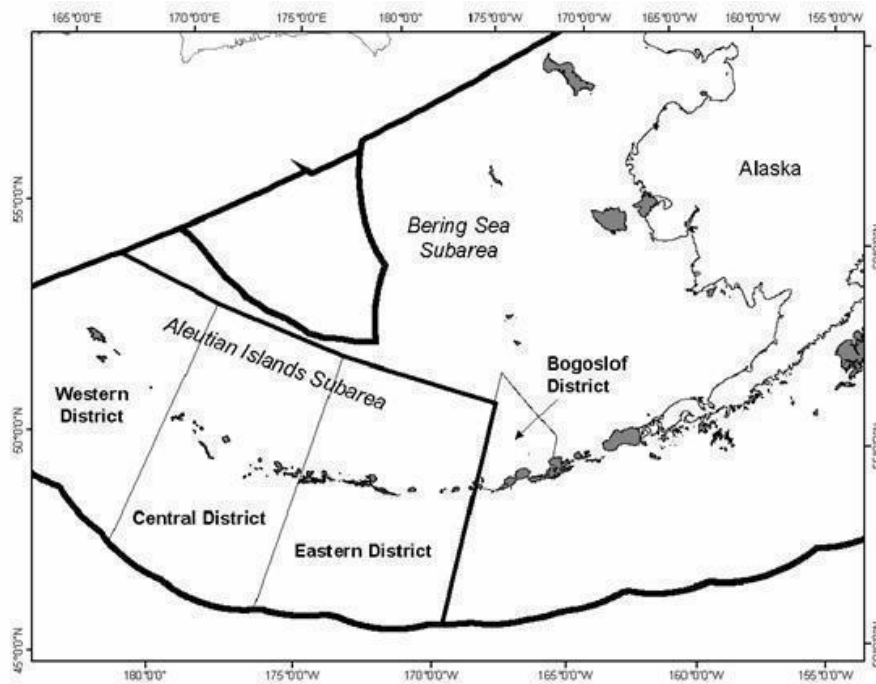


STOCK ASSESSMENT AND FISHERY EVALUATION REPORT
FOR THE GROUND FISH RESOURCES
OF THE BERING SEA/ALEUTIAN ISLANDS REGIONS

Compiled by:

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



With contributions by

K. Aydin, G. Adams, S.J. Barbeaux, L. Britt, M. Bryan, J. Conner, M.E. Conners, C. Conrath, M. Dalton, A. De Robertis, K. Echave, K.H. Fenske, B. Fissel, M. Furuness, D. Goethel, R. Haehn, D. Hanselman, A. Haynie, A. Hicks, L. Hillier, J. Hoff, K. Holsman, T. Honkalehto, T. Hurst, J.N. Ianelli, K. Kearney, A. Kingham, S. Kotwicki, B. Laurel, S. Lowe, C.R. Lunsford, I. Ortiz, S.A. MacLean, P. Malecha, M.E. Matta, C.R. McGilliard, D. McKelvey, C. Monnahan, D.G. Nichol, O.A. Ormseth, W.A. Palsson, A. Punt, C.J. Rodgveller, L. Rogers, C.N. Rooper, C. Siddon, E. Siddon, K. Siwicke, K. Shotwell, P.D. Spencer, I.B. Spies, J. Sullivan, T.T. TenBrink, G.G. Thompson, J. Thorson, C.A. Tribuzio, T.K. Wilderbuer, and S. Zador.

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North Pacific Fishery Management Council
1007 West Third, Suite 400
Anchorage, AK 99501

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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 reports: a “Stock Assessment” report, the “Economic Status of Groundfish Fisheries off Alaska” (i.e., the “Economic SAFE report”) and the “Ecosystem Status Report” (by Area between the Eastern Bering Sea (EBS) and Aleutian Islands (AI)).

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 Ecosystem Status Report 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.

The BSAI Groundfish Plan Team met remotely via the internet on November 16-20, 2020 to review the status of stocks of twenty-three species or species groups that are managed under the FMP. The Plan Team review was based on presentations by ADF&G and NMFS AFSC scientists with opportunity for public comment and input. Members of the BSAI Groundfish Plan Team who compiled this SAFE report were: Grant Thompson (Co-chair), Steve Barbeaux (Co-chair), Steve A. MacLean (BSAI Groundfish PT coordinator), Mary Furuness, Alan Haynie, Allan Hicks, Lisa Hillier, Kirstin Holsman, Andy Kingham, Kalei Shotwell, Chris Siddon, and Cindy Tribuzio.

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.

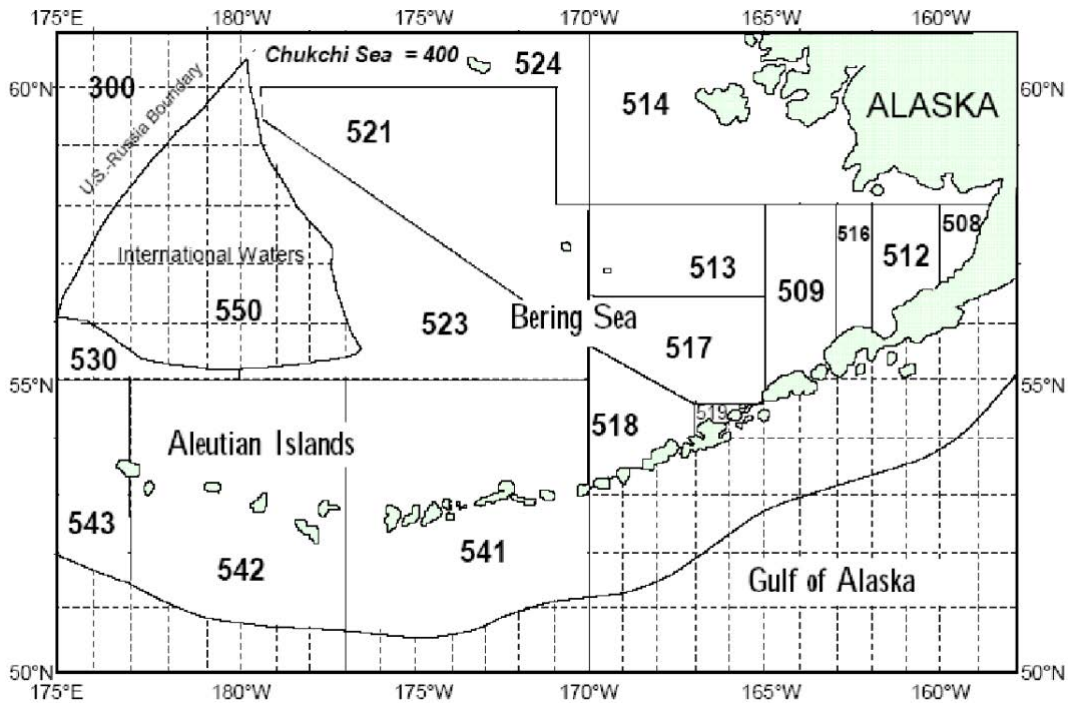


Figure 1. Bering Sea/Aleutian Islands statistical and reporting areas.

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 database 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 species¹	Prohibited species²	Forage fish species³
Walleye Pollock	Pacific halibut	Osmeridae family (eulachon, capelin, and other smelts)
Pacific cod	Pacific herring	Myctophidae family (lanternfishes)
Sablefish	Pacific salmon	Bathylagidae (deep-sea smelts)
Yellowfin sole	Steelhead trout	Ammodytidae family (Pacific sand lance)
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		Squid
Other flatfish		Sculpins
Pacific Ocean perch		
Northern rockfish		
Blackspotted/Rougheye		
Shortraker rockfish		
Other rockfish		
Atka mackerel		
Skates		
Sharks		
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.

In 2019, the NPFMC took final action to amend the FMPs for the BSAI (Amendment 121) and GOA (Amendment 110) and moved the sculpin stock complex into the ecosystem component category, and establish an MRA of 20% for sculpins for all basis species in both the BSAI and GOA. Amendments 121/110 and their implementing regulations were approved by the Secretary of Commerce in August 2020 (85 FR 133,41427). Sculpins are, therefore, categorized as an ecosystem component species and information on sculpins will be contained in a report produced every four years.

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 in the EBS in 2019 totaled 1,936,278 t, Catches through November 7, 2020 totaled 1,849,473 t. Pollock catches in the EBS totaled 1,410,898 t in 2019; catches through November 7, 2020 totaled 1,367,928 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 to 101,375 t in 2016 and 110,824 t in 2017, 123,896 t in 2018, and 114,926 t in 2019. Total catch as of November 7, 2020 was 112,350 t. Recent increases are largely due to increased catch of Atka mackerel and cod.

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. 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, 63,401 t in 2017, 69,248 t in 2018, and 56,081 t in 2019. Through November 7, 2020 Atka mackerel catch in the AI was 56,774 t. Catches since 2015 have been higher due to modifications in the Steller sea lion protection measures. 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, 23,240 t in 2017, and 25,114 t in 2019. Through November 7, 2020, POP catch in the AI was 27,408 t. 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 has increased since to 12,359 t in 2016, 12,286 in 2017, 14,719 t in 2018, and 12,941 t in 2019. Through November 7, 2020, Pacific cod catch was 5,321 t.

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), 1,909,033 t in 2017 (95% of OY) 1,947,840 t in 2018 (97% of OY), and 1,936,278 t in 2019 (97% of OY). BSAI catches through November 7, 2020 were 1,849,471 t, which is 92% 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% 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% of the BS and AI pollock TACs, 20% of the fixed gear sablefish TAC, and 7.5% of the sablefish trawl gear allocation. It also receives 10.7% 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 2020 for each subarea are derived as 9% of the Bering Sea ABC (and an additional 45 t to the State jig fishery) and 39% of the Aleutian Islands subarea ABC to a maximum of 15 million pounds (6804 t). 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% 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% of the TAC for each species or species group. 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.

Acceptable Biological Catch 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 determination, 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 $F=F_{40\%}$.

Tier	<p>1) Information available: <i>Reliable point estimates of B and B_{MSY} and reliable pdf of F_{MSY}.</i></p> <p>1a) Stock status: $B/B_{MSY} > 1$ $I_{OFL} = \mu_A$, the arithmetic mean of the pdf $F_{ABC} \leq \mu_H$, the harmonic mean of the pdf</p> <p>1b) Stock status: $\alpha < B/B_{MSY} \leq 1$ $I_{OFL} = \mu_A \times (B/B_{MSY} - \alpha)/(1 - \alpha)$ $F_{ABC} \leq \mu_H \times (B/B_{MSY} - \alpha)/(1 - \alpha)$</p> <p>1c) Stock status: $B/B_{MSY} \leq \alpha$ $I_{OFL} = 0$ $I_{ABC} = 0$</p> <p>2) Information available: <i>Reliable point estimates of B, B_{MSY}, F_{MSY}, F_{35%}, and F_{40%}.</i></p> <p>2a) Stock status: $B/B_{MSY} > 1$ $F_{OFL} = F_{MSY}$ $F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%})$</p> <p>2b) Stock status: $\alpha < B/B_{MSY} \leq 1$ $I_{OFL} = I_{MSY} \times (B/B_{MSY} - \alpha)/(1 - \alpha)$ $F_{ABC} \leq F_{MSY} \times (F_{40\%}/F_{35\%}) \times (B/B_{MSY} - \alpha)/(1 - \alpha)$</p> <p>2c) Stock status: $B/B_{MSY} < \alpha$ $F_{OFL} = 0$ $F_{ABC} = 0$</p> <p>3) Information available: <i>Reliable point estimates of B, B_{40%}, F_{35%}, and F_{40%}.</i></p> <p>3a) Stock status: $B/B_{40\%} > 1$ $F_{OFL} = F_{35\%}$ $F_{ABC} \leq F_{40\%}$</p> <p>3b) Stock status: $\alpha < B/B_{40\%} < 1$ $F_{OFL} = F_{35\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$ $F_{ABC} \leq F_{40\%} \times (B/B_{40\%} - \alpha)/(1 - \alpha)$</p> <p>3c) Stock status: $B/B_{40\%} < \alpha$ $F_{OFL} = 0$ $F_{ABC} = 0$</p> <p>4) Information available: <i>Reliable point estimates of B, F_{35%}, and F_{40%}.</i> $I_{OFL} = F_{35\%}$ $I_{ABC} \leq F_{40\%}$</p> <p>5) Information available: <i>Reliable point estimates of B and natural mortality rate M.</i> $F_{OFL} = M$ $I_{ABC} < 0.75 \times M$</p> <p>6) Information available: <i>Reliable catch history from 1978 through 1995.</i> $OFL =$ 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 $ABC \leq 0.75 \times OFL$</p>
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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, authors have the option of making projections using either Stock Synthesis or the standard AFSC projection model. For the AFSC projection model the projections begin with an estimated vector of 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.

For assessments using the standard AFSC projection model, recruitment in each year 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 2021 and 2022, 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 2021 recommended in the assessment to the $max F_{ABC}$ for 2021, and where catches for 2021 and 2022 are estimated at their most likely values given the 2021 and 2022 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 2020 or 2) above 1/2 of its MSY level in 2020 and expected to be above its MSY level in 2030 under this scenario, then the stock is not overfished.)

Scenario 7: In 2021, 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 2022 or 2) above 1/2 of its MSY level in 2022 and expected to be above its MSY level in 2032 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 2021 and 2022 ABCs and OFLs are summarized in Tables 1, 2, and 3.

The sum of the Plan Team’s recommended ABCs for target species for 2021 and 2022 are 2,732,912 t and 2,683,717 t, respectively. These compare with the 3,272,581 t in 2020 and 3,367,578 t in 2019. The primary decrease from previous years is due to declines in EBS pollock, and Pacific cod. The Team recommended maximum permissible ABCs for all stocks, except for EBS pollock and Sablefish (Table 2). For sablefish, the Team recommended a range of permissible ABCs that range from the status quo, to the author’s recommended. All potential ABCs are below the maximum permissible ABC.

Overall, the status of the stocks continues to appear favorable. All stocks are above B_{MSY} or the B_{MSY} proxy of $B_{35\%}$ (Figure 2). The abundances of EBS pollock, EBS Pacific cod, 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 2021.

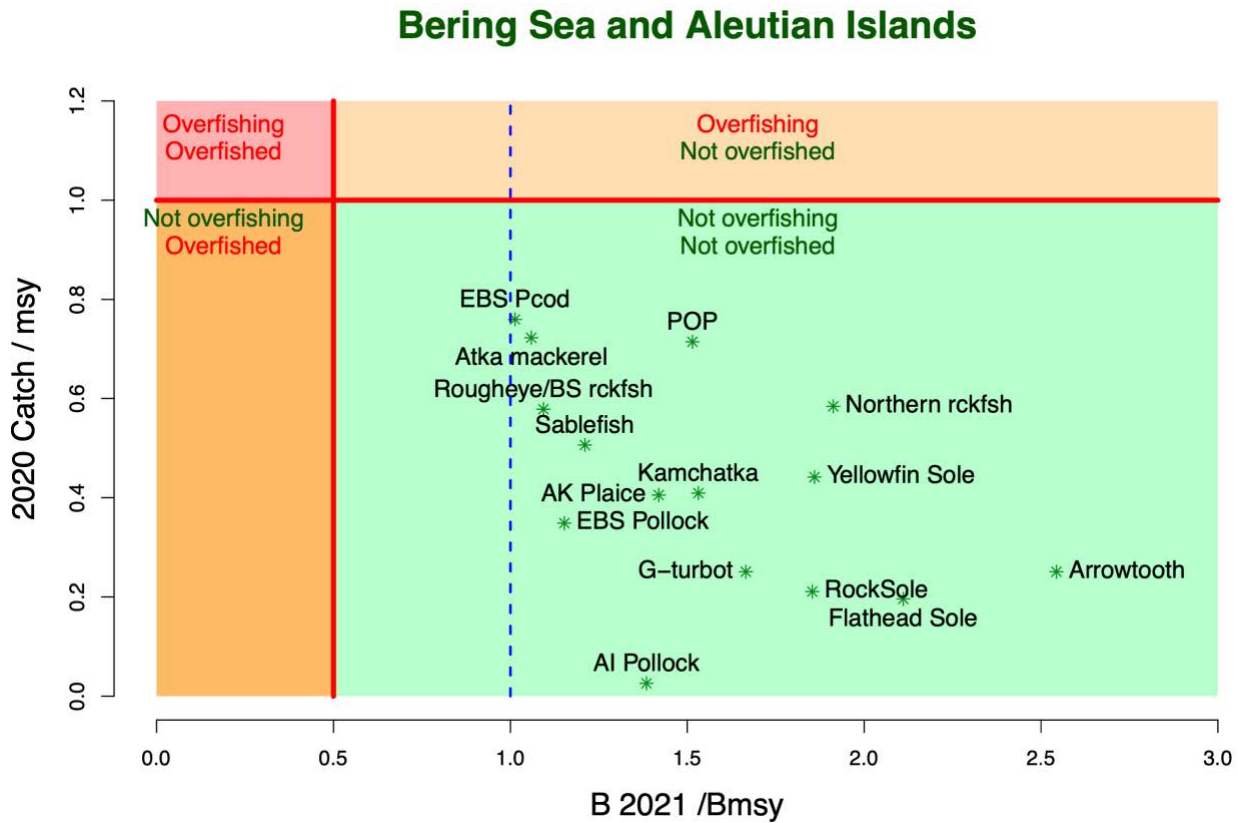


Figure 2. Summary of Bering Sea stock status next year (spawning biomass relative to B_{msy} ; horizontal axis) and current year catch relative to fishing at F_{msy} (vertical axis) where F_{OFL} is taken to equal F_{msy} .

The sum of the biomasses for 2021 listed in Table 3 (18,052,176 t) is a decline (4%) from 2020 (19,110,169 t). This is primarily due to declines in EBS pollock and Pacific cod balanced by increases in some flatfish and rockfish stocks. 2020 was a 1% decline compared to 2019, and 2018. The 2017 value 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 7, 2020.

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 2021 harvest specifications (from Council recommendations in December 2019) are in place to start the fishery on January 1, 2021, but these will be replaced by final harvest specifications that will be recommended by the Council in December 2020. The final 2021 and 2022 harvest specifications will become effective when final rulemaking occurs in February or March 2021. 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 2022 ABC and OFL values recommended in next year's SAFE report are likely to differ from this year's projections for 2022 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.

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	2020 SAFE Assessment status	Tier	Schedule (years)	Year of next full assessment
Eastern Bering Sea pollock	Full	1	1	2021
Bogoslof Island Pollock	Full	5	2	2022
Aleutian Islands pollock	Full	3	2	2022
Eastern Bering Sea Pacific Cod	Full	3	1	2021
Aleutian Islands Pacific cod	Full	5	1	2021
Sablefish	Full	3	1	2021
Yellowfin sole	Full	1	1	2021
Greenland Turbot	Full	3	2	2022
Arrowtooth flounder	Full	3	2	2022
Kamchatka flounder	Full	3	2	2022
Northern Rock sole	Full	1	2	2022
Flathead sole	Full	3	2	2022
Alaska plaice	Partial	3	2	2021
Other flatfish	Full	5	4	2024
Pacific ocean perch	Full	3	2	2022
Northern rockfish	Partial	3	2	2021
Rougheye & blackspotted rockfish	Full	3	2	2022
Shortraker rockfish	Full	5	2	2022
Other rockfish	Full	5	2	2022
Atka mackerel	Full	3	1	2021
Skates	Full	3/5	2	2022
Sharks	Full	5	2	2022
Octopus	Full	6	2	2022
Sculpins	None	5	4	2020*
Forage Species (including Squids)	None	Eco	2	2021
Grenadiers (BSAI/GOA)	Report	Eco	4	2024

*Amendments 121/110 to the BSAI/GOA FMPs moved sculpins to the ecosystem component in 2020.

The products anticipated under each year and by Tier 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 2018-2019

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, increased from \$1,963 million in 2018 to \$1,968 million in 2019 (real 2019\$). The first wholesale value of 2019 groundfish catch after primary processing was \$2,500 million. The 2019 total groundfish catch decreased by 1.8%, and the total first-wholesale value of groundfish catch decreased by 3%, relative to 2018.

The groundfish fisheries accounted for the largest share (50%) of the ex-vessel value of all commercial fisheries off Alaska, while the Pacific salmon (*Oncorhynchus spp.*) fishery was second with \$684 million or 35% of the total Alaska ex-vessel value. The value of the shellfish fishery amounted to \$193 million or 10% of the total for Alaska and exceeded the value of Pacific halibut (*Hippoglossus stenolepis*) with \$94 million or 5% 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, current year product price and ex-vessel price projections, an Amendment 80 fishery economic data report (EDR) summary, an Amendment 91 fishery economic data report (EDR), market profiles for the most commercially valuable species, and a Gulf Trawl economic data report. The report will now also include a section summarizing in-season harvest and revenue estimates for groundfish and halibut through Sept. 2020. The previous section covering community participation has been moved into a separate report titled the Annual Community Engagement and Participation Overview report (ACEPO). Data tables are organized into four relatively distinct sections: (1) All Alaska, (2) BSAI, (3) GOA, and (4) Pacific halibut. The figures and tables in the report provide estimates of total groundfish catch, groundfish discards and discard rates, prohibited species catch (PSC) and PSC rates, the ex-vessel value of the groundfish catch, the ex-vessel value of the catch in other Alaska fisheries, the gross product value of the resulting groundfish seafood products, the number and sizes of vessels that participated in the groundfish fisheries off Alaska, vessel activity, and employment on at-sea processors. Generally, the data presented in this report cover 2015-2019, 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 historical perspective on catch. The data behind the tables from this and past Economic SAFE reports are publicly available online at: <https://reports.psmfc.org/akfin> and <https://psese.psmfc.org/PSESv-2/>.

Summary of wholesale ex-vessel and first wholesale changes in Bering Sea revenues

According to data reported in the current Economic SAFE report, the total real ex-vessel value of BSAI groundfish decreased slightly from \$840 million in 2018 to \$839 million in 2019 (Figure 3), and real first-wholesale revenues from the processing and production of groundfish in the Bering Sea and Aleutian Islands (BSAI) decreased by 1.2% between 2018 (\$2,276 million) and 2019 (\$2,249 million) (Figure 4). The total quantity of groundfish products from the BSAI increased by 1% from 823 thousand metric tons to 831 thousand metric tons. These changes in the BSAI differed from those in the GOA where real first wholesale revenue decreased by 17% and the quantity of products decreased by 12%.

Decomposition of the change in first-wholesale revenues from 2018-19 in the BSAI

The following brief analysis summarizes the overall nominal revenue changes that occurred from 2018-19 and the quantity produced and revenue generated from BSAI groundfish and how revenues have been impacted by changes in quantity or prices of each species and product group (Figure 5). These values are not adjusted for inflation, so enable a simple comparison of how changes in the price and quantity for each group combine to produce revenues.

By BSAI species group, a positive price effect and larger positive quantity effect resulted in a positive net effect of about \$167 million for pollock (Figure 5, top panel). For Pacific cod, a negative price effect combined with a roughly equivalent negative quantity effect, resulted in a \$112 million net decrease in first-wholesale revenues for Pacific cod from the BSAI for 2018-19 (Figure 5). There was a nearly offsetting negative price effect and positive quantity effect for rockfish that resulted in a net negative effect of \$1.2 million. Atka mackerel had a negative price effect and a larger negative quantity effect, combining for a net negative effect of \$43 million. Flatfish had a negative price effect combined with a positive quantity effect that resulted in a net revenue decrease of \$2.1 million. Sablefish had a negative price effect of \$2.2 million and a negative quantity effect of \$0.7 million, combining for a net negative effect of \$2.8 million. The “Other” species group experienced a net revenue decrease of \$2.7 million.

By product group, large positive price effects coupled with similar positive quantity effects in the fillets category resulted in a positive net effect of \$97 million in the BSAI first-wholesale revenue decomposition for 2018-19 (Figure 5, bottom panel). For surimi, large negative price effects coupled with a small negative quantity effects resulted in a positive net effect of \$31 million. For roe, large negative price effects coupled with an approximately offsetting positive quantity effects to result in a negative net effect of \$3.2 million. For whole fish and head & gut, a large negative price effect combined with a smaller but still large negative quantity effect to produce a net negative effect of \$131 million. For the ‘other’ products a negative price effect combined with a larger positive quantity effect resulted in a net positive effect of \$9.2 million.

In summary, the changes in first-wholesale revenues from the BSAI groundfish fisheries increased only slightly from 2018-19 due in large part to positive price effects and quantity effects for pollock which offset the negative revenue effects from Pacific cod and Atka mackerel. In comparison, first-wholesale revenues decreased from 2018-19 in the GOA. The main drivers of this GOA decline were negative net revenue effects for pollock, rockfish, and sablefish only being partially offset by positive or negligible net effects for the remaining GOA species.

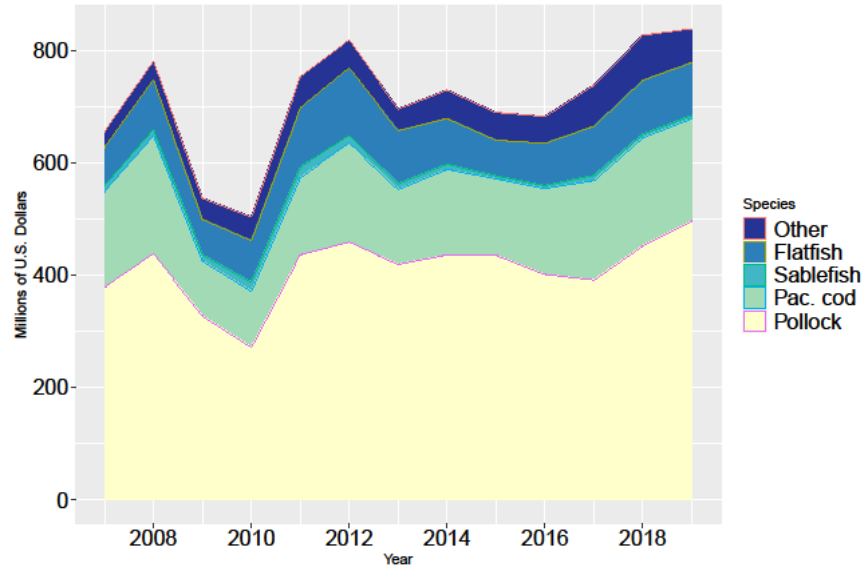


Figure 3. Real ex-vessel value of the groundfish catch in the domestic commercial fisheries in the BSAI area by species, 2007-2019 (base year = 2019).

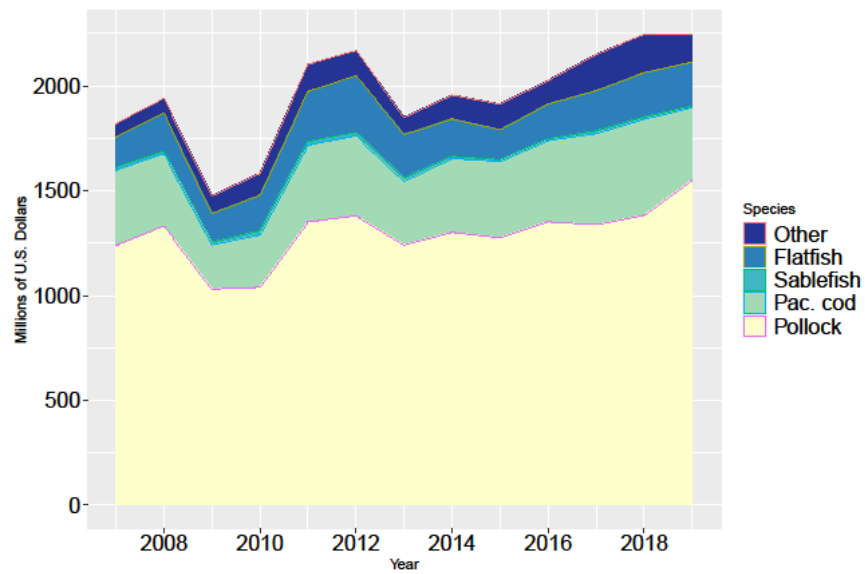


Figure 4. Real gross product value of the groundfish catch in the BSAI area by species, 2007-2019 (base year = 2019).

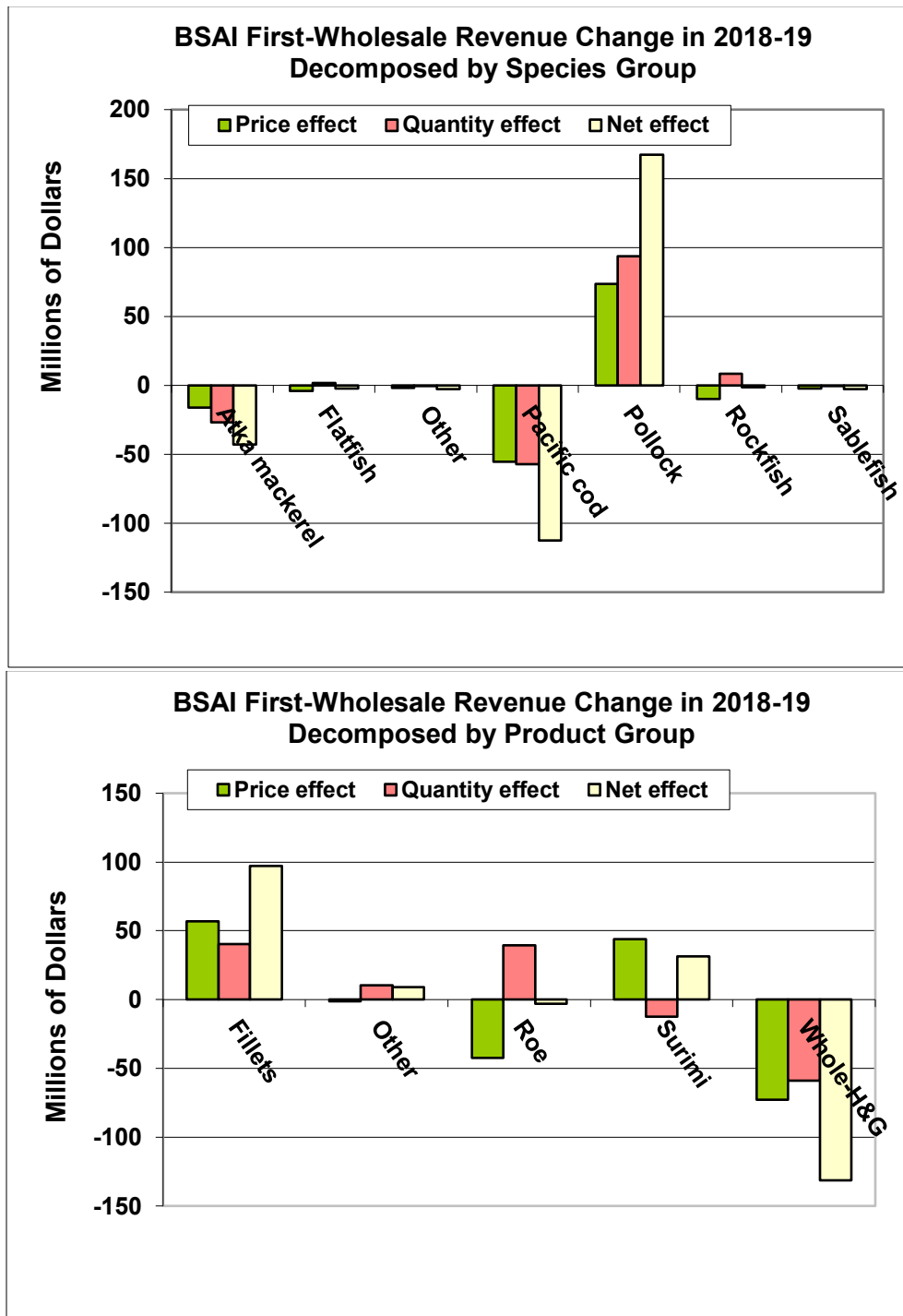


Figure 5. Decomposition of the change in first-wholesale revenues from 2018-19 in the BSAI area. The first decomposition is by the species groups used in the Economic SAFE report, and the second decomposition is by product group. The price effect refers to the change in revenues due to the change in 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 Status Report for the EBS and AI

Recent conditions in the Bering Sea and Aleutian Islands are not particularly favorable, with persistence of warmer than normal conditions.

Bering Sea Conditions

Marine heatwaves (based on SST) as high as category 3 were observed in winter 2019/2020 but had decreased to warmer than average conditions in SEBS by end of summer 2020, while the NEBS remains in a MHW (category 1). While warmer than average, 2020 is markedly cooler in general than the extremely warm preceding years, representing a trend towards average conditions. Sea ice extent in the winter 2019/2020 was normal to slightly above normal, although thinner than normal and weak ice led to an early rapid break up and melt in spring 2020. The cold pool index in 2020 is based on the hindcast of the high resolution ROMSNPZ model (which has good skill for bottom temperature). The cold pool index is approximately average for July 2020. A new ocean acidification index from the ROMSNPZ model predicts areas of corrosive bottom water for crab (< pH7.8) in areas of Norton sound and along the shelf break.

There is evidence of earlier than normal spring bloom (~ 1 week) and below average Chl-a biomass during spring 2020 across all areas (has been low since 2016) except for the outer domain which was above average in 2020. Coccolithophores were more extensive in 2020 particularly over the middle shelf relative to 2019 and 2018 and indicate longer trophic chains and less efficient energy transfer through the food web. Coccolithophore blooms can reduce foraging success for birds and fish (visual predators).

Upper trophic conditions are limited by disruption of ecosystem surveys in 2020 due to Covid but multiple observations and knowledge sources provide insight into current conditions in the EBS. Co-production of knowledge in the report includes the seabird synthesis (see “Integrated seabird information”) and which found that NEBS had a die-off event that continued in the Northern Bering Strait of primarily fish eating birds (as well as some planktonic foragers). In contrast, bird populations in the Pribilof islands were average or just below average for fish eating bird species while planktivorous bird species continue to decline (i.e., fish eaters appeared able to find food while planktivorous birds could not find forage).

The Unusual Mortality Event (UME) for gray whales which began in 2019 continued into 2020. Whales spend summer and fall in the Bering and Chukchi Seas and feed on small invertebrates (mysids, amphipods, and crab larvae). This UME could be due to a variety of causes including disease, starvation, and Harmful Algal Blooms (HABS).

2020 was the 5th largest run of Bristol bay sockeye salmon on record. Juvenile sockeye salmon feed on zooplankton and age-0 pollock and adults feed on zooplankton and krill. Herring bycatch in 2020 was extremely high during the pollock A season in particular (exceeding the limit). Age-1 predation mortality of pollock continues to decline towards or below the long-term mean.

The report summarizes a large marine debris event in the Bering Strait including plastics along beaches and wrack lines. Debris is predominantly foreign in manufacturing (Russian and Korean writing). This emerging threat raises concern regarding food security and contamination.

Aleutian Islands Conditions

Since 2013 there is an increasing trend in marine heatwave days with the eastern AI SST in a category 1 (of 4) prolonged marine heatwave through 2019. Warm conditions were observed in the central and western AI but are not high enough to be characterized as a heatwave. There were extended periods of above average sea surface temperatures and subsurface temperatures since 2016. Warmer temperatures may 1) increase bioenergetic costs and consumption demands beyond what may be available, may partly explain why the observed body condition of several commercial groundfish has been lower than the survey mean since 2012, 2) impact benthic habitat and ontogenesis of Atka mackerel eggs for example, and 3) is the most important determinant of egg and larval stage distribution of commercial fish in Alaska and may impact recruitment.

NPGO has been below the long-term average since 2013-2014 and SST has been positive across the AI chain. There is a low eddy kinetic energy (EKE) since 2012 in the eastern Aleutians which are characterized by high-intensity distinct eddy events, and less intense but consecutive or prolonged multi-year eddies characteristic in the north and south of the central and western Aleutians respectively. There is generally a low volume of heat, salt and nutrient flow through the passes. These changes coincide with decreasing trends in large diatom abundance and copepod size. Abundance of large diatoms has been decreasing, becoming negative in 2019 coupled with a decreasing trend in copepod community size.

There was decreased storminess in 2019/2020 winter favoring seabird foraging. Seabird data was updated in 2019 and in both the west and eastern AI, the hatching chronology (phenology) of plankton and fish eating seabirds had earlier or average timing signaling an early spring bloom. Average or above average reproductive success of plankton and fish-eating seabirds compared to previous failure of fish-eating and zooplankton eaters, are all above average for Aiktak. On Buldir, only three species had below average reproductive success; common murre (failed), red legged kittiwake and fork tailed storm petrel had below average reproductive success, while all others had above average.

Kamchatka pink salmon and POP are planktivorous species that have increased and stayed high in the last few years, while Atka mackerel has decreased since 2006. Area occupied by POP has also increased. Fish condition (weight at length) across the AI has been below average since 2012 for several commercially important groundfish. West AI there are continued declines in the numbers of pups and non-pups of Steller sea lions while in the east there are some increasing estimates of pups and non-pups.

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 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Biomass	OFL	ABC	TAC*	Catch
Eastern Bering Sea	2019	10,119,000	3,914,000	2,163,000	1,397,000	1,406,063
	2020	9,128,000	4,085,000	2,043,000	1,425,000	1,364,949
	2021	8,145,000	2,594,000	1,626,000	n/a	n/a
	2022	7,641,000	2,366,000	1,484,000	n/a	n/a
Aleutian Islands	2019	319,892	64,240	52,887	19,000	1,592
	2020	340,680	66,973	55,120	19,000	2,971
	2021	292,967	61,856	51,241	n/a	n/a
	2022	308,671	61,308	50,789	n/a	n/a
Bogoslof	2019	610,267	183,080	137,310	75	8
	2020	610,267	183,080	137,310	75	8
	2021	378,262	113,479	85,109	n/a	n/a
	2022	378,262	113,479	85,109	n/a	n/a

* In 2019, NMFS reallocated 16,500 t of pollock TAC from the Aleutian Islands to the Bering Sea, which increased the Bering Sea TAC to 1,413,500 t and decreased the Aleutian Islands TAC to 2,500 t. In 2020, NMFS reallocated 11,900 t of pollock TAC from the Aleutian Islands to the Bering Sea, which increased the Bering Sea TAC to 1,436,902 t and decreased the Aleutian Islands TAC to 7,099 t.

Eastern Bering Sea pollock

Changes from previous assessment

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

1. Observer data for catch-at-age and average weight-at-age from the 2019 fishery were finalized and included.
2. Total catch as reported by NMFS Alaska Regional office was updated and included through 2020.
3. Acoustic data from a survey conducted during summer of 2020, using unmanned surface vehicles (USV), were included.

The authors’ and Team’s recommended model for setting harvest specifications is a new model (20.0a), which differs from last year’s model (16.2), in that it: 1) includes the 2020 USV data as an extension of the standard (design-based) acoustic-trawl survey time series; and 2) ignores the 1978 year class in estimation of the stock-recruitment curve, as this year class may be an outlier in terms of current stock productivity.

Spawning biomass and stock trends

Spawning biomass in 2008 was at the lowest level since 1980 but had increased by a factor of 2.89 by 2017, and has since started trending downward again. 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 (above average by factors of 2.27, 2.42, and 2.40 for the post-1976 time series, respectively), along with spawning exploitation rates below 20% since 2008. Spawning biomass is projected to be above B_{MSY} in 2021 by a factor of 1.15.

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 2.257 million t. Projected spawning biomass for 2021 is 2.602 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 0.304. The harvest ratio of 0.304 is multiplied by the geometric mean of the projected fishable biomass for 2021 (7.597 million t) to obtain the maximum permissible ABC for 2021, which is 2.307 million t. However, as with other recent EBS pollock assessments, the authors recommend setting ABCs well below the maximum permissible levels. Their reasons for doing so are listed in the “ABC Recommendation” section of the SAFE chapter, where the assessment and population dynamics categories are both scored as Level 1 (“normal”), and the environmental/ecosystem and fishery performance categories are both scored as Level 2 (“substantially increased concern”). The authors conclude that these levels of concern warrant setting the 2021 and 2022 ABCs at 1,626,000 t and 1,484,000 t (reductions of 30% from the corresponding maxABC in both cases), which are the values associated with the Tier 3 maxABC harvest control rule. This is the same harvest policy that has been recommended by both the Team and SSC for the EBS pollock stock since the 2014 assessment cycle. The Team concurs with the authors’ recommendation to continue this policy for the 2021 and 2022 fisheries.

The OFL harvest ratio under Tier 1a is 0.341, 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 2021 determines the OFL for 2021, which is 2.594 million t. Given a projected 2021 catch of 1.300 million t, the current projection for OFL in 2022 is 2.366 million t.

Status determination

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

Aleutian Islands pollock

Changes from previous assessment

There were no changes to the recommended model for ABC/OFL advice. Catches for 1978 to 2020 were updated to latest estimates from the catch accounting system (CAS). There were no significant changes except the addition of the 2020 estimate at 3,000 t. 2018 AI bottom trawl survey age composition data were added. 2018 fishery age composition data were added. Due to COVID-19 precautions the 2020 Aleutian Islands (AI) bottom trawl survey was not conducted.

In 2019 and 2020 an Experimental Fishing Permit (EFP) was implemented which allowed for 500 t of Pacific ocean perch bycatch in the A-season pollock fishery instead of the trip specific bycatch limits. This EFP provided more opportunities for a limited directed AI pollock fishery. In 2019 weather precluded a substantial fishery and total catch in the AI was limited to 1,660 t, and as of October 22 the 2020 catch was at 2,971 t.

Spawning biomass and stock trends

This year’s assessment estimates that spawning biomass reached a minimum level of about $B_{27\%}$ in 2010, but has increased every year since, reaching a level of about $B_{49\%}$ in 2020, with a slight projected decline to about $B_{46\%}$ for 2021. Although nearly all of the cohorts spawned after 2008 have tended to be stronger than nearly all of the cohorts spawned between 1994 and 2008, and the 2011-2015 cohorts are all above the median value, there have been no above-average cohorts spawned since 1989 (the average is much higher than the median, due to the fact that the 1978 year class was larger than the average of the other year classes by a factor of about 16.7).

Tier determination/Plan Team discussion and resulting ABCs and OFLs

Updated estimates of 2021 spawning biomass at 89,906 t which is above the $B_{40\%}$ value of 74,190 t, placing the AI pollock stock in sub-tier “a” of Tier 3. The model estimated the values of $F_{40\%}$ as 0.313 and $F_{35\%}$ as 0.390. Under Tier 3a, the 2021 maximum permissible ABC and OFL are 51,241 t and 61,856 t, respectively. The Team recommends setting the 2021 ABC and OFL at these values. Projections assumed catches of 3,000 t for 2020 and 1,670 t for 2021 based on the five-year average (2015-2019).

Status determination

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

Bogoslof pollock

Changes from previous assessment

Estimated catches for 2019 and 2020 were updated and the 2020 acoustic-trawl survey biomass estimate and preliminary 2020 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, as in 2018. Natural mortality was re-evaluated using the age-structured model presented in previous assessments (unchanged except for new survey, fishery, and age composition data from the survey).

Spawning biomass and stock trends

NMFS acoustic-trawl survey biomass estimates are the primary data source used in this assessment. Between 1997 and 2018, the values varied between a low of 67,063 t and a high of 663,070 t in 2018. The most recent acoustic-trawl survey of the Bogoslof spawning stock was conducted in February 2020 and resulted in a biomass estimate of 344,663 t. The random-effects method of survey averaging resulted in 378,662 t, compared to the three-survey average of 505,261 t.

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. The assessment authors and the Team recommend using the biomass estimate based on the random effects (378,262 t) for calculating the Tier 5 ABC.

The maximum permissible ABC value for 2021 is 85,109 t (assuming $M = 0.3$ and $F_{ABC} = 0.75 \times M = 0.225$ and the random effects survey estimate for biomass). The ABC for 2022 is the same.

The OFL was calculated using the random effects estimate for the survey biomass. Following the Tier 5 formula with $M=0.3$, OFL for 2021 is 113,479 t. The OFL for 2022 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 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 2021 and 2020 are those recommended by the Plan Team. Catch data are current through October 21, 2020.

Area	Year	Age 0+ biomass	OFL	ABC	TAC*	Catch
Eastern Bering Sea	2019	824,000	216,000	181,000	166,475	178,816
	2020	824,000	185,650	155,873	141,799	143,734
	2021	694,700	112,851	94,552	n/a	n/a
	2022	757,900	108,662	90,665	n/a	n/a
Aleutian Islands	2019	80,700**	27,400	20,600	14,214	19,162
	2020	80,700**	27,400	20,600	13,796	11,918
	2021	80,700**	27,400	20,600	n/a	n/a
	2022	80,700**	27,400	20,600	n/a	n/a

*In 2018, 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 was set equal to 6.4% of the Bering Sea ABC and 27% of the AI ABC for 2018. This proportion is increased in 2019 to 8% plus 45 mt Bering Sea and 31% AI. 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. Catches for 1991-2019 were updated, and a preliminary catch estimate for 2020 were incorporated.
2. Commercial fishery size compositions for 1991-2019 were updated, and a preliminary size composition from the 2020 commercial fishery was incorporated.
3. Age compositions from the EBS, NBS, and combined EBS+NBS survey time-series were updated through 2019, based on the VAST approach.
4. Long-term average weight-length parameters, and the time-series of annual deviations therefrom, were re-estimated.
5. For a pair of new models, a catch-weighted, all-gear, relative CPUE timeseries for the commercial fishery was incorporated.

Many changes have been made or considered in the stock assessment model since the 2019 assessment. Fourteen models (including the current base model) were presented in this year's preliminary assessment. After reviewing the preliminary assessment, the Team requested that five of the models from the preliminary assessment be included in this final assessment, including the current base model (19.12) and a model featuring explicit movement back and forth between the EBS and NBS. The SSC agreed, for the most part, with the Team's requested list, but suggested that the model featuring explicit movement be omitted. The SSC's model set spans a 2×2 factorial design, where the factors are: A1) whether survey catchability should be allowed to vary, and A2) whether the EBS and NBS bottom trawl surveys should be combined into a single (EBS+NBS) survey. The models in the 2×2 design were supplemented with three new models intended to explore features that were suggested during public comment at the September Team meeting: B1) whether fishery catch per unit effort (CPUE) should be used as an index of abundance, and B2) whether dome-shaped survey selectivity should be allowed. The Team chose to include the A1 and A2 factors in the ensemble along with B2, but determined that the CPUE analysis could be improved. This resulted in five models in the ensemble spanning a range of structural uncertainties. The weighting criteria were updated and models were nearly weighted equally.

Spawning biomass and stock trends

Three different survey abundance time-series were calculated with the vector autoregressive spatio-temporal model called VAST using two different areas: the EBS shelf survey area and the NBS area with the truncated survey stations used in 2018. Time-series were predicted for each survey individually and for the surveys combined. One feature of VAST is that each year has a prediction, even when there are no observations in a particular area, because it uses information from nearby locations in years with observations. Neither of these surveys were completed in 2020, thus the time-series was not extended past 2019. Comparing VAST estimates for 2019 to VAST estimates for 2018, the EBS-only abundance index increased by 95%, the NBS-only abundance index decreased by 13%, and the combined EBS and NBS abundance index increased by 44%. Estimated spawning biomass from the ensemble increased from 2010 through 2018 to 307,582 t, and declined to 251,065 t in 2020 and is predicted to decrease to 208,640 t in 2021. Recruitment is estimated to have been below average for the 2014-2017 year classes.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

This stock is assigned to Tier 3b for 2021. The maximum 2021 maxABC in this tier as calculated using the weighted average of the models in the ensemble is 94,552 t and the projected 2022 maxABC is 90,665 t. The 2021 OFL from the weighted ensemble is 112,851 t, which is slightly less than the projected 2021 OFL from the previous assessment. The 2022 projected OFL, given the respective 2021 catch from each individual model, is 108,662 t. Even though a slightly elevated risk to the stock was identified due to environmental/ecosystem considerations, the Team did not recommend a reduction in the ABC.

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, but catch data from 1991-2019 were updated and preliminary catch data for 2020 were included.

Spawning biomass and stock trends

After declining by more than 50% between 1991 and 2002, survey biomass has since stayed in the range of 50-90 kilotons. The 2018 Aleutians survey biomass estimate (81,272 t) was down approximately 4% from the 2016 estimate (84,409 t).

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The author and Team recommend using the Tier 5 assessment again for 2020. The Team's recommended ABC is 20,600 t, and OFL is 27,400 t. The estimate of the natural mortality rate is 0.34, which is unchanged from the previous assessment.

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 the Bering Sea and Aleutian Islands 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 2021 and 2022 are those recommended by the Plan Team. Beginning in the 2020 fishery year, the OFL was made Alaska-wide (i.e., for both BSAI and GOA FMPs combined). For

2021 and 2022 ABC apportionment the Teams provided a recommended range of values (see description below). Catch data are current through November 7, 2020.

Area	Year	Age 4+ Biomass	OFL	ABC	TAC	Catch
Alaska (all areas)	2019	414,000				
	2020	657,000	50,726			
	2021	707,000	61,319			
	2022	694,000	71,756			
Bering Sea	2019	52,000	2,887	1,489	1,489	3,157
	2020	116,000		2,174	1,861	5,184
	2021	142,000		(see below)	n/a	n/a
	2022	139,000			n/a	n/a
Aleutian Islands	2019	98,000	3,917	2,008	2,008	663
	2020	154,000		2,952	2,039	1,123
	2021	175,000		(see below)	n/a	n/a
	2022	172,000			n/a	n/a

Changes from the previous assessment

New data included in the assessment model were relative abundance and length data from the 2020 longline survey, relative abundance and length data from the fixed gear fishery for 2019, length data from the trawl fisheries for 2019, age data from the longline survey and fixed gear fishery for 2019, updated catch for 2019, and projected 2020 - 2022 catches. Estimates of killer and sperm whale depredation in the fishery were updated and projected for 2020 - 2022. In 2020, there was not a NMFS Gulf of Alaska trawl survey.

There were no changes from the 2019 assessment methodology. The risk table was updated with new rationale. The authors recommended ABC be set equal to the 2019 values, which are considerably lower than the maximum permissible. This reduction was based on points raised in the risk table. The authors noted that this recommendation is 17% higher than their recommendation from last year.

The appendices to the assessment have been updated with new information and analyses. The Ecosystem and Socioeconomic Profile (ESP), Appendix 3C, was updated with new 2020 data. The catch apportionment appendix (3D) has been significantly revised and updated to address requested changes to the operating model and apportionment strategies based on SSC and Plan Team comments. An appendix (3E) was added which discusses the large increase of sablefish trawl fishery CPUE in the Bering Sea.

Spawning biomass and stock trends

Biomass-based reference points have increased by 20% from the 2019 SAFE model. The main factor driving these changes is the incorporation of the strong 2016 year class in the calculation of reference points for 2020, which was not incorporated in the 2019 SAFE estimate of average recruitment. It is likely that a similar pattern will occur in the next assessment, because the 2017 year class is estimated to be large, which will further increase the average recruitment used to determine reference points. Thus, relative stock status estimated in the model year 2021 stock assessment will likely decline due to further increases in the $B_{40\%}$ reference point.

Projected female spawning biomass (combined areas) for 2020 is 134,400 t (42% of $B_{100\%}$). The longline survey abundance index increased 32% from 2019 to 2020 following a 47% increase in 2019 from 2018. The lowest point of the time series was 2015. Similarly, the trawl survey biomass was at a time series low in 2013, but more than tripled since then. The fishery catch-rate/abundance index increased 20% in 2019 from 2018, which was the time series low (the 2020 data were unavailable). However, increases were primarily driven by uncertain and limited information from fisheries in the western areas, while the region-wide increase in use of pot gear has yet to be incorporated into the CPUE index used in the model. Spawning biomass is projected to increase rapidly through 2022 moving the stock to well above $B_{40\%}$, before declining and then stabilizing at $B_{40\%}$ in the long-term.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The reference values of $B_{100\%}$, $B_{35\%}$ and $B_{40\%}$ increased relative to 2019 by 19.7%. Projected female spawning biomass (combined areas) for 2020 is 134,400 t (42% of this year's $B_{100\%}$; 51% of $B_{100\%}$ from 2019). Given spawning biomass estimates relative to reference points, sablefish fall under Tier 3a of the BSAI and GOA FMPs. Reference points were calculated using recruitments from the 1977-2016 year classes. The authors recommended maintaining the overall Alaska-wide ABC equal to the 2020 specified ABC of 22,551 t, which is a less than half of the maximum permissible ABC (57% reduction). Adjusting for updated whale depredation estimates they recommended an Alaska-wide 2021 ABC of 22,237 t (slightly higher than the 2020 ABC due to changes in whale depredation). The recommended ABC represents a 3,250 t (17%) increase from the author recommended 2020 ABC in 2019, and an 88% increase in the ABC since 2016 when the lowest ABC on record (11,795 t) was enacted. The maximum permissible ABC for 2021 is 52,427 t, which represents a 19% increase from the 2020 maximum permissible ABC of 44,065 t projected by the 2019 assessment. The authors followed the risk table format and information in the ESP to provide rationale for the reduction to the maximum permissible ABC.

The authors explained that their recommended ABCs were lower than maximum permissible ABC for several reasons based on application of the risk table. While there are clearly positive signs of strong incoming recruitment, concerns exist regarding the lack of older fish contributing to spawning biomass, the uncertainty surrounding the estimates of the strength of the 2014, 2016, and 2017 year classes, and ambiguity related to how existing environmental conditions may affect the success of these year classes in the future. Although survey and fishery indices of abundance show positive signs consistent with recent strong recruitment, the model fits to these indices are poor where the assessment model tends to overstate population growth compared to rates of increase observed in the various indices. Lastly, there are substantial concerns over the strong retrospective bias exhibited by the model.

Status determination

Model projections indicate that this stock is not being subjected to overfishing, is not overfished, and is not approaching an overfished condition.

Area apportionment

Apportionments have been held constant since the 2013 assessment. The 2016 CIE review panel concurred that there does not appear to be a biological concern with this apportionment approach, given the high mixing rates of the stock. However, several above average year classes of sablefish are entering the population following a long period of lower than average recruitment. The long period of low recruitment led to increased fishing pressure on the spawning biomass due to their relative predominance in the harvestable population and increased value over smaller fish. Now, recent large recruitments have created concerns about removing too many young fish before they have had a chance to mature and contribute to the spawning population. Because of the historically observed distribution of younger fish appearing first in western areas (BS, AI, WGOA) and older mature fish being more prevalent in eastern areas (CGOA, WY, EY), the location of catches in periods of high or low recruitment can clearly have an impact on different portions of the sablefish population-at-age. Thus, regional ABC apportionment to management areas can result in different impacts on the population depending on the apportionment. The SSC and Plan Teams requested that new apportionment approaches be presented. However, the assessment authors currently do not have enough information on spatial processes (e.g., distribution of the population by age, movement rates by age among regions, or juvenile habitat preferences and distributions associated with large year classes) to adequately determine whether specific, reasonably distributed apportionment approaches create a conservation concern (e.g., localized depletion, age truncation, or year class reduction) for the Alaskan sablefish population. The results of simulation work (see Appendix 3D), though limited in scope of process and observation error, indicated that apportionment of ABC to the six management regions can be conducted in numerous ways with little biological implications for the population. This is primarily due to the high movement rates exhibited by sablefish and the existing harvest control rule and management framework. The authors noted that the simulation model was conditioned on the general dynamics as

estimated by the 2018 sablefish assessment and incorporates limited knowledge regarding the movement and distribution of juvenile sablefish.

The Teams concurred with the authors that an apportionment method that tracks regional biomass or a best proxy thereof is likely the best defense against localized depletion or other conservation concerns (e.g., disproportionately targeting spawners in only a handful of regions or population strongholds). While there are tradeoffs among all the methods examined, the rationale for moving away from the status quo fixed method is that it fails to reflect increasing proportions of fish in the EBS. It is noted that the former apportionment method used before 2014 depends on fishery CPUE data. Given the issues related to boats converting to pot gear, whale depredation impacts in the biennial BS and AI longline surveys, and fishery coverage rates changing in different areas, the Team concurred with the authors to exclude the earlier apportionment method from consideration this year until these issues could be resolved. From a biological standpoint, the Teams agreed that a range of apportionment approaches be considered for Council specifications, including starting from the status quo (fixed apportionment) and the authors' recommended 5-year moving average. The Teams recommended to the extent practical, moving away from the fixed apportionment to the true distribution of the stock would be preferred from a biological perspective. However, there was consensus that in the near term and at these reduced recommended exploitation rates, the impacts to the stock would likely be minimal under any apportionment range within these two options.

Apportionment values presented here include whale depredation adjustments for the two apportionment strategies:

Table of author-recommended ABC for 2021 and 2022 by the survey 5-year non-exponential survey apportionment method for the BSAI and GOA subareas. 2020 ABC is from the fixed apportionment method.

Region	2020			2021		2022	
	OFL _w	ABC _w	TAC	OFL _w	ABC _w	OFL _w	ABC _w
BS	--	2,174	1,861	--	3,674	--	4,843
AI	--	2,952	2,039	--	5,294	--	6,978
BSAI	--	5,126	3,900	--	8,968	--	11,821
GOA¹	-	16,883	14,393	--	13,269	--	17,489
Alaska-wide	50,481	22,009	18,293	60,426	22,237	70,710	29,309

¹GOA information included to show total breakdown. For details please see the GOA SAFE document.

2020, 2021, and 2022 ABC from the Fixed (Status Quo) apportionment method for the BSAI and GOA subareas.

Region	2020			2021		2022	
	OFL _w	ABC _w	TAC	OFL _w	ABC _w	OFL _w	ABC _w
BS	--	2,174	1,861	--	2,177	--	2,869
AI	--	2,952	2,039	--	2,959	--	3,901
BSAI	--	5,126	3,900	--	5,136	--	6,770
GOA¹	--	16,883	14,393	--	17,087	--	22,520
Alaska-wide	50,481	22,009	18,293	60,426	22,223	70,710	29,290

¹GOA information included to show total breakdown. For details please see the GOA SAFE document.

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 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Age 6+ Biomass	OFL	ABC	TAC	Catch
BSAI	2019	2,462,400	290,000	263,200	154,000	122,309
	2020	2,461,850	287,307	260,918	150,700	128,320
	2021	2,755,870	341,571	313,477	n/a	n/a
	2022	3,025,430	374,982	344,140	n/a	n/a

The Flatfish Flexibility Exchange program has increased the TAC from 154,000 t to 155,250 t for 2019 and from 150,700 t to 158,518 t for 2020.

Changes from previous assessment

Changes to the input data include:

1. 2019 fishery age composition.
2. 2019 survey age composition.
3. The estimate of the total catch made through the end of 2019 was updated as reported by the NMFS Alaska Regional office. The catch through the end of 2020 was estimated based on available data. Catch of 139,283 t was assumed for the 2021 and 2022 projections.
4. Due to COVID-19, the 2020 NMFS Eastern Bering Sea (EBS) shelf bottom-trawl survey was not conducted. Therefore, there is no survey biomass estimate from 2020.
5. Fishery weight-at-age was calculated based on methodology in the document.

The recommended model (18.2) for this year differs from last year's reference model in that male natural mortality is estimated within the model.

Spawning biomass and stock trends

The projected female spawning biomass estimate for 2021 is 1,040,900 t, which is $1.86 \times B_{MSY}$. This is a 29% increase from last year's 2021 estimate (809,813 t). A general slow decline in spawning biomass has prevailed for the most part since 1995.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The lead author presented the results from four assessment models. One is last year's model (18.1); one is the same as last year's model, except with natural mortality fit for males (18.2); and two are exploratory models with VAST estimates of survey biomass for only the EBS (18.3) and for both the EBS and NBS (18.4). The author recommended use of model 18.2 for this year's management and the Team concurred. The risk table indicated no adjustment to the maximum ABC was advised, and the Team concurred.

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 559,704 t, and projected spawning biomass for 2021 is 1,040,900 t, meaning that yellowfin sole qualify for management under Tier 1a. Corresponding to the approach used in recent years, the 1978-2014 age-1 recruitments (and corresponding spawning biomass estimates) were used this year to determine the Tier 1 harvest recommendations. This provided a maximum permissible ABC harvest ratio (the harmonic mean of the F_{MSY} harvest ratio) of 0.114. The current value of the OFL harvest ratio (the arithmetic mean of the F_{MSY} ratio) is 0.124. The product of the maximum permissible ABC harvest ratio and the geometric mean of the 2021 biomass estimate produced the 2021 ABC of 313,477 t recommended by the Team, and the corresponding product using the OFL harvest ratio produces the 2021 OFL of 341,571 t. For 2022, the corresponding quantities are 344,140 t and 374,982 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 2021 and 2022 are those recommended by the Plan Team. Catch data for 2020 are current through November 7, 2020.

Area	Year	Age 1+ Biomass	OFL	ABC	TAC	Catch
BSAI	2019	105,930	11,362	9,658	5,294	2,849
	2020	106,101	11,319	9,625	5,300	2,312
	2021	87,849	8,568	7,326	n/a	n/a
	2022	79,382	7,181	6,139	n/a	n/a
Eastern Bering Sea	2019	n/a	n/a	8,431	5,125	2,678
	2020	n/a	n/a	8,403	5,125	1,639
	2021	n/a	n/a	6,175	n/a	n/a
	2022	n/a	n/a	5,175	n/a	n/a
Aleutian Islands	2019	n/a	n/a	1,227	169	171
	2020	n/a	n/a	1,222	175	673
	2021	n/a	n/a	1,150	n/a	n/a
	2022	n/a	n/a	964	n/a	n/a

Changes from previous assessment

Generally the assessment remained unchanged except for a minor correction that was made to correctly specify the units of the AFSC longline survey RPN. This change had little impact on the assessment model. Additionally, the following new and/or updated data inputs were included:

1. 2019 NMFS shelf bottom trawl survey biomass estimates and size compositions.
2. AFSC longline survey biomass estimates for 2019 and 2020.
3. 2018-2019 NMFS shelf bottom trawl surveys size at age.
4. 2019 fishery catch estimates.
5. 2020 preliminary fishery catch estimates.
6. 2019-2020 fishery size comps.

Spawning biomass and stock trends

The projected 2021 female spawning biomass is 51,914 t, which is a 3% decrease from last year's 2021 projection of 53,617 t. Female spawning biomass is projected to decrease slightly to 47,197 t in 2022. The previous assessment (2018) indicated that the incoming 2007-2009 year classes were creating increases in both the female spawning biomass and total biomass estimates. However, this recruitment now appears to be fully integrated into the fishery, and no new recruitment has been observed since then. After peaking in 2017 and 2020, respectively, age 1+ and spawning biomass are once again trending downward or are projected to begin to do so. There are ecosystem-related concerns for future recruitment given the recent warming in the Bering Sea and the shrinking of the cold pool.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The $B_{40\%}$ value, using the mean recruitment estimated for the period 1978-2018 is 35,662 t. The projected 2021 female spawning biomass of 51,914 t is well above the estimate of $B_{40\%}$. Because the projected spawning biomass in year 2021 is above $B_{40\%}$, Greenland turbot ABC and OFL levels will be determined under Tier 3a of Amendment 56. The OFLs for 2021 and 2022 are 8,568 t and 7,181 t respectively, and the corresponding maximum permissible ABCs are 7,326 t and 6,139 t, respectively. The author

recommended setting ABC at the maximum permissible values for 2021 and 2022, and the Team concurred.

Area apportionment

The authors and Team recommend that apportionment of ABC between the EBS and the Aleutian Islands be based on the assumption that 15.7% of the biomass is in the Aleutian Islands. This is documented in the 2018 and 2020 assessments, and as in previous assessments, is 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 2021 and 2022 ABCs in the EBS are 6,175 t and 5,175 t. The 2021 and 2022 ABCs for the AI are 1,160 t and 964 t. Area apportionment of the 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 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Age 1+ Bio	OFL	ABC	TAC	Catch
BSAI	2019	892,591	82,939	70,673	8,000	10,052
	2020	934,008	84,057	71,618	10,000	10,265
	2021	923,646	90,873	77,349	n/a	n/a
	2022	921,074	94,368	80,323	n/a	n/a

Changes from previous assessment

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

1. Estimates of catch through October 25, 2020.
2. Fishery size compositions for 2018 (updated) and 2019.
3. Biomass point-estimates and standard errors from the 2019 Eastern Bering Sea shelf survey.
4. Age data from the 2018-2019 eastern Bering Sea shelf and the 2018 Aleutian Islands surveys.
5. Length compositions from the 2019 eastern Bering Sea shelf survey.
6. The recommended model did not include eastern Bering Sea shelf survey data for 1982-1991.

Spawning biomass and stock trends

The projected age 1+ total biomass for 2021 is 923,646 t, which is a slight decrease from the value of 934,008 t projected for 2021 in last year’s assessment. The projected female spawning biomass for 2021 is 497,556 t, which is also a slight increase from last year’s 2021 estimate of 478,260 t. Overall stock trends remain fairly stable, with continuation of the slight upward trend in age 1+ biomass estimates that has been observed since 2016.

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 223,530 t and 0.135. The projected 2021 spawning biomass is well above $B_{40\%}$, so ABC and OFL recommendations for 2021 were calculated under sub-tier “a” of Tier 3. The authors recommend setting F_{ABC} at the $F_{40\%}$ level, which is the maximum permissible level under Tier 3a, resulting in 2021 and 2022 ABCs of 77,349 t and 80,323t, respectively. Projected harvesting at $F_{35\%}$ (0.160) gives 2021 and 2022 OFLs of 90,873 t and 94,368 t respectively. The Team agrees with these recommendations.

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.

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 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Age 2+ Biomass	OFL	ABC	TAC	Catch
BSAI	2019	155,251	10,965	9,260	5,000	4,487
	2020	162,709	11,495	9,708	6,800	7,279
	2021	144,671	10,630	8,982	n/a	n/a
	2022	143,248	10,843	9,163	n/a	n/a

Changes from previous assessment

Changes to the input data include:

1. Estimates of catch were updated for all years. As of October 26, 2020, catch exceeded the TAC. The 2020 catch was estimated using an expansion factor of 1.025 that was derived from the 5-yr average proportion of the catch caught as of October 26.
2. The 2019 and 2020 fishery length composition data were added to the assessment.
3. The 2019 EBS shelf bottom trawl survey biomass and length composition estimates were added to the assessment.
4. The 2016 age composition data from the EBS slope bottom trawl survey were added to the assessment model. The 2016 length data were used in the 2018 assessment; therefore, were not included in this year's model.
5. The 2016 and 2018 age composition data from the Aleutian Islands bottom trawl survey were added to the assessment model. The 2016 and 2018 length data were used in the 2018 assessment model and were not included in this year's model.
6. The length-weight and von Bertalanffy growth relationships were updated with age and length data from the RACE Bottom Trawl Surveys. In turn, the sex-specific, age-length transition matrices were updated.

No changes were made to the assessment model methodology.

Spawning biomass and stock trends

The projected 2021 female spawning biomass is 54,341 t, above the $B_{40\%}$ level of 40,550 t, and spawning biomass is projected to remain above $B_{40\%}$ for the foreseeable future. The early shelf survey size composition data suggest that some significant recruitment events (assessed at age 2) occurred prior to 1991. Since 1991, the preferred assessment model (16.0b) estimates that the 2001, 2002, 2008, and 2014 year classes are all at least 80% above average. Female spawning biomass has been increasing since 2015.

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 2021 is above $B_{40\%}$, placing Kamchatka flounder in sub-tier "a" of Tier 3. For the 2021 fishery, the authors and Team recommend setting 2021 ABC at the maximum permissible value of 8,982 t from the projection model. This value is a decrease of 7% from the 2020 ABC currently specified (9,688 t). The recommended 2021 OFL is 10,630 t, a 7% decrease from the 11,472 t currently specified for 2021.

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 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Age 6+ Biomass	OFL	ABC	TAC	Catch
BSAI	2019	828,000	122,000	118,900	47,100	25,721
	2020	1,068,000	157,300	153,300	47,100	25,762
	2021	923,197	145,180	140,306	n/a	n/a
	2022	1,359,440	213,783	206,605	n/a	n/a

Changes from previous assessment

No changes were made to the assessment methodology. Changes to the input data include:

1. 2020 catch biomass through October 28, 2020 and 2018 catches were added to the model.
2. 2018 catch biomass was updated to reflect October – December 2018 catches.
3. 2018-2019 fishery age composition data were added to the model.
4. 2018-2019 survey age composition data were added to the model.
5. 2019 Eastern Bering Sea (EBS) shelf survey biomass was added to the model.

Spawning biomass and stock trends

Spawning biomass was at a low in 2008, increased through the early 2010's, and has been steadily decreasing since around 2015. The 2001-2005 year classes are all estimated to be above average; however, recruitment was maintained at near historic lows for several years straight in the mid 2010's. More recently a slug of recruits has begun to show up in the surveys. The stock assessment model projects a 2021 female spawning biomass of 294,627 t, a 24% decrease from the previous 2021 female spawning biomass estimate of 389,000 t. The projected spawning biomass for 2022 is 286,381 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 2021 is projected to be well above the B_{MSY} estimate of 158,972, placing northern rock sole in sub-tier "a" of Tier 1. The Tier 1 2021 and 2022 ABC harvest recommendations are 140,306 t and 206,605 t, respectively ($F_{ABC} = 0.152$). The 2021 and 2022 OFLs are 145,180 t and 213,783 t ($F_{OFL} = 0.157$). Recommended ABCs correspond to the maximum permissible levels.

This is a stable fishery that lightly exploits the stock because it is constrained by PSC limits and the BSAI optimum yield cap. Usually the average catch/biomass ratio is about 3-4 percent.

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 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Age 3+Biomass	OFL	ABC	TAC	Catch
BSAI	2019	673,718	80,918	66,625	14,500	15,062
	2020	684,768	82,810	68,134	19,500	9,001
	2021	602,497	75,863	62,567	n/a	n/a
	2022	608,576	77,763	64,119	n/a	n/a

The Flatfish Flexibility Exchange Program increased the TAC from 14,500 t to 21,351 t in 2019. The TAC was decreased from 19,500 t to 13,319 t in 2020.

Changes from previous assessment

This assessment was changed to a biennial cycle beginning with the 2014 assessment; this is a full assessment year.

Changes to the input data in this analysis include:

1. Final 2018 and 2019 catch biomasses and 2020 catch biomass through October 26, 2020 were added to the model.
2. 2018-2019 fishery age composition data were added.
3. 2020 fishery length composition data were added to the model.
4. 2019 Eastern Bering Sea shelf survey biomass was added to the linear regression used to determine estimates of AI survey biomass in years when no AI survey occurred; this updated survey biomass index was added to the assessment model for 1982-2019.
5. 1999 and 2018-2019 survey age composition data were added to the model.
6. 2019 survey length composition data were added to the model.
7. Survey ages 1-2 were added to the model, and survey ages for Bering flounder were removed, both of which were mistakes in the previous assessment.

No new models were considered this year. The previously accepted model 18.2c was updated with new data and is referred to as 18.2c (2020).

Spawning biomass and stock trends

Age 3+ biomass declined by 31% from 1994 through 2015, but has steadily increased since then and is approaching historic highs. However, spawning biomass has declined consistently since 1998 although spawning biomass is projected to begin increasing in 2022.

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 $B_{40\%}=81,463$ t, $F_{40\%}=0.38$, and $F_{35\%}=0.47$. Because projected spawning biomass for 2021 (150,433 t) is above $B_{40\%}$, flathead sole is in Tier 3a. The authors and Team recommend setting ABCs for 2021 and 2022 at the maximum permissible values under Tier 3a, which are 62,567 t and 64,119 t, respectively. The 2021 and 2022 OFLs under Tier 3a are 75,863 t and 877,763 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 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Age 3 + Biomass	OFL	ABC	TAC	Catch
BSAI	2019	400,700	39,880	33,600	18,000	16,163
	2020	428,800	37,600	31,600	17,000	19,954
	2021	427,587	37,924	31,657	n/a	n/a
	2022	430,164	36,928	30,815	n/a	n/a

In accordance with the approved schedule, no assessment was conducted for Alaska plaice this year. However, a full stock assessment will be conducted in 2021. In a partial assessment year, the full assessment model is not rerun but instead a Tier 3 projection model with an assumed future catch is run to estimate the stock level in future years. This incorporates the most current catch information without re-estimating model parameters and biological reference points. The Tier 3 projection operates outside the full assessment model by projecting estimates of future female spawning biomass, age 6+ total biomass, ABC and OFL from the full model estimate of 2019 numbers-at-age and weight-at-age. Please refer to last year's stock assessment for details regarding the rolled over estimates. Additional information listed below summarizes the 2019 assessment.

Changes from previous assessment

New data was added to the Tier 3 projection model which is used to forecast stock condition ahead to year 2032, included an updated 2019 catch estimate (16,163 t) and new catch estimates for 2020 through October 23, 2020. The full-year 2020 catch was estimated by rounding the catch as of October 23 (19,685) upward to 20,000 t based on predicted further accumulation of catch. To estimate future catches through 2032, the catches that corresponded to the average F of the most recent 5 years were used, as estimated by the 2019 full assessment.

Changes to the last year's full assessment included:

1. Estimates of catch (t) and discards for 2018 and 2019.
2. 2018 and 2019 shelf trawl survey biomass estimates and standard errors.
3. 2019 survey length composition.
4. 2017 and 2018 survey age composition.
5. 2017 and 2018 fishery length composition.

No modifications were made to the assessment methodology this year or last year.

Spawning biomass and stock trends

Last year's assessment indicated that above average recruitment strength in 1998 and exceptionally strong recruitment in 2001 and 2002 have contributed to recent high level of female spawning biomass. The Alaska plaice stock is projected to remain above the $B_{35\%}$ level of female spawning biomass while declining over the next several years. Exploitation rates are increasing but remain relatively low (3-5% in recent years).

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 $B_{40\%} = 134,069$ t, $F_{40\%} = 0.132$, and $F_{35\%} = 0.16$. Given that the projected 2021 spawning biomass of 166,528 t exceeds $B_{40\%}$, the ABC and OFL recommendations for 2021 were calculated under sub-tier "a" of Tier 3. Projected harvesting at the $F_{40\%}$ level gives a 2021 ABC of 31,657 t

and a 2022 ABC of 30,815 t. The recommended Tier 3a OFLs are 37,924 t and 36,928 t for 2021 and 2022, 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

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 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Total Biomass	OFL	ABC	TAC	Catch
BSAI	2019	141,450	21,824	16,368	6,500	3,765
	2020	113,450	21,824	16,368	4,000	4,113
	2021	146,679	22,919	17,189	n/a	n/a
	2022	146,679	22,919	17,189	n/a	n/a

Changes from previous assessment

This chapter was presented as a full assessment.

Changes to the input data included:

1. The 2016 catch was updated, catches for 2017, 2018, and 2019 were included and catch through 30 October 2020.
2. The 2017, 2018, and 2019 Eastern Bering Sea shelf survey and 2018 Aleutian Islands survey biomass estimates were added.

No modifications were made 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. This is a not-targeted species complex and in 2019 approximately 23% of the ABC was caught. The random effects model estimates indicate that the other flatfish species group is at a high level relative to the time series average and is lightly exploited.

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. The resultant 2021 OFL and ABC are 22,919 t and 17,189 t respectively.

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 (POP) 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 2021 and 2022 are those recommended by the Team. Catch data are current through November 7, 2020.

Area	Year	Age 3+ Bio	OFL	ABC	TAC	Catch
BSAI	2019	934,293	61,067	50,594	44,069	43,614
	2020	908,529	58,956	48,846	42,875	36,303
	2021	756,011	44,376	37,173		n/a
	2022	735,367	42,384	35,503		n/a
Eastern Bering Sea	2019			14,675	14,675	14,022
	2020			14,168	14,168	8,895
	2021			10,782	n/a	n/a
	2022			10,298	n/a	n/a
Eastern Aleutian Islands	2019			11,459	11,009	10,945
	2020			11,063	10,613	9,557
	2021			8,419	n/a	n/a
	2022			8,041	n/a	n/a
Central Aleutian Islands	2019			8,435	8,385	8,263
	2020			8,144	8,094	7,966
	2021			6,198	n/a	n/a
	2022			5,919	n/a	n/a
Western Aleutian Islands	2019			16,025	10,000	9,888
	2020			15,471	10,000	9,885
	2021			11,774	n/a	n/a
	2022			11,245	n/a	n/a

Changes from previous assessment

This chapter was presented as a full assessment. Changes to the input data included updated catch data through 2019, projected 2020-2022 catch estimates, 2018 Aleutian Islands (AI) survey age compositions replace the 2018 length compositions, new 2018 fishery length composition and 2019 fishery age composition, updated length-at-age, weight-at-age, and age-to-length conversion matrices, and reweighted age and length data using the iterative reweighting procedure (McAllister-Ianelli method). There were no changes to the assessment methodology.

Spawning biomass and stock trends

There were no survey updates since the last full assessment due to concerns over COVID-19. The high survey biomass estimates over the past five years have contributed to a substantial increase in estimated stock size in recent years; however, there remains a poor residual pattern in the fit to the AI survey index. Spawning biomass is projected to be 310,036 t in 2021 and decline to 297,091 t in 2022. The estimates of a recent large year classes (i.e., 2000, 2004-2005, and 2008) appear to be relatively flat or have declined slightly since the last full assessment.

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 POP for management under Tier 3. The updated point estimates of $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$ are 233,899 t, 0.073, and 0.089, respectively. Spawning biomass for 2019 (310,036 t) is projected to exceed $B_{40\%}$, thereby placing POP in sub-tier “a” of Tier 3. The maximum permissible value of F_{ABC} under Tier 3a is 0.073, which results in the author and Plan Team recommended 2021 ABC of 37,173 t and 2022

ABC of 35,503 t. The OFL fishing mortality rate is 0.089. which results in a 2021 OFL of 44,376 t and 2022 OFL of 42,384 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 2021): EBS = 10,782 t, Eastern Aleutians (Area 541) = 8,419 t, Central Aleutians (Area 542) = 6,198 t, and Western Aleutians (Area 543) = 11,774 t. The recommended OFLs for 2021 and 2022 are not regionally apportioned.

Status determination

This stock 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 2021 and 2022 are those recommended by the Team. Catch data are current through November 7, 2020.

Area	Year	Age 3+ Biomass	OFL	ABC	TAC	Catch
BSAI	2019	244,196	15,507	12,664	6,500	9,058
	2020	250,235	19,751	16,243	10,000	8,362
	2021	244,600	18,917	15,557	n/a	n/a
	2022	240,022	18,221	14,984	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 stock assessment prioritization guidelines. Therefore, only the projection model was run, with updated catches. New data in the 2020 assessment included updated 2019 catch and estimated 2020-2022 catches. No changes were made to the assessment model. Exploitation rates (i.e., catch/biomass) have averaged 0.017 from 2004-2020, which is below the exploitation rate associated with fishing at $F_{40\%}$.

Spawning biomass and stock trends

The 2019 catch was 9,058 t, 3% larger than the estimate of 8,828 t that was used in the 2019 projection. The 2020 catch is projected to be 8,946 t, 29% larger than the estimate of 6,930 in the 2019 projection. Spawning biomass is projected to be 107,003 t in 2021 and to decline to 103,467 t in 2022. The exploitation rates from the BSAI subareas are below $F_{40\%}$. The exploitation rate in the eastern Aleutian Islands peaked in 2015 and 2019, but was substantially lower in 2020. The exploitation rates in the central Aleutian Islands have been increasing since 2014.

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 63,940 t, 0.061, and 0.075, respectively. Spawning biomass for 2021 (107,003 t) is projected to exceed $B_{40\%}$, thereby placing northern rockfish in sub-tier “a” of Tier 3. The maximum permissible value of F_{ABC} under Tier 3a is 0.061, which results in the author and Plan Team recommended 2021 ABC of 15,557 t and 2022 ABC of 14,984 t. The OFL fishing mortality rate is 0.075 which results in a 2021 OFL of 18,917 t and 2022 OFL of 18,221 t.

Status determination

This stock 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. Catch data are current through November 7, 2020.

Area/subarea	Year	Total Biomass (t)	OFL	ABC	TAC	Catch
BSAI	2019	47,853	676	555	279	391
	2020	50,376	861	708	349	453
	2021	19,003	576	482	n/a	n/a
	2022	19,100	595	500	n/a	n/a
Western/ Central Aleutian Islands	2019			204	204	304
	2020			264	264	333
	2021			169	n/a	n/a
	2022			176	n/a	n/a
Eastern AI/ Eastern Bering Sea	2019			351	75	88
	2020			444	85	120
	2021			313	n/a	n/a
	2022			324	n/a	n/a

Changes from previous assessment

This assessment was changed to a biennial cycle beginning with the 2014 assessment; this is a full assessment year.

Changes to the input data include:

1. Catch data were updated through 2019, and total catch for 2020 was projected.
2. The 2018 AI survey length composition was replaced by the 2018 survey age composition.
3. The 2018 and 2019 AI fishery age compositions were included in the assessment.
4. The length-at-age, weights-at-age, and age-at-length conversion matrices were updated based on data from NMFS AI trawl survey beginning in 1991.

Changes in the assessment methodology include:

1. The weights for the age/length composition data were calculated based on the Francis iterative reweighting procedure. This method was used in the recommended model for 2018 but was not used in the model accepted by the SSC in 2018.
2. The mean of the prior distribution for natural mortality was increased to 0.045.
3. The proportion mature at age was estimated within the model

Spawning biomass and stock trends

Since 2005, spawning biomass has increased from 2,965 t to 3,337 t in 2020 and the total biomass has increased from 11,353 to 17,584 for this period. Much of this increase in total biomass can be attributed to relatively recent year classes that have not fully matured. Spawning biomass for AI blackspotted/rougheye rockfish in 2021 is projected to be 3,372 t and is projected to increase slightly in 2022.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The BSAI is separated into Aleutian Islands (AI) and Bering Sea (BS) components for this assessment. For the AI, this stock qualifies for management under Tier 3 due to the availability of estimates for $B_{40\%}$, $F_{40\%}$, and $F_{35\%}$. Because the projected female spawning biomass for 2021 of 3,372 t is less than $B_{40\%}$ (3,524 t), the stock qualifies as Tier 3b and is projected to remain in Tier 3b in 2022. For the BS, this stock is managed under Tier 5 with a projected biomass for both 2021 and 2022 of 1,371 t.

The Team recommends an overall 2021 ABC of 482 t and a 2021 OFL of 576 t. The apportionment of the 2021 ABC to subareas is 169 t for the Western and Central Aleutian Islands and 313 t for the eastern Aleutian Islands and eastern Bering Sea.

Area apportionment

Ongoing concerns about fishing pressure relative to biomass in the Western Aleutians have been noted by the Team. The fishery has regularly exceeded the Maximum Sub-area Species Catch (MSSC) and in 2020 exceeded the MSSC by more than 300%. There was substantial discussion on the utility of the continued utility of the MSSC as a tool to reduce bycatch of this species, however consensus was not reached. The Team requested guidance from the SSC and Council for spatial management strategies. The MSSC levels recommended by the author, but not agreed to by the Plan Team, within the WAI/CAI, based on the random effects model, are as follow:

	WAI	CAI
2021 MSSCs	31	138
2022 MSSCs	32	144

Status determination

The BSAI blackspotted/rougeye stock complex is not subjected to overfishing. For the Aleutian Islands region, the blackspotted and rougeye rockfish complex is not overfished, and is not approaching an overfished condition. It is not possible to determine whether the complex in the Bering Sea region is overfished or whether it is approaching an overfished condition because it is managed under Tier 5.

15. Shortraker rockfish

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 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Survey Biomass	OFL	ABC	TAC	Catch
BSAI	2019	24,055	722	541	358	380
	2020	24,055	722	541	375	214
	2021	24,055	722	541	n/a	n/a
	2022	24,055	722	541	n/a	n/a

Changes from previous assessment

This assessment was changed to a biennial cycle beginning with the 2014 assessment; this is a full assessment year.

Changes to the input data:

1. The catch data have been revised and updated through October 25, 2020.
2. There were no survey updates this year for the Aleutian Islands (AI) trawl survey or the eastern Bering Sea slope survey.

No changes were made to the assessment model from the previous full assessment.

Spawning biomass and stock trends

Estimated shortraker rockfish biomass in the BSAI has been relatively stable since 2002. Increases in the 2018 AI survey biomass estimates occurred in the western and eastern AI with a decrease in the central AI. According to the random effects model, total biomass (AI and EBS slope combined) from 2002-2018 has been very stable. 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. Exploitation rates have generally been well below the ABC levels in all areas, except for the western area, where exploitation rates exceeded the ABC levels from 2011-2013.

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 shorttraker 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 shorttraker rockfish, resulting in a $maxF_{ABC}$ value of 0.0225. The ABC is 541 t for 2021 and 2022 and the OFL is 722 t for 2021 and 2022.

Status determination

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

16. Other rockfish complex

Status and catch specifications (t) of other rockfish in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Survey Biomass	OFL	ABC	TAC	Catch
BSAI	2019	55,312	1,793	1,345	663	1,266
	2020	53,290	1,793	1,345	1,088	996
	2021	53,248	1,751	1,313	n/a	n/a
	2022	53,248	1,751	1,313	n/a	n/a
Eastern Bering Sea	2019	n/a	n/a	956	275	697
	2020	n/a	n/a	956	700	293
	2021	n/a	n/a	919	n/a	n/a
	2022	n/a	n/a	919	n/a	n/a
Aleutian Islands	2019	n/a	n/a	388	388	569
	2020	n/a	n/a	388	388	703
	2021	n/a	n/a	394	n/a	n/a
	2022	n/a	n/a	394	n/a	n/a

Changes from previous assessment

A full stock assessment was conducted this year.

Changes to the input data:

1. Catch and fishery lengths updated through October 13, 2020.
2. The only new survey biomass for this assessment is a zero biomass observation for non-SST species in the 2019 Eastern Bering Sea (EBS) shelf survey. The 2020 AI and EBS shelf surveys were canceled due to Covid-19, and there has been no EBS slope survey since 2016.
3. Following guidance from the Resource Assessment and Conservation Engineering Division (RACE) division, survey biomass inputs to the random effects (RE) model were limited to: AI (1991-present), EBS shelf (1982-present), and EBS slope (2002-present).

There were no changes in the assessment methodology.

Spawning biomass and stock trends

This is a Tier 5 complex, thus trends in spawning biomass are unknown. The random effects survey biomass estimates for shortspine thornyhead (SST) in the Aleutian Islands and EBS slope have been variable. The non-SST portion of the complex varies dramatically among surveys, although there was no survey this year.

Biomass estimates are frequently zero or very small for the non-SST portion of the complex in both the eastern Bering Sea 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 the non-SST portion of the complex yields 2021 and 2022 ABCs of 919 t in the eastern Bering Sea and 394 t in the Aleutian Islands. 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, yielding an OFL of 1,751 t for 2021 and 2022.

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 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Age 1+ Biomass	OFL	ABC	TAC	Catch
BSAI	2019	498,320	79,200	68,500	57,951	57,209
	2020	515,890	81,200	70,100	59,305	57,506
	2021	560,360	85,580	73,590	n/a	n/a
	2022	599,690	79,660	68,220	n/a	n/a
E Aleutian Islands / EBS	2019	n/a	n/a	23,970	23,970	23,657
	2020	n/a	n/a	24,335	24,535	22,926
	2021	n/a	n/a	25,760	n/a	n/a
	2022	n/a	n/a	23,880	n/a	n/a
Central Aleutian Islands	2019	n/a	n/a	14,390	14,390	14,110
	2020	n/a	n/a	14,721	14,721	14,588
	2021	n/a	n/a	15,450	n/a	n/a
	2022	n/a	n/a	14,330	n/a	n/a
Western Aleutian Islands	2019	n/a	n/a	30,140	19,591	19,441
	2020	n/a	n/a	30,844	20,049	19,992
	2021	n/a	n/a	32,380	n/a	n/a
	2022	n/a	n/a	30,010	n/a	n/a

Changes from previous assessment

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

1. The 2019 catch estimate was updated, and estimated total catch for 2020 was set equal to the TAC (59,305 t).
2. Estimated 2021 and 2022 catches are 60,400 t and 56,925 t, respectively.
3. The 2019 fishery age composition data were added.

4. The estimated average selectivity for 2015-2019 was used for projections.
5. It was assumed that approximately 85% of the BSAI-wide ABC is likely to be taken under the revised Steller Sea Lion Reasonable and Prudent Alternatives (SSL RPAs) implemented in 2015. This percentage was applied to the 2021 and 2022 maximum permissible ABCs, and those reduced amounts were assumed to be caught in order to estimate the 2021 and 2022 ABCs and OFL values.
6. As in 2019, the sample sizes specified for fishery age composition data were rescaled to have the same means as in the original baseline model (100), but varied relative to the number of hauls for the fishery. The 2019 data were added.

No changes to the base model (Model 16.0b) were made this year.

Spawning biomass and stock trends

Spawning biomass 2005 was at the highest level since 1982, after which it decreased almost continuously through 2020 (the estimated spawning biomass in 2021 is projected to be roughly 38% of what it was in 2005). It is projected to decrease further, at least through 2022. Total biomass follows a similar decreasing trend. The 1999-2001 year classes were all very strong, and the 2006 and 2007 year classes were 54% and 32% above the post-1976 average. The projected female spawning biomass for 2021 (107,830 t) is projected to be below $B_{40\%}$ (116,330 t), and the stock is projected to remain below $B_{40\%}$ through 2025.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

The projected female spawning biomass under the recommended harvest strategy is estimated to be below $B_{40\%}$, thereby placing BSAI Atka mackerel in Tier 3b. The projected 2021 yield (ABC) at $F_{40\%adj} = 0.43$ is 73,590 t, up 5% from the 2020 ABC and up 14% from last year's projected ABC for 2021. The projected 2021 overfishing level at $F_{35\%} = 0.51$ is 85,580 t, up 5% from the 2020 OFL and up 14% from last year's projected OFL for 2021.

A risk table was completed for this stock with Level 1 ratings for all four categories. No adjustment to maxABC was proposed.

Area apportionment

The Tier 5 random effects model used since 2015 was not used to apportion the ABC among areas last year and instead the four-survey weighted averaging method that had been used prior to 2015 was used to apportion ABC among areas. This method was once again applied this year. The recommended ABC apportionments by subarea for 2021 are 25,760 t for Area 541 and the Bering Sea region (a 5.0% increase from 2020), 15,540 t for Area 542 (a 5.0% increase from 2020), and 32,380 t for Area 543 (a 5.0% increase from 2020).

Status determination

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

18. Skates

Status and catch specifications (t) of skates in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Age 0+ Biomass	OFL	ABC	TAC	Catch
BSAI	2019	624,338	51,152	42,714	26,000	20,139
	2020	611,761	49,792	41,543	16,313	17,221
	2021	611,865	49,297	41,257	n/a	n/a
	2022	591,905	47,372	39,598	n/a	n/a

For 2020, NMFS increased the TAC to 17,266 t with a reallocation of 3,400 t from the non-specified reserves.

Changes from previous assessment

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

1. Catch data have been updated through October 23, 2020.
2. The biomass estimates from the 2019 EBS shelf bottom trawl survey was added.
3. The Alaska skate model now incorporates EBS shelf survey biomass estimates through 2018, EBS shelf size compositions through 2019, fishery length compositions through 2019 and catch data through 2020.
- 4.

No changes were made to the Tier 3 assessment model for Alaska skate. The Tier 5 random effects model was updated for the "other skates" component of the assemblage.

Spawning biomass and stock trends

Spawning biomass of Alaska skate increased continuously from 2006 (198,418t) through 2020 (284,268 t), and is currently at an all-time high for the post-1976 environmental regime. Recruitment of Alaska skate was above average for all but two cohorts spawned between 1995 and 2011, but has been below average for all cohorts spawned since 2012. The remaining species of skates have relatively flat or increasing biomass trends, except for whiteblotched and leopard skates in the AI. Both of these species have been declining (since 2006 (whiteblotched) and 2010 (leopard)).

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 2021 (123,390 t) exceeds $B_{40\%}$ (71,370 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 2021 and 2022 ABCs are 33,219 t and 31,560 t, respectively, and the Alaska skate portions of the 2021 and 2022 OFLs are 38,580 t and 36,655 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 2021 and 2022 ABCs is 8,038 t for both years and the "other skates" portion of the 2021 and 2022 OFLs is 10,717 t for both years.

For the skate complex as a whole, ABCs for 2021 and 2022 total 41,257 t and 39,598 t, respectively, and OFLs for 2021 and 2022 total 49,297 t and 47,372 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. [Sharks](#)

Status and catch specifications (t) of sharks in recent years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2021 and 2022 are those recommended by the Plan Team. Catch data are current through November 7, 2020.

Area	Year	Biomass	OFL	ABC	TAC	Catch
BSAI	2019	n/a	689	517	125	151
	2020	n/a	689	517	150	179
	2021	n/a	689	517	n/a	n/a
	2022	n/a	689	517	n/a	n/a

Changes from previous assessment

This assessment was changed to a biennial cycle beginning with the 2014 assessment; this is a full assessment.

Changes to the input data in this analysis include:

1. Total catch for BSAI sharks is updated for 2003–2020 (as of Oct 13, 2020).
2. International Pacific Halibut Commission (IPHC) longline survey relative population numbers (RPNs) are updated through 2019.
3. Biomass estimates have been updated for the Bering Sea shelf trawl survey through 2019 (no surveys were conducted in 2020).

There were no changes in the assessment methodology.

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. In 2017, the IPHC RPN showed a slight increase, which was the first increase in a decade. All sleeper sharks taken in the survey and fisheries are likely juveniles, so it is impossible to know what effect those catches have on spawning stock biomass. Bycatch of salmon sharks has generally increased since 2010. 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 OFL is fixed at the maximum catch during 2003–2015 (689 t) and ABC at 75% 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.

20. [Octopus](#)

Status and catch specifications (t) of the octopus complex in recent years. The octopus stock complex is made up of at least nine distinct species and is assessed on even years. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. The OFL and ABC for 2021 and 2022 are those recommended by the Team. Catch data are current through November 7, 2020.

Area	Year	Biomass	OFL	ABC	TAC	Catch
BSAI	2019	n/a	4,769	3,576	400	268
	2020	n/a	4,769	3,576	275	682
	2021	n/a	4,769	3,576	n/a	n/a
	2022	n/a	4,769	3,576	n/a	n/a

Changes from previous assessment

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

1. Updated 2019 and preliminary 2020 incidental catch
2. Biomass estimates from the 2019 EBS shelf survey have been added. No relevant surveys were conducted during 2020.

Since the 2015 assessment, no changes have been 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 previously. Increases in both Pacific cod and percentage of octopus in Pacific cod diet increased the annual consumption estimates from 2009-2015.

Spawning biomass and stock trends

Species composition and size frequencies from the surveys were similar to previous years. Survey biomass estimates increased in 2019 for the EBS shelf survey when compared to 2018 estimates and the 2018 estimate decreased in the AI survey when compared to the 2016 estimate.

On the EBS shelf and in the commercial catch, giant Pacific octopus is the most abundant of at least nine 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 was 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. Data availability has not changed from the 2016 assessment, so harvest recommendations are the same as in 2016. The recommended ABCs and OFLs for 2020 and 2021 are 3,576 t and 4,769 t, respectively.

A risk table was completed for this stock with Level 1 ratings for all four categories and no adjustment to maxABC was proposed.

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. Grenadier

An abbreviated grenadier assessment is provided in Appendix 1; while not required, it is provided to assist the Council in tracking abundance of the assemblage in the groundfish FMPs. The Secretary of Commerce approved Amendments 100/91 on August 6, 2014, which added the grenadier complex into both FMPs as Ecosystem Components. Under this rule, they are not allowed to be targeted but there is an 8% Maximum Retainable Allowance (MRA) (Federal Register, Proposed Rules, Vol. 79, No. 93). As an Ecosystem Component, a stock assessment is not required and there is no ABC or OFL.

Changes from previous assessment

The authors provided update estimates of catch and biomass calculated as relative population weight from the longline survey. New data inputs include catch data, 2018 and 2020 AI biomass using the estimation method presented in the 2012 SAFE, AFSC longline survey relative population weights (RPWs) in the GOA for 2017-2020, in the EBS for 2017 and 2019, and in the AI for 2018 and 2020, and updated GOA

trawl survey biomass time series through 2019 using a random effects model. There were no changes to assessment methodology.

Spawning biomass and stock trends

The main grenadier species taken in the BSAI or GOA fisheries (mainly sablefish) are giant grenadiers. Grenadier are primarily caught in the Greenland turbot and Pacific halibut fishery in the Bering Sea and in the sablefish fishery in the GOA. Catch in the Aleutian Islands is fairly stable. Biomass for the BSAI and GOA are both down and in the GOA is the lowest it has been since 1998. The AFSC longline survey index is down in all areas, possibly due to hook competition for sablefish since they are increasing. However, catch and biomass using other surveys are also down, and the extent to which sablefish are affecting grenadier on the longline survey is unknown. Recent catch levels have been well below ABC.

Tier determination/Plan Team discussion and resulting ABCs and OFLs

No tier is determined, nor ABCs and OFLs set for Ecosystem Component species or complexes. However, Tier 5 methods are used for the grenadier complex to estimate ABC and OFL values to monitor the complex. The 2021 ABC for the BSAI is 61,738 t with an OFL of 82,317 t. The 2021 ABC for the GOA is 21,623 t with an OFL of 28,830 t.

Status determination

A status is not determined for Ecosystem Component species, however, using the Tier 5 criteria, the complex is not subject to overfishing. The Tier 5 methods do not provide a means to determine if the complex is overfished.

Tables

Table 1. BSAI Groundfish Plan Team Recommended OFLs and ABCs for 2021 and 2022 (metric tons); OFL, ABC, TAC and catch through November 7, 2020.

Species	Area	2020		Catch as of		Final 2021			Final 2022		
		OFL	ABC	TAC	11/7/2020	OFL	ABC	TAC	OFL	ABC	TAC
Pollock	EBS	4,085,000	2,043,000	1,425,000	1,364,949	2,594,000	1,626,000		2,366,000	1,484,000	
	AI	66,973	55,120	19,000	2,971	61,856	51,241		61,308	50,789	
	Bogoslof	183,080	137,310		75	113,479	85,109		113,479	85,109	
Pacific cod	BS	191,386	155,873	141,799	136,185	112,851	94,552		108,662	90,665	
	AI	27,400	20,600	13,796	5,321	27,400	20,600		27,400	20,600	
	AK					60,426	22,237		70,710	29,309	
	BSAI	50,481	n/a	n/a	n/a						
Sablefish	BS	n/a	2,174	1,861	5,184						
	AI	n/a	2,952	2,039	1,123						
Yellowfin sole	BSAI	287,307	260,918	150,700	128,320	341,571	313,477		374,982	344,140	
Greenland turbot	BSAI	11,319	9,625	5,300	2,312	8,568	7,326		7,181	6,139	
	BS	n/a	8,403	5,125	1,639		6,175			5,175	
	AI	n/a	1,222	175	673		1,150			964	
Arrowtooth flounder	BSAI	84,057	71,618	10,000	10,265	90,873	77,349		94,368	80,323	
Kamchatka flounder	BSAI	11,495	9,708	6,800	7,279	10,630	8,982		10,843	9,163	
Northern rock sole	BSAI	157,300	153,300	47,100	25,762	145,180	140,306		213,783	206,605	
Flathead sole	BSAI	82,810	68,134	19,500	9,001	75,863	62,567		77,763	64,119	
Alaska plaice	BSAI	37,600	31,600	17,000	19,954	37,924	31,657		36,928	30,815	
Other flatfish	BSAI	21,824	16,368	4,000	4,113	22,919	17,189		22,919	17,189	
Pacific Ocean perch	BSAI	58,956	48,846	42,875	36,303	44,376	37,173		42,384	35,503	
	BS	n/a	14,168	14,168	8,895		10,782			10,298	
	EAI	n/a	11,063	10,613	9,557		8,419			8,041	
	CAI	n/a	8,144	8,094	7,966		6,198			5,919	
	WAI	n/a	15,471	10,000	9,885		11,774			11,245	
Northern rockfish	BSAI	19,751	16,243	10,000	8,362	18,917	15,557		18,221	14,984	
Blackspotted/Rougheye Rockfish	BSAI	861	708	349	458	576	482		595	500	
	EBS/EAI	n/a	444	85	125	n/a	50		n/a	324	
	CAI/WAI	n/a	264	264	333	n/a	432		n/a	176	
Shortraker rockfish	BSAI	722	541	375	214	722	541		722	541	
Other rockfish	BSAI	1,793	1,344	1,088	996	1,751	1,313		1,751	1,313	
	BS	n/a	956	700	293		919			919	
	AI	n/a	388	388	703		394			394	
Atka mackerel	BSAI	81,200	70,100	59,305	57,506	85,580	73,590		79,660	68,220	
	EA/BS	n/a	24,535	24,535	22,926		25,760			23,880	
	CAI	n/a	14,721	14,721	14,588		15,450			14,330	
	WAI	n/a	30,844	20,049	19,992		32,380			30,010	
Skates	BSAI	49,792	41,543	16,313	17,221	49,297	41,257		47,372	39,598	
Sculpins	BSAI	67,817	50,863	5,300	4,805	N/A	N/A		N/A	N/A	
Sharks	BSAI	689	517	150	179	689	517		689	517	
Octopuses	BSAI	4,769	3,576	275	682	4,769	3,576		4,769	3,576	
Total	BSAI	5,584,382	3,272,581	2,000,000	1,849,473	3,910,217	2,732,597		3,782,489	2,683,717	

Sources: 2020 OFLs and ABCs are from harvest specifications adopted by the Council in December 2019; 2020 catches through November 7, 2020 from AKR Catch Accounting.

Table 2. Summary of groundfish tier designations under Amendment 56, maximum permissible ABC fishing mortality rate ($\max F_{ABC}$), the Plan Team’s recommended tier designation, ABC fishing mortality rate (F_{ABC}), the maximum permissible value of ABC ($\max ABC$), the Plan Team’s recommended ABC, and the percentage reduction (% Red.) between $\max ABC$ and the Plan Team’s recommended ABC for 2019-2020. 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	2021					
		Tier	$\max F_{ABC}$	F_{ABC}	$\max ABC$	ABC	% Red.
Pollock	EBS	1a	0.304	0.214	2,307,000	1,626,000	30%
Sablefish	BSAI	3a	0.100	0.042	52,427	22,237 ¹	58%
		2022					
		Tier	$\max F_{ABC}$	F_{ABC}	$\max ABC$	ABC	% Red.
Pollock	EBS	1a	0.304	0.214	2,105,000	1,484,000	30%
Sablefish	BSAI	3a	0.100	0.048	61,393	29,309 ¹	52%

¹Sablefish ABC for 2021 and 2022 are the author’s recommended whale adjusted ABC. The Teams recommended a range of possible apportionments as described in the Sablefish section above.

Table 3. Summary of stock abundance (biomass), overfishing level (OFL), acceptable biological catch (ABC), the fishing mortality rate corresponding to ABC (F_{ABC}), and the fishing mortality rate corresponding to OFL (F_{OFL}) for the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district as projected for 2021 and 2022. “Biomass” corresponds to projected January abundance for the age+ range reported in the summary. Stock-specific biomass, OFL, and ABC are in metric tons.

	Tier	Area	2021					2022			
			Biomass	OFL	ABC	F_{OFL}	F_{ABC}	OFL	ABC	F_{OFL}	F_{ABC}
Pollock	1a	EBS	8,145,000	2,594,000	1,626,000	0.341	0.214	2,366,000	1,484,000	0.341	0.214
	3a	AI	292,967	61,856	51,241	0.390	0.313	61,308	50,789	0.390	0.313
	5	Bogoslof	378,662	113,479	85,109	0.300	0.225	113,479	85,109	0.300	0.225
Pacific cod	3b	BS	694,707	112,851	94,552	0.300	0.250	108,662	90,665	0.290	0.240
	5	AI	80,700	27,400	20,600	0.340	0.255	27,400	20,600	0.340	0.255
Sablefish		AK	753,110	60,426	22,237			70,710	9,309		
	3b	BS		n/a	3,674	0.117	0.042	n/a	4,843	0.117	0.048
	3b	AI		n/a	5,294	0.117	0.042	n/a	6,978	0.117	0.048
Yellowfin sole	1a	BSAI	2,755,870	341,571	313,477	0.124	0.114	374,982	344,140	0.124	0.114
Greenland turbot	3a	BSAI	87,849	8,568	7,326	0.220	0.180	7,181	6,139	0.220	0.180
Arrowtooth flounder	3a	BSAI	923,646	90,873	77,349	0.160	0.135	94,368	80,323	0.160	0.135
Kamchatka flounder	3a	BSAI	144,671	10,630	8,982	0.108	0.090	10,843	9,163	0.108	0.090
Northern rock sole	1a	BSAI	923,197	145,180	140,306	0.157	0.152	213,783	206,605	0.157	0.152
Flathead sole	3a	BSAI	602,497	75,863	62,567	0.460	0.370	77,763	64,119	0.460	0.370
Alaska plaice	3a	BSAI	427,587	37,924	31,657	0.160	0.132	36,928	30,815	0.160	0.132
Other flatfish	5	BSAI	146,679	22,919	17,189	0.17 / 0.085 / 0.15	0.128 / 0.064 / 0.113	22,919	17,189	0.17 / 0.085 / / 0.15	.128 / 0.064 / 0.113
Pacific ocean perch	3a	BSAI	756,011	44,376	37,173	0.089	0.073	42,384	35,503	0.089	0.073
Northern rockfish	3a	BSAI	244,600	18,917	15,557	0.075	0.061	18,221	14,984	0.075	0.065
Shorttraker rockfish	5	BSAI	24,055	722	541	0.030	0.0225	722	541	0.030	0.0225
Blackspotted/Rougheye	3b	BSAI	19,003	576	482	0.038	0.032	595	500	0.038	0.033
Other rockfish	5	BSAI	53,248	1,751	1,313	0.03/0.09	0.0225 / 0.0675	1,751	1,313	0.03 / 0.09	0.0225 / 0.0675
Atka mackerel	3b	BSAI	560,360	85,580	73,590	0.510	0.430	79,660	68,220	0.490	0.410
Skate	3a/5	BSAI	504,691	49,297	41,257	.092 / 0.075	0.081 / 0.075	47,372	39,598	0.100 / / 0.075	0.079 / 0.075
Shark	6	BSAI	n/a	689	517	n/a	n/a	689	517	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	18,519,110	3,904,759	2,732,597			3,782,489	2,683,717		

Table 4. Groundfish catches (metric tons) in the eastern Bering Sea, 1954-2020.

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	1,356,445	196,761	1,150	125,620	2,691	5,680	3,166	34,877	8,859	15,549	4,089
2018	1,379,320	186,702	1,598	131,539	1,672	6,182	1,373	28,059	11,045	23,342	5,945
2019	1,409,235	164,092	3,157	128,046	2,678	9,410	2,940	25,403	15,831	16,163	3,716
2020/f	1,364,956	136,185	5,184	128,308	1,639	8,034	2,902	25,637	8,982	19,951	4,040

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. Squid moved in 2019 and sculpin moved in 2020 to Ecosystem Component. f/ Data through November 7, 2020.

Table 4 (continued). Groundfish catches (metric tons) in the eastern Bering Sea, 1954-2020.

Year	POP		N.		RE	BS/SR	Other	Atka	Other	Skate	Sculpin	Shark	Squid	Octopus	Total
	Complex/d	POP	Rockfish	Rockfish	Rockfish	Rockfish	Rockfish	Mack.	Species/e						(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		8,904	218	32	89		252	255		27,002	4,152	174	2,057	187	1,798,209
2018		9,635	188	15	170		212	1,146		29,475	4,397	96	1,701	132	1,823,944
2019		14,022	478	55	298		697	1,128		18,867	4,816	148	0	175	1,821,355
2020		8,895	298	36	107		293	732		16,139	4,178	168	0	457	1,732,121

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, shorttraker, and sharpchin rockfish until 2004. e/ Octopus, sculpin, sharks, skates included in Other species prior to 2011. Squid moved in 2019 and sculpin moved in 2020 to Ecosystem Component. f/ Data through November 7 2020.

Table 5. Groundfish catches (metric tons) in the Aleutian Islands, 1954-2020.

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	1,492	12,286	588	1	122	509	1,296	246	19	0	32
2018	1,860	14,719	660	4	161	820	1,735	216	17	0	39
2019	1,663	12,941	663	5	171	642	1,547	318	27	0	49
2020	2,971	5,321	1,123	11	673	2,231	4,377	125	19	3	73

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. Squid moved in 2019 and sculpin moved in 2020 to Ecosystem Component. f/ Data through November 7, 2020.

Table 5 (continued). Groundfish catches (metric tons) in the Aleutian Islands, 1954-2020.

Year	POP		N.		BS/SR	Other	Atka	Other	Skate	Sculpin	Shark	Squid	Octopus	Total (All Species)		
	Complex/d	POP	Rockfish	RE Rockfish	Rockfish	Rockfish	Mack.	Species/e								
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				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			23,240	4,461	165	62	568	63,401			1,387	882	4	42	21	110,824
2018			25,114	5,579	223	80	775	69,248			1,733	712	8	35	158	123,896
2019			29,097	8,851	336	82	569	56,081			1,272	786	3	0	93	114,926
2020/f			27,408	8,064	422	107	703	56,774			1,082	627	11	0	225	112,350

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, shorttraker, and sharpchin rockfish until 2004. e/ Octopus, sculpin, sharks, skates included in Other species prior to 2011. Squid moved in 2019 and sculpins moved in 2020 to Ecosystem Component. f/ Data through November 7, 2020.

Table 6. Groundfish catches (metric tons) in the Bering Sea and Aleutian Islands, 1954-2020.

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	0
1955	0	0	0	14,690	0	0	0	0	0	0	0
1956	0	0	0	24,697	0	0	0	0	0	0	0
1957	0	0	0	24,145	0	0	0	0	0	0	0
1958	6,924	171	6	44,153	0	0	0	0	0	0	0
1959	32,793	2,864	289	185,321	0	0	0	0	0	0	0
1960	0	0	1,861	456,103	36,843	0	0	0	0	0	0
1961	0	0	15,627	553,742	57,348	0	0	0	0	0	0
1962	0	0	25,989	420,703	58,226	0	0	0	0	0	0
1963	0	0	14,370	85,810	31,572	0	0	0	0	0	35,643
1964	174,792	13,649	5,086	111,177	34,233	0	0	0	0	0	30,604
1965	230,551	15,170	6,087	53,810	10,047	0	0	0	0	0	11,686
1966	261,678	18,354	10,846	102,353	13,105	0	0	0	0	0	24,864
1967	550,362	32,357	13,350	162,228	24,263	0	0	0	0	0	32,109
1968	702,181	58,191	6,047	84,189	35,445	0	0	0	0	0	29,647
1969	862,789	50,571	17,682	167,134	36,257	0	0	0	0	0	34,749
1970	1,256,565	70,377	12,985	133,079	19,976	12,872	0	0	0	0	64,690
1971	1,743,763	45,132	18,042	160,399	42,214	19,373	0	0	0	0	92,452
1972	1,874,534	43,340	16,289	47,856	77,384	14,446	0	0	0	0	76,813
1973	1,758,919	54,363	8,859	78,240	63,946	12,922	0	0	0	0	43,919
1974	1,588,390	63,841	6,735	42,235	78,442	24,668	0	0	0	0	37,357
1975	1,356,736	54,389	4,513	64,690	67,789	21,616	0	0	0	0	20,393
1976	1,177,822	54,671	4,582	56,221	62,590	19,176	0	0	0	0	21,746
1977	985,995	36,597	4,615	58,373	30,161	11,489	0	0	0	0	14,393
1978	985,713	45,838	2,013	138,433	42,189	10,140	0	0	0	0	21,040
1979	923,385	39,354	2,158	99,017	41,409	14,357	0	0	0	0	19,724
1980	1,016,435	51,649	2,480	87,391	52,553	18,364	0	0	0	0	20,406
1981	1,029,021	62,458	3,137	97,301	57,321	17,113	0	0	0	0	23,428
1982	1,013,942	56,566	4,139	95,712	52,122	11,518	0	0	0	0	23,809
1983	1,041,389	93,167	3,368	108,385	47,558	13,969	0	0	0	0	30,454
1984	1,180,617	133,160	3,328	159,526	23,120	9,452	0	0	0	0	44,286
1985	1,238,489	145,426	3,796	227,107	14,731	7,375	0	0	0	0	71,179
1986	1,235,090	140,887	6,546	208,597	9,864	6,903	0	0	0	0	76,328
1987	1,266,317	157,746	8,012	181,429	9,599	4,539	0	0	0	0	50,372
1988	1,271,000	197,891	6,608	223,156	7,108	5,883	0	0	0	0	137,418
1989	1,386,000	168,918	4,500	153,165	8,822	3,222	0	0	0	0	63,452
1990	1,426,000	171,008	4,445	80,584	9,620	4,232	0	0	0	0	22,568
1991	1,346,464	172,158	3,199	96,135	6,878	13,686	0	46,681	0	0	30,489
1992	1,438,412	206,129	2,104	146,946	2,770	11,980	0	51,956	0	0	34,825
1993	1,358,758	167,390	2,747	105,809	8,468	9,298	0	64,260	0	0	28,871
1994	1,421,402	196,572	2,470	144,544	10,379	14,377	0	60,584	0	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	1,357,937	209,047	1,738	125,621	2,813	6,189	4,462	35,123	8,878	15,549	4,121
2018	1,381,180	201,421	2,258	131,543	1,833	7,002	3,108	28,275	11,062	23,342	5,984
2019	1,410,898	177,033	3,820	128,051	2,849	10,052	4,487	25,721	15,858	16,163	3,765
2020/f	1,367,927	141,506	6,307	128,319	2,312	10,265	7,279	25,762	9,001	19,954	4,113

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, shorttraker, and sharpchin rockfish until 2004. e/ Octopus, sculpin, sharks, skates included in Other species prior to 2011. Squids moved in 2019 and sculpins moved in 2020 to Ecosystem Component. f/ Data through November 7, 2020.

Table 6 (continued). Groundfish catches (metric tons) in the Bering Sea and Aleutian Islands, 1954-2020.

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	1,817,774
2012	0	24,143	2,479	191	344	947	47,829		0	24,823	5,799	96	688	1,857,977
2013	0	31,362	2,038	322	371	815	23,181		0	27,030	5,828	116	300	1,914,585
2014	0	32,381	2,342	196	197	944	30,951		0	27,511	4,860	137	1,678	1,928,379
2015	0	31,425	7,197	181	153	686	53,270		0	28,123	4,980	107	2,364	1,914,061
2016	0	31,318	4,541	158	105	786	54,485		0	29,126	4,892	128	1,378	1,952,492
2017	0	32,144	4,679	197	151	820	63,656		0	28,389	5,034	178	2,099	1,909,033
2018	0	34,749	5,767	238	250	987	70,394		0	31,208	5,109	104	1,736	1,947,840
2019	0	43,119	9,059	391	380	1,266	57,209		0	20,139	5,602	151	0	1,936,281
2020/f	0	36,303	8,362	458	214	996	57,506		0	17,221	4,805	179	0	1,849,471

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, shorttraker, and sharpchin rockfish until 2004. e/ Octopus, sculpin, sharks, skates included in Other species prior to 2011. Squids moved in 2019 and sculpins moved in 2020 to Ecosystem Component. f/ Data through November 7, 2020.