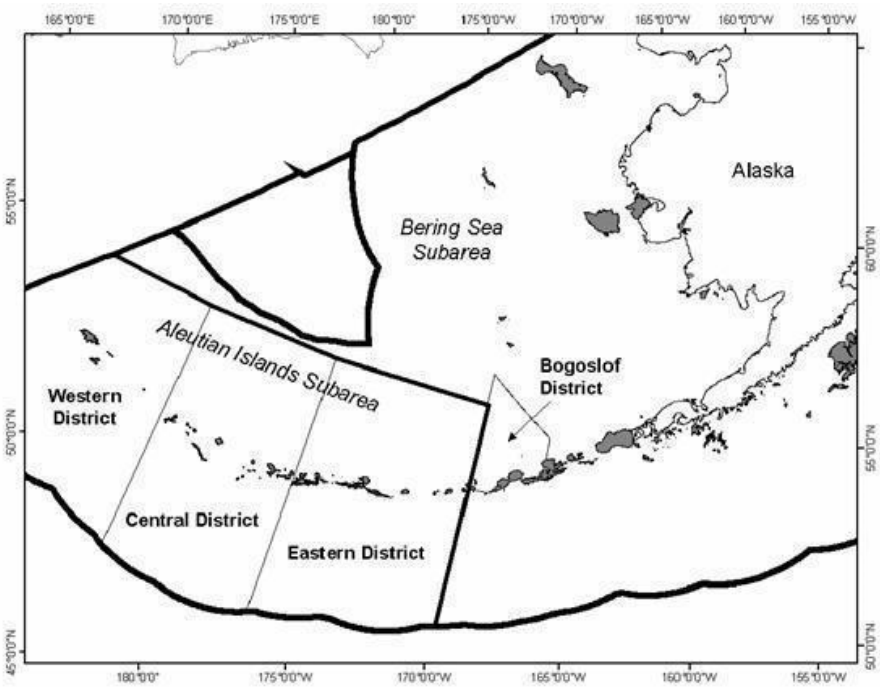
STOCK ASSESSMENT AND FISHERY EVALUATION REPORT

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 Stock Assessment and Fishery Evaluation (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" (i.e., the "Economic SAFE report") 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.

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 the 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: Grant Thompson (co-chair), Dana Hanselman (co-chair), Diana Stram (BSAI Groundfish FMP coordinator), Kirstin Holsman, Jane Sullivan, Jennifer Cahalan, Allan Hicks, Mary Furuness, Cindy Tribuzio, 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.

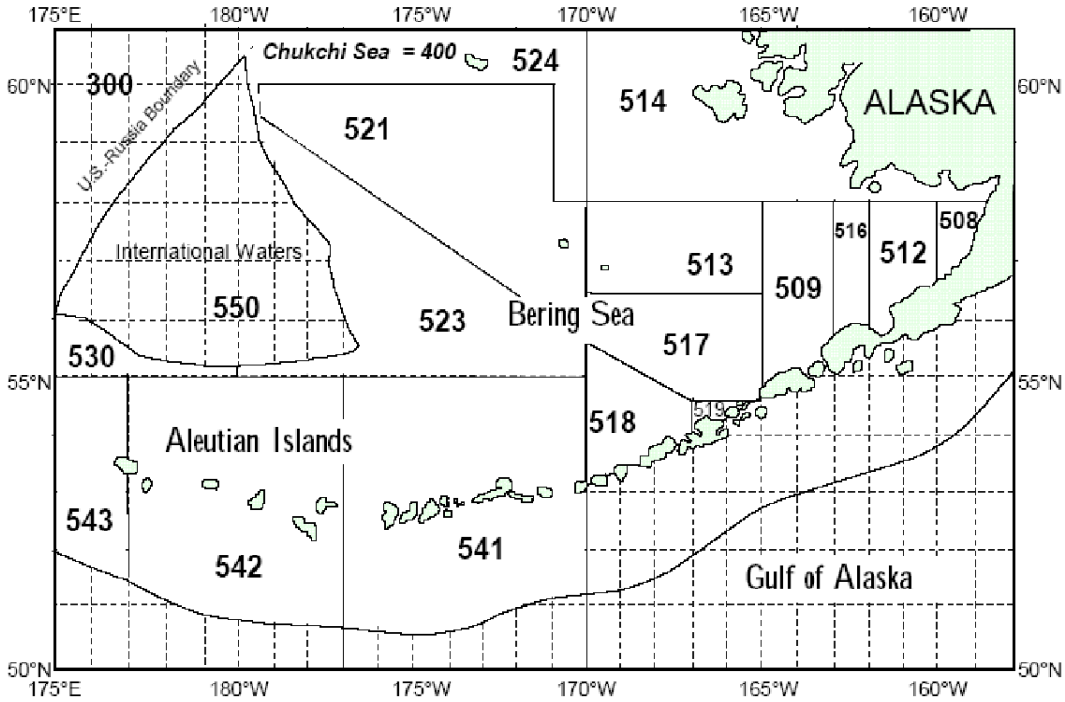

Figure 1. Bering Sea/Aleutian Islands statistical and reporting areas.

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 4. 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 2016 totaled 1,851,117 t; catches through November 4, 2017 totaled 1,798,209 t. Pollock catches in the EBS totaled 1,353,312 t in 2016; catches through November 4, 2017 totaled 1,356,445 t.

Catches in the Aleutian Islands (AI) subarea always are much less than in the EBS (Table 5). Total AI catches peaked at 190,750 t in 1996. Total AI catches were 144,446 t in 2010, and dropped to 103,804 t in 2012. Total catch decreased again in 2015 to 99,916 t but rose in 2015 to 99,916 t and to 101,375 t in 2016. Total catch as of November 4, 2017 rose to 110,824 t. This increase from 2015 on is largely due to increased catch of Atka mackerel.

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 26,311 t in 2013; 26,944 t in 2014, 23,507 in 2015, 23,097 t in 2016 and remained stable at 23,240 through November 4, 2017. 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 9,064 in 2015 as a result of Steller sea lion protection measures; catch is 12,286 t through November 4, 2017. 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 30,815 t in 2014 and increased to 53,003 in 2015, to 54,125 t in 2016 and with catch as of November 4, 2017 at 63,401 t.

Catches since 2015 have been higher due to modifications in the Steller sea lion protections measures starting with the 2015 fishery.

Total catches since 1954 for the BSAI, combined, are shown in Table 6. Total BSAI catches were 1,354,662 t in 2010 (81 percent of the total TAC and 67 percent of the OY) and rose to 1,817,774 t in 2011 (92 percent of total TACs (which equaled the OY)), 1,914,585 t (96 percent of OY) in 2013 and 1,928,379 t in 2014 (96 percent of OY), 1,914,061 in 2015 (96 percent of OY), 1,952,492 t in 2016 (98 percent of OY). BSAI catches through November 4, 2017 totaled 1,909,033 t, which equaled 95% of 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.

Overfishing is defined as any amount of fishing in excess of a prescribed maximum allowable rate. This maximum allowable rate is prescribed through a set of six tiers which are listed below in descending order of preference, corresponding to descending order of information availability. The SSC will have final authority for determining whether a given item of information is reliable for the purpose of this definition, and may use either objective or subjective criteria in making such determinations. For Tier (1), a pdf refers to a probability density function. For Tiers (1-2), if a reliable pdf of B_{MSY} is available, the preferred point estimate of B_{MSY} is the geometric mean of its pdf. For Tiers (1-5), if a reliable pdf of B is available, the preferred point estimate is the geometric mean of its pdf. For Tiers (1-3), the coefficient '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 $F=F_{40\%}$.

Overfished or approaching an overfished condition 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 2018 or 2019 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 2018 and 2019, 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 2018 recommended in the assessment to the *max* F_{ABC} for 2018, and where catches for 2018 and 2019 are estimated at their most likely values given the 2018 and 2019 maximum permissible ABCs under this scenario. (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 average of the five most recent years. (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 2019 or 2) above 1/2 of its MSY level in 2019 and expected to be above its MSY level in 2028 under this scenario, then the stock is not overfished.)

Scenario 7: In 2018 and 2019, 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 2019 or 2) above 1/2 of its MSY level in 2019 and expected to be above its MSY level in 2029 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 2018 and 2019 ABCs and OFLs are summarized in Tables 1, 2, and 3.

The sum of the recommended ABCs for 2018 and 2019 are 3,766,809 t and 3,578,956 t, respectively. These compare with the sums of the 2017 (4,013,993 t) and 2016 ABCs (3,236,662). The primary increase from previous years is due to EBS pollock balancing out a recent decline in Pacific cod. The Team recommended maximum permissible ABCs for all stocks, except for EBS pollock, Bogoslof pollock, EBS Pacific cod and Sablefish (Table 2).

Overall, the status of the stocks continues to appear favorable. Nearly all stocks are above B_{MSY} or the B_{MSY} proxy of $B_{35\%}$ (Figure 2). The abundances of EBS pollock, EBS Pacific cod, Sablefish, all rockfishes managed under Tier 3, and all flatfishes managed under Tiers 1 or 3 are projected to be above B_{MSY} or the B_{MSY} proxy of $B_{35\%}$ in 2018.

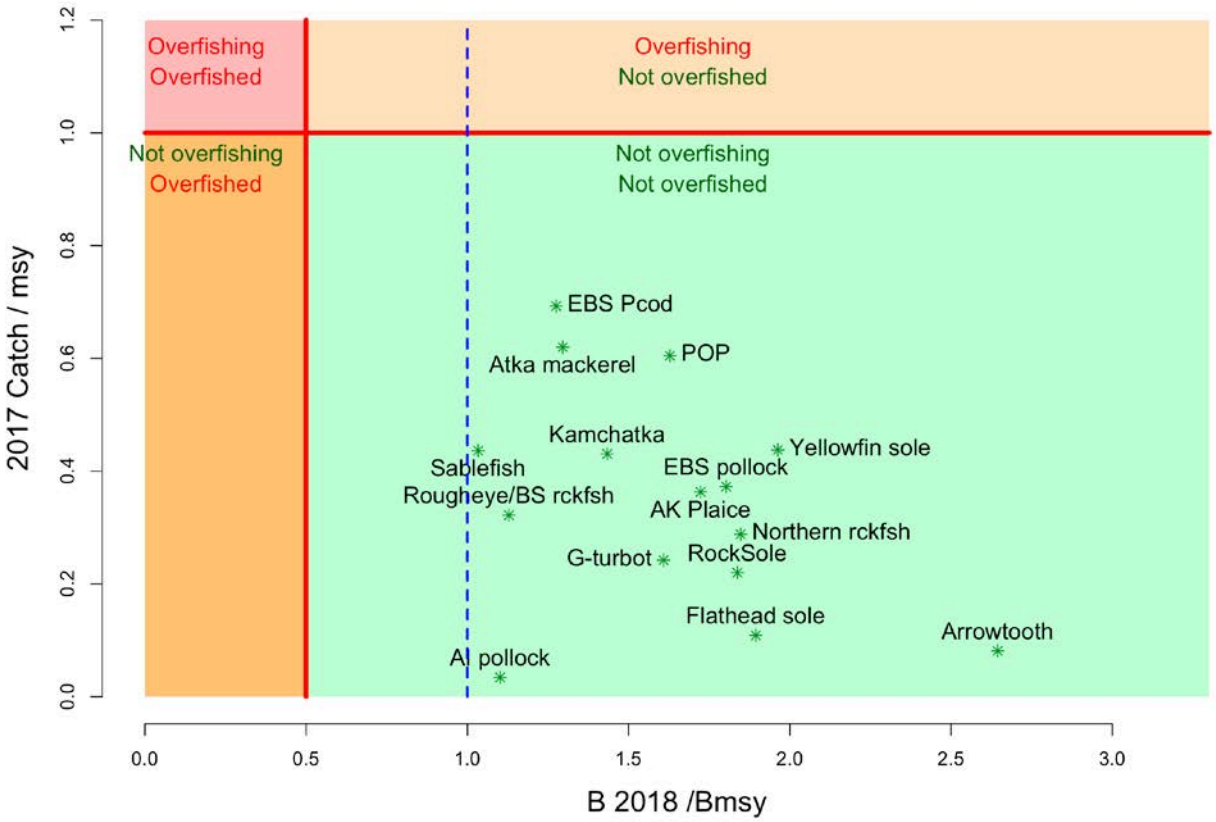

Figure 2. Summary of Bering Sea stock status next year (spawning biomass relative to B_{msy}; horizontal axis) and current year catch relative to fishing at F_{msy} (vertical axis) where F_{OFL} is taken to equal F_{msy}.

The sum of the biomasses for 2018 listed in Table 3 represents a 16% decrease from 2017. This is primarily due to declines in EBS pollock and Pacific cod. The 2017 value, in turn, was represented an increase of 9% from 2016 after stable biomasses from 2013. This stability and current relative increases follow periods of declines since 2010.

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 4, 2017.

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 2018 harvest specifications (from Council recommendations in December 2017) are in place to start the fishery on January 1, 2018, but these will be replaced by final harvest specifications that will be recommended by the Council in December 2017. The final 2018 and 2019 harvest specifications will become effective when final rulemaking occurs in February or March 2018. 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 2019 ABC and OFL values recommended in next year's SAFE report are likely to differ from this year's projections for 2019 because of new information (e.g., survey) 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 Scenario 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*
   - $ABC \le 0.75 \times OFL$

Revised Stock Assessment Schedule

Based on consideration of stock prioritization including assessment methods and data availability, some stocks are assessed on an annual basis while others are assessed less frequently. The following table provides an overview of the level of assessment presented in this year's SAFE report, the Tier level and schedule as well as the year of the next full assessment by stock.

Stock Assessment schedule for Bering Sea-Aleutian Islands

Stock	2017 SAFE Assessment status	Tier	Schedule (years)	Year of next full assessment
Eastern Bering Sea pollock	Full	1	1	2018
Bogoslof Island Pollock	None	5	2	2018
Aleutian Islands pollock	Partial	3	2	2018
Eastern Bering Sea Pacific Cod	Full	3	1	2018
Aleutian Islands Pacific cod	Full	5	1	2018
Sablefish	Full	3	1	2018
Yellowfin sole	Full	1	1	2018
Greenland Turbot	Partial	3	2	2018
Arrowtooth flounder	Partial	3	2	2018
Kamchatka flounder	Partial	3	2	2018
Northern Rock sole	Partial	1	2	2018
Flathead sole	Partial	3	2	2018
Alaska plaice	Full	3	2	2019
Other flatfish	None	5	4	2020
Pacific ocean perch	Partial	3	2	2018
Northern rockfish	Partial	3	2	2019
Rougheye & blackspotted rockfish	Partial	3	2	2018
Shortraker rockfish	None	5	2	2018
Other rockfish	None	5	2	2018
Atka mackerel	Full	3	1	2018
Squid	None	6	2	2018
Skates	Partial	3/5	2	2018
Sharks	None	5	2	2018
Octopus	None	6	2	2018
Sculpins	Partial	5	4	2019
Forage Species	Report	Eco	2	2019
Grenadiers (BSAI/GOA)	None	Eco	4	2020

The products anticipated under each year and by Tier level are shown below depending upon the 1-,2-, or 4 year assessment cycle for different stocks.

Year	1-year cycle		2-year cycle		4-year cycle	
	Tiers 1-3	Tiers 4-6	Tiers 1-3	Tiers 4-6	Tiers 1-3	Tiers 4-6
1	full	full	full	full	full	full
2	full	full	partial	nothing	partial	nothing
3	full	full	full	full	partial	partial
4	full	full	partial	nothing	partial	nothing

Economic Summary of the BSAI commercial groundfish fisheries in 2015-16

The ex-vessel value of all Alaska domestic fish and shellfish catch, which includes the amount paid to harvesters for fish caught, and the estimated value of pre-processed fish species that are caught by catcher/processors, decreased from $1,781 million in 2015 to $1,717 million in 2016. The first wholesale value of 2016 groundfish catch after primary processing was $2,379 million. The 2016 total groundfish catch decreased by 2%, and the total first-wholesale value of groundfish catch increased by 4%, relative to 2015.

The groundfish fisheries accounted for the largest share (51%) of the ex-vessel value of all commercial fisheries off Alaska, while the Pacific salmon (*Oncorhynchus spp*.) fishery was second with $444 million or 26% of the total Alaska ex-vessel value. The value of the shellfish fishery amounted to $270 million or 16% of the total for Alaska and exceeded the value of Pacific halibut (*Hippoglossus stenolepis*) with $119 million or 7% of the total for Alaska.

The Economic SAFE report (appendix bound separately) contains detailed information about economic aspects of the groundfish fisheries, including figures and tables, economic performance indices, 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, an Amendment 91 fishery economic data report (EDR) and vessel master survey 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. Beginning in this report, data tables have been re-organized and are now divided into four relatively distinct sections: (1) All Alaska, (2) BSAI, (3) GOA, and (4) Pacific halibut. Additionally, flatfish and rockfish data are now incorporated into the main data tables (rather than in the appendices in previous years). 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. Appendices contain global whitefish production from the FAO, fisheries export data from the Census Bureau, employment data from the Alaska Dept. of Labor, and alternative ex-vessel pricing and value based on CFEC fish tickets. Generally, the data presented in this report cover 2012 - 2016, but limited catch and ex-vessel value data are reported for earlier years to illustrate the rapid development of the domestic groundfish fishery in the 1980s and to provide a more complete historical perspective on catch. 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 2015-16 in the BSAI

The following brief analysis summarizes the overall changes that occurred between 2015-16 in the quantity produced and revenue generated from BSAI groundfish. According to data reported in the 2017 Economic SAFE report, the ex-vessel value of BSAI groundfish increased from $1,125 million in 2015 to $1,166 million in 2016 (Figure 3), and first-wholesale revenues from the processing and production of groundfish in the Bering Sea and Aleutian Islands (BSAI) increased by 5% between 2015 ($1,932 million) and 2016 ($2,025 million) (Figure 4). At the same time, the total quantity of groundfish products from the BSAI increased from 819 thousand metric tons to 832 thousand metric tons, a 2% increase. These changes in the BSAI are comparable to those in the GOA,

which together account for the 4% year-to-year increase in first-wholesale revenues from Alaska groundfish fisheries overall.

By species group, positive price effects and small negative quantity effects resulted in a positive net effect of about $79 million for pollock. For Pacific cod, negative price effect combined with significant positive quantity effects, resulting in a $22 million net increase in first-wholesale revenues for Pacific from the BSAI for 2015-16 (Figure 5). There was both a negative price effect and negative quantity effect for rockfish, resulting in a net negative effect of $8 million. Atka and sablefish had little change in price or quanity and "other" experienced a small net decline of 3%.

By product group, large positive price effects coupled with smaller positive quantity effects in the fillets category resulted in a positive net effect of $49 million in the BSAI first-wholesale revenue decomposition for 2015-16. For surimi, large positive price effects coupled with smaller positive quantity effects in the surimi category resulted in a positive net effect of $32 million. For roe, positive price effects coupled with significant negative quantity effects to result in a negative net effect of $6 million. For whole fish and head & gut, a positive price effect combined with a flat quantity effect to produce a net positive effect of $8 million while for 'other' products a positive price effect combined with a lager positive quantity effect for a net positive effect of $40 million.

In summary, first-wholesale revenues from the BSAI groundfish fisheries increased by $93 million from 2015-16 due in large part to positive price effects for flatfish and pollock, and positive quantity effects for Pacific cod. In comparison, first-wholesale revenues descreased by$1 mllion from 2015-16 in the GOA. The main drivers of this decline was a negative net revenue effect for Pacific cod being offset by positive net effects for sablefish.

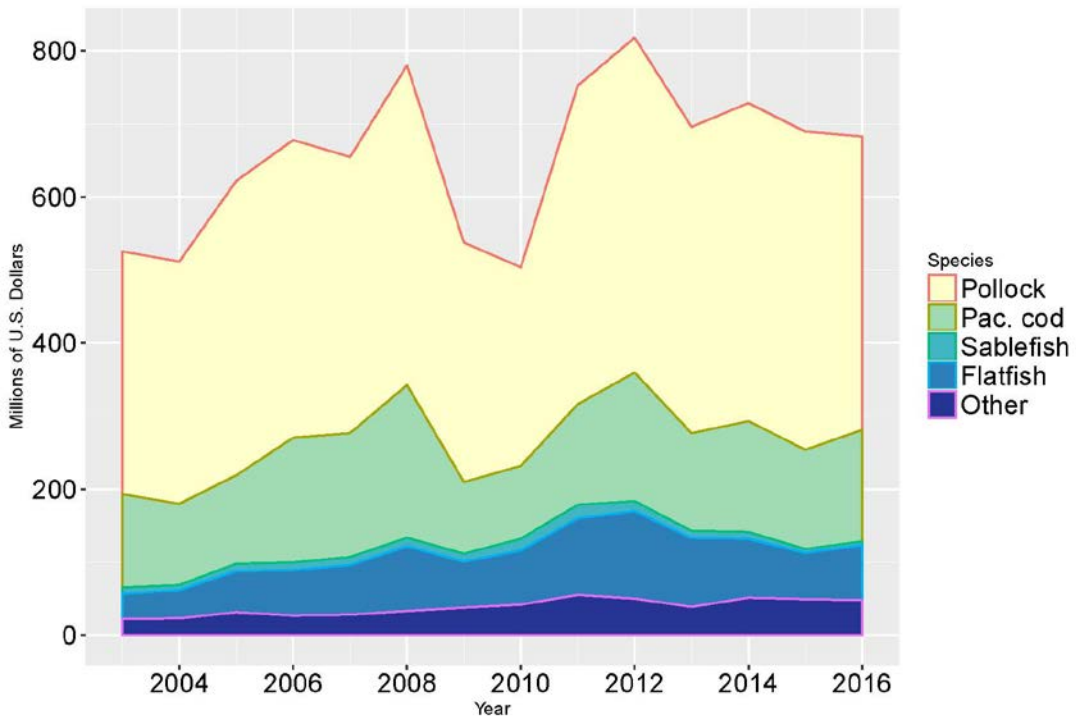

Figure 3. Real ex-vessel value of the groundfish catch in the domestic commercial fisheries in the BSAI area by species, 2003-2016 (base year = 2016).

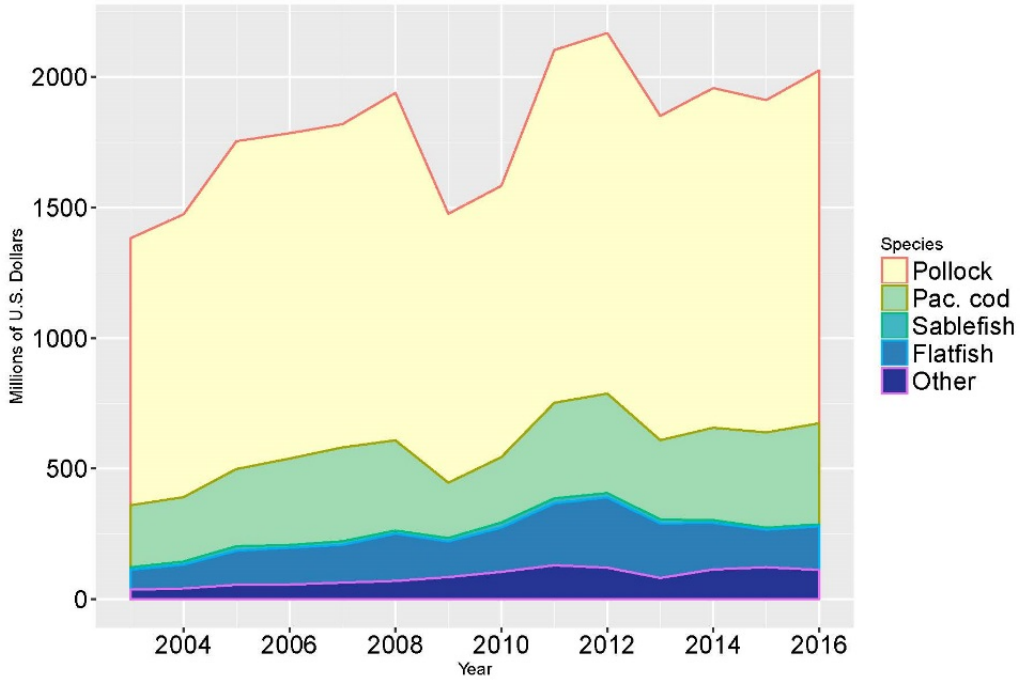

Figure 4. Real gross product value of the groundfish catch in the BSAI area by species, 2003-2016 (base year = 2016).

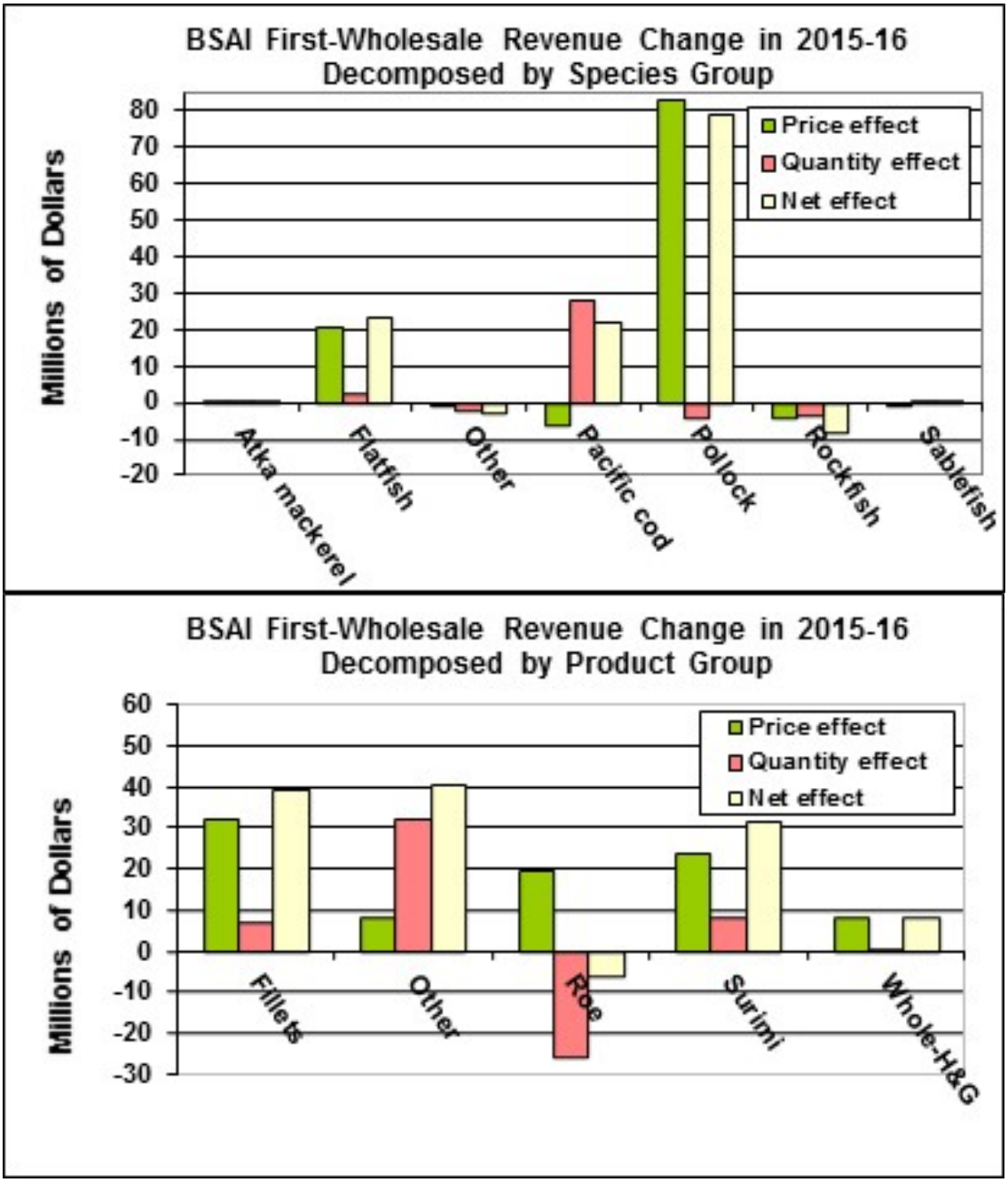

Figure 5. Decomposition of the change in first-wholesale revenues from 2015-16 in the BSAI area. The first decomposition is by the species groups used in the Economic SAFE report, and the second decomposition is by product group. The price effect refers to the change in revenues due to the change in 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).

Ecosystem Considerations

While the Bering Sea ecosystem is physically returning to near neutral conditions (while still slightly warmer than average), there are still notable anomalies in ecological patterns; notable patterns raised include:

- A potential red flag for the system includes reports across the EBS of dead and dying seabirds, with over 1,250 beached seabird carcasses documented since early August 2017 as well as 70 dead birds reported by USFWS and the University of Washington in the northern Bering Sea (as compared to only a few typically reported during these June to September surveys). Necropsies on 20 carcasses from across the system indicate drowning and severe emaciation.

- Walleye pollock, Pacific cod, yellowfin sole, and flathead sole are all lighter than average for a give size, especially in the south Bering Sea (Fig. 65). These species as well as Alaska plaice, arrowtooth flounder, and age 1 pollock, all experienced reduced condition in 2017 relative to 2016 and may be a leading indicator of poor overwinter survival and the potential for smaller stocks in 2018.

- Some anomalous physical signals from 2016 persist, including a "disproportionately large positive-magnitude NPI occurred in winter of 2016-2017, considering the weak amplitude of La Niña in late 2016." The implications of this anomaly are not evident.

- Sea level pressure patterns set up persistent winds from the south that prevented sea ice formation in the Gulf of Anadyr creating an unusual retraction of ice extent over the northwestern shelf. As a result, the NBS responded more similarly to a "warm year," whereas ice coverage over the southern middle domain lead to more moderate conditions in the southeast.

- There is a ~50/50 chance that there will be a weak La Niña fall through winter 2017-2018. Slight cooling of SST is predicted for the EBS based on 3 month forecasts. Summer predictions for 2018 are for a larger than average <=2 ^{o}C cold pool, but a smaller than average 0-1 ^{o}C cold pool.

Physical conditions: A transition from a strong El Niño to a weak La Niña occurred in 2016 and with it moderation of physical conditions in 2017 in the Bering Sea following the marine heat wave of 2014-2016. This included cooling of the EBS over the winter (SST was still elevated above normal in fall 2016) to near mean SSTs by fall of 2017. However, despite cooling of surface waters, bottom temperatures were cooler in summer 2017 but still moderately above long-term mean; temperatures above and below the mixed layer depth (MLD) were warmer than average in all regions of the shelf. A weak AI low suppressed storminess for the SE EBS, and southern winds were very light and from the south, leading to slightly warm anomalies in air temperature over the Bering Sea. While the system was very warm in 2016 with a small and northern cold pool ("cold puddle"), the 2017 sea ice extended south over the shelf (similar to 2006) and an associated narrow cold pool extended over the southern and middle domain.

Biological conditions and ecosystem response:
Ecosystem productivity signals for 2017 are mixed. The lowest cocolithophore index was lowest on record, indicating improved visual forager success, and euphausiids were slightly elevated. However large copepod abundances were low in the S EBS, indicating reduced fall food resources. Jellyfish CPUE, was lowest since 1989, although slightly up from 2016 (especially large jellyfish). Survey catches of sponges and sea anemones were lowest in 7 years, sea whips decreased markedly from 2016. Primary productivity in the middle domain may be limited (as indicated by dissolved inorganic nitrogen). Warm conditions from 2014 to 2016 were associated with a lower ratio of large-size phytoplankton and a possible lengthening of the food web and reduced transfer efficiency to fish (i.e., more production of nutrients required in 2014-2016).

Cliff-nesting seabirds showed overall poor reproductive success at the Pribilof Islands in 2017, with the exception of nearshore-feeding red-faced cormorants. Crab biomass is highly variable with negative trends in 2017. Multiple crab species experienced > 20% decline in 2017 over 2016, with distributions retracted to

northern regions of the EBS. Fur seal pup production at St. Paul Island decreased 12.1% from 2014 to 2016 while it increased 8.2% on St. George Island. Forage fish abundances decreased late summer 2016, as did estimated juvenile groundfish abundance, while juvenile salmon increased and were distributed further south (except sockeye which distributed farther north and west). In contrast, juvenile Chinook salmon of Canadian origin in 2017 is below average and may impact fish by-catch caps 3-4 years in the future. Juvenile pollock were distributed further north during warm years. Fish condition (defined as residuals of mean length-weight regressions) of all species except arrowtooth flounder were lower in 2017 than 2016, and for Pacific cod and age 1+ pollock in 2017, condition indices remain below average, and were second lowest on record for age 1+ pollock. Estimated predation mortality for age 1 pollock, Pacific cod, and arrowtooth flounder remained elevated above long-term means, though down slightly from the peak in 2016. Total biomass of demersal fish and invertebrates suggests a long-term stability in prey base over the past 20 years. Species richness and diversity increased in 2016 and 2017, richness was highest along the 100 m isobath, while diversity was highest in middle shelf. Fish are shorter but living longer in 2017 relative to 2016.

Human dimensions : Discard rates in the pollock fishery have remained below 1% since 1998, and below 8% for non-pollock trawl since 2011. For fixed gear, discard rates are trending upwards slightly in recent years, and were around 14% in 2016. Jellyfish in the catch tracked jellyfish abundance, peaking in 2014 and declining sharply in 2015 and 2016. Seabird by-catch in 2016 exceeded the 2007-2015 average by 78% and was second highest on record, namely due to by-catch of shearwater and northern fulmars. Habitat impacts due to fishing gear has decreased steadily to the present level of 2.3%. As of June 30, 2017, only the Pribilof Islands blue king crab stock is considered overfished and subject to overfishing; the stock is in year 3 of a rebuilding plan. Pelagic foragers represent the largest share of total landings (trends driven by TAC levels for representative species). Subsistence harvest for Pacific halibut represented 2.3% of total harvest; EBS represents 9% of halibut subsistence harvest. Subsistence harvest for salmon decreased state-wide, particularly for Chinook (Bristol bay represents 41% of all Chinook subsistence harvest). Flatfish revenue has declined recently due to decreased prices, crab value has increase with increased landing, salmon has increased due to stable landings and increased prices. Pollock price has decreased, but landings have increased. Pacific cod prices dropped in 2009 but have been stable. The number of sport fishing anglers has declined since the mid-1990s and is at about 2000 anglers. The unemployment rate is higher in NBS communities than other EBS communities, but rates dropped across the BS from 3.29% in 2015 to 3.16% in 2016 in the EBS and from 12.77% in 2015 to 12.48% in 2016 in the NBS. The population has remained relatively stable across the EBS, yet 41% of communities experienced population decline between 1990 and 2016. The NBS population has remained relatively stable with only 21% of communities experiencing population declines between 1990 and 2016. There is a general trend toward decreasing school enrollment in most EBS boroughs and many have had school closures.

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 biomass is reported as age 3+ for eastern Bering Sea, age 2+ for the Aleutian Islands and the survey biomass for Bogoslof, as reported in the respective assessments. The OFL and ABC for 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Biomass	OFL	ABC	TAC*	Catch
Eastern Bering Sea	2016	11,300,000	3,910,000	2,090,000	1,340,000	1,349,724
	2017	13,000,000	3,640,000	2,800,000	1,345,000	1,356,259
	2018	10,967,000	4,797,000	2,592,000	n/a	n/a
	2019	10,119,000	4,592,000	2,467,000	n/a	n/a
Aleutian Islands	2016	241,929	39,075	32,227	19,000	1,257
	2017	250,221	43,650	36,061	19,000	1,427
	2018	272,675	49,289	40,788	n/a	n/a
	2019	262,010	37,431	30,803	n/a	n/a
Bogoslof	2016	106,000	31,906	23,850	500	1,005
	2017	434,760	130,428	51,300	500	186
	2018	434,760	130,428	51,300	n/a	n/a
	2019	434,760	130,428	51,300	n/a	n/a

*In 2016, NMFS reallocated 14,900 t of pollock TAC from the Aleutian Islands to the Bering Sea, which increased the Bering Sea TAC to 1,354,900 t and decreased the Aleutian Islands TAC to 4,100 t. In 2017, NMFS reallocated 14,900 t of pollock TAC from the Aleutian Islands to the Bering Sea, which increased the Bering Sea TAC to 1,354,900 t and decreased the Aleutian Islands TAC to 4,100 t.

Eastern Bering Sea pollock

Changes from previous assessment

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

- The 2017 NMFS bottom-trawl survey (BTS) biomass and abundance at age estimates were included.
- The 2016 NMFS acoustic-trawl survey (ATS) biomass and abundance at age estimates were updated based on age data collected from the ATS sampling (in 2016 the BTS age-length key was used).
- The ATS age data from 1994-2016 that includes the bottom layer analysis (0.5-3m from bottom) was completed and used in the base/reference model (last year the accompanying biomass time series for these data were evaluated but the full set of age data was unavailable). This is new to the assessment.
- Two additional years of opportunistic acoustic data from vessels transiting the EBS shelf region were processed and the time series now extends from 2006-2017.
- Observer data for catch at age and average weight at age from the 2016 fishery were finalized and included.
- Total catch as reported by NMFS Alaska Regional office was updated and included through the 2017 fishing season.

There were no changes to assessment methodology this year.

Spawning biomass and stock trends

Spawning biomass in 2008 was at the lowest level since 1980, but has increased by 150% since then, although spawning biomass is projected to decline from the current high level in the near term. The 2008 low was the result of extremely poor recruitments from the 2002-2005 year classes. Recent increases were fueled by recruitment from the very strong 2008, 2012, and 2013 year classes (126%, 152%, and 68% above average for the post-1976 time series, respectively), along with spawning exploitation rates in 2009-2017 that averaged 11% below the post-1976 time series average. Spawning biomass is projected to be 80% above B_{MSY} in 2018.

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 updated estimate of B_{MSY} from the present assessment is 2.043 million t, down 6% from last year's estimate of 2.165 million t. Projected spawning biomass for 2018 is 3.679 million t, placing EBS walleye pollock in sub-tier "a" of Tier 1. As has been the approach for many years, 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 0.466, up 17% from last year's value of 0.398. The harvest ratio of 0.398 is multiplied by the geometric mean of the projected fishable biomass for 2018 (7.714 million t) to obtain the maximum permissible ABC for 2018, which is 3.598 million t, up 15% and down 4% from the maximum permissible ABCs for 2017 and 2018 projected in last year's assessment, respectively. However, as with other recent EBS pollock assessments, the authors recommend setting ABCs well below the maximum permissible levels. They list seven reasons for doing so in the SAFE chapter.

During the period 2010-2013, the Team and SSC based ABC recommendations on the most recent 5-year average fishing mortality rate. Beginning in 2014, however, the Team and SSC felt that stock conditions had improved sufficiently that an increase in the ABC harvest rate was appropriate. Specifically, the Team and SSC recommended basing the ABCs on the harvest rate associated with Tier 3, the stock's Tier 1 classification notwithstanding. The Team recommends continuing this approach for setting the 2018 and 2019 ABCs, giving values of 2.592 million t and 2.467 million t, respectively.

The OFL harvest ratio under Tier 1a is 0.622, 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 2018 determines the OFL for 2018, which is 4.797 million t. The current projection for OFL in 2019 given a projected 2018 catch of 1.390 million t is 4.592 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.

Ecosystem considerations

An appendix to the SAFE chapter describes a multi-species model ("CEATTLE") involving walleye pollock, Pacific cod, and arrowtooth flounder. The authors view this as a "strategic" model rather than a model that would be used for setting annual harvest specifications. Nevertheless, the 2018 "target" ABC values from CEATTLE are similar to the maximum permissible ABC value from the stock assessment (being 2% and 11% higher than the value from the stock assessment when CEATTLE is run in single-species mode and multi-species mode, respectively). Like the authors of the stock assessment, the authors of the CEATTLE appendix suggest setting the actual 2018 ABC at a significantly lower value (although based on a different harvest control rule than the Tier 3 rule).

Several of the concerns listed by the stock assessment authors in support of their ABC recommendation involve ecosystem considerations, specifically:

- Because the environmental conditions in summer 2017 followed a warm period, precaution may be warranted, since warm conditions are thought to negatively affect the survival of larval and juvenile pollock.

- There is apparently a considerable amount of pollock showing up in the northern part of the shelf beyond the traditional EBS shelf survey area, approximately 1.3 million t in 2017. (The authors clarified during the Team meeting that this is a concern because, if it reflects a unidirectional migration and further such migrations occur in the future, this could reduce the biomass in the traditional EBS shelf survey area).
- Pollock are an important prey species for the ecosystem and apparent changes in the distribution may shift their availability as prey. In particular, fur seal populations around the Pribilof Islands have had declines in pup production from 2014-2016. The extent that fishing intensity can allow for continued prey availability could be considered as a means to minimize further declines in the fur seal populations.
- The CEATTLE model suggests that the B_{MSY} level is around 3.6 million t instead of the 2.3 million t estimated in the current assessment (noting that total natural mortality is higher in the multi-species model).

Aleutian Islands pollock

Changes from previous assessment

This chapter was presented in a "partial assessment" format because it was a scheduled "off-year" assessment under the new Stock Assessment Prioritization guidelines. Therefore, only the projection model was run, with updated catches. New data in the 2017 assessment included updated 2016 catch and estimated 2017 through 2019 catches. No changes were made to the assessment model. A new feature included in the "off-year" assessments was a time series of exploitation rate (i.e., catch/biomass).

Spawning biomass and stock trends

This year's assessment estimates that spawning biomass reached a minimum level of about $B_{30\%}$ in 1999 and then has generally increased, with a projected value of $B_{38\%}$ for 2017. 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 2017 is projected to be 77,579 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 2018 spawning biomass at 78,305 t which is below the $B_{40\%}$ value of 81,240 t, placing the AI pollock stock in sub-tier "b" of Tier 3. The model estimates the values of $F_{35\%}$ as 0.397 and $F_{40\%}$ as 0.319. Under Tier 3b, with the adjusted $F_{40\%}$ = 0.319, the maximum permissible ABC is 40,788 t for 2018. The Team recommends setting the 2018 ABC at this level. The 2017 catch was estimated by increasing the official catch as of October 29, 2017 (i.e., 1,384 t), by an expansion factor of 3.1%, which represents the average fraction of catch taken after October 29 in the last three complete years (2014-2016). Following the Tier 3b formula with the adjusted $F_{35\%}$=0.397, OFL for 2018 is 49,289 t. If the 2017 catch is 1,427 t (i.e., 3.1% expansion on 1,384 t) and 1,516 t for 2018 (i.e., equal to the three year average for 2014-2016), the 2019 maximum permissible 2019 ABC would be 30,803 t and the 2019 OFL would be 37,431 t. The Team recommends setting 2018 and 2019 ABC and OFL at these 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 [from the 2016 assessment]

In accordance with the approved schedule, no assessment was conducted for Bogoslof this year, however, a full stock assessment will be conducted in 2018. Until then, the values generated from the previous stock assessment are rolled over for 2018 specifications. Additional information listed below summarizes the 2016 assessment.

Changes from previous assessment

Estimated catches for 2015 and 2016 were updated and the 2016 acoustic-trawl survey biomass estimate and preliminary 2016 survey age data were included. Two methods for computing the survey average are provided: one using the random effects and the other using a simple 3-survey average.

Spawning biomass and stock trends

NMFS acoustic-trawl survey biomass estimates are the primary data source used in this assessment. Between 2000 and 2014, the values varied between 292,000 t and 67,000 t. The most recent acoustic-trawl survey of the Bogoslof spawning stock was conducted in March of 2016 and resulted in a biomass estimate of 506,228 t. The random-effects method of survey averaging resulted in 434,760 t, compared to the 2016 point estimate of 506,228 t. The degree of uncertainty in the estimate increases going forward and is fairly substantial. As an alternative method, the three-survey average approach gives an estimate of 228,000 t from which to make the Tier 5 calculations.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The SSC has determined that this stock qualifies for management under Tier 5. The assessment authors and the Team recommend that the maximum permissible ABC and OFL continue to be based on the random-effects survey averaging approach. Given the large degree of uncertainty in the 2016 survey estimate, and the fact that the next survey is scheduled for 2018, the assessment authors and the Team recommend using the biomass estimate based on the average of the three most recent surveys (228,000 t) for ABC.

The maximum permissible ABC value for 2017 is 97,428 t (assuming M = 0.3 and F_{ABC} = 0.75 x M = 0.225 and the random effects survey estimate for biomass). The ABC for 2017 = 228,000 x M x 0.75 = 51,300 t. The recommended ABC for 2018 is the same. The recommended ABC for 2017 is close to what would be obtained from a two-year stair-step (60,800 t).

The OFL was calculated using the random effects estimate for the survey biomass. Following the Tier 5 formula with M=0.3, OFL for 2017 is 130,428 t. The OFL for 2018 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

Status and catch specifications (t) of Pacific cod in recent years are shown below. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Age 0+ biomass	OFL	ABC	TAC*	Catch
Eastern Bering Sea	2016	1,830,000	390,000	255,000	238,680	231,511
	2017	1,260,000	284,000	239,000	223,704	196,761
	2018	918,000	238,000	188,000	n/a	n/a
	2019	762,000	201,000	170,000	n/a	n/a
Aleutian Islands	2016	68,900**	23,400	17,600	12,839	12,356
	2017	79,600**	28,700	21,500	15,695	12,286
	2018	79,600**	28,700	21,500	n/a	n/a
	2019	79,600**	28,700	21,500	n/a	n/a

*In 2016 and 2017, the Council set the Federal TAC to account for the State of Alaska Aleutian Islands Guideline Harvest Level (GHL) fishery and the Bering Sea GHL fishery each of which is set equal to 6.4% of the Bering Sea ABC and 27% of the AI ABC. Catch includes only that which accrues to the Federal TAC.

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

Eastern Bering Sea Pacific cod

Changes from previous assessment

Changes to the input data have been made in the EBS Pacific cod assessment.

1. Catch data for 1991-2016 were updated, and preliminary catch data for 2017 were incorporated.
2. Commercial fishery size composition data for 1991-2016 were updated, and preliminary size composition data from the 2017 commercial fishery were incorporated.
3. Size composition data from the 2017 EBS shelf bottom trawl survey were incorporated.
4. The numeric abundance estimate from the 2017 EBS shelf bottom trawl survey was incorporated (the 2017 estimate of 347 million fish was down about 46% from the 2016 estimate).
5. Age composition data from the 2016 EBS shelf bottom trawl survey were incorporated.
6. Age composition data from the 2013-2016 fisheries were incorporated into some of the models

Many changes have been made or considered in the stock assessment model since the 2016 assessment (Thompson 2016). Ten models were reviewed by the BSAI Plan Team Subcommittee on Pacific Cod Models ("Subcommittee") at its June meeting, and seven models were presented in this year's preliminary assessment (Appendix 2.1), as requested at the conclusion of the June Subcommittee meeting. After reviewing the preliminary assessment, the BSAI Plan Team and SSC requested that a number of models from the preliminary assessment and one new model be presented in this final assessment. The model presented here for use in setting harvest specifications for 2018 and 2019 is unchanged from the previous year.

Spawning biomass and stock trends

Survey abundance in 2017 (346,693,000 fish) declined by 46% from 2016 (640,359,000 fish) and biomass in 2017 (598,260 t) was 37% less than in 2016 (944,621 t). As estimated in the present model, spawning biomass is above $B_{40\%}$ and has been increasing since 2009 due to a number of strong year-classes beginning in 2006. However, spawning biomass is projected to begin declining again in the near future.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

This stock is assigned to Tier 3a. The maximum 2018 ABC in this tier as calculated using the present model fit is 201,000 t, and the Team recommends that the ABC be reduced to 188,000 t due to concerns related to the

dramatic declines in the EBS shelf survey index, recent poor environmental conditions, lack of incoming recruitment, and recent small size-at-age of young Pacific cod . The Team recommends an ABC of 170,000 t for the preliminary 2019 ABC. The 2018 OFL from this new model is 238,000 t, which is less than the projected OFL from the previous assessment. The 2019 projected OFL is 201,000 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

This stock has been assessed separately from Eastern Bering Sea Pacific cod since 2013, and managed separately since 2014. The stock has been managed under Tier 5 since it was first assessed separately. No changes were made to assessment methodology.

A random effects model of the Aleutian Islands trawl survey biomass trajectory was used in 2016 to estimate the biomass and provide management advice. There are no new survey biomass estimates, thus the only changes are updating the catch data for 1991-2016 and including preliminary catch data for 2017.

Spawning biomass and stock trends

After declining by more than half between 1991 and 2002, survey biomass has since stayed in the range of 50-100 kilotons. The 2016 Aleutians survey biomass estimate (84,409 t) was up about 15% from the 2014 estimate (73,608 t).

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The analyst and Team recommend using the Tier 5 assessment again for 2018. The Team's recommended ABC is 21,500 t, and OFL is 28,700 t. The estimate of the natural mortality rate was 0.36 and was taken from the 2017 EBS Pacific cod assessment model (Model 16.6).

Status determination

This stock 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.

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 2017 and 2018 are those recommended by the Plan Team. Catch data are current through November 4th, 2017.

Area	Year	Age 4+ Biomass	OFL	ABC	TAC	Catch
Bering Sea	2016	25,000	1,304	1,151	1,151	532
	2017	24,000	1,499	1,274	1,274	1,150
	2018	94,000	2,887	1,464	n/a	n/a
	2019	98,000	4,576	2,061	n/a	n/a
Aleutian Islands	2016	23,000	1,766	1,557	1,557	349
	2017	43,000	2,101	1,735	1,735	588
	2018	65,000	3,917	1,988	n/a	n/a
	2019	68,000	6,209	2,798	n/a	n/a

Relative to last year's assessment, the following substantive changes in the current assessment were made.

Changes in the input data

New data included in the assessment model were relative abundance and length data from the 2017 longline survey, biomass and length data from the 2017 bottom trawl survey, relative abundance, and length data from the 2016 fixed gear fishery, length data from the 2016 trawl fisheries, age data from the 2016 longline survey and 2016 fixed gear fishery, updated catch for 2016, and projected 2017 - 2019 catches. In addition, estimates of killer and sperm whale depredation in the fishery were updated and projected for 2017-2019.

Changes in the assessment methodology

Relative to the 2016 assessment, which adopted several Center for Independent Experts (CIE) review panel recommendations for improving the reference model, there were no changes to the assessment methodology.

New for this year, a new Ecosystem and Socioeconomic Profile (ESP) was presented as an appendix that highlights specific ecosystem indicators that may help explain variability in the stock assessment and included an economic performance report for the sablefish fishery.

Spawning biomass and stock trends

Projected 2018 spawning biomass is 36% of unfished spawning biomass. The longline survey abundance index increased 14% from 2016 to 2017 following a 34% increase between 2015 and 2016. However, the lowest point of the time series occurred in 2015. The fishery abundance index decreased 23% from 2015 to 2016 and is the time series low (the 2017 data are not available yet). Spawning biomass is projected to increase rapidly from 2018 to 2022, and then stabilize.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Sablefish are managed under Tier 3 of NPFMC harvest rules. Reference points were calculated using recruitments from 1977-2013. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ from this assessment are 98,332 t (combined across the EBS, AI, and GOA), 0.096, and 0.114, respectively. Projected female spawning biomass (combined areas) for 2018 is 88,928 t (90% of $B_{40\%}$ or $B_{36\%}$), placing sablefish in Tier 3b.

The authors recommended ABCs for 2018 and 2019 that are lower than maximum permissible ABC and the Team concurred for two important reasons. First, a lower ABC than maximum permissible was recommended based on estimates of whale depredation occurring in the fishery in the same way that was recommended and accepted in 2016. Second, the 2014 year class is estimated to be 10 times higher than average, and 2.5 x higher than the next highest year class (1977). Thus, the recruitment estimate for the 2014 year class was set equal to the 1977 recruitment estimate (4 times average) because there are concerns regarding the lack of older fish and spawning biomass, the uncertainty surrounding the estimate of the strength of the 2014 year class, and the uncertainty about the environmental conditions that may affect the success of the 2014 year class.

The maximum permissible value of F_{ABC} under Tier 3b is 0.086. After accounting for the uncertainty surrounding the extremely high 2014 recruitment estimate and whale depredation, the authors' recommended F_{ABC} equals 0.077, which results in a recommended 2018 ABC of 11,505 t for the GOA. The OFL fishing mortality rate is 0.102 which results in a 2017 OFL of 22,073 t for the GOA.

Status determination

Model projections indicate that this stock is not subject to overfishing, overfished, nor approaching an overfished condition.

Area apportionment

Apportionments have been held constant since the 2013 fishery and the Teams concurred:

	2017			2018		2019	
Region	**OFL**	**ABC**	**TAC**	**OFL**	**ABC**	**OFL**	**ABC**
BS	1,499	1,274	1,274	2,887	1,464	4,576	2,061
AI	2,044	1,735	1,735	3,917	1,988	6,209	2,798

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 2017 and 2018 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Age 6+ Biomass	OFL	ABC	TAC	Catch
BSAI	2016	2,170,000	228,100	211,700	144,000	135,350
	2017	2,290,000	287,000	260,800	154,000	125,620
	2018	2,553,100	306,700	277,500	n/a	n/a
	2019	2,460,700	295,600	267,500	n/a	n/a

The Flatfish Flexibility Exchange Program increased the TAC from 144,000 t to 154,278 t in 2016, and as of November 17, 2017 the TAC increased from 154,000 t to 154,699 t in 2017.

Changes from previous assessment

Changes to the input data include:

- 2016 fishery age composition
- 2016 survey age composition
- 2017 trawl survey biomass point estimate and standard error
- Estimate of the discarded and retained portions of the 2016 catch
- Estimate of total catch made through the end of 2017.
- Updated weight at age for survey and fishery

Changes to the assessment methodology:

No changes were made to the assessment model.

Spawning biomass and stock trends

The projected female spawning biomass estimate for 2018 is 895,000 t, which is $2.0\times B_{MSY}$. This is a 15% increase from last year's 2017 estimate (778,600 t). Although there has been a general decline that has prevailed since 1993, there is now some indication of a slow increase over the past three years.

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 456,000 t, and projected spawning biomass for 2018 is 895,000 t, meaning that yellowfin sole qualify for management under Tier 1a. Corresponding to the approach used in recent years, the 1978-2010 age 1 recruitments (and corresponding spawning biomass estimates) 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 0.109. The current value of the OFL harvest ratio (the arithmetic mean of the F_{MSY} ratio) is 0.12. The product of the maximum permissible ABC harvest ratio and the geometric mean of the 2018 biomass estimate produced the 2018 ABC of 277,500 t recommended by the author and Team, and the corresponding product using the OFL harvest ratio produces the 2018 OFL of 306,700 t. For 2019, the corresponding quantities are 267,500 t and 295,600 t, respectively.

Status determination

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

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 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Age 1+ Biomass	OFL	ABC	TAC	Catch
BSAI	2016	114,438	4,194	3,462	2,873	2,238
	2017	121,804	11,615	6,644	4,500	2,813
	2018	126,417	13,148	11,132	n/a	n/a
	2019	127,021	13,540	11,473	n/a	n/a
Eastern Bering Sea	2016	n/a	n/a	2,673	2,673	2,117
	2017	n/a	n/a	8,577	4,375	2,691
	2018	n/a	n/a	9,718	n/a	n/a
	2019	n/a	n/a	10,016	n/a	n/a
Aleutian Islands	2016	n/a	n/a	789	200	121
	2017	n/a	n/a	1,248	125	122
	2018	n/a	n/a	1,414	n/a	n/a
	2019	n/a	n/a	1,457	n/a	n/a

Changes from previous assessment

This chapter was presented in a "partial assessment" format because it was a scheduled "off-year" assessment under the new Stock Assessment Prioritization guidelines. Therefore, only the projection model was run, with updated catches. New data in the 2017 assessment included updated 2016 catch and estimated 2017 and 2018 catches. No changes were made to the assessment model. A new feature included in the "off-year" assessments was a time series of exploitation rate (i.e., catch/biomass).

Changes to the input data include:

- Updated 2016 and projected 2017 catch data
- 2017 EBS shelf trawl survey estimates
- 2017 ABL longline survey estimates
- 2017 EBS shelf survey and ABL longline survey length composition estimates

Spawning biomass and stock trends

The projected 2018 female spawning biomass is 58,035 t, which is a 15% increase from last year's 2017 estimate of 50,461 t. Female spawning biomass is projected to increase to 61,878 t in 2019. The effects of the incoming 2007-2009 year classes are creating a steep increase in both the female spawning biomass and total biomass estimates. These increases are also due, in part, to the increase in average weight at age with the inclusion of the 2015 length at age data. Projections for 2018 predict an increase in spawning biomass as these year classes grow and mature.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The B40% value using the mean recruitment estimated for the period 1978-2014 gives a long-term average female spawning biomass of 41,239 t. The projected 2018 female spawning biomass was at 58,035 t or, well above the estimate of B40% (41,239 t). Because the projected spawning biomass in year 2018 is above B40%, Greenland turbot ABC and OFL levels will be determined at Tier 3a of Amendment 56. The maximum permissible value of F_{ABC} under this tier translates into an OFL of 13,148 t for 2018 and 13,540 t for 2019 and

a maximum permissible ABC of 11,132 t for 2018 and 11,473 t for 2019. These are the authors' and Team's OFL recommendations. The author recommended a more conservative maximum permissible ABC of 7,000 t for both 2018 and 2019 due to the likelihood that this stock will continue to have poor recruitment for the foreseeable future. The Team disagreed with the author's ABC choice as it was subjective and not supported by the model and recommended that the ABCs for 2018 and 2019 be set at maximum permissible.

Area apportionment

As in previous assessments, apportionment recommendations are based on unweighted averages of EBS slope and AI survey biomass estimates from the four most recent years in which both areas were surveyed. The Team's recommended 2018 and 2019 ABCs in the EBS are 9,718 and 10,016 t. The 2018 and 2019 ABCs for the AI are 1,414 and 1,457 t. 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 are below. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 9, 2017.

Area	Year	Age 1+ Bio	OFL	ABC	TAC	Catch
BSAI	2016	910,012	94,035	80,701	14,000	11,105
	2017	779,195	76,100	65,371	14,000	6,189
	2018	785,141	76,757	65,932	n/a	n/a
	2019	782,840	75,084	64,494	n/a	n/a

Changes from previous assessment

This chapter was presented in a "partial assessment" format because it was a scheduled "off-year" assessment under the new Stock Assessment Prioritization guidelines. Therefore, only the projection model was run, with updated catches. New data in the 2017 assessment included updated 2016 catch and estimated 2017 and 2018 catches. No changes were made to the assessment model. A new feature included in the "off-year" assessments was a time series of exploitation rate (i.e., catch/biomass).

The total catch for 2017 by calculating the proportion of catch between January 1st and September 21st from the previous five years (2012-2016), 90.2%. The total year's catch was extrapolated from the catch through September 21, 2017, for an estimated total of 5,698 t. We note that the actual catch is slightly higher as of November 9, 2017. The 2018 catch was estimated as the average catch over the past four years, with the average catch from 2014-2016 from AKFIN, and the full year's catch estimate for 2017, for a 2018 estimate of 11,797 t. There has been a decreasing trend in ATF catch and the years selected for the 2018 catch estimate capture that trend.

Spawning biomass and stock trends

The projected age 1+ total biomass for 2018 is 785,131 t, an increase from the value of 772,153 t projected for 2018 in last year's assessment. The projected female spawning biomass for 2018 is 490,663 t which is an increase from last year's 2018 estimate of 464,066 t.

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 this year's assessment are 212,054 t and 0.129. The projected 2017 spawning biomass is above $B_{40\%}$, so ABC and OFL recommendations for 2018 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, resulting in 2018 and 2019 ABCs of 65,932 t and 64,494 t, respectively, and 2018 and 2019 OFLs of 76,757 t and 75,084 t.

Status determination

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

Ecosystem Considerations

Arrowtooth flounder is not a dominant predator 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 are below. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Age 2+ Biomass	OFL	ABC	TAC	Catch
BSAI	2016	182,300	11,100	9,500	5,000	4,850
	2017	170,300	10,360	8,880	5,000	4,462
	2018	189,868	11,347	9,737	n/a	n/a
	2019	199,223	12,022	10,317	n/a	n/a

Changes from previous assessment

This chapter was presented in a "partial assessment" format because it was a scheduled "off-year" assessment under the new Stock Assessment Prioritization guidelines. Therefore, only the projection model was run, with updated catches. New data in the 2017 assessment included updated 2016 catch and estimated 2017 and 2018 catches. No changes were made to the assessment model. A new feature included in the "off-year" assessments was a time series of exploitation rate (i.e., catch/biomass).

New input data for the projection model included updating the 2016 catch and estimating the 2017 catch. The 2017 catch was 4,112 t as of mid- October. The estimated catch for 2017 was the product of the 2017 TAC (5,000 t) and the average fraction of the TAC captured from the past two years (86.9%). The projected 2017 catch was 4,347 t. We note that this was slightly exceeded as of November 4.

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 2018 female spawning biomass is estimated at 63,718 t, above the $B_{40\%}$ level of 50,782 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 2018 is above $B_{40\%}$, placing Kamchatka flounder in sub-tier "a" of Tier 3. For the 2018 fishery, the authors and Team recommend setting 2018 ABC at the maximum permissible value of 9,737 t from the projection model. This value is an increase of 11% over the 2017 ABC (8,800 t). The recommended 2018 OFL is 11,347 t, a 10% increase from 10,360 t for 2017.

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 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Age 6+ Biomass	OFL	ABC	TAC	Catch
BSAI	2016	1,085,200	165,900	161,100	57,100	44,873
	2017	1,000,600	159,700	155,100	47,100	35,123
	2018	923,200	147,300	143,100	n/a	n/a
	2019	852,000	136,000	132,000	n/a	n/a

The Flatfish Flexibility Exchange Program decreased the TAC from 57,100 t to 52,659 t in 2016, and as of November 17, 2017 the TAC decreased from 47,100 t to 46,825 t in 2017.

Changes from previous assessment

This chapter was presented in a "partial assessment" format because it was a scheduled "off-year" assessment under the new Stock Assessment Prioritization guidelines. Due to unforeseen technical complications involved with extending the projection range in the Tier 1 assessment model from 2 to 3 years, the authors retained last year's 2018 projection values and computed the 2019 projection values by assuming that the percentage change from 2018 to 2019 would equal the percentage change from 2017 to 2018. The authors anticipate that the technical complications will be overcome before the next partial assessment is conducted. New data in the 2017 assessment included updated 2016 catch and estimated 2017 catch. No changes were made to the assessment model. A new feature included in the "off-year" assessments was a time series of exploitation rate (i.e., catch/biomass).

Spawning biomass and stock trends

Spawning biomass was at a low in 2008, but has increased continuously since then. The 2001-2005 year classes are all estimated to be above average; however, the spawning biomass has peaked and is now projected to be declining. The stock assessment model projects a 2018 spawning biomass of 472,200 t. This. The projected spawning biomass for 2019 is 413,300 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 2018 is projected to be well above the B_{MSY} estimate of 257,000, placing northern rock sole in sub-tier "a" of Tier 1. The Tier 1 2018 ABC harvest recommendation is 143,100 t (F_{ABC} = 0.155) and the 2018 OFL is 147,300 t (F_{OFL} = 0.160). The 2019 ABC and OFL values are 132,000 t and 136,000 t, respectively. Recommended ABCs correspond to the maximum permissible levels.

This is a stable fishery that lightly exploits the stock. Usually the average catch/biomass ratio is about 3-4 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 2017 and 2018 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Age 3+ Biomass	OFL	ABC	TAC	Catch
BSAI	2016	737,777	79,562	66,250	21,000	10,384
	2017	747,557	81,654	68,278	14,500	8,879
	2018	762,513	79,862	66,773	n/a	n/a
	2019	777,961	78,036	65,227	n/a	n/a

The Flatfish Flexibility Exchange Program decreased the TAC from 21,000 t to 15,163 t in 2016, and as of November 17, 2017 the TAC decreased from 14,500 t to 14,076 t in 2017.

Changes from previous assessment

This chapter was presented in a "partial assessment" format because it was a scheduled "off-year" assessment under the new Stock Assessment Prioritization guidelines. Therefore, only the projection model was run, with updated catches. New data in the 2017 assessment included updated 2016 catch and estimated 2017 and 2018 catches. No changes were made to the assessment model. A new feature included in the "off-year" assessments was a time series of exploitation rate (i.e., catch/biomass).

Changes to the input data in this analysis include:

- 2017 catch biomass was added to the model
- 2016 catch biomass was updated to reflect October – December 2015 catches

Spawning biomass and stock trends

Age 3+ biomass has declined slowly since the mid 1990's (20% overall), but show a steady increase since 2016. Estimates for 2019 show continued increases are likely.

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 $B_{40\%}$=129,175 t, $F_{40\%}$=0.34, and $F_{35\%}$=0.41. Because projected spawning biomass for 2018 (214,124 t) is above $B_{40\%}$, flathead sole is in Tier 3a. The authors and Team recommend setting ABCs for 2018 and 2019 at the maximum permissible values under Tier 3a, which are 66,773 t and 65,227 t, respectively. The 2018 and 2019 OFLs under Tier 3a are 79,862 t and 78,036 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 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Age 3 + Biomass	OFL	ABC	TAC	Catch
BSAI	2016	468,100	49,000	41,000	14,500	12,957
	2017	412,600	42,800	36,000	13,000	15,549
	2018	417,300	41,170	34,590	n/a	n/a
	2019	412,000	38,800	32,700	n/a	n/a

Changes from previous assessment

Changes to the input data in this full analysis include:

- Estimates of catch (t) and discards for 2016-2017
- 2017 shelf trawl survey biomass estimates and standard errors
- 2017 survey length composition
- 2016 survey age composition
- 2016 fishery length composition
- No modifications were made for this assessment methodology.

Spawning biomass and stock trends

The assessment indicates that above average recruitment strength in 1998 and exceptionally strong recruitment in 2001 and 2002 have contributed to the recent high level of female spawning biomass. The spawning stock biomass is projected to decline as these year classes exit the population.

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 current estimates are $B_{40\%}$ = 126,900 t, $F_{40\%}$ = 0.124, and $F_{35\%}$ = 0.149. Given that the projected 2018 spawning biomass of 191,460 t exceeds $B_{40\%}$, the ABC and OFL recommendations for 2018 were calculated under sub-tier "a" of Tier 3. Projected harvesting at the $F_{40\%}$ level gives a 2018 ABC of 34,590 t and a 2019 ABC of 32,700 t. The recommended Tier 3a OFLs are 41,170 t and 38,800 t for 2018 and 2019, respectively.

Status determination

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

11. Other Flatfish complex [from the 2016 Assessment]

In accordance with the approved schedule, no assessment was conducted for other flatfish this year, however, a full stock assessment will be conducted in 2018. Until then, the values generated from the previous stock assessment (below) will be rolled over for 2018 specifications. Additional information listed below summarizes the 2016 assessment.

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 2017 and 2018 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Total Biomass	OFL	ABC	TAC	Catch
BSAI	2016	102,300	17,414	13,061	2,500	2,847
	2017	113,450	17,591	13,193	2,500	4,121
	2018	113,450	17,591	13,193		
	2019	113,450	17,591	13,193		

In 2016, the other flatfish TAC increased to 2,862 t after a reallocation of 362 t from the non-specified reserves.

Changes from previous assessment

The assessment incorporates 2015 and 2016 total and discarded catch and 2016 EBS shelf trawl survey biomass, 2016 AI trawl survey biomass, and 2016 EBS slope trawl survey biomass. There were no changes to the assessment methodology.

Spawning biomass and stock trends

EBS shelf survey biomass estimates for this complex were all below 100,000 t from 1983-2003, and reached a high of 150,480 t in 2006. The EBS and AI survey estimate for 2016 was 113,450 t, about 10% above that of last year. 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.

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) borrowed from the Gulf of Alaska are used, along with a value of 0.15 for all other species in the complex. Projected harvesting at the 0.75 *M* level (biomass-weighted) average F_{ABC} = 0.117) gives a 2017 ABC of 13,193 t for the "other flatfish" complex. The corresponding 2016 OFL (average F_{OFL} = 0.155) is 17,591 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 2018 and 2019 are those recommended by the Team. Catch data are current through November 4, 2017.

Area	Year	Age 3+ Bio	OFL	ABC	TAC	Catch
BSAI	2016	557,886	40,529	33,320	31,900	31,319
	2017	767,767	53,152	43,723	34,900	32,144
	2018	749,925	51,675	42,509		n/a
	2019	734,431	50,098	41,212		n/a
Eastern Bering Sea	2016			8,353	8,000	8,221
	2017			12,199	11,000	8,904
	2018			11,861	n/a	n/a
	2019			11,499	n/a	n/a
Eastern Aleutian Islands	2016			7,916	7,900	7,444
	2017			10,307	7,900	7,486
	2018			10,021	n/a	n/a
	2019			9,715	n/a	n/a
Central Aleutian Islands	2016			7,355	7,000	4,765
	2017			8,009	7,000	6,868
	2018			7,787	n/a	n/a
	2019			7,549	n/a	n/a
Western Aleutian Islands	2016			9,696	9,000	8,888
	2017			13,208	9,000	8,886
	2018			12,840	n/a	n/a
	2019			12,449	n/a	n/a

Changes from previous assessment

This chapter was presented in a "partial assessment" format because it was a scheduled "off-year" assessment under the new Stock Assessment Prioritization guidelines. Therefore, only the projection model was run, with updated catches. New data in the 2017 assessment included updated 2016 catch and estimated 2017 and 2018 catches. No changes were made to the assessment model. A new feature included in the "off-year" assessments was a figure describing exploitation rate (i.e., catch/biomass).

Spawning biomass and stock trends

The survey biomass estimates in the Aleutian Islands were high in 2016. New projections were very similar to last year's projections because observed catches were very similar to the estimated catches used last year. Spawning biomass is projected to be 305,804 t in 2018 and to decline to 295,593 t in 2019. Exploitation rates by area since 2004 appeared to be low in all areas.

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 Pacific ocean perch for management under Tier 3. The current estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ are 214,685 t, 0.082, and 0.101, respectively. Spawning biomass for 2018 (305,804 t) is projected to exceed $B_{40\%}$, thereby placing POP in sub-tier "a" of Tier 3. The 2018 and 2019 catches associated with the $F_{40\%}$ level of 0.082 are 42,509 t and 41,212 t, respectively, and are the authors' and Team's recommended ABCs. The 2018 and 2019 OFLs are 51,675 t and 50,098 t.

Area apportionment

The Team agreed with the author's recommendation that ABCs be set regionally based on the proportions in combined survey biomass as follows (values are for 2018): EBS = 11,861 t, Eastern Aleutians (Area 541) = 10,021 t, Central Aleutians (Area 542) = 7,787 t, and Western Aleutians (Area 543) = 12,840 t. The recommended OFL for 2018 and 2019 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 2018 and 2019 are those recommended by the Team. Catch data are current through November 4, 2017.

Area	Year	Age 3+ Biomass	OFL	ABC	TAC	Catch
BSAI	2016	213,674	14,689	11,960	4,500	4,541
	2017	248,160	16,242	13,264	5,000	4,201
	2018	246,160	15,888	12,975	n/a	n/a
	2019	244,963	15,563	12,710	n/a	n/a

Changes from previous assessment

This chapter was presented in a "partial assessment" format because it was a scheduled "off-year" assessment under the new Stock Assessment Prioritization guidelines. Therefore, only the projection model was run, with updated catches. New data in the 2017 assessment included updated 2016 catch and estimated 2017 and 2018 catches. No changes were made to the assessment model. A new feature included in the "off-year" assessments was a time series of exploitation rate (i.e., catch/biomass).

Spawning biomass and stock trends

New projections were slightly different from last year's projections because observed catches were quite different from the estimated catches used last year. Spawning biomass is projected to be 106,486 t in 2018 and to decline to 104,699 t in 2019. Exploitation rates by area since 2004 appeared to be low in all areas in most years.

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 northern rockfish for management under Tier 3. The current estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ are 65,870 t, 0.065, and 0.80, respectively. Spawning biomass for 2018 (106,486 t) is projected to exceed $B_{40\%}$, thereby placing POP in sub-tier "a" of Tier 3. The 2018 and 2019 catches associated with the $F_{40\%}$ level of 0.065 are 12,975 t and 12,710 t, respectively, and are the authors' and Team's recommended ABCs. The 2018 and 2019 OFLs are 15,888 t and 15,563 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

Status and catch specifications (t) of blackspotted and rougheye rockfish complex 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 2018 and 2019 are those recommended by the Team. Catch data are current through November 4, 2017.

Area/subarea	Year	Total Biomass (t)*	OFL	ABC	TAC	Catch
BSAI	2016	43,944	693	561	300	157
	2017	35,669	612	501	225	183
	2018	37,453	749	613	n/a	n/a
	2019	39,169	829	678	n/a	n/a
Western/ Central Aleutian Islands	2016			382	200	87
	2017			195	125	132
	2018			239	n/a	n/a
	2019			264	n/a	n/a
Eastern AI/ Eastern Bering Sea	2016			179	100	71
	2017			306	100	51
	2018			374	n/a	n/a
	2019			414	n/a	n/a

*For 2016, the total biomass is from the AI age-structured model, and survey biomass estimates from EBS. For 2017-2019, the total biomass is from a BSAI age-structured model.

Changes from previous assessment

This chapter is a partial assessment and update of the 2016 full assessment and the author recommends that Tier 3 age-structured model be applied to the BSAI whereas previously the model was only used for the AI portion of the assessment. New data included updated catch for 2016 and estimated catches for 2017 - 2019.

Spawning biomass and stock trends

Spawning biomass for BSAI blackspotted/rougheye rockfish in 2018 is projected to be 8,208 t and is projected to increase. This increasing trend is supported by evidence of several large recruitments in the 2000s. The most recent survey in the AI (2016) increased substantially from the low estimate in 2014.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

For the BSAI, 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 2018 of 8,208 t is less than $B_{40\%}$, (8,311 t) the stock qualifies as Tier 3b but is projected to be in Tier 3a in 2019 and the adjusted $F_{ABC} = F_{40\%}$ values for 2018 and 2019 are 0.044 and 0.045, respectively. The maximum permissible ABC for the Aleutian Islands is 501 t, which is the authors' and Team's recommendation for the AI portion of the 2018 ABC. The apportionment of 2018 ABC to subareas is 239 t for the Western and Central Aleutian Islands and 374 t for the Eastern Aleutian Islands and Eastern Bering Sea. The Team recommends an overall 2018 ABC of 613 t and a 2018 OFL of 749 t.

Area apportionment

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

	WAI	CAI
2018 MSSCs	35	204
2019 MSSCs	39	225

Status determination

The blackspotted and rougheye rockfish complex is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition. is overfished or whether it is approaching an overfished condition because it is managed under Tier 5.

15. Shortraker rockfish [from the 2016 Assessment]

In accordance with the approved schedule, no assessment was conducted for shortraker this year, however, a full stock assessment will be conducted in 2018. Until then, the values generated from the previous stock assessment (below) will be rolled over for 2018 specifications. Additional information listed below summarizes the 2016 assessment.

Status and catch specifications (t) of shortraker 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 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Survey Biomass	OFL	ABC	TAC	Catch
BSAI	2016	23,009	690	518	200	105
	2017	22,191	666	499	125	151
	2018	22,191	666	499	n/a	n/a
	2019	22,191	666	499	n/a	n/a

Changes from previous assessment

2016 is a full assessment for this Tier 5 stock; there were no changes in the assessment methodology. New data included updated catch from 2015, estimated catch for 2016 and the biomass estimates from the 2016 Aleutian Islands and Eastern Bering Sea slope surveys were added to the model.

The 2017 biomass estimate is based on the Aleutian Island survey data through 2016 as well as the 2002-2012, and 2016 eastern Bering Sea slope survey data. The 2014 eastern Bering Sea slope survey was cancelled. Prior to 2012, the EBS slope survey data had not been included in previous biomass estimates for this species.

Spawning biomass and stock trends

Estimated shortraker rockfish biomass in the BSAI has been relatively stable since 2002. Biomass estimates have decreased slightly from 23,009 t in the 2014 assessment to 22,191 t in the current assessment. For the period 2002-2016, EBS slope survey biomass estimates ranged from a low of 2,570 t in 2004 to a high of 9,299 t in 2012 with CVs at 0.22 and 0.57, respectively. For the period 1991-2016, the AI survey biomass estimates ranged from a low of 12,961 t in 2006 to a high of 38,487 t in 1997 with CVs at 0.23 and 0.26, respectively. According to the random effects model, total biomass (AI and EBS slope combined) from 2002-2016 has been very stable, ranging from a low of 21,214 t in 2006 to a high of 23,990 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 survey biomass estimates.

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 499 t for 2017 and 2018 and the OFL is 666 t for 2017 and 2018.

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 [from the 2016 assessment]

In accordance with the approved schedule, no assessment was conducted for shortraker this year, however, a full stock assessment will be conducted in 2018. Until then, the values generated from the previous stock assessment (below) will be rolled over for 2018 specifications. Additional information listed below summarizes the 2016 assessment.

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 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Survey Biomass	OFL	ABC	TAC	Catch
BSAI	2016	49,630	1,667	1,250	875	786
	2017	55,312	1,816	1,362	875	820
	2018	55,312	1,816	1,362	n/a	n/a
	2019	55,312	1,816	1,362	n/a	n/a
Eastern Bering Sea	2016	n/a	n/a	695	325	280
	2017	n/a	n/a	791	325	252
	2018	n/a	n/a	791	n/a	n/a
	2019	n/a	n/a	791	n/a	n/a
Aleutian Islands						
	2016	n/a	n/a	555	550	506
	2017	n/a	n/a	571	550	568
	2018	n/a	n/a	571	n/a	n/a
	2019	n/a	n/a	571	n/a	n/a

Changes from previous assessment

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

- Catch and fishery length data updated through October 2016
- Biomass estimates, catch per unit effort (CPUE), and length frequency compositions were included from the 2016 AI trawl survey, the 2016 EBS slope survey, and the 2015 and 2016 EBS shelf surveys.

There were no changes to the assessment methodology.

Spawning biomass and stock trends

This is a Tier 5 complex, thus trends in spawning biomass *per se* are unknown. However, the random effects biomass estimates for the short-spined thornyhead (SST) in the Aleutian Islands and EBS slope have been increasing. The non-SST portion of the complex also appears to be increasing, but only in the Aleutian Islands. Biomass estimates are often zero or very small for the non-SST portion of the complex in both the EBS slope and shelf surveys.

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 SST 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 2017 and 2018 ABCs of 791 t in the EBS and 571 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 1,816 t for 2017 and 2018.

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 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Age 1+ Biomass	OFL	ABC	TAC	Catch
BSAI	2016	672,184	104,749	90,340	55,000	54,485
	2017	598,791	102,700	87,200	65,000	63,657
	2018	599,000	108,600	92,000	n/a	n/a
	2019	600,440	97,200	84,400	n/a	n/a
E Aleutian Islands / EBS	2016	n/a	n/a	30,832	28,500	28,360
	2017	n/a	n/a	34,890	34,500	33,475
	2018	n/a	n/a	36,820	n/a	n/a
	2019	n/a	n/a	33,780	n/a	n/a
Central Aleutian Islands	2016	n/a	n/a	27,216	16,000	15,795
	2017	n/a	n/a	30,330	18,000	17,749
	2018	n/a	n/a	32,000	n/a	n/a
	2019	n/a	n/a	29,350	n/a	n/a
Western Aleutian Islands	2016	n/a	n/a	32,292	10,500	10,330
	2017	n/a	n/a	21,980	12,500	12,433
	2018	n/a	n/a	23,180	n/a	n/a
	2019	n/a	n/a	21,270	n/a	n/a

Changes from previous assessment

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

- Total 2016 year-end catch was updated, and the projected total catch for 2017 was set equal to the 2017 TAC.
- The 2016 fishery age composition data were added.
- The 2016 Aleutian Islands survey age composition estimates were added.

Methodological changes included the following:

- Refinements to the time-varying fishery selectivity inputs were made using the same statistical weighting ("Francis") method for the time-varying fishery selectivity variance term that was used for the survey age composition data.
- In the projection model:

- Catches for 2018 and 2019 were assumed to equal 75% of the BSAI-wide ABC, based on the effect of the revised Steller Sea Lion Reasonable and Prudent Alternatives that were implemented in 2015 (it was 62% in last year's assessment).

Spawning biomass and stock trends

Spawning biomass reached an all-time high in 2005, then decreased continuously through 2017 (the estimated spawning biomass is estimated to be roughly 50% of what it was in 2005). It is projected to decrease further, at least through 2018. The 1998-2001 year classes were all very strong, and the 2006 and 2007 year classes were above average. The addition of the 2016 fishery and survey age compositions information impacted the estimated magnitude of the 2011 year class which increased 14%, relative to last year's assessment, and the magnitude of the 2012 year class which increased 32% relative to last year assessment. The 2012 year class is now estimated to be slightly above average. The projected female spawning biomass for 2018 (139,300 t) is still above $B_{40\%}$ (122,860 t), and the stock is projected to remain above $B_{40\%}$ through the next several years.

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 2018 yield (ABC) at $F_{40\%}$ = 0.38 is 92,000 t, up 5% from the 2017 ABC and up 8% from last year's projected ABC for 2018. The projected 2018 overfishing level at $F_{35\%}$ = 0.46 is 108,600 t, up 5% from the 2017 OFL and up 8% from last year's projected OFL for 2018.

Area apportionment

As in last year's assessment, the standard Tier 5 random effects model was used to apportion the ABC among areas. The recommended ABC apportionments by subarea for 2018 are 36,820 t for Area 541 and the Bering Sea region (a 5% increase from 2017), 32,000 t for Area 542 (a 5% increase from 2017), and 23,180 t for Area 543 (a 5% increase from 2017).

Status determination

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

Ecosystem Considerations

As requested, this section was significantly expanded and updated. Temperature anomaly profiles from the 2016 Aleutian Island survey data appear to be some of the warmest on record. Temperature may affect recruitment of Atka mackerel and availability to the bottom trawl survey.

Atka mackerel is the most common prey item of the endangered western Steller sea lion throughout the year in the Aleutian Islands. Steller sea lion (SSL) surveys indicate slight population increases, except in the western Aleutians (area 543).

Regulations implemented in 2015 significantly adjusted SSL management measures that were in place from 2011-2014 and re-opened area 543 to directed fishing for Atka mackerel (but with a maximum TAC of 65% of the area ABC), removed the TAC reduction in area 542, and re-opened areas in 541 and 542 that had been closed to directed Atka mackerel fishing. Prior to 2011, a "platoon" system was in place that restricted the timing of fishing effort in the AI.

18. Skates

Status and catch specifications (t) of skates in recent years are below. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Age 0+ Biomass	OFL	ABC	TAC	Catch
BSAI	2016	631,614	50,215	42,134	26,000	29,125
	2017	605,617	49,063	41,144	26,000	28,389
	2018	578,436	46,668	39,082	n/a	n/a
	2019	552,375	44,202	36,957	n/a	n/a

For 2016, NMFS increased the TAC to 27,502 t with a reallocation of 1,502 t from the non-specified reserves.

Changes from previous assessment

This chapter was presented in the partial assessment format, as a scheduled "off-year" assessment. The following new data were updated for the Alaska skate projection model in this year's assessment:

- updated 2015, 2016 and preliminary 2017 catch
- 2017 EBS shelf survey data

No changes were made to the assessment model. The projection model for Alaska skate was re-run with the most recent catch data. The 2017 EBS shelf survey data were presented in the chapter, but the Tier 5 random effects model was not re-run for the other skates component of the assemblage.

Spawning biomass and stock trends

The 2017 biomass estimates from the EBS shelf survey for the aggregate skate complex increased from 2016. In the case of Alaska skates, survey biomass estimates, though variable, are basically trendless since species identification began in 1999. Model estimates of Alaska skate total biomass have declined for the last three years that the model covers (1992-2016).

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 2018 (107,136 t) exceeds $B_{40\%}$ (72,222 t), Alaska skates are managed in sub-tier "a" of Tier 3. Other reference points are $maxF_{ABC} = F_{40\%} = 0.079$ and $F_{OFL} = F_{35\%} = 0.092$. The Alaska skate portions of the 2018 and 2019 ABCs are 31,572 t and 29,447 t, respectively, and the Alaska skate portions of the 2018 and 2019 OFLs are 36,655 t and 34,189 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 2018 and 2019 ABCs is 7,510 t for both years and the "other skates" portion of the 2017 and 2018 OFLs is 10,013 t for both years.

For the skate complex as a whole, OFLs for 2018 and 2019 total 46,668 t and 44,202 t, respectively, and ABCs for 2018 and 2019 total 39,082 t and 36,957 t, respectively.

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 is not being subjected to overfishing.

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 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Biomass	OFL	ABC	TAC	Catch
BSAI	*2016	180,570	52,365	39,725	4,500	4,892
	2017	199,937	56,582	42,387	4,500	5,035
	2018	188,656	53,201	39,995	n/a	n/a
	2019	188,656	53,201	39,995	n/a	n/a

*For 2016, NMFS increased the BSAI TAC to 4,625 t with a reallocation of 125 t from the non-specified reserves.

Changes from previous assessment

This chapter was presented in a "partial assessment" format because it was a scheduled "off-year" assessment under the new Stock Assessment Prioritization guidelines. The random effects model was re-run with new survey data. No changes were made to the assessment model. A new feature included in the "off-year" assessments was a time series of exploitation rate (i.e., catch/biomass).

Spawning biomass and stock trends

The biomass changed for one species, plain sculpin, which declined from 53,570 t in 2016 to 33,962 t in 2017. The 5-year average (2012-2016) for plain sculpin was 56,951 t so the 2017 estimate appears to be a decline. Catch and retention for BSAI sculpin has been updated for 2017. Catches appear stable, with 4,967 t in 2015, 4,892 t in 2016, and 5,035 t in 2017 (through November 4, 2017). Retention is low at about 2%. The catch to biomass ratio has been stable with catch to biomass at 2% in those years,

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The BSAI sculpin complex is managed as a Tier 5 stock. The recommended ABCs and OFLs for 2018 and 2019 are 39,995 t and 53,201 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 [from the 2016 Assessment]

In accordance with the approved schedule, no assessment was conducted for sharks this year, however, a full stock assessment will be conducted in 2018. Until then, the values generated from the previous stock assessment (below) will be rolled over for 2018 specifications. Additional information listed below summarizes the 2016 assessment.

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 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Biomass	OFL	ABC	TAC	Catch
BSAI	2016	n/a	1,363	1,022	125	127
	2017	n/a	689	517	125	178
	2018	n/a	689	517	n/a	n/a
	2019	n/a	689	517	n/a	n/a

For 2016, NMFS increased the TAC to 130 t with a reallocation of 5 t from the non-specified reserves.

Changes from previous assessment

Total catch is updated for 2015 and 2016 (as of Oct 3, 2016). The IPHC survey RPNs are updated through 2015. The biomass estimates have been updated for the Aleutian Islands and EBS shelf/slope surveys through 2016.

Changes in assessment methodology

The 2016 SAFE uses a new time series of catch for calculating OFL and ABC. The OFL equals maximum catch (2003–2015) and ABC equals 0.75*OFL, rather than the OFL equal to maximum catch from the years 1997–2007. This decreases the OFL and ABC, but TAC and catch has been well below these new amounts.

Spawning biomass and stock trends

The main shark species taken in the BSAI fisheries (mainly pollock and Pacific 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. However, 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. The authors plan to continue studies to investigate stock structure of Pacific sleeper sharks and further investigate methods for assessing size and maturity for sharks caught in both survey and commercial fishing operations. Recent catch levels have been well below the 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. The authors reviewed the catch history and found an unreasonably high estimate from a shark observation in 2002. Based on the increased species identification and better catch estimates from the restructured observer program in the catch accounting system, the Team recommended not including catch data prior to 2003 and setting OFL at the maximum catch during 2003–2015 (689 t), and ABC at 75 percent of OFL, 517 t.

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 [from the 2016 Assessment]

In accordance with the approved schedule, no assessment was conducted for squid this year, however, a full stock assessment will be conducted in 2018. Until then, the values generated from the previous stock assessment (below) will be rolled over for 2018 specifications. Additional information listed below summarizes the 2016 assessment.

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 2017 and 2018 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Biomass	OFL	ABC	TAC	Catch
BSAI	2016	n/a	6,912	5,184	1,500	1,378
	2017	n/a	6,912	5,184	1,342	2,099
	2018	n/a	6,912	5,184	n/a	n/a
	2019	n/a	6,912	5,184	n/a	n/a

In 2015, the squids TAC increased to 1,970 t after a reallocation of 1,570 t from the non-specified reserves.

Changes from previous assessment

The author presented updated survey biomass estimates and size compositions from the 2015 and 2016 eastern Bering Sea trawl survey, 2016 EBS slope survey, and the 2016 AI trawl survey and the fishery. Additional information has also been provided on the ecology of different squid species, an exploration of CPUE and effort during the early part of the historical catch time series (1977-1990), and discussion of the implications of basing catch limits on historical catch. A range of approaches that have been previously considered were outlined again with further discussion of the issues and relative merits of each approach.

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. As with last year, the Team recommends an OFL based on the use of an alternativ period (1977-1981) which may be more representative of incidental catch levels. This leads to an OFL = 6,912 t and an ABC of 5,184 t.

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 [from the 2016 Assessment]

In accordance with the approved schedule, no assessment was conducted for octopus this year, however, a full stock assessment will be conducted in 2018. Until then, the values generated from the previous stock assessment (below) will be rolled over for 2018 specifications. Additional information listed below summarizes the 2016 assessment.

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 2018 and 2019 are those recommended by the Plan Team. Catch data are current through November 4, 2017.

Area	Year	Biomass	OFL	ABC	TAC	Catch
BSAI	2016	n/a	3,452	2,589	400	594
	2017	n/a	4,769	3,576	400	208
	2018	n/a	4,769	3,576	n/a	n/a
	2019	n/a	4,769	3,576	n/a	n/a

For 2016, NMFS increased the TAC to 500 t with a reallocation of 100 t from the non-specified reserves.

Changes from previous 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. New Pacific cod stomach data through 2015 were added. Recent increases in both Pacific cod and percentage of octopus in Pacific cod diet increased the annual consumption estimates from 2009-2015

In addition to the new cod stomach data described above, the following new data were included in this year's assessment:

- Updated 2015 and preliminary 2016 catch
- 2016 EBS shelf survey, EBS slope survey, and Aleutian Islands survey biomass estimates

Spawning biomass and stock trends

All of the estimated survey biomass estimates in 2016 were at or higher than in all the previous surveys.The substantial recent increase in octopus biomass in 2015 and 2016 also appeared in the Gulf of Alaska. 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 2011, 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 2017 and 2018 with additional years from 1984-2015 of Pacific cod diet data based on the requested five-year review of Pacific cod diet estimates.

The 2012 and 2013 Pacific cod diet data were not available for this assessment. The author will include them when they become available. The ABC and OFL estimates increased based on the increase in Pacific cod and more octopus in Pacific cod stomach samples. The recommended ABCs and OFLs for 2017 and 2018 are 3,576 t and 4,769 t, respectively.

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. Forage Fish

A report on the status of forage species in the Bering Sea and Aleutian Islands is prepared on a biennial basis. While not a formal stock assessment, forage populations are analyzed if data are available. The forage fish category in the BSAI Groundfish FMP includes the following species or groups of species: 1) more than 50 species in the "forage fish group" that are listed in an appendix of the assessment; 2) Pacific herring *Clupea pallasiii*; 3) juvenile groundfishes and salmon; 4) shrimps; 5) squids; and 6) Arctic cod *Boreogadus saida*. Species in the forage fish category have been identified as having ecological importance as prey, and directed fishing is prohibited for the group. As of 2011, the forage fish category in the BSAI Groundfish FMP is managed within the "ecosystem component" of the FMP. The report includes an analysis of temporal and spatial trends in three of the most important forage species (capelin, eulachon, Pacific herring), a more detailed bycatch section particularly on Pacific herring and a 'data gaps and research priorities' section.

Table 1. BSAI Groundfish Plan Team Recommended OFLs and ABCs for 2018 and 2019 (metric tons); OFL, ABC, TAC and catch through November 4, 2017.

November BSAI Plan Team Proposed OFL and ABC Recommendations (metric tons) for 2

		2017			Catch as of	2018 draft SAFE		2019 draft SAFE	
Species	Area	OFL	ABC	TAC	11/4/2017	OFL	ABC	OFL	ABC
Pollock	EBS	3,640,000	2,800,000	1,345,000	1,356,259	4,797,000	2,592,000	4,592,000	2,467,000
	AI	43,650	36,061	19,000	1,492	49,289	40,788	37,431	30,803
	Bogoslof	130,428	60,800	500	186	130,428	60,800	130,428	60,800
Pacific cod	BS	284,000	239,000	223,704	196,761	238,000	188,000	201,000	170,000
	AI	28,700	21,500	15,695	12,286	28,700	21,500	28,700	21,500
Sablefish	BS	1,499	1,274	1,274	1,150	2,887	1,464	4,576	2,061
	AI	2,044	1,735	1,735	588	3,917	1,988	6,209	2,798
Yellowfin sole	BSAI	287,000	260,800	154,000	125,620	306,700	277,500	295,600	267,500
Greenland turbot	BSAI	11,615	6,644	4,500	2,813	13,148	11,132	13,540	11,473
	BS	n/a	5,800	4,375	2,691	n/a	9,718	n/a	10,016
	AI	n/a	844	125	122	n/a	1,414	n/a	1,457
Arrowtooth flounder	BSAI	76,100	65,371	14,000	6,189	76,757	65,932	75,084	64,494
Kamchatka flounder	BSAI	10,360	8,880	5,000	4,462	11,347	9,737	12,022	10,317
Northern rock sole	BSAI	159,700	155,100	47,100	35,123	147,300	143,100	136,000	132,000
Flathead sole	BSAI	81,654	68,278	14,500	8,879	79,862	66,773	78,036	65,227
Alaska plaice	BSAI	42,800	36,000	13,000	15,549	41,170	34,590	38,800	32,700
Other flatfish	BSAI	17,591	13,193	2,500	4,121	17,591	13,193	17,591	13,193
Pacific Ocean perch	BSAI	53,152	43,723	34,900	32,144	51,675	42,509	50,098	41,212
	BS	n/a	12,199	11,000	8,904	n/a	11,861	n/a	11,499
	EAI	n/a	10,307	7,900	7,486	n/a	10,021	n/a	9,715
	CAI	n/a	8,009	7,000	6,868	n/a	7,787	n/a	7,549
	WAI	n/a	13,208	9,000	8,886	n/a	12,840	n/a	12,449
Northern rockfish	BSAI	16,242	13,264	5,000	4,679	15,888	12,975	15,563	12,710
Blackspotted/Rougheye rockfish	BSAI	612	501	225	197	749	613	829	678
	EBS/EAI	n/a	306	100	64	n/a	374	n/a	414
	CAI/WAI	n/a	195	125	133	n/a	239	n/a	264
Shortraker rockfish	BSAI	666	499	125	151	666	499	666	499
Other rockfish	BSAI	1,816	1,362	875	820	1,816	1,362	1,816	1,362
	BS	n/a	791	325	252	n/a	791	n/a	791
	AI	n/a	571	550	568	n/a	571	n/a	571
Atka mackerel	BSAI	102,700	87,200	65,000	63,657	108,600	92,000	97,200	84,400
	EAI/BS	n/a	34,890	34,500	33,475	n/a	36,820	n/a	33,780
	CAI	n/a	30,330	18,000	17,749	n/a	32,000	n/a	29,350
	WAI	n/a	21,980	12,500	12,433	n/a	23,180	n/a	21,270
Skates	BSAI	49,063	41,144	26,000	28,389	46,668	39,082	44,202	36,957
Sculpins	BSAI	56,582	42,387	4,500	5,035	53,201	39,995	53,201	39,995
Sharks	BSAI	689	517	125	178	689	517	689	517
Squids	BSAI	6,912	5,184	1,342	2,099	6,912	5,184	6,912	5,184

Sources: 2016 OFLs, ABCs, and TACs and 2017 OFLs and ABCs are from harvest specifications adopted by the Council in December 2015 and December 2016, respectively; 2016 catches through December 31, 2016 and 2017 catches through November 4, 2017 from AKR Catch Accounting.

Table 2. 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 2018-2019. Stock-specific max ABC and ABC are in metric tons, reported to three significant digits (four significant digits are used EBS pollock and when a stock-specific ABC is apportioned among areas on a percentage basis). Fishing mortality rates are reported to two significant digits.

Species or Complex	Area	2018					
		Tier	max F_{ABC}	F_{ABC}	max ABC	ABC	% Red.
Pollock	EBS	1a	0.466	0.336	3,598,000	2,592,000	28%
Pollock	BOG	5	0.225	0.12	97,821	60,800	38%
Pacific cod	EBS	3a	0.31	0.29	201,000	188,000	6%
Sablefish	BSAI	3b	0.086	0.077	3,531	3,452	2%
Species or Complex	**Area**	**2019**					
		Tier	**max F_{ABC}**	**F_{ABC}**	**max ABC**	**ABC**	**% Red.**
Pollock	EBS	1a	0.622	0.336	3,445,000	2,467,000	28%
Pollock	BOG	5	0.225	0.12	97,821	60,800	38%
Sablefish	BSAI	3b	0.096	0.085	4,970	4,859	2%

Table 3. 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 2018 and 2019. "Biomass" corresponds to projected January abundance for the age+ range reported in the summary. Stock-specific biomass, OFL, and ABC are in metric tons.

			2018					2019			
Species or Complex	**Tier**	**Area**	**Biomass**	**OFL**	**ABC**	F_{OFL}	F_{ABC}	**OFL**	**ABC**	F_{OFL}	F_{ABC}
Pollock	1a	EBS	10,967,000	4,797,000	2,592,000	0.622	0.336	4,592,000	2,467,000	0.622	0.336
	3b	AI	272,675	49,289	40,788	0.397	0.319	49,291	30,803	0.341	0.273
	5	Bogoslof	434,760	130,428	60,800	0.300	0.120	130,428	60,800	0.300	0.120
Pacific cod	3a	BS	918,000	238,000	188,000	0.380	0.290	201,000	170,000	0.380	0.310
	5	AI	79,600	28,700	21,500	0.380	0.285	28,700	21,500	0.380	0.285
Sablefish	3b	BS	94,000	2,887	1,464	0.086	0.077	4,576	2,061	0.096	0.085
	3b	AI	65,000	3,917	1,988	0.086	0.077	6,209	2,798	0.096	0.085
Yellowfin sole	1a	BSAI	2,290,000	306,700	277,500	0.120	0.109	295,600	267,500	0.120	0.109
Greenland turbot	3a	BSAI	126,417	13,148	11,132	0.290	0.180	13,540	11,473	0.220	0.180
Arrowtooth flounder	3a	BSAI	785,141	76,757	65,932	0.151	0.129	75,084	64,494	0.151	0.129
Kamchatka flounder	3a	BSAI	189,868	11,347	9,737	0.075	0.064	12,022	10,317	0.075	0.064
Northern rock sole	1a	BSAI	923,200	147,300	143,100	0.160	0.155	136,000	132,000	0.160	0.155
Flathead sole	3a	BSAI	762,513	79,862	66,773	0.410	0.340	78,036	65,227	0.410	0.340
Alaska plaice	3a	BSAI	417,300	41,170	34,590	0.149	0.124	38,800	32,700	0.149	0.124
Other flatfish	5	BSAI	113,450	17,591	13,193	0.17/.085/.15	.128/.064/.113	17,591	13,193	0.17/.085/.15	.128/.064/.113
Pacific ocean perch	3a	BSAI	749,925	51,675	42,509	0.101	0.082	50,098	41,212	0.101	0.082
Northern rockfish	3a	BSAI	246,160	15,888	12,975	0.080	0.065	15,563	12,710	0.080	0.065
Shortraker rockfish	5	BSAI	22,191	666	499	0.030	0.0225	666	499	0.030	0.0225
Blackspotted/Rougheye	3a	BSAI	37,453	749	613	0.054	0.044	829	678	0.055	0.045
Other rockfish	5	BSAI	55,353	1,816	1,362	.03/.09	0.0225/.0675	1,816	1,362	.03/.09	0.0225/.0675
Atka mackerel	3a	BSAI	599,000	108,600	92,000	0.460	0.380	97,200	84,400	0.460	0.380
Skate	3a/5	BSAI	578,436	46,668	39,082	0.092/0.100	0.079/.075	44,202	36,957	0.092/.100	0.079/.075
Sculpin	5	BSAI	188,656	53,201	39,995	0.282	0.212	53,201	39,995	0.282	0.212
Shark	6	BSAI	n/a	689	517	n/a	n/a	689	517	n/a	n/a
Squid	6	BSAI	n/a	6,912	5,184	n/a	n/a	6,912	5,184	n/a	n/a
Octopus	6	BSAI	n/a	4,769	3,576	n/a	n/a	4,769	3,576	n/a	n/a
Total		**BSAI**	**20,916,098**	**6,235,729**	**3,766,809**			**5,954,822**	**3,578,956**		

Table 4. Groundfish catches (metric tons) in the eastern Bering Sea, 1954-2017.

Year	Pollock	Pacific Cod	Sablefish	Yellowfin Sole	Greenland Turbot	Arrowtooth Flounder/a	Kamchatka Flounder/b	Rock Sole	Flathead Sole	Alaska Plaice	Other Flatfish/c
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	810,390	142,868	755	118,624	2,273	14,782		52,644	20,097	16,165	2,158
2011	1,199,216	209,222	705	151,166	3,136	16,864	4,478	60,353	13,546	23,655	3,121
2012	1,205,276	232,674	743	147,186	3,058	18,978	2,510	75,777	11,355	16,612	3,501
2013	1,270,823	236,700	634	164,944	1,449	14,056	2,110	59,590	17,344	23,522	1,501
2014	1,297,846	238,735	315	156,772	1,479	14,928	3,268	51,569	16,505	19,447	4,340
2015	1,322,312	232,832	210	126,937	2,090	10,330	3,386	45,347	11,293	14,614	2,386
2016	1,353,711	231,511	532	135,350	2,117	9,777	3,165	44,860	10,358	13,385	2,827
2017/f	1,356,445	196,761	1,150	125,620	2,691	5,680	3,166	34,877	8,859	15,549	4,089

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69. Note: Numbers don't include fish taken for research.
b/ Kamchatka flounder included in Arrowtooth flounder prior to 2011.
c/ Rock sole prior to 1991 and flathead sole prior to 1995 are included in other flatfish catch statistics.
d/ Includes POP, northern, rougheye, shortraker, and sharpchin rockfish until 2004.
e/ Octopus, sculpin, sharks, skates included in Other species prior to 2011.
f/ Data through November 4, 2017.

Table 4 *(continued)*. Groundfish catches (metric tons) in the eastern Bering Sea, 1954-2017.

Year	POP Complex/d	POP	N. Rockfish	RE Rockfish	BS/SR Rockfish	Other Rockfish	Atka Mack.	Other Species/e	Skate	Sculpin	Shark	Squid	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	151	20,697				305		1,206,215
2011		5,601	196	36	106	328	1,217		22,422	4,872	103	237	576	1,721,158
2012		5,589	91	17	117	211	966		23,740	4,991	94	560	126	1,754,172
2013		5,051	137	26	104	191	147		25,972	5,222	99	158	185	1,829,966
2014		7,437	147	23	96	323	136		26,326	4,487	134	1,568	410	1,846,290
2015		7,918	199	31	75	185	267		26,871	4,055	103	2,281	423	1,814,145
2016		8,221	208	41	51	280	360		27,952	4,381	117	1,328	585	1,851,117
2017/f		8,904	218	32	89	252	255		27,002	4,152	174	2,057	187	1,798,209

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69. Note: Numbers don't include fish taken for research.
b/ Kamchatka flounder included in Arrowtooth flounder prior to 2011.
c/ Rock sole prior to 1991 and flathead sole prior to 1995 are included in other flatfish catch statistics.
d/ Includes POP, northern, rougheye, shortraker, and sharpchin rockfish until 2004.
e/ Octopus, sculpin, sharks, skates included in Other species prior to 2011.
f/ Data through November 4, 2017.

Table 5. Groundfish catches (metric tons) in the Aleutian Islands, 1954-2017.

Year	Pollock	Pacific Cod	Sable fish	Yellowfin Sole	Greenland Turbot	Arrowtooth Flounder/a	Kamchatka Flounder/b	Rock Sole	Flathead Sole	Alaska Plaice	Other Flatfish/c
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	1,546	4	895	900		236			68
1993	57,184	34,234	2,078	0	2,138	1,348		318			59
1994	58,708	22,421	1,771	0	3,168	1,334		308			55
1995	64,925	16,534	1,119	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	1,070	13	1,086	1,157		480	80		32
2001	824	34,207	1,074	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	1,100	1	2,263	10,688		570	23	0	45
2010	1,235	29,001	1,097	0	1,873	24,098		577	29		41
2011	1,208	10,858	1,024	1	532	3,269	5,493	279	7		56
2012	975	18,220	1,205	1	1,658	3,400	6,995	322	12	0	42
2013	2,964	13,607	1,062	0	296	6,485	5,656	210	10	0	35
2014	2,375	10,595	818	0	177	4,181	3,190	155	9	0	51
2015	915	9,225	430	0	114	937	1,608	120	14	0	29
2016	1,257	12,359	349	0	121	1,328	1,685	241	26	0	21
2017/f	1,492	12,286	588	1	122	509	1,296	246	19	0	32

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69. Note: Numbers don't include fish taken for research.
b/ Kamchatka flounder included in Arrowtooth flounder prior to 2011.
c/ Rock sole prior to 1991 and flathead sole prior to 1995 are included in other flatfish catch statistics.
d/ Includes POP, northern, rougheye, shortraker, and sharpchin rockfish until 2004.
e/ Octopus, sculpin, sharks, skates included in Other species prior to 2011.
f/ Data through November 4, 2017.

Table 5 *(continued)*. Groundfish catches (metric tons) in the Aleutian Islands, 1954-2017.

Year	POP Complex/d	POP	N. Rockfish	RE Rockfish	BS/SR Rockfish	Other Rockfish	Atka Mack.	Other Species/e	Skate	Sculpin	Shark	Squid	Octopus	Total (All Species)
1954														0
1955														0
1956														0
1957														0
1958														0
1959														0
1960														0
1961														0
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		148,446
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	46,863		1,083	808	2	128	11	103,804
2013		26,311	1,900	296	267	623	23,034		1,058	606	17	141	39	84,619
2014		24,944	2,195	173	101	621	30,815		1,185	373	3	110	18	82,089
2015		23,507	6,998	150	78	501	53,003		1,252	925	4	83	23	99,916
2016		23,097	4,333	117	54	506	54,125		1,174	511	11	50	10	101,375
2017/f		23,240	4,461	165	62	568	63,401		1,387	882	4	42	21	110,824

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69. Note: Numbers don't include fish taken for research.
b/ Kamchatka flounder included in Arrowtooth flounder prior to 2011.
c/ Rock sole prior to 1991 and flathead sole prior to 1995 are included in other flatfish catch statistics.
d/ Includes POP, northern, rougheye, shortraker, and sharpchin rockfish until 2004.
e/ Octopus, sculpin, sharks, skates included in Other species prior to 2011.
f/ Data through November 4, 2017.

Table 6. Groundfish catches (metric tons) in the Bering Sea and Aleutian Islands, 1954-2017.

Year	Pollock	Pacific Cod	Sablefish	Yellowfin Sole	Greenland Turbot	Arrowtooth Flounder/a	Kamchatka Flounder/b	Rock Sole	Flathead Sole	Alaska Plaice	Other Flatfish/c
1954	0	0	0	12,562	0	0	0	0		0	0
1955	0	0	0	14,690	0	0	0	0		0	0
1956	0	0	0	24,697	0	0	0	0		0	0
1957	0	0	0	24,145	0	0	0	0		0	0
1958	6,924	171	6	44,153	0	0	0	0		0	0
1959	32,793	2,864	289	185,321	0	0	0	0		0	0
1960	0	0	1,861	456,103	36,843	0	0	0		0	0
1961	0	0	15,627	553,742	57,348	0	0	0		0	0
1962	0	0	25,989	420,703	58,226	0	0	0		0	0
1963	0	0	14,370	85,810	31,572	0	0	0		0	35,643
1964	174,792	13,649	5,086	111,177	34,233	0	0	0		0	30,604
1965	230,551	15,170	6,087	53,810	10,047	0	0	0		0	11,686
1966	261,678	18,354	10,846	102,353	13,105	0	0	0		0	24,864
1967	550,362	32,357	13,350	162,228	24,263	0	0	0		0	32,109
1968	702,181	58,191	6,047	84,189	35,445	0	0	0		0	29,647
1969	862,789	50,571	17,682	167,134	36,257	0	0	0		0	34,749
1970	1,256,565	70,377	12,985	133,079	19,976	12,872	0	0		0	64,690
1971	1,743,763	45,132	18,042	160,399	42,214	19,373	0	0		0	92,452
1972	1,874,534	43,340	16,289	47,856	77,384	14,446	0	0		0	76,813
1973	1,758,919	54,363	8,859	78,240	63,946	12,922	0	0		0	43,919
1974	1,588,390	63,841	6,735	42,235	78,442	24,668	0	0		0	37,357
1975	1,356,736	54,389	4,513	64,690	67,789	21,616	0	0		0	20,393
1976	1,177,822	54,671	4,582	56,221	62,590	19,176	0	0		0	21,746
1977	985,995	36,597	4,615	58,373	30,161	11,489	0	0		0	14,393
1978	985,713	45,838	2,013	138,433	42,189	10,140	0	0		0	21,040
1979	923,385	39,354	2,158	99,017	41,409	14,357	0	0		0	19,724
1980	1,016,435	51,649	2,480	87,391	52,553	18,364	0	0		0	20,406
1981	1,029,021	62,458	3,137	97,301	57,321	17,113	0	0		0	23,428
1982	1,013,942	56,566	4,139	95,712	52,122	11,518	0	0		0	23,809
1983	1,041,389	93,167	3,368	108,385	47,558	13,969	0	0		0	30,454
1984	1,180,617	133,160	3,328	159,526	23,120	9,452	0	0		0	44,286
1985	1,238,489	145,426	3,796	227,107	14,731	7,375	0	0		0	71,179
1986	1,235,090	140,887	6,546	208,597	9,864	6,903	0	0		0	76,328
1987	1,266,317	157,746	8,012	181,429	9,599	4,539	0	0		0	50,372
1988	1,271,000	197,891	6,608	223,156	7,108	5,883	0	0		0	137,418
1989	1,386,000	168,918	4,500	153,165	8,822	3,222	0	0		0	63,452
1990	1,426,000	171,008	4,445	80,584	9,620	4,232	0	0		0	22,568
1991	1,346,464	172,158	3,199	96,135	6,878	13,686	0	46,681		0	30,489
1992	1,438,412	206,129	2,104	146,946	2,770	11,980	0	51,956		0	34,825
1993	1,358,758	167,390	2,747	105,809	8,468	9,298	0	64,260		0	28,871
1994	1,421,402	196,572	2,470	144,544	10,379	14,377	0	60,584		0	29,775
1995	1,329,503	245,030	2,048	124,752	8,193	9,283	0	55,028	14,715	0	20,196
1996	1,218,229	240,590	1,349	130,163	6,376	14,610	0	47,146	17,344	0	18,580
1997	1,142,140	234,641	1,326	166,915	7,666	9,651	0	67,520	20,688	0	22,964
1998	1,125,249	195,645	1,181	101,315	9,124	15,679	0	33,667	24,569	0	15,390
1999	989,684	174,855	1,349	69,288	5,861	11,359	0	41,085	18,568	0	15,535
2000	1,133,980	191,056	1,812	84,070	6,974	13,228	0	49,666	20,422	0	16,485
2001	1,388,276	176,659	1,937	63,578	5,312	14,056	0	29,475	17,811	0	9,973
2002	1,482,992	197,353	2,261	74,985	3,635	11,853	0	41,865	15,575	0	2,627
2003	1,493,692	207,146	2,048	81,050	3,530	14,580	0	37,339	14,181	10,118	2,954
2004	1,481,710	212,618	1,996	75,511	2,259	18,185	0	48,681	17,398	7,888	4,788
2005	1,484,643	205,635	2,551	94,385	2,608	14,243	0	37,362	16,108	11,194	4,592
2006	1,489,776	193,025	2,229	99,160	1,989	13,442	0	36,456	17,981	17,318	3,160
2007	1,357,021	174,485	2,350	120,964	2,004	11,916	0	37,126	18,958	19,522	5,724
2008	991,865	171,030	2,040	148,894	2,911	21,370	0	51,276	24,540	17,377	3,624
2009	812,520	175,756	2,016	107,513	4,515	29,900	0	48,716	19,558	13,944	2,178
2010	811,625	171,869	1,852	118,624	4,146	38,880	0	53,221	20,127	16,165	2,199
2011	1,200,424	220,080	1,730	151,168	3,668	20,133	9,971	60,632	13,553	23,655	3,177
2012	1,206,252	250,894	1,948	147,187	4,716	22,378	9,505	76,099	11,366	16,612	3,543
2013	1,273,787	250,307	1,697	164,944	1,745	20,541	7,766	59,800	17,354	23,522	1,535
2014	1,300,221	249,330	1,133	156,772	1,656	19,109	6,458	51,724	16,514	19,447	4,391
2015	1,323,227	242,057	640	126,937	2,204	11,267	4,994	45,467	11,307	14,614	2,415
2016	1,354,968	243,870	881	135,350	2,238	11,105	4,850	45,101	10,384	13,385	2,848
2017/f	1,357,937	209,047	1,738	125,621	2,813	6,189	4,462	35,123	8,878	15,549	4,121

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69. Note: Numbers don't include fish taken for research.

b/ Kamchatka flounder included in Arrowtooth flounder prior to 2011.

c/ Rock sole prior to 1991 and flathead sole prior to 1995 are included in other flatfish catch statistics.

d/ Includes POP, northern, rougheye, shortraker, and sharpchin rockfish until 2004.

e/ Octopus, sculpin, sharks, skates included in Other species prior to 2011.

f/ Data through November 4, 2017.

Table 6 *(continued)*. Groundfish catches (metric tons) in the Bering Sea and Aleutian Islands, 1954-2017.

Year	POP Complex/d	POP	N. Rockfish	RE Rockfish	BS/SR Rockfish	Other Rockfish	Atka Mack.	Other Species/e	Skate	Sculpin	Shark	Squid	Octopus	Total (All Species)
1954	0	0	0	0	0	0	0	0				0		12,562
1955	0	0	0	0	0	0	0	0				0		14,690
1956	0	0	0	0	0	0	0	0				0		24,697
1957	0	0	0	0	0	0	0	0				0		24,145
1958	0	0	0	0	0	0	0	147				0		51,401
1959	0	0	0	0	0	0	0	380				0		221,647
1960	6,100	0	0	0	0	0	0	0				0		500,907
1961	47,000	0	0	0	0	0	0	0				0		673,717
1962	20,100	0	0	0	0	0	0	0				0		525,018
1963	45,300	0	0	0	0	0	0	0				0		212,695
1964	116,200	0	0	0	0	0	0	802				0		486,543
1965	125,900	0	0	0	0	0	0	2,986				0		456,237
1966	106,100	0	0	0	0	0	0	2,370				0		539,670
1967	75,500	0	0	0	0	0	0	12,920				0		903,089
1968	76,400	0	0	0	0	0	0	31,006				0		1,023,106
1969	53,300	0	0	0	0	0	0	13,547				0		1,236,029
1970	76,800	0	0	0	0	0	949	25,966				0		1,674,259
1971	31,600	0	0	0	0	0	0	16,469				0		2,169,444
1972	38,900	0	0	0	0	0	5,907	33,340				0		2,228,809
1973	15,500	0	0	0	0	0	1,712	60,070				0		2,098,450
1974	36,400	0	0	0	0	0	1,377	69,987				0		1,949,432
1975	25,200	0	0	0	0	0	13,326	63,133				0		1,691,785
1976	28,900	0	0	0	0	0	13,126	33,196				0		1,472,030
1977	10,734	0	0	0	0	3,354	20,975	52,072				6,734		1,235,492
1978	7,507	0	0	0	0	3,535	24,249	73,973				8,971		1,363,601
1979	7,210	0	0	0	0	6,625	23,264	51,701				6,538		1,234,742
1980	5,797	0	0	0	0	879	20,488	47,661				6,372		1,330,475
1981	4,844	0	0	0	0	684	19,688	42,925				5,945		1,363,865
1982	1,238	0	0	0	0	2,390	19,874	23,367				5,039		1,309,716
1983	501	0	0	0	0	1,265	11,726	19,140				3,980		1,374,902
1984	2,200	0	0	0	0	232	36,055	10,178				3,167		1,605,321
1985	1,092	0	0	0	0	191	37,860	13,553				1,620		1,762,419
1986	846	0	0	0	0	271	31,990	11,980				868		1,730,170
1987	1,934	0	0	0	0	621	30,061	9,724				131		1,720,485
1988	3,026	0	0	0	0	619	22,084	12,643				417		1,887,853
1989	4,723	0	0	0	0	673	17,994	5,101				306		1,816,876
1990	20,289	0	0	0	0	1,248	22,205	6,325				471		1,768,995
1991	7,289	0	0	0	0	945	24,523	16,376				574		1,765,397
1992	13,586	0	0	0	0	4,364	49,441	33,074				880		1,996,467
1993	17,138	0	0	0	0	685	66,006	23,953				682		1,854,065
1994	18,866	0	0	0	0	562	69,591	24,532				588		1,994,242
1995	15,944	0	0	0	0	849	81,554	22,201				459		1,929,755
1996	23,078	0	0	0	0	642	103,867	21,437				1,167		1,844,578
1997	16,747	0	0	0	0	468	65,839	22,552				1,761		1,780,878
1998	14,863	0	0	0	0	588	57,096	25,604				916		1,620,886
1999	19,155	0	0	0	0	798	56,233	20,586				401		1,424,757
2000	15,597	0	0	0	0	840	47,229	26,108				383		1,607,850
2001	16,735	0	0	0	0	906	61,560	27,177				1,766		1,815,221
2002	15,854	0	0	0	0	952	45,294	28,619				1,344		1,925,209
2003	20,156	0	0	0	0	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	23,410				410		1,354,662
2011		24,004	2,762	165	333	944	51,817	0	23,154	5,374	107	336	587	1,817,774
2012	0	24,143	2,479	191	344	947	47,829	0	24,823	5,799	96	688	137	1,857,977
2013	0	31,362	2,038	322	371	815	23,181	0	27,030	5,828	116	300	224	1,914,585
2014	0	32,381	2,342	196	197	944	30,951	0	27,511	4,860	137	1,678	428	1,928,379
2015	0	31,425	7,197	181	153	686	53,270	0	28,123	4,980	107	2,364	446	1,914,061
2016	0	31,318	4,541	158	105	786	54,485	0	29,126	4,892	128	1,378	595	1,952,492
2017/f	0	32,144	4,679	197	151	820	63,656	0	28,389	5,034	178	2,099	208	1,909,033

a/ Arrowtooth flounder included in Greenland turbot catch statistics, 1960-69. Note: Numbers don't include fish taken for research.
b/ Kamchatka flounder included in Arrowtooth flounder prior to 2011.
c/ Rock sole prior to 1991 and flathead sole prior to 1995 are included in other flatfish catch statistics.
d/ Includes POP, northern, rougheye, shortraker, and sharpchin rockfish until 2004.
e/ Octopus, sculpin, sharks, skates included in Other species prior to 2011.
f/ Data through November 4, 2017.