DRAFT
SCIENTIFIC AND STATISTICAL COMMITTEE
REPORT TO THE
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
December 2nd – 4th, 2019

The SSC met from December 2nd through 4th at the Hilton Hotel, Anchorage, AK.

Members present were:

Gordon Kruse, Co-Chair *University of Alaska Fairbanks*	Anne Hollowed, Co-Chair *NOAA Fisheries—AFSC*	Sherri Dressel, Vice Chair *Alaska Dept. of Fish and Game*
Amy Bishop *Alaska Sea Life Center*	Curry Cunningham *University of Alaska Fairbanks*	Mike Downs *Wislow Research*
Jason Gasper *NOAA Fisheries – Alaska Region*	Dana Hanselman *NOAA Fisheries—AFSC*	Brad Harris *Alaska Pacific University*
George Hunt *University of Washington*	Dayv Lowry *Washington Dept. of Fish and Wildlife*	Franz Mueter *University of Alaska Fairbanks*
Andrew Munro *Alaska Dept. of Fish and Game*	Kate Reedy *Idaho State University Pocatello*	Matt Reimer *University of Alaska Anchorage*
Heather Renner *U.S. Fish and Wildlife Service*	Ian Stewart *Intl. Pacific Halibut Commission*	Alison Whitman *Oregon Dept. of Fish and Wildlife*

Members absent were:

Chris Anderson
University of Washington

B-1 Plan Team Nomination

The SSC reviewed the nomination of Andrew Olson (ADF&G) to the Scallop Plan Team, replacing Quinn Smith who has taken another position within ADF&G unrelated to scallop research and management. **The SSC finds Mr. Olson to be well-qualified and recommends the Council approve his nomination.**

General Comments

The SSC wishes to thank Dana Hanselman and Tom Wilderbuer for their many years of contributions to sustainable management of sablefish and BSAI flatfish. Their dedication to providing the NPFMC with high-quality assessments provided the foundation for sound management of these valuable fisheries. The SSC looks forward to working with new authors in the future.

The SSC wishes to thank Heather Renner for her excellent contributions to the SSC over the past two years. We are very sad to lose her expertise on seabirds and mammals of the Alaska Maritime Wildlife Refuge. We will miss her and wish her well.

General Stock Assessment Comments

Joint Plan Team Report

The SSC received a presentation from Grant Thompson (AFSC) on the Joint Plan Team and BSAI Plan Team Reports.

Risk Tables

Dr. Thompson provided the SSC with an overview of the application of risk tables to this year's full assessments, as well as the Joint Plan Team's requested clarification and additional guidance on their application in the future. Public comment was provided by Jon Warrenchuk (Oceana), Ruth Christiansen (United Catcher Boats), Julie Bonney (Alaska Groundfish Data Bank), Chad See (Freezer Longline Coalition), Chris Woodley (Groundfish Forum), and Austin Estabrooks (At-sea Processors Association). Written comments were also received from Jon Warrenchuk (Oceana).

The SSC had a general discussion about the purpose and structure of the risk tables and reiterated several SSC's specific statements that were provided in our December 2018 minutes. It was noted that, to provide comprehensive guidance on the tables, the SSC needed to review them for each assessment and, therefore, decided to finalize their responses to the Joint Plan Team's request after completing their review of the complete suite of BSAI and GOA stock assessments. There was also some discussion of the need to make risk tables neutral, or to have some category that corresponded to less risk than typical for either that assessment or across assessments.

Prior to consideration of the Joint Plan Team's requests, the SSC provided an overview of key considerations included in our October and December 2018 and October 2019 minutes:

> *Adjustments from the maximum ABC are used to address uncertainty and risk that is not already accounted for via the Tier system and associated harvest control rules. Reductions from the maximum ABC are an infrequent action prompted by extraordinary circumstances, or considerable uncertainty, in an attempt to respond to substantial unquantified risk. Although it is a work in progress, the SSC considers the risk table approach an efficient method to organize and report this information. The risk table approach includes four increasing levels of concern crossed with four types of contributing factors: (1) assessment, (2) population dynamics, (3) ecosystem and (4) concerns related to fishery/resource-use performance and behavior, considering commercial as well as local/traditional knowledge for a broader set of observations. This framework is intended to clarify the basis for any potential reduction. The SSC did not request this approach in order to add new reasons for adjusting from the maximum ABC, but to better describe the rationale when such changes are warranted.*

The Plan Teams completed risk tables for each full assessment and noted any important concerns or issues associated with completing the tables. A summary table of risk rankings for each stock was provided in the Joint Plan Team Minutes with detailed tables provided in the SAFE Reports. The SSC recognizes that this was a substantial effort and appreciates the authors' and Teams' diligence. **The SSC requests** that the Plan Teams, as time allows, update the risk tables for the 2020 full assessments, as the SSC found this exercise to be very helpful.

The summary table provided proposed reductions below maxABC for sablefish, EBS pollock, GOA pollock, and brought elevated risks for the EBS Pacific Cod, AI Pacific cod, and GOA Pacific cod stocks to the attention of the SSC but deferred potential specific ABC reductions to the SSC's judgement.

The Joint Plan Team's minutes noted that summarizing the concerns listed in the risk tables was helpful as a decision framework for potential reductions from maxABC and that the risk table approach fostered increased collaboration between scientists with different expertise, and more formally brought ecosystem considerations into assessment deliberations. The SSC was encouraged by this and indicated that this was exactly what we were hoping for.

The SSC provided direct responses to 10 specific requests raised by the Teams.

1 - Whether an overall elevated risk level (>1) mandates a reduction in ABC, and, more generally, the relationship of the risk level to the amount of reduction (if any);

No. The intention was to organize, report and clarify risks that are not addressed in the assessment or the Tier system to promote transparency and consistency among assessments. The Plan Team minutes and the risk tables in this year's SAFE report suggest that this is happening. As the SSC outlined in the December 2018 report, the risk tables are intended to be informative rather than prescriptive regarding potential reductions from maxABC.

2 - How to document changes that may not warrant higher levels of precaution, specifically when an overall elevated level of risk (>1) does not lead to a reduction in ABC (e.g., BSAI northern rockfish, GOA POP, GOA arrowtooth flounder);

Notation in the table along with associated explanation of the rationale in the SAFE reports is sufficient.

3 - The appropriateness of the overall level of risk being based on the maximum value across the categories, such that scores of 4, 4, 4, and 4 would be the same as a score of 1, 1, 1 and 4;

This approach is consistent with between-category variability in risk meaning and serves to elevate stocks with any risk concerns for further review (but see comments below regarding the over-all rating).

4 - Whether to state a default level of no risk (=1) or an unknown level of risk when there is no information to evaluate the risk level for a given category (this was of particular concern for Tier 5 and 6 stocks);

"No risk" versus "no information" determinations are different and should be specified (GOA Atka mackerel and BSAI Alaska plaice provide good examples). Further, a rating of 1 does not necessarily mean no risk, but instead may reflect that the risks are dealt with in the assessment directly or via the Tier system and that no *additional, unaccounted for* risk was identified.

5 - How to determine the relative influence of stock-specific versus indirect ecosystem indicators for setting the risk level (e.g., EBS Pacific cod, BSAI northern rockfish);

This is at the discretion of the author/team. No between-category "influence" is likely to be consistent between assessments, and attempts to establish category weights is likely to cause as many issues as it might address.

6 - How many direct or indirect ecosystem indicators would constitute an elevated concern;

This is left to the judgement of the assessment author and the team on a case-by-case basis.

7 - How evaluations of fishery performance indicators determine risk to stock productivity;

As indicated in the SSC's December 2018 report, this additional column should include indications of fishery concern, such as inability to catch the TAC, large changes in CPUE (when not accounted for in the model), or dramatic changes in spatial or temporal distribution that could indicate anomalous biological conditions. If, and how, these indicators are developed is left up to the assessment author and team on a case-by-case basis.

8 - Delineating issues that fall under more than one category;

This is at the discretion of the author and plan team. Categories are not mutually exclusive, and risks can be attributed as deemed most appropriate by the author/team.

9 - Whether every item, positive or negative, listed in the context of the risk table necessarily constitutes a "concern" (e.g., for Alaska sablefish, is an unusually large year class necessarily a "concern" simply because it is unusual?);

No. The tables are intended to promote transparency and prompt further discussion as appropriate. Whether or not an unusual event (e.g. large year class) merits notation in the table is at the discretion of the assessment author and the Team.

10 - The Teams noted that risk table discussions were time consuming and could be simplified if the process to determine levels of risk was decoupled from the decision to propose a reduction and the associated amount.

As stated in our December 2018 report, it is the intention of the SSC that these be decoupled but developed in concert:

The SSC endorsed the Teams' request that the authors continue to fill out the risk tables for full assessments and affirmed the Teams' recommendation that adjustment from maxABC in response to levels of concern should be left to the discretion of the author, the Team(s), and/or the SSC, but should not be mandated by the inclusion of a >1 level in any particular category. The SSC encourages authors or Teams to provide recommendations on reductions and rationale for those reductions when appropriate. The SSC also requests authors to note changes in risk scoring from one assessment to the next, along with the rationale.

The SSC reminds the authors that the tables are intended to capture risks and uncertainties that are NOT addressed in assessment and/or the application of the Tier system. In cases where these concerns are partially addressed, the SSC requests that the authors clearly articulate the extent to which the listed items are not already addressed by the assessment and/or the Tier system.

The SSC considered the Teams' suggestion to develop a decision table for evaluating the potential for ABC reductions if there were successive designations of elevated risk levels for a given category but concluded that this would be premature at this point.

The SSC recommends dropping the overall risk scores in the tables as these provided no additional information relative to ABC-setting and seemed to cause confusion. They simply report the maximum value of risk for the four factors, which is redundant information.

The SSC noted that the table ranking descriptions (e.g., description of what the scores mean) were not included in all of the SAFE reports. The SSC requests that the table explanations be included in all the assessments which include a risk table for completeness.

The SSC considered the suggestion, provided during public testimony, that the numerical scoring approach be replaced with more qualitative descriptions. We recommend continuing with the current risk ranking approach.

The SSC discussed whether increased risk or uncertainty was relative to previous assessments of the same stock, or relative to other stocks. Both are relevant and elaboration by the authors or Plan Teams as to what the elevated risk refers to is encouraged. For example, the Golden King Crab stock assessment has an increased risk relative to other assessments associated with the use of fishery CPUE in lieu of a survey, and the Gulf of Alaska pollock assessment experienced an increased risk owing to the recent divergence of alternative survey indices from each other.

Finally, the SSC notes that the risk tables provide important information beyond ABC-setting which may be useful for both the AP and the Council and welcomes feedback to improve this tool going forward.

Economic SAFE Report

The Joint Plan Team report provided some comments on the Economic SAFE Report. Although SSC review of the Economic SAFE report is not scheduled until the February 2020 meeting, the SSC offers the following brief remarks.

The Joint Plan Team minutes note that, due to delays in the arrival of finalized data, the catch share performance metrics and community section will no longer be included in the Economic SAFE and instead will be provided in separate documents.

The SSC requests that the authors of the Economic SAFE provide a plan for the reporting of, and the review schedule for, that information, given the National Standard 2 guidelines that each SAFE report should contain pertinent economic, social, community, and ecological information. The Plan Team minutes do note that the Economic SAFE Report now includes economic information based on the A80 and GOA trawl economic data reports (EDRs) and will include information from Chinook A91 EDRs. The newly provided information is clearly useful, including the crew employment data, such as those in Table 9.14 of the current Economic SAFE, which provides A80 crew employment and income information by community of residence. In that table, however, Unalaska/Dutch Harbor is the only Alaska locality reported (as it alone meets a 3% threshold for inclusion in the table). Given the relative importance of even small numbers of jobs and even modest income opportunities to smaller Alaska communities, including but not limited to CDQ communities, **the SSC requests a more complete reporting of crew employment and income data for Alaska communities in particular in future versions of the document.** This same request applies to Table 10.2 (GOA trawl CV fleet) and would apply to any similar tables developed in the future.

GOA Plan Team Report

At the Plan Team meeting guidelines for how apportionments are determined for partial assessments were discussed, which is not addressed in current guidelines. The Plan Team recommended that for Tiers 4-5, when the random effects model is re-run with a new survey point, the author updates the regional apportionment percentages. For Tiers 1-3 on a 2-year cycle when only the projection model is run, the Plan

Team recommended using the apportionment percentages from the last full assessment. These guidelines will be revised and clarified by the AFSC.

The Plan Team also discussed the upcoming Center for Independent Experts (CIE) reviews and encouraged the authors to consistently notify the Council of upcoming reviews so that the reviewers can benefit from the management perspective.

The SSC, like the Plan Team, are concerned about the reduction of survey effort in the GOA to two vessels and number of stations. The large reductions in biomass estimates across many species in the Western GOA point to a potential result of the thinned survey design, and the status of Pacific cod highlights the importance of full surveys in making informed management decisions.

C-1 BSAI and C-2 GOA Ecosystem Status Report

The SSC received a review of the EBS and GOA Ecosystem Status Reports (ESRs) from Drs. Stephani Zador and Elizabeth Siddon (AFSC) on aspects of the marine ecosystems of the eastern Bering Sea and Gulf of Alaska. There were no public comments.

This year, as in the past, the ESRs are insightful, well-written, and well-edited. Both chapters were helpful in providing a context within which to assess the stocks of commercially harvested fish in the Federal waters off Alaska. The editors and authors have been very responsive to the comments and suggestions provided by the SSC in 2018, with many improvements evident. The SSC appreciates the positive impacts of the additional resources devoted to the ESRs. These additional resources allowed for a more in-depth analysis of recent environmental changes, such as the examination of the reappearance of the heatwave in 2019 in the Gulf of Alaska, and the extraordinary conditions in the northern Bering Sea in both 2018 and 2019.

Given the rapidly changing conditions in the EBS, there is increased need for information about the effects of climate on the carrying capacity of the EBS and GOA marine ecosystems. In the eastern Bering Sea, this need is great in both the southeastern Bering Sea and the Northern Bering Sea. Likewise, there is cause for concern because the western Gulf of Alaska has remained in heatwave conditions for most of 2019, and summer sea surface temperatures were similar to the warmest temperatures during the 2014 - 2016 marine heatwave. **The SSC strongly recommends the conduct of annual surveys** of not only groundfish, but also zooplankton across the entire eastern Bering Sea and the GOA. This additional coverage should not be at the expense of biennial surveys of the Aleutians and Bering Sea slope.

There were several lines of evidence indicating concern about the lack of large zooplankton on the EBS shelf. The Rapid Zooplankton Assessment indicated low abundances of large copepods and euphausiids. We can see the effects of these low abundances especially well in the seabirds that are obligate planktivores, like the *Aethia* auklets. Although fish-eating seabirds had relatively good reproductive success, auklets had poor reproductive success and abandoned colonies in the Pribilof Is., as well as at St. Lawrence and Hall Islands (next to St. Matthew Island). These reproductive failures, coupled with the die off of short-tailed shearwaters due to starvation in July/August, are compelling evidence for a poor plankton prey base.

The high mortality rates of grey whales and ice seals in the EBS and of seals in the Chukchi Sea may be a matter of concern. They reflect the general decline in several benthic species (e.g., northern rock sole, yellowfin sole, Tanner crab, red king crab). In toto, these declines may be signaling a decrease in benthic productivity.

These implications of changes in foodweb structure and carrying capacity are of particular concern in the NBS. The SSC recognizes the challenge to find indicators of benthic communities, and recommends continued efforts to integrate data on benthic infauna and epifauna into the ESR, perhaps exploring data from the NBS separately from those available in the southeastern Bering Sea (e.g., diet of flatfish, crab, grey whales, ice seals; changes in benthic community structure in the NBS). For updated information, it may be useful to contact some of the academic investigators working in the NBS, such as Jackie Grebmeier.

There was a high number (179) of Laysan albatrosses bycaught in the EBS. If all were indeed Laysan, the population implications do not seem overly bad, as there is a large population of Laysan albatrosses in the North Pacific. However, if these numbers include mis-identified endangered short-tailed albatrosses, these losses could have serious conservation impacts. **The SSC is concerned that observers are well trained in differentiating Laysan and short-tailed albatrosses.**

Comments Applicable to both the EBS and the GOA ESRs

These are very long reports and it is likely that few readers will read them in their entirety. Their greatest value is in the syntheses and in the sections that focus attention on emerging ecosystem-wide problems and key messages. Presently, there are a number of areas in the ESRs where there are several overlapping contributions on the same subject. It would shorten the ESRs and make the information more comprehensible if the authors could collaborate to produce a single contribution on a given subject that summarizes the current situation. As an example, **the SSC recommends that there be a single, short, but comprehensive (integrated) contribution on sea temperatures in each region** (presently, 17 Figures in the GOA ESR). The integrated section on seabirds might provide a good example, Synthesis products, presentations, discussions with assessment authors, and collaboration among contributors are among the high value outcomes of the ESR reports.

In both the EBS and GOA, there are several Ecosystem or Community Indicators that could be much more informative if split up into different species groups. Mean Community Life Span, Mean Community Length, Mean Community Weight, Mean Community Trophic level (not in this year's reports) are often indices that are driven by the abundance of one or two species. In the EBS, pollock dominate the statistics, and in the GOA, forage fish may drive the averages. **The SSC suggests calculating these indices with and without the dominant species**, or in several species groups that make some ecological sense.

The SSC strongly supports the production of the 'In Brief' versions of the ESRs aimed at conveying a summary of ecosystem information to the public. The 'In Brief' report on the EBS from 2018 was well-received by communities, and the 2019 versions for both the EBS and GOA look excellent. The SSC continues to encourage these efforts, as well as further attempts to provide information back to the communities that have provided information for the ESR.

In the human dimensions section of the ESRs, the utility of a number of the indicators would be improved with the addition of a spatial dimension. Seafood production and value and unit value indicators are presented at the EBS-level only, and unemployment is presented at the EBS and NBS levels only, which does not allow for discernment of changing patterns over time at a sub-regional or community scale. Trends in population are presented at a community level but, like observed trends of unemployment, there is no apparent nexus of changes in ecosystem- or fishery-specific variables to changes in human dimension indicators (e.g., no community level time series data on federally managed fisheries engagement are presented that would provide a perspective on potential relationships between these data and observed population trends).

Overall, the human dimensions section would benefit from a series of maps that show the relationships between the various geographic units discussed and the location of communities within those geographies

(and the larger ecosystem geographies). It would also be beneficial to clarify the relationship between the type of human dimensions data that are contained in ESRs, ESPs, SAFEs, the Economic SAFE, and the apparently new and to-be-defined documents that will contain the fishing community information that was removed from the current version of the Econ SAFE. This would provide clarity and consistency in meeting the data needs to address social and community focused management obligations under National Standard 2 and National Standard 8 while avoiding redundancy of effort.

Comments Specific to the Eastern Bering Sea Ecosystem Status Report:

The SSC was pleased to note that most report card indicators have current data.

The SSC appreciated the section detailing which patterns were reflective of 2018 vs 2019 vs cumulative impacts. This format made it easier to see the influence of two years of low sea ice and the differences and potential connectivity between the southeastern Bering Sea and NBS. It was also helpful to understand which observations were the result of lagged-effects or cumulative effects of changes to the ecosystem.

The EBS ESR includes several leading indicators of pollock recruitment that yield, in some cases, contradictory results. It would be useful to assess alternative hypotheses as to why these differences were found. For instance, what role could the differences between the winters of 2017/18 and 208/19 have played?

Current Conditions 2019 section:

- Page 21: Note that both species of kittiwakes are primarily fish eaters, with some plankton taken by both species.
- Page 21: The comments about the movements of cod (and other fish from the Inner Shelf Domain) seem a bit too speculative.

Noteworthy Items section:

SSC greatly appreciates the excellent contributions on marine mammal ecology provided by the Marine Mammal Laboratory and others. The SSC hopes that the MML will continue to provide reports in the future, as they add greatly to our understanding of probable stressors in the Eastern Bering Sea ecosystem.

The SSC appreciates the inclusion of data on northern fur seals from bioenergetic models and ongoing foraging studies. In the southeastern Bering Sea, the new information tying female fur seal foraging to a lack of prey, especially of age-0 and age-1 pollock, suggests that these forage fish (and possibly others) are less abundant around St. Paul Island than was previously the case. For some forage, such as capelin, there may have been a movement to cooler waters in the 1980s. For others, there may be increased consumption by predators such as arrowtooth flounder, adult pollock and P. cod. Alternatively, the EBS coccolithophore blooms (Figure 45) may have some impact on the ability of fur seals to locate and capture prey. These blooms cannot account for the declines in the 1970s, 80s and 90s, before there were major blooms in the SEBS. Collectively, the results of the foraging effort and bioenergetics studies suggest that lactating females on St. Paul Is. are having difficulty finding food in close proximity to the rookery, which could adversely affect pup growth rates and contribute to the ongoing population decline on St. Paul Island. It is not clear how adjustments to fishing pressures might influence the availability of age-0 and age-1 pollock near St. Paul Is. and still protect Pribilof Island Blue King Crab.

At the October preview, the SSC requested information on Harmful Algal Blooms (HABs). Some interesting examples were provided in the Ecosystem Recap section. Particularly noteworthy were the reports that saxitoxin was detectable in the stomach contents of all pollock sampled. In the future, it would

be useful to have more information on the occurrence of HABs in the components of the EBS marine ecosystem, as well as some context on typical 'background levels'.

Ecosystem Status Indicators section:

The SSC welcomes the addition of the new, excellent section on sea ice in the Bering Sea. The SSC hopes that it will still be relevant in coming years! If this contribution on sea ice continues in subsequent years, it may not be necessary for the EBS FOCI contribution to cover these topics. It would be useful for all indices to use a standardized year; the ice-year is presently 1 August to 31 July, but later in the document the SST-year is 1 September to 31 August.

- It would be interesting to see the salinity data and to see how it might reveal transport mechanisms. This is an area for additional investigation.
- Figure 39: 2019 has a VERY sharp peak in chlorophyll compared to 2018. How might that affect the availability of phytoplankton for zooplankton? It would be useful to see a figure from a year with ice (e.g., 2017).
- Figure 42: Very nice to see the hotspots around the Pribilofs and in the Chirikov Basin near where the Anadyr water (nutrient rich) meets the fresh coastal water (nutrient depleted). The maps of stability and Chl-a are potentially quite useful.

The SSC supports continued exploration of the use of VAST models as an update of the large copepod (*Calanus marshallae/glacialis*, *Metridia pacifica*) index. However, we caution that the 2008 estimate should be carefully examined. This estimate is suspect given that the estimate increased, as did the variance. Neither of these outcomes would be expected.

In discussions about zooplankton, it is important to differentiate small species of copepods from early life stages of large species that will grow and accumulate lipid stores in summer. It is these large species that support the overwintering of age-0 pollock. In the same vein, it could be useful to distinguish among copepod species that store lipids (*Calanus* spp. and *Neocalanus* spp.) and those that do not (*Metrida*e spp. and *Eucalanus bungii*), and therefore have low nutritional value to fish.

The new condition factor analysis for age-0 Pacific cod and walleye pollock provides a useful update to previous work. **The SSC requests that criteria for assigning the categories "warm", "cold" and "average" to year-classes be clearly defined.** The figures show data from 2003-2018, but it is not clear whether the categorization was based on this time series or some other period.

- The SSC found the Bering Strait project on HABs of great interest. However, no details, contact information, etc. was available. A full contribution would be nice.
- Figure 55: The energy content of most of these salmon seems low. How does that relate to ocean survival and salmon returns?
- Page 120: "In contrast, surface silicate (silicic acid) is found in higher concentrations than nitrogen and inter-annual variations are reliably detectable making silicate a possible indicator of nutrient availability in surface waters." But why is surface silicate important if it is N that is limiting?
- Page 125/126: The average energy content of age-0 pollock in warm years between 2003 - 2017 accounts for 72% of the variation in age-1 recruits per spawning biomass, but only 9% in cold years (Figure 84) due to two years with very high recruitments in 2008 and 2012.2012 was an exceptionally cold year with much ice and a large cold pool, possibly pushing adult cod and pollock off much of the shelf. It has been hypothesized that in cold years with a large cold pool, the amount of predation on age-0 pollock is reduced
- Figure 80: Relationships between estimated mean abundance of large copepods (sum of *Calanus marshallae/glacialis*, *Metridia pacifica*, and *Neocalanus* spp.) during the age-0 life stage of

pollock, and the estimated abundance of age-3 pollock. It might be interesting to repeat this analysis without *Metridia*.

Integrated Seabird Section: **The SSC commends the authors and editors in assembling this section.** It provides an excellent overview and avoids repetition. It also spurred valuable collaborations among the contributors. It would be nice to have a two- or three-sentence summary statement at the end.

- Figure 97: **The SSC recommends providing the raw numbers of bycaught west coast Chinook salmon, at least in the text.** An increase in the proportion of west coast salmon could just indicate a decreasing capture of salmon from other stocks.
- Figure 101: Could the bycatch of assorted benthic invertebrates be affecting crab stocks?

Human Dimensions section:

This section would benefit from a thorough edit, as there are apparent errors in the population tables (e.g., Scammon Bay population) and they lack clarity in labeling. The migration pattern figures and school enrollment data conflate boroughs and census areas (the differences between which equate to different relationships between communities therein).

- Page 198 "The closure of a school in either of these places would have a profound effect." What are these places?

Comments Specific to the Gulf of Alaska Ecosystem Status Report:

Issues of Major Concern:

As in the EBS, GOA SST in the summer of 2019 was similar to the warmest temperatures during the 2014-2016 marine heatwave. However, some components of the GOA differed in 2019 compared to 2014-2016 (e.g., mesozooplankton biomass). The comparisons of these two heatwave events provides a nice addition that will eventually help tease apart the differences between heatwaves and their impacts on the GOA ecosystem.

The spatial analysis showed that not all areas of the GOA were affected in the same way (e.g., variability in the responses of euphausiids and age-0 pollock). Thus, the **SSC appreciates the continued efforts to present GOA data specific to western and eastern regions**, recognizing that a number of indicators are only available for one region (e.g. several zooplankton indicators are available for the western GOA, while the only comparable indicator is available for the eastern GOA). **Where possible the SSC encourages continued exploration of new data sources that can address these gaps.**

In the eastern GOA, several indicators suggest that forage availability may be limited: 1) below average zooplankton counts in Icy Strait, 2) the overall size of zooplankton being small, 3) low growth rates for rhinoceros auklets. This lack of forage is of concern.

Ecosystem Status Indicators section:

- Figure 39: There is a need to integrate what we know about bloom timing and zooplankton biomass and growth. Will temperature alone cause them to be mis-matched in time?
- Middleton Island seabirds: How can one tell whether the changes reflect the relative abundance of prey, the accessibility of prey, or actual preferences of the birds. Are there any independent data that might help?

Marine mammal section:

More humpback whales were observed during September 2019 in Prince William Sound than had been observed in 2017 and 2018; however, they remain well below 2008-2014 numbers. The overall body condition of humpback whales in PWS was good. However, adult herring are still missing from whale diets in PWS. These observations contrast with those from Glacier Bay where mothers were in sub-optimal condition and low birth rates persisted. The SSC welcomed the development of the integrated data sharing system "HappyWhale.com" that enables assessment of trends in abundance/sightings to be differentiated from shifts in distributions.

The SSC notes that data on non-pup counts of Steller Sea Lions (SSL) were received too late for the ESR report, but they were available for the presentation to the SSC. There was a pattern of decreasing non-pup numbers from west to east in the western GOA, but then increasing numbers in the eastern GOA. The SSC suggests an exploration of whether this pattern reflected emigration. Numbers of SSL pups in the western GOA continued increasing following the 2014-2016 heatwave. This suggests there was a lagged effect and that conditions for SSLs may be improving after two seasons of 'normal' conditions. The **SSC recommends continued efforts to make this indicator dataset available in time to be included in the ESR.**

This year (2019) was the first among recent 4-5 years that Aleutian terns have had any nesting success at all in the GOA. After many years of complete reproductive failure, they successfully hatched and raised chicks in many colonies in the GOA. This suggests improved foraging conditions for this nearshore obligate piscivore.

- Page 120/121: The observation of low ocean survival for salmon may be related to the heatwaves, zooplankton abundance or forage fish abundance. Analysis of the causes of low ocean survival would be useful in developing an understanding of how the warmer temperatures are impacting the GOA marine ecosystem, including groundfish.
- Page 132/33: The increase in shrimp around Kodiak is interesting. Is there any indication of why this may be happening?
- Figures 20 and 21: These are from two different authors, and both use the same colors of blue for WGOA, EGOA and SEA, but assign them differently. Consistency in legends would be helpful.

The SSC recommends continued efforts to add information about Harmful Algal Blooms in the GOA. Many new research efforts are ongoing in this field. An Arctic tern mortality event in June in Southeast Alaska received press coverage because saxitoxin was found in the carcasses of Arctic tern chicks at the same time as it was found in shellfish in a local, non-commercial harvest. Saxitoxin is clearly of high interest to local residents for food safety reasons and has been implicated in the deaths of nearshore-foraging terns in other instances.

Human Dimensions Section:

Specific to fishing and human dimensions aspects of the GOA ESR, the term "urban" is contrasted with both "remote" and "rural" in different places in the text; it is unclear when the term is being used in a technical/subsistence regulatory sense versus in a common use sense. **This should be clarified**.

- Figure 109 should be clarified by removal of extraneous BSAI data and Figure 116 should be clarified with the addition of a key.
- Employment Trends: 3rd paragraph, "The unemployment rate increased by 90.24% between 1990 and 2018." Why? Was this change related to fisheries?
- Figure 121: Do we have any ideas as to why Yakutat graduation rates dropped so much in 2018? Is this fishing-related?

C-1 BSAI and C-2 GOA specifications and SAFE Report

Grant Thompson (NMFS-AFSC) gave an overview of the November 2019 Joint and BSAI Plan Team meetings and on recommendations for BSAI groundfish OFLs and ABCs. Jim Ianelli (NMFS-AFSC) presented the EBS pollock stock assessment, Dana Hanselman (NMFS-AFSC) presented the sablefish stock assessment, and Grant Thompson presented the BS and AI Pacific cod assessments.

The SSC received a presentation by Jim Ianelli (NOAA-AFSC), Sara Cleaver (NPFMC) and Chris Lunsford (NOAA-AFSC) on the November 2019 GOA Plan Team meeting and on GOA groundfish OFL and ABC recommendations. Steve Barbeaux presented the GOA Pacific cod stock assessment. The SSC reviewed the SAFE chapters and 2019 OFLs with respect to status determinations for GOA and BSAI groundfish. **The SSC-approved models indicated that no stocks were subject to overfishing in 2019. Also, in reviewing the status of stocks with reliable biomass reference points (all Tier 3 and above stocks and rex sole), the SSC concurs that these stocks are not overfished or approaching an overfished condition.**

In an effort to streamline and simplify the SSC report our recommended ABC/OFL's and area apportionments are summarized exclusively in Table 1 (BSAI) and Table 2 (GOA). Recommendations that differ from Plan Team(s) are marked in **bold**.

Table 1. SSC recommendations for BSAI groundfish OFLs and ABCs for 2020 and 2021 are shown with the 2019 OFL, ABC, TAC, and Catch amounts in metric tons (2019 catches through November 2nd, 2019, from AKR Catch Accounting include CDQ). Recommendations are marked in **bold** where SSC recommendations differ from those of the BSAI Plan Team. **The sablefish OFL is duplicated in this table and in Table 2 (and added into the totals for both), because the SSC recommends that it be Alaska-wide.**

		2019			Catch as of	2020		2021	
Species	Area	OFL	ABC	TAC	11/2/2019	OFL	ABC	OFL	ABC
Pollock	EBS	3,914,000	2,163,000	1,397,000	1,406,063	**4,085,000**	**2,043,000**	**3,385,000**	**1,767,000**
	AI	64,240	52,887	19,000	1,592	66,973	55,120	70,970	58,384
	Bogoslof	183,080	137,310	75	121	183,080	137,310	183,080	137,310
Pacific cod	BS	216,000	181,000	166,475	148,142	**191,386**	155,873	**125,734**	102,975
	AI	27,400	20,600	14,214	12,954	27,400	20,600	27,400	20,600
Sablefish	Alaska-wide	n/a	n/a	n/a	n/a	**50,481**	n/a	**64,765**	n/a
	BS	3,221	1,489	1,489	3,202	n/a	**2,174**	n/a	**2,895**
	AI	4,350	2,008	2,008	662	n/a	**2,952**	n/a	**3,891**
Yellowfin sole	BSAI	290,000	263,200	154,000	122,309	287,307	260,918	287,943	261,497
Greenland turbot	BSAI	11,362	9,658	5,294	2,855	11,319	9,625	10,006	8,510
	BS	n/a	8,431	5,125	2,681	n/a	8,403	n/a	7,429
	AI	n/a	1,227	169	174	n/a	1,222	n/a	1,081
Arrowtooth flounder	BSAI	82,939	70,673	8,000	9,591	84,057	71,618	86,647	73,804
Kamchatka flounder	BSAI	10,965	9,260	5,000	4,494	11,495	9,708	11,472	9,688
Northern rock sole	BSAI	122,000	118,900	47,100	25,497	157,300	153,300	236,800	230,700
Flathead sole	BSAI	80,918	66,625	14,500	15,062	82,810	68,134	86,432	71,079
Alaska plaice	BSAI	39,880	33,600	18,000	15,812	37,600	31,600	36,500	30,700
Other flatfish	BSAI	21,824	16,368	6,500	3,756	21,824	16,368	21,824	16,368
Pacific Ocean perch	BSAI	61,067	50,594	44,069	41,653	58,956	48,846	56,589	46,885
	BS	n/a	14,675	14,675	13,178	n/a	14,168	n/a	13,600
	EAI	n/a	11,459	11,009	10,324	n/a	11,063	n/a	10,619
	CAI	n/a	8,435	8,385	8,263	n/a	8,144	n/a	7,817
	WAI	n/a	16,025	10,000	9,888	n/a	15,471	n/a	14,849
Northern rockfish	BSAI	15,507	12,664	6,500	9,057	19,751	16,243	19,070	15,683
Blackspotted /Rougheye Rockfish	BSAI	676	555	279	387	861	708	1,090	899
	EBS/EAI	n/a	351	75	82	n/a	444	n/a	**560**
	CAI/WAI	n/a	204	204	305	n/a	264	n/a	339
Shortraker rockfish	BSAI	722	541	358	355	722	541	722	541
Other rockfish	BSAI	1,793	1,344	663	1,254	1,793	1,344	1,793	1,344
	BS	n/a	956	275	685	n/a	956	n/a	956
	AI	n/a	388	388	569	n/a	388	n/a	388
Atka mackerel	BSAI	79,200	68,500	57,951	56,563	81,200	70,100	74,800	64,400
	EAI/BS	n/a	23,970	23,970	22,802	n/a	24,535	n/a	22,540
	CAI	n/a	14,390	14,390	14,320	n/a	14,721	n/a	13,524
	WAI	n/a	30,140	19,591	19,441	n/a	30,844	n/a	28,336
Skates	BSAI	51,152	42,714	26,000	17,873	49,792	41,543	48,289	40,248
Sculpins	BSAI	53,201	39,995	5,000	5,300	67,817	50,863	67,817	50,863
Sharks	BSAI	689	517	125	141	689	517	689	517
Octopuses	BSAI	4,769	3,576	400	244	4,769	3,576	4,769	3,576
Total	BSAI	5,340,955	3,367,578	2,000,000	1,904,939	**5,584,382**	**3,272,581**	**4,910,201**	**3,020,357**

[a] The SSC recommendation for "maximum subarea species catch" of blackspotted/rougheye rockfish in the WAI portion of the CAI/WAI is 48 mt in 2020 and 61 mt in 2021.

Table 2. SSC recommendations for GOA groundfish OFLs and ABCs for 2020 and 2021, shown with 2019 OFL, ABC, TAC, and catch amounts in metric tons (2019 catches through November 2nd, 2019 from AKR catch accounting system). SSC recommendations that differed from those of the GOA Plan Team are listed in bold.

		2019			Catch	2020		2021	
Species	**Area**	**OFL**	**ABC**	**TAC**	**11/2/2019**	**OFL**	**ABC**	**OFL**	**ABC**
Pollock	State GHL	n/a	3,396	-		n/a	2,712	n/a	2,797
	W (610)	n/a	24,875	24,875	21,867	n/a	19,175	n/a	19,775
	C (620)	n/a	67,388	67,388	64,079	n/a	54,456	n/a	56,159
	C (630)	n/a	34,443	34,443	24,461	n/a	26,597	n/a	27,429
	WYAK	n/a	5,748	5,748	6,612	n/a	5,554	n/a	5,728
	Subtotal	194,230	135,850	132,454	117,019	140,674	108,494	149,988	111,888
	EYAK/SEO	11,697	8,773	8,773	-	13,531	10,148	13,531	10,148
	Total	205,927	144,623	141,227	117,019	154,205	118,642	163,519	122,036
Pacific Cod	W	n/a	7,633	5,343	5,017	n/a	4,942	n/a	**4,942**
	C	n/a	7,667	5,750	5,705	n/a	8,458	n/a	**8,458**
	E	n/a	1,700	1,275	187	n/a	1,221	n/a	**1,221**
	Total	23,669	17,000	12,368	10,909	17,794	14,621	30,099	**14,621**
Sablefish	W	n/a	1,581	1,581	1,438	n/a	**2,278**	n/a	**3,003**
	C	n/a	5,178	5,178	5,970	n/a	**7,560**	n/a	**9,963**
	WYAK	n/a	1,828	1,828	1,774	n/a	**2,747**	n/a	**3,621**
	SEO	n/a	2,984	2,984	3,037	n/a	**4,298**	n/a	**5,664**
	Total (AK wide)	25,227	11,571	11,571	12,219	**50,481**	n/a	**64,765**	n/a
Shallow-Water Flatfish	W	n/a	25,620	13,250	72	n/a	23,849	n/a	24,256
	C	n/a	25,731	25,731	2,303	n/a	27,732	n/a	28,205
	WYAK	n/a	2,279	2,279	1	n/a	2,773	n/a	2,820
	EYAK/SEO	n/a	1,957	1,957	1	n/a	1,109	n/a	1,128
	Total	68,309	55,587	43,217	2,377	68,010	55,463	69,129	56,409
Deep-Water Flatfish	W	n/a	416	416	2	n/a	226	n/a	225
	C	n/a	3,443	3,443	92	n/a	1,948	n/a	1,914
	WYAK	n/a	3,280	3,280	8	n/a	2,105	n/a	2,068
	EYAK/SEO	n/a	2,362	2,362	4	n/a	1,751	n/a	1,719
	Total	11,434	9,501	9,501	106	7,163	6,030	7,040	5,926
Rex Sole	W	n/a	2,951	2,951	74	n/a	2,901	n/a	3,013
	C	n/a	8,357	8,357	1,447	n/a	8,579	n/a	8,912
	WYAK	n/a	1,657	1,657	2	n/a	1,174	n/a	1,206
	EYAK/SEO	n/a	1,727	1,727	-	n/a	2,224	n/a	2,285
	Total	17,889	14,692	14,692	1,523	18,127	14,878	18,779	15,416
Arrowtooth Flounder	W	n/a	35,994	14,500	683	n/a	31,455	n/a	30,545
	C	n/a	70,995	70,995	22,840	n/a	68,669	n/a	66,683
	WYAK	n/a	15,911	6,900	85	n/a	10,242	n/a	9,946
	EYAK/SEO	n/a	22,941	6,900	24	n/a	17,694	n/a	17,183
	Total	174,598	145,841	99,295	23,632	153,017	128,060	148,597	124,357
Flathead Sole	W	n/a	13,234	8,650	210	n/a	13,783	n/a	14,191
	C	n/a	21,109	15,400	2,343	n/a	20,201	n/a	20,799
	WYAK	n/a	2,016	2,016	-	n/a	2,354	n/a	2,424
	EYAK/SEO	n/a	423	423	-	n/a	1,858	n/a	1,912
	Total	44,865	36,782	26,489	2,553	46,572	38,196	47,919	39,326

[a] W/C subarea amounts for pollock are apportionments of subarea ACL that allow for regulatory reapportionment

Table 2. continued.

Species	Area	2019 OFL	2019 ABC	2019 TAC	Catch 11/2/2019	2020 OFL	2020 ABC	2021 OFL	2021 ABC
Pacific ocean perch	W	n/a	3,227	3,227	3,145	n/a	1,437	n/a	1,379
	C	n/a	19,646	19,646	18,114	n/a	23,678	n/a	22,727
	WYAK	n/a	3,296	3,296	3,288	n/a	1,470	n/a	1,410
	W/C/WYAK	31,113	26,169	26,169	24,547	31,567	26,585	30,297	25,516
	SEO	2,838	2,386	2,386	-	5,525	4,653	5,303	4,467
	Total	33,951	28,555	28,555	24,547	37,092	31,238	35,600	29,983
Northern Rockfish	W	n/a	1,190	1,190	819	n/a	1,133	n/a	1,079
	C	n/a	3,338	3,338	1,790	n/a	3,178	n/a	3,027
	E	n/a	1	-	-	n/a	1	n/a	1
	Total	5,402	4,529	4,528	2,609	5,143	4,312	4,898	4,107
Shortraker Rockfish	W	n/a	44	44	55	n/a	52	n/a	52
	C	n/a	305	305	226	n/a	284	n/a	284
	E	n/a	514	514	391	n/a	372	n/a	372
	Total	1,151	863	863	672	944	708	944	708
Dusky Rockfish	W	n/a	781	781	198	n/a	776	n/a	759
	C	n/a	2,764	2,764	2,071	n/a	2,746	n/a	2,688
	WYAK	n/a	95	95	93	n/a	115	n/a	113
	EYAK/SEO	n/a	60	60	3	n/a	39	n/a	38
	Total	4,521	3,700	3,700	2,365	4,492	3,676	4,396	3,598
Rougheye and Blackspotted Rockfish	W	n/a	174	174	78	n/a	168	n/a	169
	C	n/a	550	550	433	n/a	455	n/a	455
	E	n/a	704	704	208	n/a	586	n/a	587
	Total	1,715	1,428	1,428	719	1,452	1,209	1,455	1,211
Demersal shelf rockfish	Total	411	261	261	140	375	238	375	238
Thornyhead Rockfish	W	n/a	326	326	124	n/a	326	n/a	326
	C	n/a	911	911	375	n/a	911	n/a	911
	E	n/a	779	779	265	n/a	779	n/a	779
	Total	2,688	2,016	2,016	764	2,688	2,016	2,688	2,016
Other Rockfish	W/C	n/a	1,737	1,737	684	n/a	940	n/a	940
	WYAK	n/a	368	368	180	n/a	369	n/a	369
	EYAK/SEO	n/a	3,489	3,489	50	n/a	2,744	n/a	2,744
	Total	7,356	5,594	5,594	914	5,320	4,053	5,320	4,053
Atka mackerel	Total	6,200	4,700	3,000	1,254	6,200	4,700	6,200	4,700
Big Skate	W	n/a	504	504	114	n/a	758	n/a	758
	C	n/a	1,774	1,774	977	n/a	1,560	n/a	1,560
	E	n/a	570	570	101	n/a	890	n/a	890
	Total	3,797	2,848	2,848	1,192	4,278	3,208	4,278	3,208
Longnose Skate	W	n/a	149	149	59	n/a	158	n/a	158
	C	n/a	2,804	2,804	616	n/a	1,875	n/a	1,875
	E	n/a	619	619	308	n/a	554	n/a	554
	Total	4,763	3,572	3,572	983	3,449	2,587	3,449	2,587
Other Skates	GOA-wide	1,845	1,384	1,384	867	1,166	875	1,166	875
Sculpins	GOA-wide	6,958	5,301	5,301	574	6,932	5,199	6,932	5,199
Sharks	GOA-wide	10,913	8,184	8,184	1,728	10,913	8,184	10,913	8,184
Squids	GOA-wide	-	-			-	-	-	-
Octopuses	GOA-wide	1,300	975	975	316	1,307	980	1,307	980
TOTAL		664,889	509,507	430,569	209,982	**607,120**	**465,956**	**639,768**	**471,989**

* Note that the 1 mt of EGOA northern rockfish is excluded from that stock's total as it is managed as part of the EGOA "other rockfish" category.

GOA – BSAI Sablefish

Dana Hanselman (AFSC) presented results of the 2019 sablefish assessment and Grant Thompson presented the recommendations from the Joint Plan Team. The SSC received public testimony from several attendees. Jon Warrenchuk (Oceana) expressed concerns regarding increased bycatch of young sablefish in the Bering Sea. Karl Haflinger (SeaState) noted high encounter rates of sablefish in groundfish fisheries and showed weight distributions of sablefish bycatch tracking the 2014 and subsequent 2016 cohorts over ages 1-3.

Linda Behnken (Alaska Longline Fishermen's Association) described low CPUE in the IFQ fishery, resulting in a failure to attain the 2019 TAC. She supported no increase in the ABC or TAC, and no change to the current area partitions for the OFL. Julie Bonney (Alaska Groundfish Databank) testified that it was difficult for the groundfish fleet to avoid sablefish; she supported combining OFLs across Alaska, noting that there are other tools that the NPFMC could consider to avoid bycatch, such as Maximum Retention Allowances. Jim Johnson (Deep Sea Fishermen's Union) testified that CPUE was very low during the 2019 sablefish fishery and that catching a larger quota in 2020 would be very difficult.

This year's assessment was an update of the previously accepted Model (16.5) with new data. The new data in the assessment model included: relative abundance and length data from the 2019 longline survey, relative abundance and length data from the 2018 fixed gear fishery, length data from the 2018 trawl fisheries, age data from the 2018 longline survey and 2018 fixed gear fishery, updated catch for 2018, and projected 2019 - 2021 catches. Estimates of killer and sperm whale depredation in the fishery were updated and projected for 2019 - 2021. In 2019, there was a NMFS Gulf of Alaska trawl survey. Biomass estimates and length compositions from this survey were also added.

The SSC accepts the authors' and Plan Team's recommendation to use model 16.5 and continued management under Tier 3a.

Key outcomes of the updated assessment included a marked reduction (down 56%) in the estimated strength of the 2014 year class from the 2017 assessment to the 2019 assessment. The updated model also estimated a strong 2016 year class. The 2019 model continues to fit index data poorly, predicting more rapid increases in the bottom trawl and longline surveys than observed in the indices, and does not reconcile the opposing downward trend in the domestic longline CPUE series. The author described the potential sensitivity of projected spawning biomass estimates to time-varying maturity schedules and skip spawning, and the uncertainty in the sizes of the 2014 and 2016 year classes and their maturity schedule. These issues are critically important to short term-projections as these two year classes are predicted to comprise the majority of the spawning biomass.

The author identified 12 concerns using the risk table and concluded that a reduction from the maximum permissible ABC is warranted. The 12 concerns are listed below.

1. *The estimate of the 2014 year-class strength declined 56% from 2017 to 2019. A decline of this magnitude illustrates the uncertainty in these early recruitment estimates.*
2. *Fits to abundance indices are poor for recent years, particularly fishery CPUE and the GOA trawl survey.*
3. *The AFSC longline survey Relative Population Weight index, though no longer used in the model, is still only just above average.*
4. *The retrospective bias is positive (i.e., historical estimates of spawning biomass increase as data is removed).*
5. *Mean age of spawners has decreased dramatically since 2017 and continues a downward trend, suggesting higher importance of the contribution of the 2014 year class to adult spawning biomass; however, age-4 body condition of this year-class was poor, and much lower than during the last period of strong recruitments.*
6. *The very large estimated year-classes for 2014 and 2016 are expected to comprise about 33% and 14% of the 2020 spawning biomass, respectively. The 2014 year class is about 50% mature while the 2016 year class should be less than 15% mature in 2020.*
7. *The projected increase in future spawning biomass is highly dependent on young fish maturing in the next few years; results are very sensitive to the assumed maturity rates.*

8. *Evenness in the age composition has dramatically declined, which means future recruitment and fishing success will be highly dependent on only a few cohorts of fish.*
9. *Spatial overlap between sablefish returning to adult slope habitat and the arrowtooth flounder population may have increased, resulting in potentially higher competition and predation*
10. *Another marine heat wave formed in 2018, which may have been beneficial for sablefish recruitment in 2014 - 2016, but it is unknown how it will affect fish in the population or future recruitments.*
11. *Fishery performance has been very weak in the directed fishery with CPUE at time-series lows in 2018.*
12. *Small sablefish are being caught incidentally at unusually high levels shifting fishing mortality spatially and demographically, which requires more analysis to fully understand these effects.*

Of the 12 concerns listed, concerns 5, 6, 7, and 8 are already addressed to some degree in the assessment. Concerns 5 and 8 highlight the reliance of the future spawning stock on incoming year classes and their condition. In a population that relies on episodic recruitment events and the storage effect (longevity) as a survival strategy, conditions like those currently observed will occasionally arise. These events are not of particular concern unless one can demonstrate a specific benefit of age diversity in the spawning stock. If age evenness in the spawning population is considered as a metric of population health, this criterion should be formally evaluated for potential incorporation into future recommendations for ABC. For example, is there evidence that older females are more effective spawners? Is there evidence that genetic diversity is preserved through multiple year-classes? With respect to concern 6, the maturity schedule is included in the assessment, and the harvest control rule specifically protects the future reproductive potential of the stock. Concern 7 highlights the sensitivity of the future reproductive potential of the stock to changes in juvenile natural mortality rates. This issue is not unique to the sablefish assessment. The SSC recommends that the authors utilize the excellent information provided in the ESP to develop an ecosystem-linked formulation of natural mortality for young ages of sablefish.

Concerns 1, 2, and 4 all suggest that there are structural problems with the assessment. The inability of the assessment to accurately track incoming year classes when they have been modeled in the assessment for several years suggests that natural mortality or selectivity may be misspecified. The lack of fit to survey and domestic CPUE are also a concern, and suggests that either catchability or selectivity may be misspecified. The SSC reiterates is recommendation for the authors to explore time-varying fishery selectivity and/or catchability, and their effects on estimated year-class strengths. To the degree that the fishery has shifted selectivity toward older sablefish in response to increased numbers of young fish there may be important effects on the estimated population dynamics created by the assumption of constant selectivity.

The estimated maximum permissible ABC for 2020 is 57% higher than the 2019 maximum permissible ABC. Despite model results that indicate future increases in sablefish abundance, **the SSC agrees with the authors and Joint Plan Team that a substantial reduction in ABC is merited.** In particular, concerns regarding the current uncertainty in the incoming 2014 and 2016 year classes and the poor fishery CPUE in 2019 suggest that added precaution is necessary. The authors and the Joint Plan Team recommended a 25% increase from the 2019 ABC, which corresponded to a constant fishing mortality rate from 2019 to 2020. The SSC notes that there is no biological reason to pick the 2019 reference mortality rate over other possible rates. In addition, the method used to project the 2020 ABC did not utilize the updated model nor its revised estimates. **Therefore, the SSC recommends calculating the ABC based on a 25% stairstep whereby the 2019 ABC is increased by 25% of the projected step between the 2019 ABC and the 2020 maxABC, and then that estimate is corrected for whale depredation to provide the final 2020 ABC.** This process was repeated to estimate the 2021 ABC. The 2020 ABC represented a 50% reduction from the 2020 maxABC.

The authors included an analysis of the area allocation of the ABC as an appendix to the SAFE chapter. **The SSC appreciates the author's responsiveness to SSC comments.** Based on the results of this work, the author recommended no change to the allocation scheme. The SSC accepted the authors' and the Joint Plan Team's recommended sub-area allocations of ABC. The SSC notes that the distribution of sablefish has changed considerably since 2013 and there remains a need to resolve how ABC allocations will be derived in the future. **The SSC requests that the author finalizes the allocation process no later than September 2020**.

The SSC accepts the authors' and Joint Plan Team's recommended OFLs for 2020 and 2021. The SSC reviewed the information available regarding area partitions for the OFL. **The best scientific information available regarding stock structure for sablefish supports an Alaska-wide stock designation. Therefore, based on biological considerations, the SSC recommends adoption of a single combined area OFL for sablefish.** The SSC recommends consideration of alternative spatial management approaches to address sablefish bycatch concerns.

The SSC noted that, although the stock biomass is projected to increase due to the strong 2014 and 2016 year-classes, these cohorts will also affect the calculation of reference points. Specifically, as the 2016 year class is included in the $B_{40\%}$ calculation, that reference point will increase. This has been the case as the 2014 year-class has affected both the biomass and the reference points.

The SSC recommends that the coefficients determining the degree of whale depredation be re-evaluated in the near future (and perhaps on a 3-5 year interval) in order to determine whether the relative effect of depredation may have changed over time, and/or to update existing coefficient estimates with additional available data since the previous analysis.

The SSC supports the ongoing efforts to examine sablefish dynamics including Alaska, Canada, and the US west coast. **The SSC encourages continued efforts to reconcile potential differences in ageing criteria among these regions and among laboratories with respect to asynchrony in recruitment.**

The SSC appreciates the excellent continued work of the authors on the ESP. This ESP provides a strong example for authors of other SAFE chapters. The SSC encourages the authors to focus on explaining the mechanisms underlying the observed declines in the estimated size of the 2014 year class.

The SSC appreciates the authors' effort to identify fishery performance indicators that provide relevant insight into stock status. The SSC encourages the authors to continue to explore community related socioeconomic indicators and suggests that they focus on substantially engaged and/or substantially dependent communities recognizing that in small communities, even a low level of engagement in absolute terms can result in a relatively high level of dependence on that fishery. Further, communities selected for inclusion in the analysis should not be based on commercial landings alone, as engagement in the relevant commercial fishery(ies) can and does occur through locally owned vessel activity, crew employment and income, locally occurring processing activity, and support service activity. Dependency can usefully be measured via vessel and processing diversity and annual round activity and spatial variations, among other factors (recognizing that data availability will vary widely across communities, especially for support service activity). Additionally, as noted in public testimony, it is important to recognize that sablefish are economically important to community fleets across a variety of gear types.

To be useful in an ESP application, community engagement in and dependency on the relevant fishery(ies) need to be tracked with indicator time series data to allow for the recognition of trends that could serve as ecosystem "yellow flags" or "red flags," consistent with other indicators. Indices such as Regional Quotient and Local Quotient are particularly useful in a report card context for a

variety of reasons, including the ability to provide information where data confidentiality considerations would be otherwise be a major analytic constraint, but they need to be clearly defined.

C-1 BSAI SAFE and Harvest Specifications for 2020/21

BSAI Walleye Pollock

Bering Sea

The SSC received a presentation of the 2019 stock assessment from Jim Ianelli (AFSC) and a summary of the Bering Sea Plan Team comments from Grant Thompson (AFSC). Public testimony was provided by Karl Haflinger (SeaState), who provided graphical summaries of spatial fishing patterns, and expressed concern that the newly developed spatial fishery metrics may not capture the complicated dynamics of the fishery, which balance searching and travel time, bycatch encounter rates, and many other factors in addition to the distribution of the pollock stock. Mr. Haflinger also suggested one of the reasons for the delay in the pollock fleet reaching the allowable catch limit during the 2019 "B" season was that some vessels remained on the West Coast longer to pursue Pacific whiting fisheries.

The 2019 pollock assessment included new data from the following sources:

- The 2019 NMFS bottom-trawl survey biomass and abundance at age estimates.
- The 2018 NMFS acoustic-trawl survey age composition data were updated using samples from the ATS survey.
- The 2019 opportunistic acoustic data from vessels conducting the bottom trawl survey was used as an added index of pollock biomass in mid- water.
- Observer data for catch-at-age and average weight-at-age from the 2018 fishery were finalized and included.
- Total catch as reported by NMFS Alaska Regional office was updated and included through 2019.

Data from 2019 indicated a highly concentrated fishery during the "A" season, and very dispersed fishing during the "B" season. Coincident with these spatial patterns, the time required to harvest the allowable catch in 2019 was the quickest in history for the "A" season, and among the slowest for the "B" season (similar to 2011). Bottom trawl survey biomass substantially increased from 2018 to 2019. Of note, recent age-composition information suggests a shift from a dominant 2012 year class to a mix of two consecutive strong year classes in both 2012 and 2013, which is unusual for this stock.

Modelling efforts focused on improvements to existing data sources. An investigation into the degree of constraint applied to time-varying bottom trawl survey catchability/selectivity revealed that current constraints are consistent with model fit and that additional constraint may not be conservative with regard to the estimated scale of the biomass. To account for increasing abundances of pollock outside the standard survey area, a spatio-temporal index for the combined EBS and NBS bottom trawl survey biomass was developed using the VAST approach and included a cold-pool covariate. A spatio-temporal model for deriving age-composition estimates from the bottom trawl survey showed relatively minor differences with standard design-based age compositions. Although not included in this year's assessment, an exploratory model-based approach was developed for creating a combined index for the acoustic and bottom trawl surveys, reflecting the overlapping nature of both the vertical and spatial sampling of each survey. In addition to modelling efforts, the SSC commends the author for detailed investigation of spatial and temporal patterns in fishing behavior (including a new index of effort dispersion) and weight-at-age.

The author provided two models for consideration, including last year's base model (16.1) updated with new data, and an alternative model (16.2) using the VAST-based bottom trawl survey index of biomass. Both models appear to perform well. Both models indicate a declining stock since 2017, with the decline projected to continue at least through 2021. Current spawning biomass is estimated to be above both B_{MSY} and $B_{40\%}$.

The SSC appreciates the extensive effort required to generate VAST estimates of biomass based on both the NBS and EBS surveys for both pollock and Pacific cod. In light of changing stock distributions for both species, it has become necessary to include the full spatial extent of the Bering Sea shelf in deriving indices of abundance. This process has been aided by the extensive testing and development of the VAST modelling framework. Including the extent of the annual cold-pool as a covariate in the model helped to inform biomass estimates in years in which there was no survey sampling in the NBS. The author and Plan Team recommended waiting for new genetic data on EBS and NBS pollock before adopting the new VAST model. **The SSC differed from the author and Plan Team and recommended adopting model 16.2, including the VAST-based bottom trawl survey index, as the basis for 2020-2021 specifications.** The SSC further recommends that the PTs consider defining a standard reporting format for VAST model application, including a description of the parameterization, mesh complexity, covariates, model fit diagnostics and all other components necessary for review.

The SSC has long categorized EBS pollock as a Tier 1 stock, which dictates that it must include a reliable probability density function for Fmsy. However, in recent years, the ABCs have been reduced from the maximum through the use of the Tier 3 ABC calculation. For 2020, this corresponds to a 43% reduction from the maximum ABC. **The SSC recognizes the risks associated with the application of Tier 1 specification for the ABC when productivity estimates are uncertain, and therefore recommends a highly elevated level of concern for pollock in the assessment/tier-system category of the risk table, and a commensurate reduction from the maximum ABC. As a temporary solution for this year, the SSC recommends using the Tier 1 OFLs and reducing ABC from the maximum ABC from Tier 1 to an ABC level based on the Tier 3 calculation. However, the SSC recommends a detailed review of the support for retaining the EBS Pollock assessment in Tier 1 versus reclassifying it as Tier 3 in the 2020 assessment.**

The SSC had a number of recommendations for additional research supporting this assessment:

- The SSC encourages further investigation of the apparent shift between a clear 2012 year-class to mixed 2012-2013 year classes in the data, suggestive of potentially variable ageing bias.
- Noting the work in deriving an external estimate of temporal variability in catchability for the bottom trawl survey (relative to the acoustic survey) due to vertical availability, the SSC noted that catchability would logically also vary for the acoustic survey. The SSC encourages further work to develop the simultaneous modelling of these two surveys, accounting for vertical and distributional shifts (including into the NBS). When sufficiently explored, the SSC looks forward to assessment model configurations that explore the use of a time-series from this method.
- The SSC supports ongoing genetic studies to determine the relationship between pollock in the NBS and EBS, as well as other surrounding regions (AI, GOA).
- The SSC supports the continued use of a formal decision table to illustrate risks of alternative harvest strategies.
- The SSC supports the Plan Team's recommendation to revisit the treatment of all variance parameters in the next assessment, particularly those that are set at fixed values (e.g., the value of 0.2 for the acoustic survey). The senior author indicated these efforts are currently planned for the coming year.

- The SSC also looks forward to estimates of movement and abundance along the U.S.-Russia EEZ boundary based on echosounders fixed to moorings in this area. Noting the increased concern over trans-boundary fishery and population dynamics for pollock (as well as Pacific cod, and potentially other species) the SSC requests an update on current collaborations with Russian scientists with regard to data-sharing, cooperative survey efforts, and the potential for joint assessments and management such as those used for shared fish stocks in the Barents Sea. It may be worthwhile to hold a workshop on this topic if and when appropriate participants can be identified.

Aleutian Islands

For 2019, this was a partial assessment with only updated 2018 and 2019 catch added to the previous analysis. The stock remained in Tier 3a. **The SSC concurs with the authors and the Plan Team to use maximum ABC for 2020 and 2021 and to calculate OFLs using the standard Tier 3a approach.**
The SSC looks forward to a full assessment in 2020, including a response to the 2018 recommendation to reconsider the time period over which recruitment estimates are used to estimate biological reference points. **The SSC requests that a time-series of survey biomass estimates be provided** for evaluation for this and other partial assessments, where available.

Bogoslof

No assessment was conducted for 2019, leading to a roll-over of specifications developed in 2018. **The SSC supports these specifications for the ABCs and OFLs for 2020 and 2021**.

BSAI Pacific Cod

Bering Sea

The SSC received a presentation on the PT report and a summary of the Pacific cod stock assessment from Grant Thompson (AFSC). Public comment was provided by Chad See (Freezer Longline Coalition), who indicated a preference for a single model over the current ensemble and specifically recommended model 19.12, or an ensemble representing only hypothesis #2. Mr. See further reiterated that reductions from maxABC are intended to be infrequent and that the current level of risk is not sufficient to justify a reduction, and given that the presence of Pacific cod remains high from the perspective of the fishery. Public comments were also received from Scott Hansen (F/V Beauty Bay) suggesting that fishery CPUE has remained high throughout the fishing grounds, and that both fish condition and abundance appear good in the northern Bering Sea. Finally, the SSC received public comment from Kenny Down (representing himself) highlighting that the crucial question is whether to utilize the proposed ensemble or model 19.12 and registering concern that the current ensemble includes models about which little is known. Mr. Down further indicated that Pacific cod bycatch in directed halibut fisheries has remained high.

The SSC thanks the author for his excellent and extensive work on this assessment again this year; the document provided a comprehensive analysis of a 3x3 factorial ensemble model that included 9 models in addition to the base model from 2019 (16.6i).

The models explored two axes of structural uncertainty, one exploring alternative stock structure hypotheses and one exploring levels of model complexity. The stock structure hypotheses were: 1) Pacific cod in the NBS are insignificant to the managed stock, so the assessment should include data from the EBS only, 2) Pacific cod in the EBS and NBS comprise a single stock, and data from the EBS and NBS surveys can be modeled in combination to generate a single model-based biomass index, and 3) Pacific cod in the EBS and NBS comprise a single stock, but the EBS and NBS surveys should be modeled separately. The three levels of assessment complexity were: “basic” (model 16.6i); “simple” specifying alternative input sample size calculations for composition data, alternative selectivity functions for survey and fishery catches, size-based maturity, and new methods for tuning recruitment

deviations and; “complex” which estimated a multitude of time-varying processes including catchability, selectivity, and growth.

The models presented at this meeting differed from those presented in October to reconcile comments from the SSC and Plan Team related to Hypothesis #1 and retrospective performance. The updated models reduced the retrospective patterns by removing fishery age composition data and reducing the average input N for fishery size compositions. The SSC was pleased that the authors were able to resolve some of the bad retrospective patterns seen in September. However, the SSC was disappointed that the focus on ensemble modeling precluded determining how to appropriately use these critical data without inducing strong retrospective patterns.

All of the nine ensemble members used VAST model estimates of total survey biomass. The SSC considers this an appropriate improvement over the design-based estimates, as the VAST model uses all available data from both the NBS and EBS bottom trawl surveys and provides an efficient method to address large gaps in temporal coverage in the NBS. The SSC also supported the use of a cold-pool covariate and bias correction. The SSC was comforted that the design-based and VAST indices are quite similar. The SSC supports the idea of cross-validating the results by selectively removing areas and seeing how well the VAST model can predict missing areas. In the interest of transparency and reproducibility, the SSC recommends that assessment authors include a specific description of VAST model settings in future assessment documents.

The nine models provided reasonable fits to the data and retrospective patterns. As expected, the complex models with their many more parameters provided the best overall fits to the data. Values of Mohn's rho, an indicator of retrospective bias, were within the acceptable range for all models except 19.4, for which Mohn's rho was very large. The SSC continues to disagree with the Plan Team regarding the use of Mohn’s rho. Its primary function is a measure of model misspecification, and not including portions of a population in the model would be an important misspecification.

Two different ensemble averages were presented, an unweighted and a weighted average. The weighted ensemble was determined using a set of nine criteria with different emphasis factors. These criteria were developed by extracting various comments from the PT and the SSC as to what are important features or hypotheses to include in the model. Factors that were given an emphasis of 3 were deemed to be ones that the PT or SSC has explicitly used for criteria to reject or express strong concern about a model (plausibility). Lower emphasis (factors 2 and 1) was given to criteria that generally were more related to technical model specifications. **The SSC thought this part of the weighting scheme was transparent and a reasonable step forward**. However, the choice of an exponential average instead of the arithmetic average is a much more influential choice than the *ad hoc* 3:2:1 choices. For example, Model 19.12 is given over 7 times more weight than the next candidate, despite emphasis-weighted scores of 15 and 13, respectively. The SSC suggested that it may be more transparent to use a more intuitive arithmetic mean, recognizing that all weighting systems will have subjective decisions and that assessment authors are likely best suited to identify relative model weightings.

The SSC expressed two primary concerns with the use of the ensemble model: (1) that all ensemble model members may not receive the appropriate level of review compared to reviewing a single recommended model, and (2) that the effort required to bring forward a 9-member ensemble may preclude progressive model development and testing. The recommended weighting gives most of the weight to model 19.12, which represents a substantial increase in complexity and deserves more review in future assessments. The purpose of an ensemble model is to include a diversity of models that “capture structural uncertainty” or represent alternative states of nature for which valid hypotheses exist. While the stock structure axis in the current 3x3 factorial design represents alternative states of nature, it is less clear whether the progressive changes in model complexity reflect an appropriate range of structural uncertainty. In spite of shortcomings, the SSC was encouraged by the author’s structured approach to constructing a matrix of alternative models for consideration. However, in addition to the increased workload for the assessment authors, it is unclear

at this point whether the ensemble model is more transparent or more opaque to stakeholders or review bodies. Finally, the SSC notes that although the ensemble model highlights some of the additional uncertainty associated with this stock, our current harvest control rule precludes explicit consideration of this added uncertainty.

In previous years there was considerable discussion about whether it was appropriate to average ABC after the control rule was applied rather than determining stock status first, then applying it to the average full ABC. One SSC member calculated the results for this particular ensemble doing it both ways and was satisfied that it made very little difference.

The assessment authors' efforts represent substantial progress towards using an ensemble modeling approach to address continued large uncertainties in the Pacific cod assessment. The SSC suggests that a broader discussion is needed between the Plan Teams, AFSC, and the SSC on the consequences of accepting an ensemble model for Pacific cod on the direction of other groundfish and crab assessments, and guidance on whether consistent sets of models should be required to be brought forward in subsequent assessments. It needs to be determined whether ensemble models, particularly if applied to multiple stocks, are sustainable given limited review and assessment staff resources. If an appropriate ensemble can be developed and adopted for a number of years, it may actually save time. However, the SSC expressed concern that the burden of maintaining an ensemble of this many models might preclude necessary progress in model development. This tradeoff was confirmed by the lead assessment author with respect to exploring alternative methods for successfully incorporating fishery age compositions. One advantage of an ensemble may be the inclusion of members that incorporate environmental, ecosystem, or socioeconomic data as appropriate.

The SSC appreciates the progress toward an ensemble but was hesitant to adopt either the weighted or unweighted ensemble at this time. A major discussion point was whether all three hypotheses should be retained going forward. Hypothesis #2, combining the EBS and NBS surveys, was considered the most likely given the observations of Pacific cod in the NBS and the lack of genetic differences between these areas. There was general support for removing the models related to Hypothesis #1 (19.7-19.9) altogether, given our understanding of stock structure. As currently weighted, the ensemble added complexity, but seemed to offer little benefit compared with adopting a single model from the Hypotheses 2 group. There was concern that accepting an ensemble this year would require the authors to bring the entire ensemble forward as the base case in next year's assessment, which would be a substantial workload and would likely preclude progress on other issues. There was some support toward adopting a simpler model like 19.10 (which is essentially the base model + VAST) or 19.11 as an intermediate step in complexity, but ultimately the SSC determined that the author's weighting choices clearly showed the authors' preference for Model 19.12, **and the SSC endorsed Model 19.12 as the new base model for 2020**.

There was considerable discussion about whether an additional reduction in ABC was warranted due to the ecosystem risk level of 2, reflecting uncertainty associated with a mixture of positive and negative trends. There were lingering concerns about the migration of Pacific cod outside of the EEZ and whether the large portion of the stock now located in the NBS may be subject to higher mortality or reduced reproductive success. These concerns were similar to the prior year, but because of the considerable assessment uncertainties evident in the ensemble models, the SSC elevated assessment considerations in the risk table to level 2.

Thus, the SSC selected Model 19.12 for setting OFLs for 2020 and 2021, but reduced the ABCs from maximum permissible by adopting the ABCs resulting from the weighted ensemble model, due to assessment and ecosystem concerns. Model 19.12 encapsulates the preferred hypothesis as all recent evidence suggests that the NBS has become an important habitat for a large part of the stock.

The SSC recommends that the authors focus on continuing to improve Model 19.12 and attempt to resolve problems with using fishery age compositions. The authors should consider whether 19.12 could be "overfitting" as the Plan Team suggested.

The SSC recommends that if the authors bring an ensemble model forward in 2021, that it consists of a reduced set of models that still reflect adequate diversity in model structure and hypotheses about stock structure.

The SSC encourages further investigations into fish movement, both analytically and through tagging studies.

The SSC requests that the use of VAST, including its assumptions, are clearly documented in next year's assessment. The SSC notes that development of an ESP for EBS Pacific cod would be advantageous.

Given the results of the stock assessments and the vital historic economic, social, and community importance of Pacific cod, the SSC recommends that within the recognized constraints of available time and resources, Ecosystem and Socioeconomic Profiles (ESPs) of EBS Pacific cod (as well as AI and GOA Pacific cod) be prioritized as new ESPs are developed.

Aleutian Islands

The SSC received a presentation from Grant Thompson on Aleutian Islands Pacific cod. There was no survey of the Aleutian Islands for 2019 so there were no changes to this Tier 5 assessment. **The SSC supported the authors' and PT's recommendation for a Tier 5 status determination and the associated OFL/ABC as well as the use of the random effects model for apportionment.** The SSC noted that there may be other apportionment methods if smoother outcomes are desirable such as multiple survey averaging or the use of a VAST model.

There were several age-structured models presented in an appendix and we appreciate these efforts. It appears that the models were almost viable for consideration this year. We look forward to seeing a vetted alternative in September 2018 that takes into account current GPT and past SSC recommendations**. In addition to those recommendations the authors should consider fitting the two maturity curves inside the model similar to some of the GOA rockfish assessments.**

There was a risk table overall score based on ecosystem concerns of 2. Unlike the EBS, the condition factor for the AI is quite low and continues to be low. However, given the Tier 5 estimates are more conservative than what was estimated for all of the Tier 3 models presented, the SSC concluded that no ABC reduction was necessary.

The SSC also recommends exploring the barefoot ecologist online tool for developing an appropriate prior distribution when estimating natural mortality in next year's age-structured model.

BSAI Flatfish

Yellowfin Sole

Yellowfin sole is a Tier 1 assessment. The base model for this assessment (Model 18.1a) was first developed in 2018 and was updated with 2019 data. New information included: estimates of discards and retained portions of the 2018 fishery catch, survey and fishery age composition for 2018, estimates of trawl survey biomass and standard error for 2019, and estimate of total catch through the end of 2019. Catch of 150,000 mt was assumed for the 2020 and 2021 projections. This model includes the survey mean bottom temperature across stations < 100m and survey start date as covariates on survey catchability, based on Nichol et al. (2018), and natural mortality fixed at 0.12 for both sexes. The second model presented (Model 18.2) is the same as Model 18.1a with a fixed value for female natural mortality (M=0.12), but with male

natural mortality estimated inside the model. Model 18.2 estimated male natural mortality slightly higher than female natural mortality, 0.135, similar to other flatfish species where natural mortality has been estimated separately. There was no public testimony for the yellowfin sole assessment.

The SSC appreciates the authors responding to the SSC request to examine natural mortality. **Although Model 18.2 was the authors' preferred model and appeared to provide a better fit to the data, the SSC supports the Team recommendation to use Model 18.1a for management in 2020, as Model 18.2 had not received thorough review.** This follows the Plan Team policy that "for each assessment year, models introduced in that year should ideally be previewed in September or at least requested by the Team/SSC by September/October, and that the standard for acceptance of models that do not meet at least one of these criteria will be higher than for models that do;" and adherence to the SAFE chapter guidelines, which state (under "Guidelines Pertaining to the September SAFE Report"), "...if a new assessment model or analysis is being recommended, a chapter should be produced that provides enough information for the Plan Team(s) to make a decision about what new models or analyses should be included in the November assessment." The Team noted that Model 18.2 was designated as a major change over last year's model. **Particularly in cases where a new model is brought forward to the SSC in December that is a major change not previewed in October, the SSC requests that authors include tables, graphs, and all projections from the base model in addition to the new model in the December assessment.** The SSC appreciates the authors' work on Model 18.2 and looks forward to reviewing a model with sex-specific natural mortality in next year's cycle. With regard to natural mortality, the SSC requests the authors clarify and justify why natural mortality is estimated in the model for males, rather than for females or both sexes, and whether the value previously used for both sexes combined (M=0.12) is appropriate for a single sex.

The SSC concurs with the PT recommendation of Model 18.1a to set the ABC and OFL for 2020 and 2021. Under the recommended model, Model 18.1a, yellowfin sole continues to be managed as a Tier 1a stock and remains above B_{MSY}. In agreement with the author and Plan Team, the SSC recommends the maximum ABC.

The SSC has the following suggestions for future assessments:

- The SSC requests that the authors use the model numbering convention in future assessments.
- The SSC appreciates the authors' initial response concerning the variability in the proportion of the yellowfin sole stock that occurs in the Northern Bering Sea. As described in the 2018 SSC minutes, the SSC suggests the application of the VAST model to estimate the proportion of yellowfin sole in the NBS over time, as well as an examination of other available data sources, in particular the ADF&G survey in Norton Sound that has been conducted triennially since 1978 and annually since 2017. The SSC continues to encourage the authors to consider approaches for including the substantial biomass of NBS yellowfin sole in the model, with the expectation that NBS surveys will be conducted regularly in the future.
- The SSC suggest the authors consider estimating a single selectivity curve for both sexes since the sex-specific selectivities are so similar.
- The SSC requests the authors include an explanation of why the model fit to the survey and the model estimated biomass trends diverge, including what model-estimated process explains the change, whether the process is biologically plausible, and whether this model estimated process could potentially explain the retrospective pattern.
- The SSC acknowledges the past work that has been done to resolve the retrospective pattern and recognizes that the models with the best fit are different than those that with the best retrospective pattern. However, the SSC remains concerned about the large retrospective pattern and requests the authors continue to investigate this as they are able.

- The SSC recommends the authors revisit the fixed values of natural mortality, as the document states the data from these values are based are from the 1990s.
- The SSC would greatly appreciate if there could be a thorough review of the chapter before submission in the future. There were considerable errors, omissions and transpositions in the text, figures and tables that made understanding and following the chapter difficult. For example:

    - In Table 4.18, recruitment estimates do not match Figure 4.15 or Figure 4.29 and the years in the table do not match the years in the legend.
    - No specification of the model number in numerous figure and table legends
    - On page 12, it is unclear as to what "various combinations of these data" stock recruitment relationships were fit.
    - Figure and table legends were not always correct, such as Figure 4.32 where legend states two vertical reference lines, but the plot only has one.
    - References to figures in the text did not always reference the correct figure
    - Year ranges in the text, tables and figures were not always correct
    - Features of figures were unexplained in the legends, such as dots in Figure 4.33
    - Projection scenarios 3 and 4 were swapped relative to the text in Table 4.20
    - Fishery "no retained catch" has retained catch of 375 mt in Table 4.20
    - Wrong years are noted, such as in the reference points for Model 18.1 in Table 4.15

Alaska Plaice

A full assessment was conducted for Alaska plaice. The model was unchanged from the last full assessment in 2017. Updated data included estimates of catch and discards for 2018 and 2019; shelf trawl survey biomass estimates, standard errors, and survey length composition for 2018 and 2019; survey age composition and fishery length compositions for 2017 and 2018, and the 2018 fishery length composition.

Survey biomass in the EBS decreased 12% from 2018 to 2019, and is 30% below the long-term mean. However, exploitation is low for this stock and catch was well below the ABC in 2019. The 2014 year class appears to be above average, resulting in projections showing an increase in biomass as this year class matures. The stock is projected to be well above $B_{40\%}$ at current levels of exploitation.

The risk assessment showed low levels of concerns. However, the Plan Team noted some of these concerns were unknown. A discussion on dealing with "unknowns" is provided in the risk table section of the SSC report.

The SSC support the Plan Team's and authors' recommended ABCs/OFLs for 2020 and 2021.

The authors investigated biomass in the NBS, noting that 38-47% of the survey biomass resides in the NBS. However, as noted in the assessment, trawling is prohibited in the Northern Bering Sea Research Area. The SSC appreciates the authors' investigation of this issue and recommends continuing to track survey biomass trends in the NBS. The assessment indicates that sampling in the NBS in 2017 by a NPRB project showed differential age-at-maturity and size-at-age compared to the EBS. For the next full assessment, the SSC requests that the authors investigate differences in length composition and sex ratios between the NBS and EBS surveys. In addition, the SSC recommends analysis of genetic information to inform whether there is evidence of stock structure between the survey regions.

Flathead Sole

A partial assessment was presented this year for BSAI flathead sole. This stock is assessed on a biennial basis and is managed under Tier 3. The last full assessment was in 2018. New input data for the projection

model included updated catch for 2018 and preliminary catch for 2019. The OFL and ABC recommendations for 2020 are slightly lower than what was projected with the 2018 full assessment model.

The SSC accepts the Plan Team's and authors' recommended 2020 and 2021 OFL/ABC.

Greenland Turbot

A partial assessment was conducted for BSAI Greenland turbot. This stock is assessed on a biennial basis and is managed in Tier 3. The last full assessment was in 2018. New input data for the projection model included updated catch for 2018 and preliminary catch estimate for 2019. The OFL and ABC recommendations for 2020 are higher than what was projected with the 2018 full assessment model. The stock is specified in Tier 3a.

The SSC notes a general declining stock trend and survey abundance is at the lowest in the time series. Exploitation on the stock has been low (~3%), with catch far below the TAC and the TAC set well below the ABC. There continues to be a lack of recruitment and there is uncertainty whether this is linked with current warming trends. **The SSC looks forward to further examinations on environmental effects on recruitment in the next full assessment, and supports the Plan Team recommendation to quantify the importance of the slope survey to this assessment.**

The SSC accepts the Plan Team and author recommended 2020 and 2021 OFL/ABC.

Kamchatka Flounder

A partial assessment was presented this year for BSAI Kamchatka flounder. This stock is assessed on a biennial basis and is managed in Tier 3. The last full assessment was in 2018. New input data for the projection model included updated catch for 2018 and estimated catch for 2019-2020. The OFL and ABC recommendations for 2020 are slightly higher to what was projected with the 2018 full assessment model, and the stock is specified in Tier3a.

The SSC accepts the Plan Team's and authors' recommended 2020 and 2021 OFL/ABC.

Arrowtooth Flounder

A partial assessment was presented this year for BSAI arrowtooth flounder. This stock is assessed on a biennial basis and is managed in Tier 3. The last full assessment was in 2018. New input data for the projection model included updated catch for 2018 and preliminary 2019 catch. The OFL and ABC recommendations for 2020 are slightly higher than those projected by the 2018 full assessment model. The stock is specified in Tier 3a.

The SSC accepts the Plan Team and author recommended 2020 and 2021 OFLs and ABCs.

Northern Rock Sole

A partial assessment was presented this year for BSAI northern rock sole. This stock is assessed on a biennial basis. The last full assessment was in 2018. New input data for the projection model included updated catch for 2018 and preliminary catch for 2019. Survey biomass was updated to include 2019, but was not used for the harvest specification. The OFL and ABC recommendations for 2020 are higher than projections made in 2018. The Plan Team noted there was an error in the 2018 assessment that resulted in a lower OFL/ABC than would have otherwise been projected. The stock is managed under Tier 1a.

The SSC accepts the Plan Team's and authors' recommended 2020 and 2021 OFLs and ABCs.

BSAI Rockfish

Northern Rockfish

The SSC received a presentation from Grant Thompson (NOAA-AFSC) on a full update of the BSAI northern rockfish assessment of this Tier 3a stock. The last full assessment for northern rockfish was presented in 2016.

Several updates were made to the input data including updated catch through 2018, projected catch, 2015 and 2017 fishery age composition, 2018 survey biomass estimate, 2016 and 2018 survey age compositions, 2016 and 2018 fishery length compositions, and updates to age-length and weight-at-age curves for fishery and survey data. Changes in the assessment methods included the use of sub-area age-length keys and the application of a constraint on the survey selectivity curve. The results include 30% and 31% increases in the estimates of ABC and OFL, respectively, from the values estimated last year for 2020.

The adjustment to the age-length keys involved recomputing the age composition based on subarea age-length keys rather than the global age-length keys. The adjustment did not change the fishery age compositions but did result in a reduction in the age composition for younger ages in the survey (and an increase in older ages) when compared to the global estimates. The Plan Team noted that this may be due to the length-stratified otolith sampling in the survey.

The survey age compositions are derived from two sampling strategies over time, length-stratified sampling and random sampling recently. The SSC was surprised to see a dramatic change in the survey age compositions from what appeared to be relatively small differences in length-at-age by sub-area. The SSC noted that yearly age samples by subarea were sometimes under 100 otoliths and that an age-length key that sparse would be very challenging for estimating the age composition, particularly for infrequently caught young northern rockfish.

The updated data and recomputed age-length produced a substantial change in selectivity, with values less than 1 for all ages. To address this the author added a constraint on survey selectivity to ensure that the selectivity at age 15 was close to 1. The Plan Team supported this approach but noted that other selectivity curves should be explored in the next assessment.

The SSC notes that the authors and Plan Team made effective use of the Risk Table. The Assessment-related category included concerns about the retrospective pattern in the assessment, and the use of strong priors for several key model parameters that cannot be reliably estimated, which are likely understating the level of uncertainty in the assessment.

In the Population Dynamics category, the authors noted that the spatial management of the stock is not consistent with the genetic spatial structure, which could lead to subarea depletion and loss of fishery yield, particularly as the target fishery for northern rockfish is developing.

The authors and Plan Team agreed that, given the stock abundance is high and exploitation rates are low, these concerns merit further investigation but not a reduction from maxABC. **The SSC concurs that a reduction from maxABC is not warranted and requests that going forward further clarification be included regarding the extent to which the concerns listed in the Risk Table are addressed in the assessment and Tier status for this stock.**

The SSC supports northern rockfish Tier, ABCs and OFLs recommended by the authors and the Plan Team for the 2020 and 2021.

The SSC concurs with the Team's recommendation that the authors' work to address the issues concerning the restrictive priors on key parameters in the model, explore alternatives for estimating survey selectivity, and to explore global age-length keys that are weighted by area-specific abundances.

The SSC requests further evaluation for 2022 of these sub-area age-length keys for the survey and whether the big differences are related to small sample size, sampling design (by comparing random to length-stratified estimates), or some other factor.

The SSC also notes that the aging error matrix is currently based on GOA northern rockfish information and requests that it be updated using BSAI information, if possible.

Pacific Ocean Perch (POP)

A partial assessment was conducted for BSAI Pacific ocean perch (POP). New input data include replacing estimated catch for 2018 with final catch and updating catch estimates for 2019-2021. There were no changes in assessment methodology. The estimated 2019 catch is 17% larger than the value estimated in the 2018 projection model. **The SSC supports the 2020 and 2021 Pacific ocean perch ABCs and OFLs recommended by the assessment authors and the Plan Team.**

Blackspotted and Rougheye Rockfish Complex

The SSC received a presentation on the partial assessment for the BSAI blackspotted/rougheye rockfish stock complex. This assessment involved re-running the projection model with updated 2018 - 2020 catch data. The 2020 projected (age 3+) biomass is a 5% increase from 2019. Similarly, the OFL and ABC for 2020 are projected to increase from the 2019 estimates with additional increases into 2021 (by 28% for the AI portion of the stock). The Plan Team noted that overall exploitation rates were low, but that the maximum subarea species catch (MSSC) was exceeded in the WAI again in 2019 despite fishing industry efforts to actively avoid these species in the POP fishery. The industry attributed this to an increase in abundance of small fish. The Plan Team noted that the survey selectivity on these small fish (which comprise 80% of the stock, as estimated from the 2018 model) is 20% or lower, and therefore provide limited observations for estimating recruitment for the most recent time period.

The SSC supports the assessment authors' and the Plan Team's recommended ABCs and OFLs for the blackspotted/rougheye complex for 2020 and 2021 and requests further examination of potential increases in the abundance of small fish in the WAI.

BSAI Atka Mackerel

The SSC commends the stock assessment authors for producing a document that clearly describes the history of assessments, fisheries, historical management actions (including those associated with Steller sea lions), and the current stock assessment modeling approach. Also, the SSC appreciates the authors' concise and informative responses to all recent SSC and PT recommendations in the current assessment. Though not all recommendations were entirely resolved, documentation of progress towards resolution is comprehensive and clearly reflects thoughtful efforts to find rigorous solutions to the issues raised. The SSC looks forward to seeing a completed ESP, a new weighting system for area apportionment based on both survey data and fishery CPUE, and an evaluation of the efficacy of VAST modeling to impute missing biomass estimates in the 2020 full assessment.

The Atka mackerel assessment includes no new models for 2019, and remains a Tier 3b assessment. The base model (16.0b) was used with updated data on catches, age composition, and the Aleutian Islands trawl survey in 2018, which for the first time included randomly sampled otoliths from over 1,000 fish. Model 16.0b continues to fit the data well. Area apportionment among regions of the Aleutian Islands continues to be based on the most recent four-survey weighted average biomass, though efforts to incorporate fishery CPUE in this process are ongoing. **The SSC agrees with the authors and PT to use Model 16.0b for deriving Tier 3b Atka mackerel OFLs and ABCs for 2020 and 2021 (Table 2).**

The authors applied the risk table to the Atka mackerel stock assessment. They expressed some concerns about assessment-related uncertainty, particularly with regard to the survey data. Of specific note is the fact that bottom trawl data are the source of Atka mackerel biomass estimates used in the model, despite the species occupying rocky, typically untrawlable habitats. The SSC looks forward to continued advancement of visual-based survey methods for this species, and their eventual inclusion in the assessment process. Despite concerns about assessment-related uncertainty, stock trends align with expectations given documented stock dynamics, and recent recruitment is within the lower end of the normal range. Finally, limited ecosystem information indicates no immediate concerns and fishery performance was categorized as normal. As a result, the authors scored the risks as Level 1 for all four categories and **recommended applying maximum ABC for this stock. The PT agreed with this risk assessment and maximum ABC determination.** The SSC shares the concerns about assessment-related uncertainty because, while it is typical for the Atka mackerel, the large assessment related uncertainty and potential bias associated with survey estimates is greater than many other species. However, due to the other considerations noted by the authors and PT, the **SSC concurred with applying the maximum ABC for this stock.**

SSC recommendations include:

- Continuing to develop appropriate apportionment methods for this stock in the future, with an emphasis on investigating the application and validation of the autoregressive spatio-temporal modeling approach developed in the VAST modeling framework for such purposes. As appropriate, this apportionment should consider use of both survey data and fishery CPUE.
- Reporting fish condition in the assessment over time at smaller spatial scales than in the ESR. The assessment noted that trends in condition differ across the AI but did not elaborate.
- Taking into consideration that historical fishery evidence of linkages between the AI and GOA populations of Atka mackerel suggest source-sink population dynamics that may account for unexplained fluctuations in the AI population when modeled as a single unit, especially in the eastern region, and exploring the strength of these connections to evaluate changes in the assessment approach (e.g., modeling as two separate stocks versus one metapopulation).

BSAI Sculpins

The BSAI sculpin complex is managed as a Tier 5 stock and the last full assessment was done in 2016. A partial assessment was conducted this year in which the random effects model from the last full assessment was re-run with new survey data. The new data included the 2019 Bering Sea shelf survey and 2018 Aleutian Islands survey estimates of sculpin biomass. The Bering Sea slope survey was not conducted in 2018 and 2019. The estimated total biomass for the Bering Sea shelf for 2019 of 230,291 t is higher than the total biomass estimate of 171,760 t for 2017. The recommended OFL and ABC values for 2019 and 2020 in this update are higher than those for 2018 and 2019 from the 2017 assessment (12% and 27%, respectively) because of the increase in total biomass estimate. Catch of sculpins (as bycatch) has remained

stable averaging 5,184 t and retention is about 2%. Estimates of exploitation rate (i.e., catch/biomass) has remained stable at about 3% since 2014.

The SSC concurs with the authors' and Plan Team's recommended OFLs and ABCs for BSAI sculpin stock complex for 2020 and 2021.

BSAI Skates

The BSAI skate complex is managed as an aggregate with a single set of harvest specifications. The stock is separated into two units to generate harvest recommendations: Alaska skate (*Bathyraja parmifera*) is the most abundant skate species in the BSAI, and the remaining species (i.e. "Other Skates"). Alaska skate harvest recommendations are based on an age-structured model and managed under Tier 3a, while Other Skates are managed under Tier 5. The Tier 3 and Tier 5 recommendations are combined to generate recommendations for the whole complex.

The last full assessment was done in 2016 and only a partial assessment was done this year. No changes were made to the assessment methods. New data for the Alaska skate projection model included updated 2018 catch data, preliminary 2019 catch estimates, estimated total catch for 2019 and 2020, and 2019 EBS shelf bottom trawl survey biomass estimates. The Tier 5 random effects model for the Other Skates component was not re-run. The estimated survey biomass for the aggregate skate complex on the EBS shelf decreased slightly relative to 2018 (528, 826 t vs. 610,666). The 2019 catch is on track to be substantially lower than in recent years, which had been increasing. The harvest specification recommendations for 2020 have changed slightly from last year's assessment.

Several recommendations provided by the Plan Team and SSC last year are planned to be addressed in the next full assessment in 2020, which include:

- Explore the implications of using a random effects models for aggregates of species with different life histories and vital parameters
- Conduct sensitivity runs to examine potential biases in ageing
- Consider whether separating Alaska skate from the skate complex is advisable to avoid potential undue exploitation on the other skate species
- Fill out/or update a stock-structure template for the skate complex
- Work to integrate IPHC longline data into the assessment

The SSC concurs with the author's and Plan Team's recommended OFLs and ABCs for BSAI skates for 2020 and 2021.

BSAI Forage Fish

Public testimony was provided by Karl Haflinger (SeaState) who showed annual maps of the spatial distribution of squid and the pollock fishery. The map for 2019 indicated a large increase in squid catch with catches extending much further to the northwest that in other years.

This biennial report documents trends in abundance, distribution and interactions with federal fisheries of forage species. Forage species include numerous forage fishes, Pacific herring, juveniles of managed groundfish and salmon, Arctic cod, shrimps, and new to 2019, squid. The SSC appreciates the efforts of the author and notes his responsiveness to past Plan Team and SSC comments. This report continues to improve with each cycle. The SSC emphasizes that the information presented in the report is primarily from bottom trawl surveys or observer data, neither of which are ideal for assessing the status of forage

species populations, as noted by the author. **A dedicated forage species survey is necessary for documenting potential changes in the forage base that supports BSAI fisheries and would be highly informative in the future.** This 2019 forage species report now includes information from the Northern Bering Sea bottom trawl surveys.

The SSC agrees with the Plan Team recommendation to include information from the ESR and any ESPs to provide a complete picture of certain forage species. The SSC further suggests that consideration be given to changing the timing of the two regional forage species reports (e.g., moving the BSAI forage report to even years and the GOA forage report to odd years) to better align these reports with the timing of the bottom trawl surveys, as data availability allows.

The SSC shares the author's and Plan Team's concerns regarding the precedent of allowing an ecosystem component species, such as squid, to be processed and sold, as this may encourage targeting of other forage species. The SSC also supports the Plan Team's recommendation to re-evaluate the herring savings area.

Noteworthy items from the 2019 report are provided below:

- Capelin abundance continues to be extremely low, as estimated from the EBS bottom trawl survey, with 2019 as the second lowest in the time series, though this is not unsurprising, given their preference for cold water.
- Incidental catch of squid was extremely high, over twice the previous catch record, at 5,173 tons by the end of October. This (2019) is the first year that squid are an ecosystem component species, and the lack of a catch limit may have contributed to the large catch. However, squid are also well-known to exhibit large population swings. At this point, **the SSC does not anticipate a conservation concern** with this large bycatch this year but continued monitoring is warranted. Maps of squid catch in the Pollock fishery provided by industry are useful to this effort.
- Eulachon continue to be below their long-term average abundance.
- Estimated incidental catch of forage fish in BSAI federal fisheries in 2019 is the highest since 2015 and consists mainly of osmerids. Incidental catch continues to be primarily from the yellowfin sole fishery. In 2019, an unusual large proportion were taken by the rock sole fishery.
- Pacific herring biomass estimates from the EBS bottom trawl survey continue to be above the long-term mean.

The SSC offers the following suggestions to continue to improve the forage species report:

- Given the increased understanding of the environmental conditions and connections involving forage species, it would be helpful to provide a brief summary of what is known about the drivers of forage species' abundance trends, akin to an Implications section in the ESR.
- Data from the 2018 NBS survey are not included because of the truncated survey area in that year. However, stock assessments are utilizing 2018 data by standardizing the survey area across all four NBS surveys (2010 and 2017 – 2019). This approach should be investigated to make full use of those data.
- ADF&G estimates of spawning population of Pacific herring are only presented through 2015. There appear to be more recent BSAI herring population assessments and the SSC suggests direct contact with ADF&G staff to obtain these data. It would also be helpful to provide information on ADF&G assessment frequency.
- There is historical information about high squid catches in the late 1970s. An examination of potential causes could be very informative. Are there any similarities to current environmental conditions, given that the 2019 catch is on par with the highest catches observed? Are there data

from other areas that might indicate some synchronicity in squid population increases on a regional scale? Also, species-specific information for squid bycatch would be helpful.
- Surface trawl surveys conducted by the Ecosystem Monitoring and Assessment program (EMA) are sometimes referred to as the BASIS surveys. Please be consistent with the description of the survey.
- The SSC also notes that the text states that data are only available from the EMA surveys from 2003 – 2011 (see section on rainbow smelt); however, the description of the survey indicates this survey has continued through 2019.
- It would be helpful to provide averages of biomass and bycatch estimates over time to compare the current year to in Tables 1 through 4.
- In Table 7, it would be useful to highlight years where herring PSC was exceeded.
- For the figures utilizing data from the BSAI bottom trawl surveys, the survey area in the figure only pertains to the EBS survey, yet those figures clearly contain data from the NBS surveys (Fig. 4, 7, and 16).
- Information from the 2018 Aleutian Islands survey should be included in Figures 12 and 15.

C-2 GOA SAFE and Harvest Specifications for 2020/21

GOA Walleye Pollock

The SSC received a presentation on the 2019 stock assessment and PT comments from Jim Ianelli (AFSC). Public testimony was provided by Julie Bonney (Alaska Groundfish Data Bank) and Kristin McQuaw (University of Washington) in support of making no reduction to the maximum ABC based on the risk table given reduced risk reported by the author and PT in 2019, and noting little difference in the future projections under maximum and reduced ABC levels. Additional testimony was provided by Beth Stewart (Peninsula Fishermen's Coalition) highlighting the effects of reductions in both Pacific cod and pollock TACs on the communities of Sand Point and King Cove, the importance of a 10% reduction from the maximum ABC, the necessity of considering differences in socioeconomic effects between these communities and Kodiak, and supporting additional trawl surveys in the GOA.

The 2019 assessment included two models: last year's model updated with new data (18.3) and an alternative model (19.1) that also included a minor change in the calculation of maturity schedules and an increased penalty on the degree of variability in Shelikof winter acoustic survey catchability. The SSC noted that the differing trends in the summer bottom trawl and acoustic surveys, and ADFG trawl surveys, compared to the Shelikof winter acoustic survey have continued in the data available for 2019, and that both models show a poor fit to the recent observations in these series.

The SSC supported the PT and author's choice of model 19.1. Model results indicate that the stock is declining, weight at age has decreased in recent years, and that the 2012 year class comprises much of the current abundance. 2019 Shelikof winter acoustic survey data showed a strong 2018 year class, which is very important for projections indicating that the stock biomass is likely to stabilize in 2021.

The stock is determined to be in Tier 3a as female spawning biomass is above $B_{40\%}$, and **the SSC supported the authors' and PT's recommended OFLs.** The SSC had considerable discussion regarding the need for a reduction from the maximum ABC, noting that the ABC adopted for 2019 (representing a 14.2% buffer from the maximum) was intended to be a stair step toward the maximum ABC in 2020. Further, the author and PT indicated via the risk table scoring that the level of concern was reduced relative to last year. The SSC discussed whether additional reduction was necessary based on continued concern over diverging indices, with the recommended model (19.1) tracking more in line with the declining indices rather than the high and contrary winter acoustic survey index. **The SSC recommended the PT and authors' 10%**

reduction to the maximum ABC. The basis for this was the remaining concern over lack of fit to survey indices, and the strong effect on model biomass estimates of the very large and uncertain Shelikof winter acoustic survey index from the last three years.

For the Southeast Outside area, the SSC supported the authors' and PT application of Tier 5 OFLs and ABCs based on projected biomass using the random effects model fit to 1990-2019 bottom trawl survey biomass.

The SSC commends the authors on the development of the Ecosystem and Socioeconomic Profile (ESP). The SSC looks forward to further clarification and application of the best process for elevating indicators identified in the ESP for consideration in the assessment.

The SSC supported the PT recommendations for this assessment, and also had the following additions or refinements:

- The SSC highlighted the existing recommendation to conduct a sensitivity study to the effect of survey indices on the stock assessment model (refitting the model while excluding one index at a time). In addition, the SSC recommends developing explicit hypotheses regarding why these survey series may differ (e.g., vertical and or spatial availability) and implementing them in a series of alternative models in order to evaluate which are consistent with the time-series of observations. It would be helpful to see the results from models that rely heavily on one or more indices rather than only a fit that represents a compromise among all.
- The SSC also suggests revisiting the use of a random-walk constraint on Shelikof acoustic survey catchability to constrain estimates to be near a value of 1.0, and considering alternative metrics for validating the potential values for the random-walk process variance.
- The SSC supports the PT recommendation to explore a joint analysis of the summer acoustic and bottom trawl surveys including the spatial and vertical overlap in sampling, similar to that being developed for the Bering Sea walleye pollock assessment.
- The SSC supports including GOA pollock in the ongoing genetic studies to better understand the relationship between pollock in the NBS and EBS, specifically to evaluate support for continued separation of SE outside waters in the OFL specifications.

The SSC also offered the following recommendations on the ESP of the walleye pollock stock in the Gulf of Alaska:

- The SSC comments provided on the sablefish ESP (Agenda Item C1) with respect to socioeconomic processes and community indicators are also applicable to the GOA pollock ESP.
- Specific to the GOA pollock ESP, in the text on page 111, the engagement of Sand Point and King Cove in the fishery (in addition the engagement of Kodiak) is briefly acknowledged. However, for the balance of the document, community indicators (page 116) and community profile information (page 144, Figure 1A.7) focus exclusively on Kodiak. It is a significant shortcoming to overlook the importance of pollock to the communities in western GOA, which the SSC recommends for inclusion in the next version of the ESP.

GOA Pacific cod

The SSC received a presentation on the 2019 Gulf of Alaska Pacific cod stock assessment from Steve Barbeaux (AFSC). Public comment was provided by Julie Bonney (Alaska Groundfish Data Bank), who pointed out the importance of collecting length, sex and otoliths (age) from bycatch fisheries and potential state-waters fishery given closure of the directed fishery in federal waters. She also questioned the validity

of the estimated ABC for 2021, given the optimistic use of average recruitment. Written comments relating to GOA Pacific cod were received from Jon Warrenchuk (Oceana), who highlighted the weak recruitment in recent years and the need to reduce competition between the fishery and Steller sea lions under the $B_{20\%}$ rule, if needed through additional bycatch reduction measures.

The Pacific cod stock in the Gulf of Alaska experienced a drastic decline in biomass and abundance since 2015, first reported in October following the 2017 bottom trawl survey. As detailed in the Ecosystem Status Report, the Gulf of Alaska experienced anomalous warm conditions throughout the water column starting in 2014 and extending through 2016 (a warm event known as 'The Blob', but now characterized in this assessment as 'marine heat waves'). These factors led to the current suite of models, which include environmental factors in the assessment including a brief period of high natural mortality (*M*) and temperature-dependent catchability in the trawl survey.

While the trawl survey saw a big relative increase in 2019, biomass estimates remain at low levels, and the longline survey RPN was still at an all-time low. It should be noted that the 2019 trawl survey estimate had high uncertainty, due in part to the lower survey effort in 2019, and the increase was primarily driven by small fish on Portlock and Barnabas Banks. The IPHC survey showed a slight uptick but is not used in the model. Interestingly, the trawl survey showed very little biomass in the WGOA but the IPHC survey showed much of the biomass there.

Three models were presented for consideration: (1) Last year's model updated for 2019 (Model 18.10.44), (2) A model that added ageing error and changed the plus group to a more realistic plus group of 10+ (Model 19.11.44), and a model that additionally accounted for ageing bias prior to 2007 (Model 19.14.48c). Although a direct comparison of models with and without the change in the plus-age group was not described in the draft SAFE report, the SSC confirmed this change had little impact on estimates for biomass or reference points. **The SSC supports the authors' recommended model 19.14.48c, which includes aging error and the conditional length-at-age approach, noting its acceptable model fits and reasonable retrospective patterns.** The results of the recommended model show a very low stock status for 2020, just above the "overfished level" of $B_{17.5\%}$. Since the stock is projected to be below $B_{20\%}$, there will be no directed federal fishery to protect Steller sea lions. Therefore, the projections used assume only that there will be some discards and state catch for a total of 6,300 t.

The authors expressed concern regarding less data as a result of the switch to EM for the pot fishery and the closure of the directed federal fishery. Both of these may result in added uncertainty in the assessment next year, because of less data to determine catch at age and average weights that are borrowed from different management areas with known differences in growth**. The SSC encourages the authors to evaluate ways to effectively deal with the lack of observer data, including working directly with FMA (the observer program) or ADF&G to obtain biological samples from incidental catch or state harvest.** The SSC noted that different selectivities of the fisheries that catch cod in a year with no directed catch may pose challenges to interpreting these data.

Length composition data for Pacific cod are now available for the IPHC setline survey. Although length data are only available starting in 2018, the **SSC agrees with the GPT that the authors should explore a model that includes the IPHC survey.** This additional survey is an annual survey that could provide valuable information during off years for the bottom trawl survey in depths and areas not sampled by the AFSC longline survey. Examination of the 2018 length composition may provide sufficient information on whether a selectivity curve from another survey or fishery may be a good approximation for the IPHC survey selectivity in order to avoid estimating an IPHC-specific selectivity curve internally.

There were several requests from the SSC last year that were not addressed this year, and we reiterate them for the next assessment. In particular, the SSC is concerned about structural differences between the assessment and projection models. The assessment projection uses the recruitment estimates from a model variant that does not include the differential M for the marine heat wave for future recruitment and reference points, while using the numbers at age estimated from the recommended model with the differential M block. Figure 2.85 shows that the recruitment time series is quite different between these model variants. This mismatch should be considered carefully because it affects recruitments outside of the marine heat wave period. Thus, the reference points are dependent on this assumption. This becomes especially important as the stock is close to crucial management and biological thresholds ($B_{20\%}$ and $B_{17.5\%}$) and improved estimates of the probability of being above or below these thresholds in the future could better inform Council decisions. In addition, the standard projection model and the Stock Synthesis model produce results that are different. **The SSC requests the authors compare results from the standard projection model with results from projections generated within the SS model under different assumptions about natural mortality (perhaps time or age-varying) and recruitment.** The Plan Team thought perhaps the time series of recruitment was too optimistic, but given the high recruitments estimated under the recommended model it could also be too pessimistic.

There was some discussion about the relationship of less abundant GOA Pacific cod and sea lion diets. Much of the work on Steller sea lion diet is outdated, and often those data use scat collections from the 1990s. The SSC suggests prioritization of analysis of existing data and collection of contemporary diets of sea lions.

The teams recommended an ABC reduction based on a risk table score of 2 but suggested that the SSC identify the level of such a reduction. There were some indications of poor conditions for cod and the formation of another heat wave. A number of the model features like the M block and the temperature catchability relationship address some of the environmental concerns, and if the marine heat wave affects cod, it will likely be in several years. The decrease in ABC because of stock status already results in a 56% reduction in addition to the amount resulting in low exploitable biomass. The SSC also noted that, given the potential closure of the directed fishery, catches will likely be well below maximum ABC. **There is considerable uncertainty about future recruitment and potential effects of the impending marine heat wave on cod mortality, therefore the SSC set the 2021 ABC to be the same as the 2020 ABC until next year's assessment provides more clarity about future trends.**

After SSC deliberations had been closed, GOA Pacific cod specifications were re-opened to receive information from AKRO staff. The SSC was informed it was possible the entire ABC could be achieved from non-directed fisheries through reallocation of unused TAC to other sectors. The SSC found this to be somewhat concerning and inconsistent with the intent of the $B_{20\%}$ rule. However, given the late notice of this information, the SSC thought it would be too hurried to consider a further ad hoc ABC reduction. However, the SSC draws the Council's attention to this issue. **The Council might consider whether reducing TAC or using other management tools to address the intent of the Steller Sea Lion rule are warranted.**

A recurring theme at this SSC meeting was the random effects model used for apportionment causing large swings in recommended ABC by subarea. For GOA Pacific cod, there was a large shift of apportioned ABC from the Western GOA into the Central GOA (resulting in an increase in CGOA). The IPHC and longline surveys did not support this large shift in biomass from the WGOA to the CGOA. The PT recommended averaging the 2017 and 2019 apportionments and the SSC agrees with this as an interim measure. The authors, PT, and SSC are becoming increasingly dissatisfied with results from this apportionment method. Thus, **the SSC recommends the authors consider a two-survey random effects model, a VAST apportionment method, or other options to stabilize apportionments.**

The SSC recommends that the authors in 2020 choose a model nomenclature of their new models that is more in line with SAFE guidelines, such as Model 19.3, if the base model from 2019 is chosen.

GOA Flatfish

Deepwater Flatfish Complex

A full assessment was completed for GOA deepwater flatfish. The SSC would like to commend the authors for the large amount of work done on this stock assessment since the last full assessment in 2015 and on the very clearly written assessment document. The descriptions and justifications included in the assessment were extremely helpful.

The deepwater flatfish complex is on a 4-year assessment cycle. Dover sole is assessed with an age-structured model under Tier 3, whereas the other species (Greenland turbot and deepsea sole) are assessed under Tier 6. Dover sole dominates the landings of this complex, typically making up ~75% of the harvest. ABCs and OFLs for the individual species in the deepwater flatfish complex are determined and then summed for calculating complex-level OFLs and ABCs. The catch of Kamchatka flounder has been accruing against the deepwater flatfish complex TAC since 2011, when Arrowtooth flounder was removed from the complex to be assessed independently, but Kamchatka flounder abundance is not currently assessed. **The SSC recommends including a Tier 6 OFL and ABC for Kamchatka flounder in the combined GOA deepwater flatfish complex OFL and ABC during the next partial assessment year (2020), using max catch from 2011-2019 (69 t) as OFL. The SSC supports the PT recommendation that the author examine area apportionment relative to Kamchatka flounder and consider whether it is appropriate to apportion across the entire GOA or just the WGOA.**

For Dover sole, as in 2015, the assessment was an age- and sex-structured statistical catch-at-age model. Updated data for this assessment includes updated catch from 2015, catch from 2016–2018, and estimated 2019 catch; updated 2015 fishery length composition and fishery length compositions from 2016 – 2019; 2017 and 2019 survey biomass indices and length composition data; and 2015 and 2017 survey conditional age-at-length data.

The author implemented several model changes relative to the model used for the 2015 assessment based on Plan Team and 2019 CIE recommendations in the form of a bridging analysis. These changes included removing the 1984 and 1987 survey biomass estimates, disaggregating age data for ages 1-3, re-evaluating selectivity parameters that were estimated in 2015 and fixing very poorly informed selectivity parameters, specifying the bottom trawl survey timing to June rather than at the start of the year, updating historical data to ensure inclusion of the most recent catch estimation methods, fixing historical fishing mortality at 0, setting the start of recruitment deviation estimation to 1978, estimating natural mortality with a normal prior rather than fixing it, and using data weighting method described in Francis (2011).

Four models were developed as candidate models for 2019, each representing a hypothesis about why there was a downward shift in survey biomass for the most recent three surveys over the past 5 years:

- Model 19.0 – time invariant natural mortality (M, by sex) and catchability/availability (Q) (hypothesis that downward shift is due to observation error),
- Model 19.1 – as for Model 19.0, but M by sex was estimated separately for 1978-2013 and 2014-2019 (hypothesis that downward shift is due to change in M between time blocks),
- Model 19.2 – as for Model 19.0, but Q was fixed at the value estimated in Model 19.1 for the years 1978-2013 and estimated for 2014-2019 (hypothesis that downward shift due to change in survey catchability/availability),

- Model 19.3 – Q fixed at value in 19.1 for the years 1978-2013 and estimated for 2014-2019, and sex-specific M estimated separately for 1978-2013 and 2014-2019 (hypothesis that changes in both catchability/availability and natural mortality led to downward shift in survey biomass).

The SSC concurs with the authors' and PT's recommended Model 19.3 for Dover sole.

For the purpose of setting the OFL and ABC for the deepwater flatfish complex the 2020 and 2021 catches for Dover sole were projected using the 2014-2018 average catch. The Tier 6 OFLs and ABS for Greenland turbot and deepsea sole were based on historical catch and combined with values for Dover sole to arrive at complex-wide harvest specifications.

Area apportionment for deepwater flatfish was based on the PT's recommended method from 2016. For Dover sole area apportionment, a random effects model was used to smooth survey biomass estimates and fill in gaps in depth/area strata. The resulting proportions by area were used for the 2020 and 2021 apportionments. Greenland turbot and deepsea sole area apportionments are based on average survey biomass for each species from 2001-19. The apportionments for the three species were summed to produce the overall apportionment for the complex.

The SSC endorses the Plan Team's and authors' recommended combined ABC and OFL for the deepwater flatfish complex for 2020 and 2021, as well as the associated area apportionments of ABC.

The author scored the assessment-related concerns portion of the risk table Level 2 (substantially increased concern) because the model is not accounting for the complex growth patterns (time-and space varying, cohort-specific growth pattern) that have been observed and because no fishery age data are available; however, **the SSC supports no reduction from maxABC.**

The SSC supports the collection and processing of fishery age data to address potential bias and uncertainty in estimates of selectivity. The SSC also supports the development of a GOA-specific ageing error matrix, as the model is currently borrowing an ageing error matrix from the West Coast.

For the next assessment, the SSC requests that the author include a summary or description of the historical catches that were used in the Tier 6 assessment for Greenland turbot and deepwater sole. The SSC also recommends that the VAST appendix document be brought forward in conjunction with the next partial assessment.

Arrowtooth Flounder

Two models were evaluated for 2019: 1) The model used in the 2017 assessment (17.1a); and 2) a new model (19.0) that has the same structure as 17.1a, but with the trawl survey starting in 1977 rather than 1961. The rationale for removing the 1965-1975 survey data was based on past SSC and Plan Team discussions, and the lack of evidence to support the low levels of biomass estimated during those years. Further, a 1977 start year is consistent with many assessments for other groundfish species in the GOA. The model fit was similar between 17.1a and 19.0.

The SSC supports the Plan Team's recommendation to remove the early survey years and supports using the author's preferred model 19.0 and standard regional apportionment via the random effects model.

The risk table showed a level 1 risk for all categories except the environmental and ecosystem category, which was scored as level 2. The assessment indicates reasons for the level 2 ranking include moderate to low euphausiid abundance in 2019 (an important prey for juvenile arrowtooth), poor forage fish abundance, and warm ocean conditions that are likely not favorable for arrowtooth growth and survival. The stock has had below average recruitment in recent years, and modeled biomass continues to decline from high levels observed in the mid-2000s. However, survey biomass estimates were similar for 2019 and 2017, exploitation rates on this stock were low, and the stock is projected to be above $B_{40\%}$.

The SSC accepts the Plan Team's and authors' recommended 2020 and 2021 OFL/ABC. The SSC concurs with the Plan Team that a reduction from the tier 3a maxABC is unnecessary given current stock status and exploitation level.

The SSC supports the Plan Team recommendations to evaluate whether opportunistically collected length-frequency data should be removed from the model. The SSC requests the authors investigate including IPHC survey data in this assessment, and whether fishery catch-at-age information is available for inclusion in the model.

Flathead Sole

GOA flathead sole is assessed every four years with an age-structured assessment model and is managed in Tier 3a. The last full assessment was in 2017. This year a partial assessment was conducted. New data for the projection model included updated catch for 2017 and 2018. The OFL and ABC recommendations for 2020 are very similar to what was estimated in 2018. Catches are well below maximum ABC. Area apportionments for flathead sole ABCs are based on the proportion of survey biomass projected for each area using the survey averaging random effects model. The 2019 GOA survey biomass estimate for flathead sole was down 21% from 2017 (185,840 t vs. 236,588 t).

The SSC concurs with the authors' and PT's recommended OFL and ABC for GOA flathead sole as shown in Table 2.

Rex Sole

GOA rex sole is assessed every four years with an age-structured model in two distinct areas (Western-Central GOA and Eastern GOA) and is managed in Tier 3a. The last full assessment was in 2017. This year a partial assessment was done. New data for the projection model included updated catch for 2017-2019. The projection model was run separately for the two areas and the GOA-wide ABC and OFL are a sum of the two areas. OFL and ABC recommendations for the Western-Central GOA and Eastern GOA are very similar to what was estimated in 2018. The ABCs calculated for the Western-Central and Eastern areas were apportioned based on random effects model predictions of the proportion of survey biomass among areas. The 2019 GOA survey biomass estimate for rex sole was down 8% from 2017 (90,414 t vs, 97,720 t).

The SSC concurs with the authors' and PT's recommended OFL and ABC for GOA rex sole.

Shallow-water Flatfish Complex

The shallow-water flatfish complex consists of eight species and is assessed every four years. The last full assessment was in 2017. This year a partial assessment was done.

In this complex, northern and southern rock sole are assessed separately from the other shallow-water flatfish and managed in Tier 3a. For northern and southern rock sole, new data added to the projection

model included finalized 2018 catch estimates and preliminary catch estimates for 2019. The 2019 GOA survey biomass estimate for southern rock sole was down 7%, and down 28% for northern rock sole.

Other shallow-water flatfish are managed in Tier 5. New data added to the projection model were the 2019 biomass data from the GOA bottom trawl survey.

The SSC concurs with the authors' and PT's recommended OFL and ABC for GOA shallow-water flatfish complex.

GOA Rockfish

Pacific Ocean Perch

Sara Cleaver (Council staff), Chris Lunsford (AFSC), and Jim Ianelli (AFSC) presented the results of the 2019 Pacific ocean perch assessment and the recommendations from the GOA Plan Team. Julie Bonney (Alaska Groundfish Data Bank) and Kristin McQuaw (University of Washington) noted that the model is underestimating the recent abundance of POP. They reminded us that industry has been raising concerns about lack of fit for multiple years and suggested that the AFSC conduct an internal review of the model prior to the CIE review. Kristin recommended that the terms of reference (TOR) for the CIE review should emphasize model fit including time varying selectivity and time blocks, and design based biomass estimators, with inclusion of acoustic-trawl (AT) data as an index of secondary priority.

This year's assessment was a straight forward update of the Model accepted in 2017 with new data. The new data included in the assessment model included: survey biomass estimates for 2019, survey age compositions for 2017, fishery age compositions for 2018, and final catch for 2017 and 2018 and preliminary catch for 2019-2021.

The new assessment includes the 2019 bottom trawl survey biomass (4^{th} year above 1 million t) and acoustic trawl survey biomass. Both of these surveys indicate a modest decline. **The SSC supports continued efforts to provide AT biomass estimates.** The SSC encourages the authors to explore why the AT estimates are so much lower than the bottom trawl estimates. The authors should explore whether the AT biomass estimates represent an un-sampled proportion of the population and evaluate how they can be combined with, or used complementary to, bottom trawl estimates.

Results of the updated 2017 age structured assessment model continue to reveal a poor fit to the bottom trawl survey since 2013. The SSC also requests that the authors explore data weighting methods to explore whether the age data are being over emphasized.

The SSC accepts the authors' and Plan Team's recommendation for the model and the associated recommendations for Tier (3a), ABC, and OFL. The SSC agrees with the author and Plan Team recommendations for area apportionments based on the random effects model in 2020.

The SSC appreciates the author's efforts to complete the Risk Table. This exercise was a good case study where the assessment appears to be erring on the side of conservation with estimated biomass trends being unable to track the rapid increase in the last 7 years. The SSC agrees that the lack of fit suggests a misspecification within the assessment that should be explored in the next full assessment. The SSC agrees that the risks identified in the table do not warrant additional reductions to the ABC.

The SSC supports the GOA PT recommendation to explore **incorporating hydroacoustic information into the assessment; examining catchability and selectivity; and examining the VAST model for POP abundance and apportionment.**

The SSC agrees that the formation of an internal assessment review team prior to the CIE review would be beneficial.

Shortraker Rockfish

A full assessment of GOA shortraker rockfish was presented. This Tier 5 assessment included several model changes, the most significant of which is the incorporation of the AFSC longline survey relative population weights (RPWs) as a second index in the random effects (RE) model. Both the longline survey and the GOA bottom trawl survey showed a slight increase in RPWs and biomass, respectively, from 2018. Four models were presented exploring three successive changes:

- Model 15.1 is the previously accepted base RE model with the bottom trawl survey updated through 2019
- Model 19.1 includes the addition of the longline survey RPWs (1992 – 2019) to Model 15.1
- Model 19.2 is a variant of model 19.1 where the relative catchability coefficients between the two surveys are estimated by region
- Model 19.2a takes Model 19.2 and down-weights the longline survey (0.5) relative to the bottom trawl survey (1.0)

The addition of the longline survey to the RE model stabilizes the model estimated biomass as the model responds to the relatively small uncertainty associated with the RPW estimates. This stability is generally consistent with the population dynamics and biological characteristics of this long-lived species. Estimating the regional catchability coefficients further improves model fit, and suggests that there are some regional dynamics related to availability of shortraker rockfish to survey gear.

The authors' and Plan Team's recommended model, 19.2a, down-weights the longline survey. In October 2019, the SSC requested clarification on the justification for reducing the weight of the longline survey. Their justification in the current assessment, as the SSC interprets it, is that the RE model is so heavily influenced by the longline survey that the regional biomass doesn't change and more responsiveness would be preferable. The fit to the bottom trawl survey of models 19.2 and 19.2a are very similar; however, a comparison of the fits to the longline survey of these two models was not provided. The document provides a detailed assessment of each of these surveys that the SSC found helpful to understand how shortraker rockfish might be sampled by each survey. Both surveys tend to provide variable estimates in adjacent survey years, suggesting that neither is ideal for shortraker. Size compositions are similar between the two surveys. The longline survey is conducted annually and likely surveys in more appropriate habitat than the bottom trawl survey, which is not able to sample the upper slope well due to a predominance of untrawlable habitat. However, hook competition with sablefish has been documented on the longline survey and, presently, is likely a factor with the large incoming year classes of sablefish. Currently, there is no established methodology to account for this. Uncertainty around bottom trawl biomass estimates for shortraker are relatively moderate, particularly compared to other rockfishes.

The SSC commends the authors for their work to incorporate the AFSC longline survey into the RE model for this stock. However, the SSC finds the justification for reducing the weight of the longline survey lacking, especially given that the longline survey might be a better survey to discern population trends in shortraker. However, **the SSC supports the use of Model 19.2a to calculate exploitable biomass for 2020 and 2021** as it allows for the regional biomass to vary slightly.

The SSC accepts the Plan Team's and authors' recommended 2020 and 2021 OFL/ABC. The SSC concurs with the Plan Team and author that no reduction from the Tier 5 maximum ABC is

necessary. The SSC supports the use of the random effects model fit to area-specific survey indices to calculate the area allocations.

The SSC notes the two survey indices maybe capturing different components of the shortraker population. SSC requests the authors provide a time series of the longline survey length compositions for comparison with the trawl survey time series currently in the assessment. In addition, the SSC requests the authors provide the regional catchability coefficients used in the assessment.

The SSC requests further clarification on the justification of the weightings used in the assessment. To the extent feasible, the authors should concisely describe differences in the type of information that each survey index provides about regional components of the shortraker population, and whether this is informative to the weighting of indices. Additionally, the SSC looks forward to continued exploration of alternative apportionment methods and believes this should remain a high priority.

Finally, the SSC notes the large increase in the 2019 exploitation rate for the hook and line fleet in the Western GOA, which is over triple than what occurred in 2018. The SSC highlights that new regulations will require full retention of rockfish for hook and line fisheries in the GOA, and important impacts from this regulatory change should be considered in the next full assessment.

Rougheye and Blackspotted Rockfish

The blackspotted/rougheye rockfish complex in the GOA is assessed as a Tier 3 species with an age-structured model since 2015. No changes in assessment methodology were proposed to Model 15.4. This age structured model internally estimates natural mortality, catchability and recruitment deviations. Changes to the assessment methodology in 2015 included updated growth information, updating the aging error matrix, increasing the plus age group, and using a gamma function for the trawl selectivity. Updated data for 2019 assessment include:

- Updated catch estimates for 2018 and new estimated catches for 2019 – 2021
- Fishery lengths from 2017
- 2019 trawl survey biomass and 2017 trawl survey ages
- 2018 and 2019 relative population numbers (RPNs) and lengths from the AFSC longline survey

Both surveys increased in 2019 relative to the previous surveys and are above the long-term mean. Survey biomass for the bottom trawl survey is corrected for misidentification rates in years where it's available. Discard rates have ranged from approximately 15% to 42% with an average of 23% for the period 1991 - 2019. discard rates of blackspotted/rougheye are relatively high compared with other GOA rockfish species. Discard rates were high in 2018 (42%) and substantially declined for 2019 (16.4%). The cause of the high discard rate in 2018 is unknown.

The SSC supports the author and Plan Team's recommended model (Model 15.4 with updated data) for setting harvest specifications. The updated assessment model results in a time series of biomass that is slightly lower than the previous update. Recruitment estimates are similar to the previous model, and the new age data from the bottom trawl survey confirm the presence of a larger year class in 2010. The estimate of the 2010 recruitment has increased from the previous assessment. There are some persistent residuals in the size compositions from the fishery and the longline survey, and the SSC supports an exploration of selectivity to try to address this, as suggested by the author. **The SSC recommends the maximum permissible ABC**, as supported by the risk matrix showing low levels of concern for all categories (level 1).

The methodology for area apportionment was re-evaluated in this assessment. Previously, a weighted average of the area-specific biomass proportion from the last three trawl surveys was utilized. The authors

respond directly to previous PT and SSC comments by developing a random effects model with equal weighting between the bottom trawl survey and the AFSC longline survey. . The use of two survey random effects method uses more information for apportioning than the previous method. A comparison of both methods indicate a shift of ABC allocation to the eastern and western GOA from the central GOA. **The SSC supports the authors and Plan Team recommendation to use the two-survey random effects model for area allocation.**

An important ongoing issue with this assessment is that it is a complex of two distinct species. The SSC appreciates the appendix that describes the current state of genetic research on mis-identification rates, otolith morphology, growth and maturity for this complex. It is clear that a number of positive steps are being made to understand how the species within this complex are both similar and different. As the author notes, many of these projects are ongoing. Of note is an updated maturity study on both species (Conath 2017) that clearly demonstrates a difference in age at 50% maturity (19.6 years and 27.4 years for rougheye and blackspotted, respectively) between these species. The SSC continues to encourage effort to incorporate this information into the assessment as much as possible, to improve species-specific information in this assessment and move towards splitting this complex. Alternative model configurations that incorporate these data would be highly encouraged as a step in this direction.

Finally, the SSC registers some concern regarding age structure collections moving forward, particularly if otolith morphology is a valid method for differentiating these species. Special collections may be appropriate if otolith metrics become an operational tool for species differentiation.

Other Rockfish (Combination of Slope Rockfish and Pelagic Shelf Complex Species)

Sara Cleaver (Council staff), Chris Lunsford (AFSC) and Jim Ianelli (AFSC) presented the results of the 2019 Other rockfish assessment and the recommendations from the GOA Plan Team.

Two species (Aurora rockfish and shortbelly rockfish) were added to this complex bringing the total number of species managed in the Other Rockfish complex to twenty seven species. Six species are the primary species observed in the survey and the catch: harlequin, redbanded, redstripe, sharpchin, silvergray and yelloweye rockfish. The 2019 biomass estimates for five of the six primary species declined: harlequin (-65%); redbanded (-17%), redstripe (-42%); sharpchin (-2%) and silvergrey (-21%).

Biological reference points are derived using Tier 4 (sharpchin rockfish), Tier 5 (17 species) and Tier 6 (nine species) methods for different species and summed for setting reference points for the complex. These species exhibit different longevity and maturation schedules.

This year the assessment was updated with revised estimates of total catch over 2003-2019 and added the 2019 NMFS GOA bottom trawl survey data. A new species-specific catch time series was developed by the AKRO CAS for the period 2010 to present and included in the assessment.

Random effects models are applied to the GOA Other Rockfish complex using a combination of Tier 4 and 5 estimation methods. All of these were updated to include the 2019 GOA bottom trawl survey data.

Consistent with the authors and Plan Team, the SSC accepts the models and the associated recommendations for Tiers, ABCs and OFLs for this complex and the recommended area apportionments for 2020 and 2021.

The SSC offers the following comments to the assessment authors:

1. The SSC supports the authors' plan to explore elevating species up a tier for the estimation of biological reference points (Tier 4 methods for harlequin rockfish and Tier 5 methods for yelloweye rockfish).
2. The SSC supports the Plan Team's recommendation to monitor new data collected under the 2020 full retention mandate and new EM data, and their request that the authors provide an update to the Plan Team in September, especially if there are concerns that bycatch amounts are approaching ABC levels.
3. Efforts to examine range expansions of species from Canada and the US west coast should be considered. Concurrently the SSC recommends that the stock structure template is updated given the recent additions of Aurora and shortbelly rockfish (species that have historically been found in the south) to this complex.

The SSC supports the Plan Team's recommendation for the Council move forward with Step 2 of the Spatial Management Policy for this complex.

Northern Rockfish

The SSC reviewed the partial assessment for northern rockfish. Updated estimates of ABC and OFL were derived using the projection model with updated catch information. **The SSC accepted the author and GOA Plan Team recommended status determination as Tier 3a and their recommendation for 2020 and 2021 Tier, ABC and OFL.**

Dusky Rockfish

The SSC reviewed the partial assessment for dusky rockfish and accept the author and GOA Plan Team recommended status determination as Tier 3a and their recommendation for 2020 and 2021 Tier, ABC and OFL.

Demersal Shelf Rockfish (DSR)

The 2019 assessment was updated with 2018 and 2019 survey results. The biomass of yelloweye rockfish continues to decline, meriting precautionary harvest levels. **The SSC accepts the Author and the Plan Team recommendation for 2020 and 2021 Tier, ABC and OFL.** The SSC supports the Plan Team recommendation to compare the lower 90th percentile to the biomass point estimate. Perhaps the use of the risk table. Finally, the SSC continues to encourage the development of an age-structured model.

GOA Atka Mackerel

A full assessment was completed for GOA Atka mackerel, which is a Tier 6 stock. The species is on a 2-year assessment cycle to coincide with the availability of biennial trawl survey data and the last full assessment was in 2017.

New data added to the model for this assessment cycle include: updated catch data through October 2019; fishery age data from 2017 and 2018; bottom trawl survey age data from 2017; and bottom trawl survey biomass estimates and length frequency data from 2019. No changes were made to the assessment methodology. In 2019 only 8 Atka mackerel were caught in the bottom trawl survey, which is the lowest number of individuals encountered in the history of the data series. Without a reliable estimate of biomass, due to low sample size, Atka mackerel remains a Tier 6 stock.

The SSC concurs with the authors' and PT's recommended OFLs and ABCs for GOA Atka mackerel.

GOA Skates

The SSC received a presentation on the GOA skate stock complex assessment. The GOA skate complex is managed as three units. Big skate and longnose skate have separate harvest specifications, each with a Gulf-wide OFL and ABC specified for each of the GOA regulatory areas (WGOA, CGOA, and EGOA). All remaining skate species are managed as an "other skates" group, with Gulf-wide harvest specifications. All GOA skates are managed under Tier 5, where OFL and ABC are based on survey biomass estimates and natural mortality rate.

Skates are a non-target stock with an MRA of 5%. Gulf-wide overall catches are declining with exploitation rates for big and longnose skates substantially below their OFLs. However, the Plan Team noted that, because the biomass of the Other Skates group is declining, the exploitation rate (as a ratio) is increasing.

This assessment included updated fishery catch data (as of October), biomass estimates and length composition data from the 2019 GOA bottom trawl survey, and fishery length composition data through 2019 (as of October). Harvest recommendations for big skate, longnose skate, and other skates are each based on a random-effects model biomass estimate using AFSC trawl survey data. There were no changes in the assessment methodology. **The SSC concurs with the authors' and Plan Team's recommended OFLs and ABCs.**

In addition, The SAFE Report now includes abundance information from four additional surveys: the AFSC GOA longline survey, the International Pacific Halibut Commission longline survey, and two bottom-trawl surveys conducted by the Alaska Department of Fish & Game. Data from these surveys provide additional insight into population trends but the data are not used for calculating harvest specifications. **The SSC appreciated the inclusion of the additional abundance information in the SAFE.**

The 2019 AFSC trawl survey estimate of big skate biomass increased relative to 2017. Due to the apparent west-ward shift in the distribution of big skate biomass, the ABC in the CGOA declined with increased ABC in the WGOA and EGOA. The AFSC trawl survey estimate of longnose skate biomass decreased. The longnose skate area ABCs fell in the CGOA and EGOA and increased slightly in the WGOA. The AFSC trawl survey-estimated biomass of other skates continues to decline from a peak in 2013, resulting in reduced OFL and ABC.

The increased biomass of big skates on the eastern Bering Sea shelf observed beginning in 2013 continues. There is evidence to suggest that these skates originated in the GOA and that there is exchange between the areas. This movement may be influencing GOA biomass estimates.

In the SSC's December 2017 minutes the SSC noted anticipation of a forthcoming age-structured stock assessment for longnose and big skates in the GOA, including an exploration of natural mortality. The author reports that the development of new models for big and longnose skates have been delayed and the authors aims to have a model for at least one species available for review in fall 2020.**The SSC supports the development of age-structured model for skates, including an exploration of natural mortality.**

GOA Octopus

All seven octopus species are grouped into a complex for management. In 2019, a Tier 6 full assessment of the octopus complex was presented. Octopuses are taken incidentally in trawl, longline and pot fisheries throughout the GOA. Highest catch rates are from the Pacific cod pot fishery in the GOA.

In 2017, the SSC recommended moving octopus to a Tier 6 assessment and using maximum historical catch to set harvest specifications. The assessment author recommends continuing this practice for this year and used the maximum catch from 2003 – 2019. Though not currently used for setting specifications, the author updated a random effects model with bottom trawl survey data from 2019 and the model estimate of biomass increased by an order of magnitude, from 1,848 tons to 12,257 tons. However, it is well understood that the trawl survey doesn't sample octopus well.

The SSC supports the recommended Tier 6 harvest specifications for 2020 and 2021. The catch values in the historical time period used to determine OFL and ABC have been revised slightly due to updates in the catch accounting system used to estimate catch. The revised maximum catch from 2014 is used to set OFL, with a maximum ABC set at 0.75* the OFL. **The Plan Team recommended fixing the time period from which to take the maximum catch and, in the oral presentation to the SSC, specified this time period as 2003 – 2019. The SSC supports this time period moving forward.** The SSC appreciates the author filling out the risk matrix, recognizing the difficulty doing this with such a data limited stock. Finally, the SSC also supports the Plan Team recommendation to investigate the bottom trawl survey catch by numbers as well as frequency of occurrence in hauls.

GOA Sculpins

A partial assessment was completed for the GOA sculpins complex, which is a Tier 5 stock evaluated by fitting a random effects model to survey data. No changes were made to the assessment methodology. The complex is on a 4-year assessment cycle and was last assessed in 2015, though it will be reclassified as an Ecosystem Component Species in 2020. After reclassification a regular report will be delivered to the SSC, but it will not take the form of a formal stock assessment.

The SSC concurs with the authors' and PT's recommended OFLs and ABCs for the GOA sculpins complex.

C-6 St. Matthew Blue King Crab Rebuilding Plan

The SSC received a presentation from Katie Palof (ADFG) and Jim Armstrong (NPFMC) summarizing the initial review draft Environmental Assessment (EA) for the rebuilding plan for Saint Matthew Island blue king crab (SMBKC). There was no public testimony or written comments.

The SSC recommended that the current draft is adequate for final action and meet the requirements for a formal rebuilding plan. However, the SSC suggests some revision and expansion of the document and analysis.

The SSC noted that current levels of bycatch of SMBKC appeared to have little effect on the rebuilding times for any of the alternatives. It may be possible that future shifts in environmental conditions and/or stock distribution shifts or expansion could lead to increased interaction with groundfish fisheries. **The SSC requests adding a discussion of what levels would constitute a change from the status quo and what actions would be taken as part of the rebuilding plan if those levels were to be reached.**

The SSC requests additional clarification regarding the relative biomass at which rebuilding would be determined compared to the level at which a fishery could occur under the state harvest strategy. Specifically, the SSC noted that the period of years differs: the average of 1978-2018 is used for BMSY, and 50% of the average of 1978-2012 is used for the state harvest strategy.

The SSC remains concerned that the rebuilding plan is based on a BMSY and recruitment period that is not consistent with recent very low productivity observed in this stock. Specifically, the SMBKC stock may never reach the currently defined BMSY level unless productivity shifts toward a more positive level than recently observed. The SSC recognizes that this is a cold water species with highly specific habitat requirements, which may not be amenable to current trends in the Bering Sea ecosystem conditions. The rebuilding plan uses a Ricker model using the 1978-2018 recruitment estimates; however, there appears to be little support in the assessment or break-point analysis for this choice. **The SSC therefor recommends providing additional detail, including a figure illustrating the fit of the Ricker model. Further, an expanded discussion of the pros and cons of the Ricker model vs. random sampling of recruitment should be added to the current draft. The SSC also requests additional evaluation of alternative projections using only the most recent recruitment estimates, including figures and/or tables of rebuilding times.** This section should address the issue of how and when the rebuilding plan might be revised if continued low recruitment occurs and rebuilding falls behind that projected under the currently modelled conditions.

The SSC tentatively supports alternative 2, option 2, allowing for the possibility of a state fishery during the rebuilding period. Noting that substantial rebuilding would have to occur before opening a fishery, the SSC recognized that this alternative may provide flexibility as new information and or stock dynamics arise in the future, and has only a modest effect on rebuilding times which still meet the rebuilding probability of 50% in the specified Tmax period.

The SSC concurs with the recommendation in the SMBKC ESP that habitat vulnerability indicator(s) be developed for this species. For example, the BKC species distribution modelling presented in NOAA Technical Memorandum NMFS-AFSC-357 (Page 249) indicates that ocean productivity, bottom temperature, and bottom depth were the most important covariates predicting BKC occurrence with the combined relative importance of >80% and high levels of prediction accuracy (>90%). The probability of BKC occurrence was highest when bottom temperatures were near 0°C in depths < 100 m suggesting that this species is subject to an increasingly limited window of environmental conditions which may preclude stock recovery regardless of fishing mortality. Currently habitat constraints are generally noted in the text of the Rebuilding Plan but no analyses are presented. A retrospective examination of the occurrence of these conditions in the Eastern Bering Sea prior to and after the proposed timeseries breakpoint as well as an exploration of the likelihood of these conditions occurring in the future would elucidate the degree to which these habitat constraints may influence rebuilding expectations.

The economic and social effects section of the EA is well written and well supported by quantitative data. The quartile approach to examining the revenue diversification of SMBKC catcher vessels was particularly useful given data confidentiality constraints imposed by the limited number of vessels participating in the fishery in recent years.

The SSC recommends the addition of a few years of community engagement and dependency data pre-1999/00 closure consistent with those already tracked in the EA to be able to compare patterns of community engagement and dependency pre-and post-extended closure. The SMBKC fishery is not unique in having periods of relative abundance and closures and this analysis provides a rare and valuable opportunity to better understand the socioeconomic dimensions of this set of circumstances. The SSC also

recommends the addition of data on the pattern of SMBKC quota shares ownership by community over time to better understand changes that may have occurred over this period that may serve to shape future participation in the fishery.

It was noted that the Ecosystem and Socioeconomic Profile of the Saint Matthew Blue King Crab stock in the Bering Sea has not been revised since its presentation at the October 2019 Council meetings. Previous SSC comments on the socioeconomic considerations and indicators in ESP, some of which have been incorporated into the EA, are captured in the SSC report from those meetings and are not recapitulated here.

C-7 Central GOA Rockfish Reauthorization

The SSC received a presentation of the Draft Environmental Assessment/Regulatory Impact Review/Social Impact Assessment for the reauthorization of the Central Gulf of Alaska (CGOA) rockfish program (RP) from Darrell Brannan (Contractor), Stephanie Warpinski (NOAA), and Mike Downs (Contractor). There was no public testimony.

The CGOA RP will sunset at the end of 2021, and the Council is considering a reauthorization of the program, with some potential changes to its elements. The draft EA/RIR/SIA analyzes proposed management measures that would apply to the RP fisheries, which include reauthorizing the RP and, among other things, removing the sunset date or establishing a new sunset date within a range of 10 through 20 years.

The authors of the document are commended for its comprehensiveness. The document benefits greatly from the recent completion of the 5-year review of CGOA RP program, which the SSC reviewed and approved in April 2017. The draft EA/RIR/SIA updates the RP 5-year review with new data from the intervening years and clearly documents the benefits that the RP has achieved since its inception in 2012. Table 1-3 provides an excellent comparison of the expected environmental, economic, management, and enforcement impacts of the alternatives and elements under consideration. Both the EA and RIR are well written and capture the fundamental elements of the program. The SIA is particularly well done, given the lack of social science fieldwork conducted for this analysis. In general, field work is necessary for capturing the nuanced social dynamics in fishing communities in response to fishery management changes, and for attributing changes in community-level indices to changes in fishery regulations. For future programmatic reviews, the Council should anticipate the metrics, and associated data requirements, for complying with LAPP program review requirements, and develop a systematic plan for capturing the appropriate data.

The SSC recommends that the draft EA/RIR/SIA be released for final action.

D-4 Comments on the NS1 Technical Guidance on ABC Control Rule Provisions

NPFMC SSC comments on "*National Standard 1 Technical Guidance for Designing, Evaluating and Implementing Carry-over and Phase-in Provisions within ABC Control Rules*".

Overview

In 2016, the National Marine Fisheries Service published a final rule to revise the NS1 guidelines. The revised guidelines included two provisions that were intended to provide additional flexibility within the existing statutory limits on federal fisheries. The draft document under review provides technical guidance for designing, evaluating and implementing the carry-over and phase-in provisions. These two provisions

are of great interest to some U.S. regional fishery management councils (Councils). The document is intended to provide technical guidance and is nonbinding.

The document provides: a) lessons learned from case studies where one of the two provisions was employed; b) possible approaches to apply carry-over or phase-in provisions; and c) characteristics of stocks, fisheries and management approaches that may impact the benefits and risks of applying these provisions. The document encourages Councils to seek input from their SSC's with respect to the use of the best scientific information available to design carry-over or phase-in provisions. In response to this need, the NPFMC's SSC formed a working group to examine the document closely to provide initial comments and suggestions for the entire SSC during the December 2019 meeting. This document summarizes the working group's comments and suggestions for full SSC review. An SSC-approved version of these recommendations will be provided to the Council.

Comments on carry-over of unused catch

As noted in section 2.1.1 of the report, the NPFMC has experience using carry-over (and pay-back) provisions. The NPFMC currently allows limited carry-over sablefish in its IFQ fishery. This provision has provided flexibility to the NPFMC and its stakeholders.

The report provides a useful summary of the potential benefits and risks of adopting carry-over provisions. The SSC cautions extending the use of carry-over provisions to directed catch, particularly with respect to fisheries managed under the Bering Sea Aleutian Islands (BSAI) FMP. The 2 million ton OY cap on BSAI groundfish removals is constraining. Therefore, TAC negotiations require full knowledge of the amount of catch allowed under the ABC and OFL. If carry-over provisions allow a sector of the fleet to carry-over unused catch from a given year, this could disrupt the NPFMC's approach to TAC specification. Another reason to avoid carry-over provisions for directed fisheries is that the frequency of NPFMC stock assessment updates is high relative to other Councils. If the SSC concludes that the ABC and OFL should be lowered on the basis of an assessment update, this will cause considerable disruption if a given sector considers their carry-over provision should be considered prior to the annual TAC setting process.

The SSC recognizes that the NPFMC may wish to consider carry-over provisions for special cases or sectors. For example, safety could be a special case where the NPFMC might want to consider flexibility in modest carry-over provisions in directed fisheries. However, since many fisheries are rationalized, the NPFMC's management system already provides some opportunity to avoid severe weather. Given our concerns regarding annual negotiations regarding TAC, the issues of economic and management stability would have lesser priority.

If the NPFMC does elect to bring forward a carry-over provision for a particular fishery, the SSC recommends using the approach used by New Zealand and British Columbia where managers can reduce or eliminate carry-over if a conservation concern arises.

Comments on phase-in approach to catch limits

The report also provides a useful summary of the potential benefits and risks of adopting phase-in provisions. The NPFMC also has experience using phase-in provisions when annual status determinations indicate a large increase in the ABC. This circumstance usually arises when an assessment model produces large changes in management reference points or when a large, uncertain, year-class is entering the fishery. In these cases, the SSC has occasionally adopted a precautionary "stair-step" approach for increasing the ABC over multiple years as a buffer against assessment uncertainty. **However, the SSC is not supportive of the use of phase-in provisions when annual recommendations suggest a substantial reduction the ABC is required.**

Given that the SSC's use of phase-in options is uncommon, we recommend that the NPFMC continues to evaluate its use on a case-by-case basis.

Comments on the implementation of carry-over provisions

Section 3.1 provides a discussion of the costs and benefits of implementing carry-over provisions with or without ABC adjustments. The SSC agrees that if this provision is proposed for a particular fishery or sector, the FMP amendment should include a clear demonstration of how the provisions will prevent overfishing, and how it would fit into existing harvest specifications (including TAC allocations). The SSC agrees that a formal management strategy evaluation would be the desired approach for this analysis.

Comments on implementation of phase-in provisions

The SSC recognizes that the assessment frequency approach taken by the NPFMC results in frequent updates and in some cases large changes in the ABC and TAC. The benefit of this approach is that the NPFMC is making decisions on the Best Scientific Information Available and thus the changes, if accepted, represent a sound foundation for decision making. The SSC recommends continuation of phase-in provisions on a case-by-case basis.

Comments on consideration of life history and fishery characteristics

Section 4 summarizes additional considerations that should be addressed prior to adoption of carry-over or phase-in provisions. The SSC notes that the wide range of characteristics that change the risk profile associated with carry-over or phase-in provisions underscores the difficulty that would be associated with adoption of carry-over provisions in the BSAI, and provide additional support for the continuation of phase-in provision as the need for it arises.

Comments on final recommendations of report

The report considers two options: (a) alternative analyses on a case-by-case basis or (b) a comprehensive evaluation of the policies before adoption. Of these two options, the authors' preferred alternative is to conduct a comprehensive evaluation of the carry-over and phase-in provisions within the ABC control rules before adopting them as revised ABC control rules in the respective FMPs. The SSC agrees that a comprehensive analysis would inform the NPFMC of the risks and benefits associated with adoption of one or both of these provisions. Further, this could inform the SSC on the effectiveness of "stair-step" approaches or potential alternatives. However, as noted above, the circumstances underlying the decision to adopt phase-in provisions are often case specific and may be difficult to "hard wire" into a new control rule for potential adoption as an FMP amendment. Given the NPFMC's current approach to setting harvest specifications and the mechanisms already in place in most fisheries to alleviate the issues commonly addressed through these provisions, the SSC recommends a methodical, analysis-based approach for any future wide-scale implementation.

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on the other hand, a report is prepared by individuals under the line of supervision by an SSC member, then that SSC member should recuse themselves from leading the SSC recommendations for that agenda item, though they may otherwise participate fully in the SSC discussion after disclosing their affiliations with the authors. The SSC notes that there are no financial conflicts of interest between any SSC members and items on this meeting's agenda.

At this December 2019 meeting, a number of SSC members acknowledged associations with specific agenda items under SSC review. Jason Gasper acknowledged his authorship of the National Standard 1 Technical Guidance on ABC Control Rule Provisions. Curry Cunningham, Sherri Dressel, and Brad Harris all acknowledged their contributions to the Ecosystem Status Reports and Heather Renner supervises staff who author contributions to the Ecosystem Status Reports. Mike Downs acknowledged his authorship of portions of the C-7 Central GOA Rockfish Reauthorization. Anne Hollowed supervises the lead authors of the pollock, cod, BSAI northern rockfish, BSAI blackspotted/rougheye rockfish, BSAI Pacific ocean perch, and Atka mackerel assessments. She also supervises the supervisor of the lead authors of flatfish, skate, and sculpin assessments as well as the reports on forage fish. Dana Hanselman is an author or coauthor on the sablefish assessment, GOA Pacific Ocean perch stock assessment, and GOA blackspotted and rougheye rockfish stock assessment, and supervises stock assessment authors Pete Hulson, Katy Echave, Cara Rodgveller, Pat Malecha, Kari Fenske, and Cindy Tribuzio. In addition, he supervises Ed Farley who supervises the authors of the GOA and BSAI Ecosystem Considerations, Ellen Yasumiishi and Elizabeth Siddon, as well as Auke Bay Laboratory employees that have authored many contributions to the Ecosystem Status Reports.