# General Stock Assessment Comments

*Risk Tables*

In the report of the 2021 Risk Table Workshop (see *Preliminary Guidance and SSC Recommendations* on pages 33-34 of June 2021 SSC report), the SSC recommended that risk table category levels be revised from the existing four to three categories (normal, increased, extreme). In this year's stock assessments, the risk table used three categories by dropping level 2, substantially increased concerns, from the original risk table, but left other categories and their descriptions unchanged. **The SSC continues to support a three-category risk table with categories normal, increased, and extreme, and requests that the category descriptions be revised to cover the range covered by the original table.**

The SSC appreciates the inclusion of the risk table with definitions in Stock Assessment and Fishery Evaluation (SAFE) documents and requests that authors include it (or continue to include it) for future operational full and operational update assessments.

There remains considerable confusion over the application of the fishery performance category of the risk table. **The SSC reiterates that only fishery performance indicators that provide some inference regarding biological status of the stock should be used.** SSC recommendation #5 from page 34 of the June 2021 SSC report states:

> "The SSC recommends that the fishery/community performance column should focus on information that would inform the biological status of the resource (e.g., an unexplained drop in CPUE that could indicate un-modelled stock decline, or a spatial shift indicating changes in species' range), and not the effects of proposed ABCs on the fishery or communities or bycatch related considerations. The SSC recognizes that the community impact information is critical for informed decision making for TAC setting and recommends this information be included in other Council documents ..."

For example, poor economic performance due to weak markets would not lead to an elevated fishery performance score. Examples of useful indicators include CPUE, fishery spatial and temporal patterns, and catches of thin or unhealthy fish (i.e., poor condition). In attempting to draw inferences from fishery performance, it is important to use caution and consult with industry representatives, if possible, since these indicators can also be influenced by factors unrelated to the stock, such as bycatch avoidance or economic factors.

**The SSC recommends that the risk tables consider potential future risks when these can be anticipated.** For example, the upcoming El Niño conditions in the Gulf of Alaska (GOA) are likely to impact some groundfish species in the coming year.

**When risk scores are reported, the SSC requests that a brief justification of the score be provided, even when that score indicates no elevated risk.**

The SSC found that the C3/C4 Risk Table Update 2018-2023 summary to be useful in placing the scores for individual species in a broader context and thanked Dr. Shotwell and GPT leadership and coordinators for the extra work it took to compile this for the SSC. The SSC recommends this table be updated each year and provided to the Plan Teams and the SSC. The summary table will allow tracking of stocks with elevated scores, stocks where an additional ABC buffer is recommended, the justification for those buffers, and identification of any other concerns that emerge with application of the risk table.

*Detailed Assessment Comments*

The SSC is encouraged by the development of One-Step-Ahead (OSA) residuals as an improvement to Pearson residuals for assessing fits to compositional data. The SSC welcomes a presentation on their use and interpretation, as well as a discussion of how to select one age to remove from the calculation. The SSC recognizes that the first and last age in many assessments prove challenging to fit, and therefore are the target of specific evaluation of residuals, making it problematic to remove them. The SSC encourages exploration of alternative approaches that may include calculating the OSA residuals with multiple ages removed one at a time and/or adding a compositional bin (e.g., age-1 if the first age with appreciable data is age-2). Another approach to consider would be a two-step process, producing the OSA residuals with the youngest age removed, then using those residuals to identify the best fitting age, then removing that age in the next step.

The SSC reiterates its recommendation from December 2022: "The SSC requests that the Plan Teams consider common methods among partial assessment projections [now 'harvest projections'] for estimating catch for the end of the calendar year (also see SSC December 2021 Report). The method used should be clearly stated in the partial assessment document." **The SSC further notes the differences among methods applied in 2023 and recommends working toward a common method for projecting catches in assessments, to serve as a default unless the author presents a rationale for a different method due to fishery-specific considerations.**

**The SSC requests that when Bayesian model output is reported, basic convergence diagnostics are also presented.** The appropriate statistics will depend on the algorithm used (e.g., MCMC or ADNUTS), but should include a summary of convergence for all estimated model parameters and quantities of management interest. If tail probabilities (e.g., probabilities <5-10%), are reported, Monte-Carlo estimates of estimation error would also be helpful to illustrate the uncertainty associated with the values reported.

*Economic, Social, and Community information (including Local Knowledge, Traditional Knowledge, and Subsistence Information) in Ecosystem Status Reports and Ecosystem and Socioeconomic Profiles*

**The SSC recognizes and encourages the continued efforts to develop and improve the suite of social, community, and economic indicators that are monitored at different decision-informing resolutions, complementing the Fishery Management Plan (FMP)-level information in the Economic SAFEs and the aggregated crab and groundfish community-level information in Annual Community Engagement and Participation Overview (ACEPO) documents.** This includes species-level metrics within the Ecosystem and Socioeconomic Profiles (ESPs) that are included in stock assessments, and the incorporation of ecosystem-level metrics (i.e., school enrollment) within the Ecosystem Status Reports (ESRs).

The suite of socioeconomic indicators presented at this meeting was very limited but the SSC understands it is evolving. **The SSC strongly recommends that additional coordination among AFSC, NMFS-AKRO, Council staff, Plan Team representative, and SSC representatives be readily undertaken to ensure that the best scientific information available is being applied in support of National Standards 1, 2, 4, 6 and 8. This coordination should address the multiple Council decision-informing sources of social, economic and community information and include different scales of resolution (community-level, ecosystem-level, FMP-level, aggregated-species, single-species).**

An important consideration in re-evaluating the process to meet the National Standards regards timing: **social and economic information that meets the threshold for BSIA should be available to the Council with biological information at the time of Total Allowable Catch (TAC) setting to consider socioeconomic factors in TAC recommendations consistent with 50 CFR 679.20(a)(3)**. Also important

is the requirement, on balance among the other National Standards, that conservation and management measures consider the importance of fishery resources to fishing communities. For example, the SSC understands that the most recent information on landings by fishing community is from 2021, as presented in the ACEPO in Spring 2023. Other information using 2022 (and even 2023) landings was presented, but community information for 2022 was not in the management documents presented to the SSC and does not appear to be available online through the Human Dimensions Data Explorer.

As stated in previous SSC reports (including those of October 2021, February 2022, and October 2023), social and economic information should be integrated into the management process in two main ways:

1. The first relates to effectively informing OFL/ABC determinations as social and economic data and information may be used for ABCs if the indicators provide information on the biology of the stock (e.g., population dynamics or species' distributions). Social and economic data, information, and expertise can support the aim of using the BSIA related to human behavior and outcomes for informing OFL/ABC determinations and impacts. More detail on these recommendations is available in the recent NOAA Technical Memorandum NMFS-F/SPO-232: "The Socio-Economic Aspects in Stock Assessments Workshop (SEASAW) Report Recommendations for Increasing Assessment Accuracy and Improving Management Advice."

2. The second relates to TAC setting and other Council actions as social and economic data and information describe who will be affected by a fishery policy change or changes in economic or stock status, and by how much, such that additional measures to support fishery participants may be needed. Social and economic data and indicators have been made available in various documents over time (ACEPO, SAFEs, ESRs, ESPs, risk tables), and new products are being developed under recent Climate Change Task Force work products. However, in recent years, social and economic data have been taken out of ESRs and species-specific ESPs, which has resulted in the SSC seeing and reviewing little to no species-level and ecosystem-level social or economic data, information, or indicators intended to reflect socioeconomic conditions in the fisheries and fishing communities at the time of TAC setting.

The SSC acknowledges that the ESPs are evolving and that identifying the aspects of economic and social outcomes to represent requires considerable thought, consultation, and expertise. **The SSC reiterates convening a working group or workshop that can develop species-level and ecosystem-level indicators appropriate for the ESPs and ESRs to complement ACEPO and the Economic SAFEs** (with the latter expanded to facilitate fishing community engagement, dependency, and sustained participation characterization by disaggregating selected vessel and processor aggregate data to the community or community group level) may be necessary to make progress. The working group or workshop should consider how to reflect employment, scale and distribution of participation, markets and product form, major cost components, and other factors associated with each species warranting an ESP. These proposed indicators can then be evaluated for usefulness by the SSC and the public.

The SSC suggests this process reflect the following:

- The SSC suggests that curating the suite of indicators across Council decision-informing products would benefit from a standing working group, but the initial consideration of species and ecosystem level metrics may benefit from a kickoff workshop with broader participation. The SSC recommends representation that includes Council staff, AKRO staff, and AFSC staff, including the authors of ACEPO and the Economic SAFEs, along with SSC representatives with relevant economic and sociocultural fishing community expertise.

- Additionally, the SSC notes a distinction between (1) reviewing the choice of what to prioritize and how to summarize social and economic data and information and (2) the final results with the most current data and information that would be used to support the TAC-setting process. This

distinction has an analogy to the ABC-setting process. Specifically, in the ABC-setting process models are vetted by the SSC before final data are available to expedite review of model outputs with data current as of ABC and TAC setting. A similar process where the SSC vets an approach earlier than the final summaries are constructed could be used to help space review activities throughout the year.

- The SSC suggests considering indicators that have been used in the past to provide long-term trend data at the community level, e.g. community local quotient or regional quotient at the species or species group level as used in the Community Participation in U.S. Catch Share Programs and other documents. Relevant economic data could be disaggregated to the community level.

- The SSC recognizes the effort to move socioeconomic indicators themselves, rather than appended tables, into the main document along with associated discussions and hope that this trend will be expanded into other ESRs and ESPs as the templates mature and the associated discussion is less focused on indicator specification.

- The SSC appreciates the incorporation of relevant LK/TK in the Eastern Bering Sea (EBS) ESR regarding chum salmon and encourages the expansion of local knowledge, traditional knowledge, and subsistence information in future documents. This is especially relevant to explain to some degree how fishing communities are not uniform in how they respond to ecosystem changes.

# C3 BSAI and C4 GOA Ecosystem Status Reports

The SSC received presentations from Elizabeth Siddon (NOAA-AFSC) for the eastern Bering Sea (EBS), Ivonne Ortiz (University of Washington) for the Aleutian Islands (AI), and Bridget Ferriss (NOAA-AFSC) for the Gulf of Alaska (GOA). Christopher Tran (Aleut Community of St. Paul Island) and Terese Vicente (Kuskokwim River Inter-Tribal Fish Commission) provided public testimony on the EBS ESR. There was no public testimony for the AI or GOA ESRs. The SSC thanks the ESR authors for their continued progress in collecting a large number of indicators and summarizing this information to better understand the status of marine ecosystems that support federally managed fisheries off Alaska. The SSC appreciated the structure of the reports, especially the consolidated information provided in the Report Card, Ecosystem Assessment, Noteworthy Topics, and Indicator Summary sections. The SSC acknowledges the continued value of the graphics in each report and separate "In Briefs" that visually translate how information is incorporated into Council processes and to inform broader audiences.

**The SSC finds no major ecosystem concerns from 2023, but items that are noteworthy include low productivity in the Bering Sea, continued warm conditions in the western Aleutian Islands, mixed recovery from recent heatwaves in the GOA, and potential effects of El Niño in 2024.**

## General Comments Applicable to all three ESRs

The SSC thanks the authors for their responses to SSC comments and continued efforts to further integrate and synthesize indicators in ways that are most relevant to understanding potential effects on managed stocks.

There appear to be different seasonal warming patterns among the ESR regions with winter warming more prominent in the EBS, winter and summer in the AI, and summer in the GOA. This will affect recruitment of different groundfish species, depending on seasonality of early life stages, and is another aspect by which to sustain efforts in addressing prior comments from the SSC regarding how different species might respond to changing temperatures. The SSC appreciates the inclusion of case studies in this year's document addressing life stage phenology and temperature thresholds, and encourages continued efforts along these lines.

The SSC suggests more focus on multi-year patterns and whether they are similar to other periods during the time series. This moves us beyond comparing the current year to previous years. The SSC recommends these comparisons are independent of warm or cold stanzas so that there is no *a priori* determination and to account for possible changes in climate-biology relationships.

The SSC recommends considering options for identifying step changes in times series that might indicate a new "baseline" or "regime" for that indicator. These efforts might also be relevant for time series beyond the ESRs. The SSC recognizes the sensitivity of referring to regime changes and management implications, however it is important to be vigilant of step changes in metrics and how to adapt to them.

Several recent publications note that the position of the Aleutian Low affects climate in the Bering Sea. All three ESRs share the North Pacific Index contribution which reflects the strength of the Aleutian Low. Whereas current atmospheric pressure anomaly maps in ESRs show the average position of the Aleutian Low graphically, its mean position cannot be compared to previous years. The SSC recommends that ESR authors evaluate ways to present a time series of the position of the Aleutian Low for this contribution.

The SSC appreciates the one to five month lead forecasts of expected El Niño effects in Alaska. Given that as of November 9, 2023, the NOAA National Center for Environmental Prediction suggests a 35% chance of a historically strong El Niño this winter, the SSC encourages continued monitoring of El Niño development and potential ecosystem affects, especially in the GOA.

The SSC notes that the ESR process has matured over several decades to effectively use ecosystem trends to inform annual specifications and encourages the use of trans-disciplinary approaches for linking ESR and ESPs to stock assessments in the future. The GOA pollock assessment was suggested as a potential case study, particularly in contrasting differences in the strength of 2018 vs. 2019 year classes. The SSC further discussed the process of selecting and refining indicators to minimize redundancy and ensure key information is included. The SSC supports the process where indicators are brought forward by authors and integrated into Council documents to inform NS1, NS2, NS4 and NS8 issues where appropriate. Additionally, the SSC suggests that workshops (see General Assessment Comments) or modeling could be used as part of the process to help identify indicators. It was promising to see some socioeconomic indicators in the Aleutian Islands ESR (school enrollment) and the SSC encourages ESR authors to collaborate with other social scientists about other potential indicators.

The SSC noted that many satellite-derived chlorophyll-a time series have a declining trend. To be certain these reflect real, *in situ* conditions, the SSC recommends that ESR authors work with contributors of these metrics to identify what calibration efforts have occurred, what additional calibrations might be needed, and how interpretation of the satellite time series might be affected.

Public testimony encouraged development of ways to uptake ESR information into decision making and highlighted the traditional knowledge contribution regarding the chum salmon life cycle in the Yukon and Kuskokwim Rivers and the importance of this information to EBFM.

## BSAI Ecosystem Status Reports

*Aleutian Islands*

The SSC expressed appreciation for the hard work that went into this ESR. As a particularly data-poor region, not all datasets were updated for 2023 in the report cards, but valuable ecosystem information was presented. Notably, the year started with the warmest winter on record since 1900 based on long-term sea surface temperatures, with persistent warm conditions over the past 10 years. Other indicators suggest that there were decreased fluxes of heat and nutrients from deeper water and through the Aleutian Island passes. Multi-year patterns since 2013/14, including increasing East Kamchatka pink salmon abundance, increasing Pacific ocean perch (POP) abundance, and declining Atka mackerel abundance appear linked to a thermal regime shift characterized by sustained warmer temperature at mid-depth and surface and lower

productivity. To further understand the ecological implications of a potential shift in community structure, the SSC supports dedicated ecosystem studies in the AI. For example, analyses of the food web could be used to see if predator/prey relationships have changed over time, which would help to determine if observed changes reflect a broader transition in the ecosystem. Additionally, any opportunities to survey the AI during odd years (when Kamchatka Pink salmon abundances peak biennially) would be valuable (see the AI ESR section of the December 2022 SSC report for additional discussion).

The SSC suggests that, considering the apparent importance of these interactions, the authors consider moving East Kamchatka pink salmon indicators and POP indicators into the report cards. For pink salmon, it was discussed that additional information on biomass may be valuable, as pink salmon represent about 70% of returning adult salmon abundance in the North Pacific (all species), but about 25% of the biomass when considering adults and immatures. Other patterns included declines in fish condition, particularly for Pacific cod, with a coincident shift in diet to less fish and more invertebrate prey. Conditions did vary regionally and were more favorable for some species in the eastern AI compared to the western AI. The SSC appreciated the noteworthy section synthesizing published research on the optimal temperature ranges for eggs of Pacific cod, walleye pollock and Atka mackerel.

*Bering Sea*

While some physical oceanographic metrics including sea ice extent and water temperatures have shifted back to near average condition in 2023, biological metrics have lagged in their return to levels typical of cooler conditions.

The recent warm stanza has been positive for some year classes of pollock, sablefish, Togiak herring, Bristol Bay sockeye salmon, and the multivariate seabird breeding index. Conditions have also been more favorable in the north, including improved juvenile salmon condition, adult pollock condition, and the auklet breeding population on St. Lawrence Island is very high after nearly empty colonies the last few years. This warm stanza, however, has been negative for ice and cold pool extent that only in the past two years has increased to the long-term mean. There have been declining trends in chlorophyll-a concentration, large zooplankton, pelagic and benthic forage fishes, reduced abundance of several crab stocks, and runs of multiple species of Western Alaska salmon. Given these and other metrics showing contrasting trends, the SSC concurs with the ESR author that ecologically, the EBS remains in a transitional state in 2023.

The SSC notes that walleye pollock provide a good potential case study for studying mechanisms of contrasting patterns of low body condition for adult and juvenile age classes during the current warm period, yet having a particularly strong year class in 2018 that remains unexplained.

Projections for the EBS in 2024 suggest that even with El Niño, anticipated conditions should not be extreme relative to the past 20-30 years and that sea ice should extend south of 60°N latitude and as far south as Bristol Bay along the coast. However, the retreat of the sea ice is expected to occur earlier than average in the spring of 2024.

The SSC supports the use of Dynamic Structural Equation Modeling as a promising new tool to help identify ecological mechanisms and drivers of change. The SSC agrees with incrementally moving forward with increasing complexity. The SSC notes that currently interactions are unidirectional and suggests adding interactions in the model that allow two-way interactions or feedback loops. The SSC also recommends using species-specific case studies and notes that the goal of these models is to explore correlations among variables, however, the current ESR indicators used in this pilot effort were specifically chosen to be independent.

## GOA Ecosystem Status Report

While some differences between the eastern and western GOA were identified in 2023, overall the shelf marine ecosystem ocean temperatures remain near the long-term average with mixed pelagic feeding

conditions for adult groundfish. There were mixed indicators for productivity, with some declining trends from the highly productive previous year. The SSC noted a promising return of capelin in core habitat in the GOA following the marine heatwaves (2014-2016, 2019), but discussed that while the diets of seabirds on Middleton Island included an increase in capelin, overall the community composition of their diets are still different post-2014. The SSC appreciates the multiple heatwave metrics in the 2023 GOA ESR, including the number of days and proportion of the region in a heatwave state. The SSC suggests plotting Sitka air temperature anomalies with one or two other baselines (in addition to the GAK1 Ocean Temperature Anomaly that was presented) could be helpful for depicting more recent relative changes in the time series.

Broad-scale climate patterns reflect a transition from La Niña to El Niño conditions in the GOA, with anticipated warmer ocean temperatures arriving in early spring 2024. The National Multi-Model Ensemble predictions of sea surface temperatures in 2024 currently predict a moderate warming in surface waters, with more pronounced warming predicted in the eastern GOA. In light of some uncertainty related to the duration, depths, and timing of the warmer conditions the authors provided an evaluation of which species may be at highest risk, and most vulnerable, to warming conditions and which species appear to be more resilient. For example, low zooplankton biomass observed in 2023 may be further exacerbated under El Niño conditions. Groundfish that may be vulnerable in 2024 due to warm surface waters and reduced zooplankton quality potentially include the larval and age-0 juveniles of Pacific cod, walleye pollock, and northern rock sole. It was noted that most groundfish populations have one or more recent strong year classes that could help the population persist through a challenging year, except the Pacific cod stock, which is still at low biomass. The SSC appreciates this addition to the GOA ESR, and notes that synthesizing across multiple indicators provides a robust assessment of how resilient the GOA system may be to a range of potential climate scenarios. The SSC suggests a similar section could be incorporated into other ESRs.

# C3 BSAI and C4 GOA Groundfish Specifications

Steve Barbeaux (NOAA-AFSC; BSAI GPT co-chair) and Diana Stram (NPFMC) presented the Joint Groundfish Plan Team (JGPT) report from the November 2023 JGPT meeting. Dr. Barbeaux gave an overview of the November 2023 BSAI GPT meetings and recommendations for BSAI groundfish OFLs and ABCs. Finally, the SSC received a presentation by Jim Ianelli (NOAA-AFSC; GOA GPT co-chair), Chris Lunsford (NOAA-AFSC; GOA GPT co-chair), and Sara Cleaver (NPFMC) on the November 2023 GOA GPT meeting and GOA groundfish OFL and ABC recommendations. Kalei Shotwell (NOAA-AFSC; BSAI GPT co-chair) and Cindy Tribuzio (NOAA-AFSC; BSAI GPT vice-chair) were available for clarifications and questions. Dr. Ianelli presented the EBS pollock stock assessment and Dr. Barbeaux presented the EBS Pacific cod stock assessment. Ingrid Spies (NOAA-AFSC) presented the AI Pacific cod assessment. Peter Hulson (NOAA-AFSC) presented the GOA Pacific cod assessment. The SSC thanks the entire GPT leadership team and all the authors that were online for questions. Their participation greatly improved the meeting.

The SSC reviewed the Stock Assessment and Fishery Evaluation (SAFE) report chapters with respect to status determinations for BSAI, GOA, or Alaska-wide groundfish. **The SSC-approved models indicated that no stocks were subject to overfishing in 2022. Also, in reviewing the status of stocks with reliable biomass reference points (all Tier 3 and above stocks), the SSC concurs that these stocks are not overfished or approaching an overfished condition in 2023.**

To streamline and simplify the SSC report, recommended ABCs, OFLs and area apportionments are summarized exclusively in Table 1 (BSAI) and Table 2 (GOA). Recommendations that differ from those of the GPTs are marked in **bold**.

Table 1. SSC recommended OFL, ABC for Groundfish in the Bering Sea/Aleutian Islands (metric tons) for 2024 and 2025. Bold text indicates where the SSC recommendation differed from the BSAI Plan Team.

| | | 2023 | | | Catch as of | 2024 | | 2025 | |
|---|---|---|---|---|---|---|---|---|---|
| **Species** | **Area** | **OFL** | **ABC** | **TAC** | **11/5/2023** | **OFL** | **ABC** | **OFL** | **ABC** |
| **Pollock** | EBS | 3,381,000 | 1,910,000 | 1,314,500 | 1,307,997 | 3,162,000 | 2,313,000 | 3,449,000 | 2,401,000 |
| | AI | 52,383 | 43,413 | 4,500 | 3,665 | 51,516 | 42,654 | 53,030 | 43,863 |
| | Bogoslof | 115,146 | 86,360 | 300 | 118 | 115,146 | 86,360 | 115,146 | 86,360 |
| **Pacific cod** | BS | 172,495 | 144,834 | 127,409 | 112,963 | 200,995 | 167,952 | 180,798 | 150,876 |
| | AI | 18,416 | 13,812 | 8,425 | 3,750 | 18,416 | **12,431** | 18,416 | **12,431** |
| | BSAI/GOA | 47,390 | | | | 55,084 | 47,146 | 55,317 | 47,350 |
| **Sablefish** | BS | | 8,417 | 7,996 | 5,164 | | 11,450 | | 11,499 |
| | AI | | 8,884 | 8,440 | 2,319 | | 13,100 | | 13,156 |
| **Yellowfin sole** | BSAI | 404,882 | 378,499 | 230,000 | 105,682 | 305,298 | 265,913 | 317,932 | 276,917 |
| **Greenland turbot** | BSAI | 4,645 | 3,960 | 3,722 | 1,272 | 3,705 | 3,188 | 3,185 | 2,740 |
| | BS | | 3,338 | 3,180 | 793 | | 2,687 | | 2,310 |
| | AI | | 622 | 592 | 479 | | 501 | | 430 |
| **Arrowtooth flounder** | BSAI | 98,787 | 83,852 | 15,000 | 6,948 | 103,280 | 87,690 | 104,270 | 88,548 |
| **Kamchatka flounder** | BSAI | 8,946 | 7,579 | 7,579 | 6,926 | 8,850 | 7,498 | 8,687 | 7,360 |
| **Northern rock sole** | BSAI | 166,034 | 121,719 | 66,400 | 26,907 | 197,828 | 122,091 | 264,789 | 122,535 |
| **Flathead sole** | BSAI | 79,256 | 65,344 | 35,100 | 8,759 | 81,605 | 67,289 | 82,699 | 68,203 |
| **Alaska plaice** | BSAI | 40,823 | 33,946 | 17,875 | 15,018 | 42,695 | 35,494 | 45,182 | 37,560 |
| **Other flatfish** | BSAI | 22,919 | 17,189 | 4,500 | 2,994 | 22,919 | 17,189 | 22,919 | 17,189 |
| **Pacific Ocean perch** | BSAI | 50,133 | 42,038 | 37,703 | 34,720 | 49,010 | 41,096 | 48,139 | 40,366 |
| | BS | | 11,903 | 11,903 | 10,196 | | 11,636 | | 11,430 |
| | EAI | | 8,152 | 8,152 | 7,255 | | 7,969 | | 7,828 |
| | CAI | | 5,648 | 5,648 | 5,461 | | 5,521 | | 5,423 |
| | WAI | | 16,335 | 12,000 | 11,807 | | 15,970 | | 15,685 |
| **Northern rockfish** | BSAI | 22,776 | 18,687 | 11,000 | 10,308 | 23,556 | 19,274 | 22,838 | 18,685 |
| **Blackspotted/Rougheye Rockfish** | BSAI | 703 | 525 | 525 | 523 | 761 | 569 | 813 | 607 |
| | EBS/EAI | | 359 | 359 | 207 | | 388 | | 412 |
| | CAI/WAI | | 166 | 166 | 316 | | 181 | | 195 |
| **Shortraker rockfish** | BSAI | 706 | 530 | 530 | 224 | 706 | 530 | 706 | 530 |
| **Other rockfish** | BSAI | 1,680 | 1,260 | 1,260 | 1,179 | 1,680 | 1,260 | 1,680 | 1,260 |
| | BS | | 880 | 880 | 618 | | 880 | | 880 |
| | AI | | 380 | 380 | 560 | | 380 | | 380 |
| **Atka mackerel** | BSAI | 118,787 | 98,588 | 69,282 | 65,527 | 111,684 | 95,358 | 99,723 | 84,676 |
| | EAI/BS | | 43,281 | 27,260 | 23,776 | | 41,723 | | 37,049 |
| | CAI | | 17,351 | 17,351 | 17,210 | | 16,754 | | 14,877 |
| | WAI | | 37,956 | 24,671 | 24,541 | | 36,882 | | 32,750 |
| **Skates** | BSAI | 46,220 | 38,605 | 27,441 | 24,605 | 45,574 | 37,808 | 44,203 | 36,625 |
| **Sharks** | BSAI | 689 | 450 | 333 | 320 | 689 | 450 | 689 | 450 |
| **Octopuses** | BSAI | 4,769 | 3,576 | 400 | 151 | 6,080 | 4,560 | 6,080 | 4,560 |
| **Total** | BSAI | 4,859,585 | 3,132,067 | 2,000,270 | 1,748,036 | 4,609,077 | 3,454,205 | 4,946,241 | 3,527,996 |

Sources: 2022 OFLs, ABCs, and TACs and 2023 OFLs and ABCs are from harvest specifications adopted by the Council in December 2021 and December 2022 respectively as well as inseason actions; 2022 catches through December 31, and 2023 catches through November 5, 2023 from AKR Catch Accounting. NMFS increased TACs for Sharks and Alaska Plaice in 2023 from the in-season reserve

## General Groundfish Stock Assessment Comments

*Stock Prioritization*

The SSC received a presentation from Chris Lunsford (NOAA-AFSC, GOA GPT co-chair) and Melissa Haltuch (NOAA-AFSC) on the AFSC document detailing the proposed five types of assessments in response to an SSC request from its October 2022 meeting. In this document, the AFSC defined the types of assessments and provided a summary of the required documentation, suggested trigger points for shifting between assessment types, and described an expected level of review for each of these. The backdrop for these discussions is a national level effort on stock prioritization led by NOAA Fisheries that began in 2017. The SSC requested stock prioritization be re-evaluated in 2022, and this discussion is a continuation of that re-evaluation. The SSC thanks the AFSC for this information and appreciates the thoroughness of the responses to the SSC's requests for additional detail and suggestions.

The five types of assessments include: operational full assessment, operational update assessment, harvest projections, catch reports, and research assessments. **The SSC is generally supportive of these definitions, and the suggested trigger points and level of review of each assessment type.** The SSC acknowledges that the implementation of these assessment types and review process is ongoing, and further development of assessment guidelines for documentation and clarifications on trigger points is planned by the AFSC.

The SSC offers the following suggested modifications and additions for consideration by the AFSC. For operational full assessments, the SSC suggests that only the term "full" assessment, not "benchmark", be used to reduce confusion. There were two new assessment categories to consider, the first of which is the operational update assessment type. In this current year, there appears to be some blending of the full and update assessment types. For example, there were two GOA assessments that are defined as "full/update". Another example is the BSAI/GOA sablefish assessment, which is labeled as an update assessment but includes a new dataset, which is listed as a consideration for a full assessment. This led to some confusion by the SSC, as the review requirements differ between the two types. The SSC recognizes that some of the challenges were due to differences of opinion regarding what constitutes a major change and, for these, the SSC provided some feedback for individual assessments in this report. **The SSC reiterates that an assessment with major model changes should be reviewed in both the September GPT/October SSC meetings and again at the November GPT/December SSC meetings.** While there may be exceptions to this, they should be extremely rare.

The SSC had a brief discussion regarding the suggested considerations that would qualify an assessment as an operational update versus an operational full and would welcome the opportunity to review the AFSC's final assessment guidelines. From the SSC (review) perspective, it may be safer to "up" classify an assessment to full if the application of an update is questionable. The SSC noted that major model changes might be unavoidable in some situations and in practice, it may be difficult to clearly distinguish between the full or update assessments. For example, in cases where an operational update is planned but there are unexpected impacts to an assessment model, the SSC suggests that the author guidelines under development address this type of contingency to the extent possible. The SSC is also in favor of a streamlined, consistent document for this category to facilitate review, but notes that an alternative document structure as authors rotate between assessment types may increase author workload.

With regard to the Tier 4/5 assessments at a four-year frequency, the SSC feels that the development of the catch report, the second new assessment category proposed, provides a balance between efficiency and monitoring and is a reasonable compromise to re-running the REMA model in year three of four. The SSC supports the proposed schedule of a full assessment in year 1 and catch reports in all three subsequent years (2 – 4) for these species. With regard to the Joint Groundfish Plan Team (JGPT) suggestion that the AFSC consider producing the harvest projections for review at the September Plan Team meeting, the SSC is generally supportive of this suggestion, if the AFSC believes it to be feasible, as there are obvious benefits to the assessment teams. The SSC briefly discussed whether the SSC would review in October or December

but did not develop a specific recommendation. Finally, the SSC suggests that the previous full assessment links be provided in the harvest projections and catch reports to facilitate review.

Previously, the SSC requested a research assessment category be added, and the AFSC brought forward an excellent discussion of this type of assessment. The SSC continues to support this type of assessment as time allows for assessment authors. The SSC requests that assessment authors who bring forward "research" models as alternative models in full assessments continue to be clear when a model may be appropriate to consider for setting harvest specifications.

Finally, the SSC suggests including the assessment type definitions in the SAFE Introductions, along with the proposed generalized schedule of what assessment type is planned. These would be helpful references not only for the general public but also for the SSC.

The SSC has found the five-year re-evaluation of stock prioritization productive and suggests the process shift to making modifications on a case-by-case basis, as suggested by the AFSC.

*Retrospective patterns in rockfish*

The SSC noted that rockfish may be a good candidate group of species to look for commonalities in retrospective patterns. Exploring similarities in the shape of retrospective patterns across the rockfish stocks may provide insights to potential drivers. The 2013 September JGPT white paper authored by Dana Hanselman, Bill Clark and Mike Sigler entitled "Report of the Groundfish Plan Team Retrospective Investigations Group" may provide some guidance for such a review.

## Joint Plan Team Report

The SSC received a presentation on selected JGPT report topics; the remainder of the topics were included in the JGPT report only.

*Sablefish*

The SSC received a summary of the sablefish stock assessment results and associated JGPT recommendations. This assessment was scheduled for an update, but the author made a number of substantial changes to input data and implemented some structural changes. Therefore, the SSC considered this assessment to be a full assessment for the purposes of this review.

Written and oral public testimony was provided by Linda Behnken (Alaska Longline Fishermen's Association, ALFA). Written testimony re-iterated concerns over the truncated age structure in the stock as well as shifts in the apportionment of sablefish to the Bering Sea and Aleutian Island regions. Concerns were also noted over the long-term downward trend in the stock due to extended periods of low recruitment, despite current high abundances. Oral testimony focused on ALFA's support for bringing socio-economic information to bear on the management of this stock and the desire to 'bank' fish for the future for both biological and economic reasons. Oral testimony was also provided by Erik Velsko (North Pacific Fisheries Association), who supported 'banking' sablefish for the future and echoed concerns over large catches of small sablefish in trawl fisheries and the spatial apportionment. The SSC considered this information during its deliberations as noted below.

The sablefish assessment continues to show positive trends in recruitment and spawning biomass, with all year classes since 2014 estimated to have been at or well above average recruitment. While survey biomass indices are leveling off, the estimated spawning biomass continues to increase rapidly.

The authors explored a series of model changes that included (1) removing the 1984/1987 survey data (biomass and length compositions) that has been recommended across stocks in the GOA, (2) incorporating non-commercial catches as per an SSC request, (3) implementing a revised bias correction for estimating

recruitment and other minor structural changes, and (4) incorporating a standardized CPUE index that combines data from increasingly prevalent pot gear (> 80% of catches) with data from hook-and-line gear. The SSC supports these changes, except as noted below, and appreciates the thorough bridging analyses and additional model diagnostics provided in the document.

The SSC notes that the changes implemented in this year's sablefish assessment warrant elevating it to an "Operational Full Assessment" as per the new stock assessment definitions. The SSC looks forward to the guidelines being developed by AFSC to further clarify what distinguishes an update assessment from a full assessment and what elements it should include (see Stock Prioritization section under General Groundfish Assessment Comments).

The bridging analysis showed that the effects of incorporating each of the changes individually into the approved base model (21.12) were minor. Combining all changes in the author-proposed Model 23.5 resulted in very similar recruitment and biomass estimates when compared to the previous base model, except in the early part of the time series. Impacts on reference points were negligible. The retrospective performance was good with some indication that biomass was typically underestimated in retrospective peels due to higher than average recruitments in recent years.

**The SSC concurs with the authors and JGPT recommended Model 23.5 and the resulting Tier 3a OFL and ABC, adjusted for whale depredation using 2022 depredation estimates. The SSC supports the area apportionments based on five-year moving averages of biomass distribution in each area**, as estimated from the longline survey. The SSC notes that the area apportionments result in substantial increases in area-specific ABCs in the western regions compared to the eastern regions. Public testimony noted a concern that the movement of sablefish from the western areas to the east as they mature could result in a mismatch between the five-year average biomass distribution and the actual distribution in the upcoming fishing year.

The SSC discussed risk table considerations and agreed with the elevated concern (level 2) in the Fishery Performance category. In particular, the authors and JGPT noted the declining utilization with catch well below ABC, the substantial reductions in market value, and rapid changes in the fishery such as the rapid switch to pot gear. Under-utilization has resulted in uncertain estimates of current year catches that affect the projected biomass and resulting OFL and maxABC. The rapid transition from longline to pot gear has changed selectivity patterns in the fishery that may result in increased uncertainty, but this should likely be an assessment-related concern. The SSC also notes that market-related concerns do not pertain to ABC considerations so should not be in the risk table. Other concerns that the SSC raised include the continued lack of older fish in the population of this long-lived species, which has historically been characterized by long periods of low recruitment. The relatively poor fit to the length and age compositions was also noted, resulting in an underestimation of the abundance of smaller, younger fish in recent years and an overestimation of the abundance of older fish in the model. The SSC recognizes the current truncated population age structure and the heavy reliance on younger fish contributing to the spawning biomass, a point that was also highlighted during public testimony. The SSC discussed whether this may warrant increased levels of assessment-related, population dynamics or environmental/ecosystem concerns, but ultimately agreed with the JGPT's 'Level 1' (no concern) determinations in these three categories. Despite these concerns, i**ndications are that the stock is generally healthy (above average recruitment, rapidly increasing spawning biomass, etc.) and no reduction from maxABC is recommended.**

The SSC had the following additional recommendations for the stock assessment authors and JGPT:

- Concerns about fishery performance in the sablefish fishery suggest that there is a particularly acute need for socio-economic information to be available for consideration when management decisions are made for this fishery, as was also noted in public testimony. Additional community and economic indicators could be brought forward in the ESPs to support management (TAC setting) of the stock. See also the related section on ESPs in the SSC's General Assessment Comments.

- The SSC appreciates the inclusion of residual bubble plots (Pearson and OSA) and agrees with the authors that the disconnect between fitting sex-aggregated age compositions, but disaggregated length compositions may contribute to the lack of fit. The SSC supports disaggregating age data by sex as a high priority for the next full assessment to help address residual patterns. See also SSC comments on OSA residuals in the General Stock Assessment Comments.

- The SSC suggests that retrospective analysis can be extended to 10 years in line with other stocks, despite the selectivity time block starting in 2017, but that Mohn's rho values should be computed for both the full ten years of peels and for the period after the time block.

- Describe the method used for developing input/initial (pre-Francis weighting) sample sizes used for compositional data. Consider using a bootstrapping approach, based on the work by Hulson et al., that is applied in other groundfish stock assessments.

- Provide further investigation and potential alternative model parameterizations to address the poor fit to the new domestic fishery index that combines longline and pot gear (Figure 3.12).

- The SSC encourages the use of an appropriate sigma constraining recruitment but notes that the maximum likelihood estimate of a random effects variance is negatively biased. This can be avoided by iteratively tuning in a maximum likelihood framework (per the approach of Methot and Taylor) or by using a full Bayesian analysis such that the recruitment deviations are integrated out. As suggested by the JGPT, please clarify how the bias correction is treated, as it will have to be used differently during maximum likelihood estimation and for Bayesian analyses (where the full range of each recruitment deviation is integrated regardless of the information content of the data).

*Sculpin Ecosystem Report*

The SSC received a summary of the ecosystem report for the combined BSAI and GOA sculpin complex during the JGPT presentation. As an Ecosystem Component, there is no OFL nor ABC set for this complex, but rather data are presented as a way to track changes in abundance over time of the 48 species in this complex. Sculpins are managed as a non-target group of species and are only taken as bycatch. Through the recent stock prioritization process, this report is now on a four-year cycle; the last full GOA assessment was in 2015 and the last full BSAI assessment was in 2016. New data included in this report included: updated catch through October 2023, survey biomass estimates from the various AI, GOA, and BSAI surveys since 2020, and GOA and BSAI survey biomass estimates from the random effects multivariate assessment (REMA) model.

Overall, the commercial catch of sculpins is extremely low (<5% of biomass estimates) and the overall complex biomass is relatively stable in the AI. However, overall biomass has shown a roughly 30% decline in the GOA and a 40% decline in the BSAI. Most notable declines are seen in bigmouth and great sculpins in both the GOA and AI and in the "other" sculpins in the BSAI. Increased biomass is notable for yellow Irish lords in the AI.

As sculpins are notable benthic foragers and experience very little fishing pressure, further details on their role in the ecosystem and what changes in their abundance may tell us about each of the three ecosystems would be beneficial.

**The REMA model outputs in Appendix 1 were helpful, and the SSC recommends continuing to include them in subsequent reports.**

**The SSC also recommends that the author work with ESR authors to expand the "Ecosystem Consideration" section and/or include some metrics into the appropriate ESRs.**

# C3 BSAI SAFE and Harvest Specifications for 2024/2025

## BSAI Walleye Pollock

*Eastern Bering Sea Pollock*

The SSC received a presentation on the 2023 EBS pollock stock assessment and BSAI GPT recommendations. There was no public testimony.

The SSC thanks the authors for the quality of this assessment and the breadth of analysis, especially the reporting of detailed fishery patterns and insight into how these relate to the observed data.

The 2023 stock assessment included a number of improvements, which were described in more detail during the September BSAI GPT meeting and included as a separate document to the main assessment. **The SSC supports the authors' and BSAI GPT selected Model 23.0**. Those improvements included a change in the tuning of the data weights and the use of a more season-specific spawning weight-at-age. **The SSC supports the authors- and BSAI GPT-recommended OFL based on the Tier 1a calculation.**

The author and BSAI GPT recommended ABC was based on the Tier 3 calculation, as has been standard practice in recent years. The buffer from maximum ABC using this method was 18%, and the choice was justified on the basis of the risk table, which reflected an elevated (level 2) ecosystem risk.

The SSC had a lengthy discussion on the basis for continued use of a Tier 3 calculation. The discussion recognized that neither the author, BSAI GPT, nor the SSC appears to be comfortable with the harvest recommendations provided by the standard Tier 1 calculation, despite this being a data-rich stock. The SSC recognized that annual use of a large buffer (10-44% over the last 9 years) is inconsistent with the current risk-table approach. The SSC also noted that there was not a general historical relationship between the size of the buffer using the Tier 3 approach and the level of concern about the stock or stock assessment model, making the method variable and the buffer size difficult to predict.

The SSC recognizes several considerations outlined in the assessment document, including compelling arguments for catch stability and a continuation of historical fishery performance but notes that these are primarily management- and fishery-related and therefore not directly applicable to ABC buffers. **The SSC acknowledged that they could, however, be considered by the Council in the TAC setting process.**

The SSC recognizes that pollock serve a central role in the EBS ecosystem as both the primary prey species as well as a critically important predator and competitor. The SSC discussed whether maintaining a larger pollock biomass and its critical ecosystem function might be consistent with a proactive approach to climate resiliency.

The SSC considered the application of a constant buffer to the Tier 1 maximum ABC that could reflect broad ongoing concerns with greater transparency and consistency. The SSC also discussed whether better

capturing the uncertainty in the Tier 1 management quantities could provide for an adequate buffer that could be generated intrinsically to the assessment analysis and work more seamlessly within the existing control rule.

**Ultimately, the SSC supported the use of the Tier 3 calculation as the basis for the 2024 ABC, corresponding to a reduction from maxABC of 18%.** This buffer was justified based on the elevated ecosystem risk identified in the stock assessment and also the considerable uncertainty about future selectivity, which has high interannual variability that is not accounted for in the projections. **The SSC would prefer not to make a risk table adjustment based on the difference from Tier 1 to Tier 3 again during the 2024 assessment cycle. The SSC requests that the next stock assessment bring back a new approach that may include development of a constant buffer based on factors extrinsic to the stock assessment (ecosystem function), or a better representation of the uncertainty in the Tier 1 and control rule calculations such that a reduction from maximum ABC is not needed every year.** The SSC expects that the risk table approach will continue to be used as intended to address specific risks that may arise infrequently, and warrant additional precaution and ABC reductions in excess of that from a constant buffer or additional uncertainty in the Tier 1 and control rule calculations.

The SSC had several more specific recommendations, including support for those made by the BSAI GPT; these are grouped by general topic below.

**Recommendations relating to computational methods**:

- Use posterior distributions from the MCMC to determine probabilities in the risk table and expand the columns in the risk table to include the recommended ABC (and potentially higher values).
- Identify where MLE estimates are being used and where MCMC estimates are being used. Also see the SSC's General Stock Assessment Comments to include convergence diagnostics any time Bayesian results are reported. If MCMC diagnostics continue to appear adequate, reference points could be calculated using the posterior distribution used, rather than an analytical calculation.

**Recommendations relating to data**:

- The SSC recommends that consideration be given to removal of the Japanese fishery CPUE index (1965-76) from the assessment, because this data set no longer seems to contribute to the assessment. A sensitivity test should be done to evaluate the effects of data removal on the assessment.
- Catch-at-age data provided by foreign fishing agencies in the pre-Magnuson era were not produced using the same aging criteria as the AFSC age-and-growth program. Consideration should be given to removal of these data from the assessment. A sensitivity test should be done to evaluate the effects of data removal on the assessment.

**Recommendations relating to model diagnostics**:

- Document the method used for determining the selectivity to use in the forward projections and continue to evaluate projection variability due to selectivity. The SSC appreciates the selectivity retrospective comparison and suggests that it might be helpful to limit the comparison to the projection used in each year against only the most recent (best) estimate of selectivity for that year.

- The SSC supports the use of posterior predictive distributions, an underutilized tool in fisheries science, but common in other fields. To fully implement this approach to Bayesian model checking the SSC recommends plotting a histogram for each data source of the percentile of the predictive distribution in which each data point lies, noting that in a highly consistent model this histogram would be uniform.
- There is an apparent shift towards older ages in fisheries and trawl survey selectivity that should be investigated further.

**Recommendations relating to the multi-species model:**

- The SSC agrees with the BSAI GPT's proposal in their presentation to move the multi-species model out of the pollock stock assessment, where it has been included as an appendix since it was first developed. Instead, they suggested it would be a separate chapter listed in parallel with the ESR, as it applies to multiple stocks and informs the ESRs.
- The SSC recognizes the multi-species model as a 'research model' and therefore recommends placing information that appears comparable to a stock assessment specifications table in a regular table (at the end of the document) in order to avoid confusion.
- The SSC supports the multi-species model authors' plan to work with individual assessment authors early in the process to facilitate incorporation of those results into stock assessments.
- Weight-at-age in the multi-species model is temperature driven based on a bioenergetic model. It would be useful to compare these estimates to empirical weights-at-age or the random effects model estimates of weight-at-age in the main pollock assessment.
- Consider how output from the multispecies model may best be interpreted independently from results of the actual stock assessment without drawing inference from the same data twice.

**Other recommendations:**

- The SSC suggests revisiting the treatment of the stock-recruit relationship in the assessment model using recent improvements in modeling approaches and a longer time series that encompasses the recent warm period in the EBS. Recruitment deviates should be from the stock-recruit relationship and should model variability among annual recruitment estimates based on information in the data and residual variability. The estimation process should ensure that log-normally distributed recruitments are mean unbiased, resulting in unbiased biomass estimates. If an informative prior is used for steepness, it should be based on a meta-analysis of related species and reflect the uncertainty of that meta-analysis. Further consideration of time periods (as in previous analyses) and the influence of temperature on the stock-recruit relationship may be helpful. The SSC recognizes that there were significant recent analyses in 2016, 2018 and 2020 and is not requesting a repeat of those but a review of previous work would be helpful.
- Continue efforts to estimate the proportion of the stock in Russian waters (acoustic mooring work to estimate movement) and to reach out to Russian colleagues to obtain catches in the relevant regions of the Russian EEZ (if possible).

**Minor editorial comments**:

- Table 5 needs column labels.
- The table 17 header lists 2023 but only includes data through 2022.
- The table 20 header lists 2021 but includes 2022 data.
- Catch estimates for 2023 differ in Tables 1 and 2/3, despite the same date of compilation listed. Tables 2/3 include discards, but the estimate is smaller than Table 1.

## BSAI Pacific Cod

*Eastern Bering Sea Pacific Cod*

The SSC reviewed the 2023 operational full assessment of the Pacific cod stock in the EBS. The SSC thanks the assessment authors for their efforts to advance this assessment by beginning with a simplified model and using a logical and sequential process for adding features in the development of this assessment. Written public testimony was provided by Jim Armstrong and Chad See (Freezer Longline Coalition). Oral public testimony was provided by Jim Armstrong (Freezer Longline Coalition) and Scott Hansen (F/V Beauty Bay). Written and oral public comment highlighted support for the author's recommendation to transition away from the previous four-model ensemble to a single model, which members of the public view as a superior basis for current harvest specifications and future development.

The SSC highlights the timeline for several recent changes to the EBS Pacific cod stock assessment, to provide context for the assessment models explored for the 2023 assessment cycle:

- Fishery age composition data were removed as a method for resolving a troubling retrospective pattern, beginning with the 2019 assessment.
- Beginning in the 2021, the assessment for the EBS Pacific cod stock was based on an ensemble of four alternative models, with differing features related to time-varying survey catchability, dome-shaped survey selectivity, and inclusion of a VAST model-based index of abundance derived from fishery-dependent catch rate data.

The SSC emphasizes that the purpose of model ensembles is to address fundamentally different assumptions about population dynamics, model structure, or data treatment within the estimation and management process, as a method for developing recommendations that are robust to these sources of structural uncertainty. The SSC has for many years supported the development of an ensemble approach for EBS Pacific cod and requested clear documentation and a justification for a single model, if it is deemed to provide a more robust basis for harvest specification and future development. In October 2023, the SSC agreed with the author and BSAI GPT that, at this time, exploring issues around variations in growth, selectivity, catchability and mortality could be better addressed using a single model due to a number of issues with the suite of ensemble models.

In the 2023 assessment, the authors highlight several concerning attributes of the EBS Pacific cod ensemble member models including:

- Frequent failure to converge to the same solution, or even the same objective function value, during jittering analysis.
- Perennial problems with the log-theta parameter of the Dirichlet-multinomial likelihoods for composition samples approaching their upper limits, necessitating the fixing of these parameters to facilitate model convergence.
- Potential confounding among time-varying growth and selectivity processes.

- Autocorrelated patterns in residuals from model fits to age and length composition data (i.e. failure of residual runs tests).

Further, the authors highlight that the time investment required to maintain a four-model ensemble has come at a cost in terms of limiting further development of individual models, and the potential for advancing toward a stable single platform that most accurately reflects stock dynamics.

For the 2023 assessment cycle, the authors started from a single, simplified base model to which features were added sequentially. This base model for exploration in 2023 (Model 23.1.0.a) was a simplified version of Model 22.2, with:

- Removal of survey length composition data for years in which survey age composition is available (1994-2021).
- Removal of time-varying parameters including annual survey and fishery selectivities, and annually varying growth (Lmin).
- Fixing the pre-2007 aging bias to Model 22.2 values.
- Changes in likelihoods for age and length compositions from Dirichlet-multinomial to the standard multinomial.
- Use of a bootstrap estimator for the input sample size for composition data, and use of Francis iterative weighting for age and length composition data.
- Fixing the CVs for length at age based on values estimated in the 2022 ensemble.

**The SSC supports the author recommended and BSAI GPT endorsed decision to leverage a single model in place of the previous four-model ensemble given its superior overall performance.**

The author recommended and BSAI GPT endorsed model is 23.1.0.d, which includes all of the features of the simplified Model 23.1.0.a, plus:

- Annually-varying growth.
- Annually-varying survey selectivity.
- A fishery selectivity time block implemented in 1990.
- A fixed value for natural mortality. Given the strong negative correlation between natural mortality and catchability, this stabilizes the estimate of survey catchability.

Among the models explored, Model 23.1.0.d exhibits the least retrospective bias, lowest mean absolute squared error (MASE) for fits to indices and composition samples, and the least evidence for autocorrelation in model residuals for fits to age and length composition data.

The SSC appreciates the clear documentation of the impact of these sequential additions, and justification for their inclusion within the assessment, detailed within Appendix 1 to the 2023 assessment.

Based on Model 23.1.0.d, the projected 2024 spawning biomass is above $B_{35\%}$ but below $B_{40\%}$, placing this stock in Tier 3b. **The SSC supports the 2024 recommended OFL and maxABC, with no reduction from maxABC.** The Risk Table for this stock identifies Level 1 (no concern) for all categories in 2023.

The authors clearly describe the sensitivity of model estimates and management recommendations to variation in estimated or assumed natural mortality, and its strong negative correlation with bottom trawl survey catchability. Specifically, small changes in natural mortality can result in large changes in the estimated scale of the population, with limited impact on the overall objective function value, indicating

similar ability to explain variation in the data. The authors present a useful exploration of the impact of estimating natural mortality internally within the model, by iteratively relaxing the assumed standard error for the prior on this parameter. Results indicate that as this prior is relaxed, the point estimate for natural mortality declines, 2024 spawning stock biomass declines, unfished spawning biomass increases, and survey catchability increases, highlighting the sensitivity of natural mortality estimates to the choice of the prior and that conflicts exist within the data informing this assessment.

To help address this issue, the SSC offers the following recommendations for future research:

- Continued consideration of the need for incorporating time-varying survey selectivity, relative to a static selectivity function, given what appear to be relatively small changes across the timeseries.
- The SSC reiterates its recommendation for this assessment to incorporate marginal fishery age composition data and fixing the pre-2007 aging bias to Model 22.2 values, which should help estimate fishery selectivity
- Continued exploration of directly fitting conditional age-at-length data within the assessment to inform age structure alongside temporal variation in growth, as opposed to marginal age compositions.

The SSC highlights several other areas of potential future research for this assessment:

- Given the clear demonstration following 2019 that the spatial distribution of the EBS Pacific cod stock is related to temperature, the SSC recommends exploration of whether the relationship between prevailing temperature conditions and survey catchability may be informative for this assessment.
- The SSC highlights the potential value in updating maturity estimates at age, given the last estimates appear to be from 2007 and that changes in maturity schedule may have occurred coinciding with the observation of increasing growth since the mid-2000s.
- The SSC noted that the prior on natural mortality is based on a maximum age of 14 derived from data collected since 2008 and looks forward to additional biological and/or historical information supporting this maximum age.
- Related to this, the SSC recommends including in the next assessment a likelihood profile on M that covers an extended range of values, at least encompassing values used in recent assessments.
- The SSC supports the efforts to collect and integrate data from the state waters fishery as they represent an appreciable fraction of the catch and are therefore important to inform the size structure of the fishery mortality in the stock assessment.

Given continued interest in connectivity among the three Alaska FMP cod stocks, the SSC requests a conceptual discussion of how the three cod stock assessments might be restructured in light of recent genetic and tagging information, including considerations of distinct genetic types in the Northern Bering Sea and in Southeast Alaska.

**Minor comments:**

Confidence intervals should not extend below zero for spawning biomass (Figure 2.48), relative biomass (Figure 2.49) or recruitment (Figure 2.50). It is common to use a lognormal approximation (e.g., as in GOA pollock) to avoid this artifact.

Given the known spatial responses of Pacific cod to variation in EBS surface temperature and cold pool dynamics, the SSC appreciates the description and visual representation of spatial catch patterns by gear

type (Figs. 2.7-2.8) in addition to model-based longline CPUE predictions across space (Fig 2.15), raw spatial survey catch per unit effort maps (Fig. 2.17), and VAST model-based predictions (Fig. 2.20).

*EBS Pacific Cod ESP*

The SSC supports the expanded inclusion of social and economic information for the EBS Pacific cod stock within the ESP, in order to better capture how Council actions affect social and economic outcomes for businesses and substantially engaged and dependent communities. See additional comments on ESPs in the General Comments section.

*Aleutian Islands Pacific Cod*

An operational full assessment for the AI Pacific cod stock was presented, including the Tier 5 base model and three alternative age-structured models for consideration for Tier 3 specification, as well as the key concerns and recommendations arising from this assessment.

Jim Armstrong (Freezer Longline Coalition) provided both written and oral public testimony. The FLC commented about the Council and NMFS review process after attending the BSAI GPT meeting. They suggested that better guidelines could be developed for how information is received into the review process, highlighting the lack of consistency in the assessment delivery (deadlines, sequencing, new information) and review procedures in this case, which they felt challenged confidence in the assessment review process as a whole. Public comment further highlighted challenges with the risk table. Elevated risk was identified but a recommended reduction from maximum ABC or rationale for no reduction was not presented for the base model. Their view was that AI cod have declined within the AI region, though they were uncertain as to the magnitude of the decline.

The Tier 5 Model (13.5) utilizes the REMA framework, fit to the abundance index derived from AI bottom trawl survey data. There was no new AI survey in 2023, so the model remains identical to 2022.

The Tier 3 models, specifically Models 23.0, 23.1, and 23.2, incorporate combined catch data and survey age and length data. These models diverged in their treatment of growth coefficients, fishery selectivity and natural mortality.

While the author favored Model 23.2, the BSAI GPT Plan Team had a number of concerns, highlighted the need for further review, and recommended continued use of the Tier 5 model for this year. **The SSC shares these concerns as detailed below and supports the BSAI GPT recommendation to use the Tier 5 model for 2024/2025 harvest specifications.**

Based on risk table considerations, the BSAI GPT recommended a reduction from the Tier 5 maxABC by setting the ABC equal to the OFL from Model 23.2, an 8% reduction. Both ecosystem and population dynamics considerations remained at an elevated level 2, primarily based on concerns over the suitability of the longline survey to index Pacific cod and recent elevated temperatures in the Aleutians. The SSC notes that some population dynamics metrics, such as survey abundance, seemed redundant to data already included in the stock assessment model or should be in a different category. For instance, fishery CPUE would be more appropriate to consider under fishery performance. No new lines of evidence of increased risk were presented compared to last year, except for results from a model and different projection scenarios yet to be fully reviewed. The SSC discussed whether these elevated concerns warrant a reduction in ABC below the maximum permissible ABC this year, given that no new evidence for additional concerns were provided. However, the SSC recognizes that the stock appears to be continuing to decline and that the lack of a new survey data point increases uncertainty about the current biomass of the stock. In addition, there was a recognition that the GOA Pacific cod stock experienced some of these same conditions prior to a substantial decline, and also lacked a survey while the stock was declining. The SSC believes some caution is warranted on that basis. **Therefore, the SSC recommends a 10% reduction from maximum ABC.**

The SSC shares the concerns over this year's review process that was highlighted in public testimony and notes that the models presented to the BSAI GPT in November and to the SSC in December 2023 differed from those reviewed and recommended in September and October 2023, particularly regarding the number of time blocks for selectivity and growth and introducing time blocks for natural mortality. The SSC has frequently highlighted the need for new full models to be brought forward in September/October. The SSC recognized that the September/October GPT and SSC reports did not specify the implementation of time-varying growth had to remain the same as presented in September (annually varying), and acknowledged that specification such as this could help avoid confusion in the future, but did agree that the change in implementation of time-blocks was a large enough change to consider it a new model which would need GPT review in September. Authors should bring forward only those models for consideration in November that were reviewed in September/October by the BSAI GPT and SSC, consistent with longstanding practice and with the guidelines described for operational full assessments in the Revised Stock Assessment Definitions discussion paper (see Stock Prioritization comments under General Groundfish Assessment Comments). While the Revised Stock Assessment Definitions document noted that new models could be brought forward in November/December under extenuating circumstances, the SSC did not consider improving performance of an alternative model in a non-survey year to meet that threshold. The SSC also supports the BSAI GPT recommendation against reusing model numbers to minimize confusion between old and new model versions.

The SSC appreciates the authors' creative thinking and model explorations that may be valuable improvements to consider in the future, especially with the apparent improvement in retrospective trends. However, there was insufficient time for the GPT and SSC to thoroughly review the new model and the proposed projection methods. Significantly different recruitment periods for projections were considered between documents and presentations that resulted in substantial confusion in the review process, resulting in highly variable ranges of management advice and stock status, raising concern from both the BSAI GPT Plan Team and the public. Tracking these changes was extremely challenging in the review process. Concerns regarding the author's recommended Model 23.2 along with recommendations to consider in future assessments are as follows:

- There were three parameters for natural mortality (M) where only two were required. This is confusing and might have influenced the model results in ambiguous ways that were not fully described in the document. Standard practice would be to estimate two lognormal parameters for the two M blocks.
- Similarly, there were three parameters estimated for time varying growth where only two were required. As a result, the SSC has the same concerns as noted in the previous bullet. In addition, the author presented a slide showing almost identical growth coefficients for time varying kappa in two periods, suggesting that time-varying growth may not be needed.
- The 'q sensitivity' model, where q is calculated analytically but was almost identical to the estimated value, resulted in significant impacts on model results, indicating potential convergence issues or other inconsistencies in the model.
- The increasing OFL and decreasing ABC in Model 23.2 for 2025 in the author and BSAI GPT recommended recruitment time series for projections raises concerns about the accuracy of the projections and the projection methods.
- When estimating catch for projections, a more realistic value than maxABC should be considered, given that maxABC has not been achieved in recent years. This problem isn't unique to AI Pacific cod (see General Stock Assessment Comments section).
- The SSC recommends a sensitivity analysis and a possible prior on M. It is surprising that estimating M was difficult in the data-rich EBS Pacific cod assessment, but estimating M in the AI

cod assessment was successful with fewer data points. The SSC encourages further collaboration among authors of the three cod assessments with regard to the treatment of M.

The SSC supports the BSAI GPT's emphasis on the importance of ongoing analysis and sensitivity checks in light of the uncertainties in the current Tier 3 models and environmental conditions. **The SSC recommends that the authors present a simplified version of the original September 23.0 model with minimal time varying parameters alongside a preferred model or set of models in September 2024.** Any recommendations involving recruitment, natural mortality, and growth blocks in a projection or model should be accompanied by thorough documentation in September that clearly describes the rationale for these time blocks and sequentially evaluates their impacts on stock assessment results.

Other considerations:

- In the ESR, the need for an indicator of winter bottom temperature during spawning was noted, possibly derived from winter fisheries data, to assess potential detrimental effects of high temperatures in the AI on spawning and egg survival.

- The SSC questioned whether the new models and projections brought into the review process after the September/October GPT and SSC review and between November/December documents and presentations resulted from a compressed model development due to the annual cycle of this assessment and whether moving to a biennial cycle would reduce these challenges. Although the SSC previously recommended that AI Pacific cod be on an annual cycle, the SSC welcomes author and GPT feedback on whether moving to a biennial assessment would be beneficial to allow for more model development time, while coinciding with new AI survey data. Because 2024 will have a new survey, this consideration for a biennial cycle could begin after 2024, especially if a Tier 3 model is accepted in 2024.

## BSAI Flatfish

*Yellowfin Sole*

Yellowfin sole is assessed annually and an operational update was presented this year. Two models (22.1 and 23.0) were presented for this Tier 1 assessment. Model 22.1 was the accepted model in 2022; model 23.0 was identical except that it included a single-sex fishery selectivity rather than separate selectivities for males and females. Model 23.0 results showed improved model fit to the data. Both models included VAST estimates for the EBS and NBS. Updated data included: 2022 fishery age compositions, 2022 VAST survey age compositions, total catch and catch estimates for 2022 and 2023, and the 2023 NMFS survey biomass estimates and standard errors. Additionally, VAST estimates and standard errors were included. The SSC notes that as per the new stock assessment definitions, changes in selectivity would constitute a basis for a "full" rather than "update" assessment. There was no public testimony.

Overall, there was a dramatic (~25%) decline in total biomass but only a small (1%) decline in female spawning biomass. This decline was due to a marked decline in survey estimates (second lowest in the time-series). However, the spawning biomass is still 1.6 times greater than $B_{MSY}$, which qualifies this stock for management under Tier 1a. While this was a sudden decline, good recruitment in the past few years suggests a slow increase into the future.

The risk table has a Level 2 risk for both Population Dynamics and Ecosystem considerations. The marked declines in survey estimates are at odds with typical dynamics of a species that lives 20+ years. Additionally, the body condition of yellowfin declined to its long-term average in the EBS but was well below average in the NBS. These observations were consistent with other flatfishes in the BSAI and may suggest decreasing prey quality. However, this body condition index was at odds with the weight at age utilized in the assessment where the current year weights at age were nearly the largest in the time series.

It was also noted that these weights at age generally increased over time, which seemed ecologically unlikely.

**The SSC accepts the BSAI GPT's and authors' recommended model (23.0) with its associated OFL and ABC and no reduction from maxABC for 2024 and 2025.**

The SSC requests that the authors update the Analytical Approach section of the SAFE document to clearly describe both (1) how sex-structured population dynamics are represented within this model including assumptions about the sex ratio at recruitment, and (2) describe the likelihood functions that are used to fit this model to data and specifically whether the survey and fishery age composition proportions are assumed to sum to 1.0 across ages within sexes or across ages and sexes. The SSC suggests that greater transparency in methods will help identify how much information on sex ratio at age is being provided to the model.

Additional recommendations:

- The SSC supports the November 2023 BSAI GPT recommendations for the author to conduct a model sensitivity analysis to evaluate the current approach used for natural mortality. The SSC suggests an evaluation of whether it is possible to estimate sex-specific natural mortality, and an evaluation of whether this approach is a significant improvement overestimating a single natural mortality for both sexes.

- The SSC recommends that the author examine and reconcile (if necessary) the seeming contradiction in body conditions between the weight at age matrix in the assessment and the body condition metric presented for the risk table.

- The SSC recommends the author investigate (or provide discussion of) the sharp decline in the size of the 2017-year class.

- The SSC notes time-varying fisheries selectivity is modeled beginning in 1954. Time-varying selectivity should only be modeled for periods with informative data in the assessment.

- The SSC requests documentation of the early catch-at-age data used in the assessment. The data availability table in the document indicates that the fishery catch-at-age data begin in 1964, but the data tables only show catch-at-age data starting in 1975. Older catch-at-age data should be removed if it cannot be documented.

- The SSC supports the transition to the stock synthesis platform for yellowfin sole but notes that the data available for the yellowfin sole stock assessment is perhaps the best in the world, making yellowfin sole a good test bed for advanced modeling techniques.

- The VAST model for the Northern + Eastern Bering Sea was included in the yellowfin sole assessment in 2022. Since VAST accounts for an unsurveyed portion of the population, the SSC requests that the temperature-dependent catchability relationship be rechecked to confirm that the relationship is still significant and in the same direction as before.

## BSAI Rockfish

*Northern Rockfish*

An operational update assessment for northern rockfish was conducted under Tier 3. This stock is assessed every two years, and the last full assessment was conducted in 2021. The SSC thanks the authors for a clear and concise presentation and document. There was no public testimony.

BSAI northern rockfish is primarily a bycatch species in the Atka mackerel and POP fisheries, with some evidence of more recent direct targeting. Catches have been steadily increasing over the past decade, although harvest levels continue to be well below ABC and there are no concerning trends in the biomass estimates.

As an update, the assessment was based on the most recently accepted model from 2021, with only minor changes and updates to the data. Additions included survey age compositions, fishery age and length compositions, catch data (projected through the end of 2023), and the 2022 AI survey biomass estimate. The input data were also re-weighted, which resulted in very minor differences between the 2021 and the current weights.

The SSC thanks the authors for their responsiveness to previous SSC requests. These included updating the aging error matrix, such that it now reflects additional aging uncertainty and consideration of the EBS survey as a potentially informative index. The additional aging error had minimal influence over the timeseries of biomass, and the EBS survey data will continue to be excluded due to low biomass estimates aside from the anomalously high 2018 estimate and generally very high CVs.

The author and BSAI GPT continue to highlight potential spatial management concerns for this stock. Recent genetic research, presented in October, along with a revised stock structure evaluation for Northern rockfish further demonstrated evidence of population structure at much finer scales than are represented by the current management units. Combined with the potential trend towards increased targeting of Northern rockfish in a relatively concentrated area, there is increasing concern over vulnerability to localized depletion. A figure of regionalized exploitation rates relative to a reference rate (corresponding to a population subjected to fishing at $F_{40\%}$), demonstrated that no regional over-exploitation is currently occurring. **The SSC concurs with the author and BSAI GPT that there is a mismatch between the spatial management unit and the stock structure. Consequently, the stock is vulnerable to localized depletion should the increasing trend in catch and regional targeting continue. The SSC also agrees that while there is not presently a conservation concern, the author and BSAI GPT should continue to closely monitor sub-area trends in exploitation, incorporating industry perspectives to elucidate trends in directed targeting if possible.** The SSC appreciates the inclusion of a figure with sub-area exploitation rates and suggests that the authors also evaluate other sources of data for possible signs of localized depletion and include an updated stock structure template as an appendix to the next full assessment.

The author identified two elevated risk table categories for this assessment. The ‘assessment considerations’ category was elevated to level 2 (major concern) because the estimation of multiple highly influential parameters is constrained, resulting in an underestimate of uncertainty internally to the model and challenges with estimating the population scale. In addition, there was a strong retrospective bias. The ‘population dynamics’ category was also elevated to level 2 as a result of the spatial mismatch between population stock structure and the management unit scale.

**The SSC supports the author and BSAI GPT plan team recommended maximum permissible ABC and OFL resulting from this update assessment.** Despite the elevated level of risk, the author and BSAI GPT did not recommend a reduction from maxABC because catches have been well below the ABC consistently. **The SSC supports the recommendation of maxABC with no reduction.**

Several areas of concern in this assessment have been previously identified by the author, BSAI GPT, and SSC during the last full assessment review, including a relatively strong retrospective bias and difficulties associated with estimating key parameters, such as M and survey q, which necessitate the use of strong priors. The SSC provided the following recommendations for future evaluation.

- Investigate whether information on sex ratio, that might indicate different mortalities between sexes, or the inclusion of time blocks for survey selectivity and/or catchability may be informative in resolving the retrospective pattern.
- Examine retrospective patterns across species to identify commonalities that may point to broader ecosystem-level influence or biology unique to slope rockfish (see also General Groundfish Stock Assessment Comments)

## Octopus

An operational update was presented for the octopus complex this year. The BSAI octopus complex (eight species) is managed as a single assemblage and assessed on a quadrennial basis using an alternative Tier 6 approach. The last full assessment was presented in 2020. There was no public testimony.

The alternative Tier 6 method, accepted by the SSC in 2011, employs a predation-based estimate of total natural mortality using the amount of octopus detected in Pacific cod stomach samples. In the current assessment, calculations of annual and long-term average consumption rates were updated using 13,614 additional Pacific cod stomach samples collected from 2012-2013 and 2016-2023. This constitutes a substantial (25%) increase in samples, bringing the total number of stomach samples in the full time series (1984-2023) to 52,843. New data reported in this assessment were 2023 EBS shelf survey data, incidental catch data through September 16, 2023, and the number of Pacific cod stomachs samples used in the total natural mortality analyses. The 2020 catch (691 t) is the highest in the time series, while the catches in 2022 (251 t) and to date in 2023 (120 t) are substantially lower.

The 2024 and 2025 recommended OFL and the maxABC are a 22% increase from the projected 2023 values. **The SSC supports the author and BSAI GPT recommended 2024 and 2025 OFLs and ABCs.**

The SSC supports the BSAI GPT recommendation to link the original predation-based total natural mortality estimation method from the 2012 assessment. Further, the SSC recommends that the author continue to track the survey estimates even though they are not used in ABC or OFL calculations.

## Skates

An operational update for the BSAI skate complex was presented this year. The last full assessment was conducted in 2020. There was no public testimony.

Harvest recommendations for the BSAI skate complex includes two components, a Tier 3 age-structured model for Alaska skate (*Bathyraja parmifera*) and a Tier 5 random effects model for all other skates. These components are combined to produce the harvest specifications for the BSAI skate complex. Updated data for this assessment included: catch through October 1, 2023, EBS shelf bottom trawl survey biomass estimates updated through 2023, 2022 Aleutian Islands survey data, and survey length compositions from the 2021–2023 EBS shelf bottom trawl surveys.

The Tier 3 Alaska skate model, Model 14.2, was migrated to a newer version of Stock Synthesis (SS3 v3.30.21) and some changes to historical data were incorporated, but assessment methodology did not change. A series of bridging steps were evaluated, and it was determined that the updated model, Model 14.2d, was consistent with the previously accepted structure in Model 14.2. In Model 14.2d, the longline fishery selectivity changed to dome-shaped from asymptotic, but it was suggested that this change was related to the newer Stock Synthesis version. It was also noted that biomass is overestimated during the colder years and underestimated during the warmer years. **The SSC concurs with the recommendation to explore using a catchability tuned to temperature.** The model also tends to underestimate lengths of the oldest skates in early years, but there has been no new age data since 2015. The BSAI GPT discussed whether there would be collections of age structures (vertebrae) and new age estimates in the future because lack of more recent samples will result in increased uncertainty in this Tier 3 assessment in the future. While collection and aging of vertebrae are time-intensive, **the SSC encourages considerations of collecting and aging Alaska skate vertebrae when prioritizing fishery and survey sampling and determining age-reading priorities at the AFSC Age and Growth Lab.** Overall, the model fit the data reasonably well and performed similarly to the 2020 model. The model, however, has substantial retrospective bias with indication that the model is overestimating SSB.

The assessment model indicates that spawning biomass of Alaska skate peaked in 2020 and has since shown a decreasing trend since 2021; however, estimates are still well above the long-term average. Lower recruitment in recent years suggests that spawning biomass is expected to decrease in the future, but there is indication that a new cohort may be beginning to recruit into the population. The 2023 estimate of female spawning biomass is above $B_{40\%}$ and, therefore, harvest specifications for Alaska skate are set in Tier 3a.

The Other Skate complex consists of many species over multiple BSAI regions. Species composition varies by region. This assessment uses the EBS shelf, the EBS slope and the AI survey. The total biomass estimate for the Tier 5 Other Skate species in the complex was updated from the previous random effects model framework to the REMA framework (Model 23.0).

Since the last full assessment in 2020, there have been three EBS shelf surveys and one survey in the AI. Biomass estimates in the EBS shelf have been trending upward since 2013 and the 2023 estimate was the highest in the time series and is mostly driven by big skate. The assessment model, however, underestimated the high 2023 value. The combined Tier 5 AI biomass is slightly down from the 2020 assessment, which continues the downward trend starting around 2010. The leopard skate biomass in the AI continues to decline and **the SSC reiterates its concern over the decline of this rare endemic species**. The SSC is encouraged that the authors have initiated discussions with RACE GAP staff about this and will prioritize further evaluations in collaboration with RACE staff regarding the reliability of the AI trawl survey for assessing leopard skates, and skate species in general because of habitat rugosity and the survey gear used. There has not been an EBS slope survey since 2016; therefore, the estimated biomass from that region is unchanged, but with increased uncertainty.

The SSC appreciates the implementation of the risk table. Assessment-related concerns were rated at a level 2 (major concern) for Alaska skates because of the strong retrospective bias, but level 1 for other skates. All other categories were rated as level 1 (no concern). **The SSC accepts the authors' and BSAI GPT's recommended OFL and ABC for the skate complex in 2024 and 2025 with no reduction from maxABC.**

The SSC concurs with assessment authors' plans for future assessments including exploring updated natural mortality rates (M) for each of the Tier 5 Other Skate species. The SSC also reiterates the suggestion from the previous two full assessments (2018 and 2020) to update the stock structure template with a focus on Alaska skate during the next full assessment and appreciate the authors' agreement that this is something to revisit. Finally, The SSC would like to commend the authors for their work on this assessment. The SSC

appreciates the thoughtful approach the authors took with this operational update and agree with the BSAI GPT that this assessment is a good template for transitioning authorship of a SAFE in the future.

## Harvest Projections

*Aleutian Islands Pollock*

The AI Pollock stock is assessed every two years. The last full assessment was in 2022. This year, a harvest projection was presented. A full assessment is scheduled for 2024. There was no public testimony.

AI Pollock is assessed using an age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2022 catch, and estimated 2023–2025 catches. The 2024 total biomass is a 5% increase from the 2023 total biomass.

**The SSC concurs with the BSAI GPT and author recommended ABC and OFL for the AI pollock for 2024 and 2025.**

*Greenland Turbot*

Greenland turbot is assessed every two years. The last full assessment was in 2022. This year, a harvest projection was presented. A full assessment is scheduled for 2024. There was no public testimony.

Greenland turbot is assessed using an age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2022 catch, and estimated 2023–2025 catches. The 2024 total biomass is a 7% decrease from the 2023 total biomass.

**The SSC concurs with the BSAI GPT and author recommended ABC and OFL for the Greenland turbot for 2024 and 2025.**

*Arrowtooth Flounder*

Arrowtooth flounder is assessed every four years. The last full assessment was in 2022. This year, a harvest projection was presented. Another harvest projection is scheduled for 2024. There was no public testimony.

Arrowtooth flounder is assessed using an age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2022 catch, and estimated 2023–2025 catches. The 2024 total biomass is a 1% decrease from the 2023 total biomass.

**The SSC concurs with the BSAI GPT and author recommended ABC and OFL for arrowtooth flounder for 2024 and 2025.**

*Kamchatka Flounder*

Kamchatka flounder is assessed every two years. The last full assessment was in 2022. This year, a harvest projection was presented. A full assessment is scheduled for 2024. There was no public testimony.

Kamchatka flounder is assessed using an age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2022 catch, and estimated 2023–2025 catches. The 2024 total biomass is a 2% decrease from the 2023 total biomass.

**The SSC concurs with the BSAI GPT and author recommended ABC and OFL for Kamchatka flounder for 2024 and 2025.**

*Northern Rock Sole*

Northern rock sole is assessed every two years. The last full assessment was in 2022. This year, a harvest projection was presented. A full assessment is scheduled for 2024. There was no public testimony.

Northern rock sole is assessed using an age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2022 catch, and estimated 2023–2025 catches. The 2024 total biomass is a 19% increase from the 2023 total biomass.

**The SSC concurs with the BSAI GPT and author recommended ABC and OFL for Northern rock sole for 2024 and 2025**.

*Flathead Sole*

Flathead sole is assessed every four years. The last full assessment was in 2020. This year, a harvest projection was presented. An update assessment is scheduled for 2024. There was no public testimony.

Flathead sole is assessed using an age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2022 catch, and estimated 2023–2025 catches. The 2024 total biomass is a 0.5% increase from the 2023 total biomass.

**The SSC concurs with the BSAI GPT and author recommended ABC and OFL for the flathead sole for 2024 and 2025.**

*Alaska Plaice*

Alaska Plaice is assessed every four years. The last full assessment was in 2021. This year, a harvest projection was presented. A full assessment is scheduled for 2024. There was no public testimony.

Alaska plaice is assessed using an age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2022 catch, and estimated 2023–2025 catches. The 2024 total biomass is a 2% increase from the 2023 total biomass.

**The SSC concurs with the BSAI GPT and author recommended ABC and OFL for Alaska plaice for 2024 and 2025.**

*Pacific Ocean Perch*

Pacific Ocean Perch (POP) is assessed every two years. The last full assessment was in 2022. This year, a harvest projection was presented. A full assessment is scheduled for 2024. There was no public testimony.

Pacific Ocean Perch is assessed using an age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2022 catch, and estimated 2023–2025 catches. The 2024 total biomass is a 2% decrease from the 2023 total biomass.

**The SSC concurs with the BSAI GPT and author recommended ABC and OFL for POP for 2024 and 2025.**

*Blackspotted/Rougheye Rockfish*

Blackspotted/rougheye (BS/RE) rockfish are assessed every two years. The last full assessment was in 2022. This year, a harvest projection was presented. A full assessment is scheduled for 2024. There was no public testimony.

BS/RE is assessed using an age-structured model and is managed in Tier 3b. The standard projection model was updated with the final 2022 catch, and estimated 2023–2025 catches. The 2024 total biomass is a 2% increase from the 2023 total biomass. The Maximum Subarea Species Catch (MSSC) continues to be exceeded for this stock.

**The SSC concurs with the BSAI GPT and author recommended ABC and OFL for BS/RE for 2024 and 2025.**

*Atka mackerel*

Atka mackerel is assessed every two years. The last full assessment was in 2022. This year, a harvest projection was presented. A full assessment is scheduled for 2024. There was no public testimony.

Atka mackerel is assessed using an age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2022 catch, and estimated 2023–2025 catches. The 2024 total biomass is a 2% increase from the 2023 total biomass.

**The SSC concurs with the BSAI GPT and author recommended ABC and OFL for Atka mackerel for 2024 and 2025.**

## Catch Reports

The purpose of catch reports under the revised stock assessment definitions is to ensure sudden changes in the fishery are not missed in years when no operational stock assessment is conducted. This is a new product under the stock assessment prioritization process, applicable to stocks classified under Tiers 4-6. Catch reports are intended to compare observed fishery removals to the TACs and ABCs.

The SSC provides the general comment on catch reports that table captions should include units for the listed values.

Based upon the catch reports as presented, the SSC highlights:

- The 2022 and 2023 catches reported for sharks, shortraker rockfish, and other flatfish are all below the respective TACs for these years.
- For the Bogoslof pollock stock, the 2022 catch of 259 t exceeded the TAC by 9 t. However, the 2022 TAC of 250 t was well below the ABC of 85,109 t. The 2023 catch for this stock was below the TAC.
- For the Other Rockfish complex, the 2022 total BSAI catch (1,308 t) exceeded the BSAI-wide TAC (1,144 t), and in both 2022 and 2023 AI catch exceeded both the TAC and ABC by 47-67%. The SSC notes that exceedances have occurred in a majority of the last 10 years for this complex within the AI region.

## Forage Species Report

The 2023 BSAI Forage Report is not a formal stock assessment. The SSC appreciates new directions the author is exploring with this report. The author notes that future efforts will be aimed at developing synthetic indices from multiple data sources and is hoping to link spatial and temporal changes in these indices to environmental conditions. It is expected that next year this report will switch to an even year cycle along with the Gulf of Alaska forage report. No forage report will be presented in odd numbered years going forward.

In 2023, the abundance of EBS forage was generally low, including near all-time lows for capelin, eulachon, and the integrated forage index. EBS bottom trawl and BASIS surveys indicate increases for herring since 2018, which is promising for herring predators, but problematic in avoiding bycatch of this prohibited species. Prohibited species catch of herring has increased since 2020, with 2023 the third highest year. Squid catches since 2019 are double historical maximums, maintaining the large increase since 2019.

The SSC is pleased to see the report including data from surface trawls conducted during the Bering Arctic Subarctic Integrated Survey (BASIS). In past reports, BASIS data have not been included to avoid overlap with the Ecosystem Status Reports. The SSC supports the author's efforts to include novel use of the BASIS

survey data that is complementary to other data sources in this report and not redundant to the Ecosystem Status Reports.

The SSC is also pleased that the authors noted the BASIS data will be presented in units of catch-per-unit-effort (CPUE) so that comparisons can be made with the BTS and across regions of varying size. Whereas the bottom trawl and surface trawls surveys generally do not overlap in time, the SSC recommends evaluating whether there is sufficient spatiotemporal overlap of the two surveys, potentially late summer in the northern Bering Sea, where a more direct comparison between results can be made. Nonetheless, annual trends in CPUE from the two survey methods should be informative.

The SSC appreciates inclusion of maps and figures to compare annual changes in prevalence and density. The SSC did question why prevalence is not presented as a proportion in the time series graphs. Using proportion or another standardized metric of frequency of occurrence would allow comparison across survey platforms.

The authors note that the Fishery Management Plan forage group is large and diverse, containing over fifty species. Additionally, many of these species have markedly different life spans, maximum sizes, growth rates, and body shapes. The SSC suggests that one way to identify species for greater focus is to consider the predators of interest. Quantitatively, this might be forage species that constitute a certain proportion of a predator's diet or a certain proportion of predators that consume a given prey item. The SSC recognizes the majority of the report would not be structured this way, but it would help in understanding what predators are affected by changes in a given species. For example, only predators with a very large gape size (halibut, cod, pinnipeds), could eat adult herring in the Bering Sea, whereas predators with smaller gape sizes can only eat the smaller size classes of juvenile herring.

The SSC supports the Plan Teams recommendations for authors of this report to include reference levels in graphs and work with the Ecosystem Status Report team to interface with their reports and the Ecosystem and Socioeconomic Profiles.