NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

Angel Drobnica, Chair | David Witherell, Executive Director
1007 W. 3rd Avenue, Suite 400, Anchorage, AK 99501
Phone 907-271-2809 | www.npfmc.org

SCIENTIFIC AND STATISTICAL COMMITTEE
FINAL REPORT TO THE
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
December 4th – 6th, 2023

The SSC met from December 4th – 6th, 2023 in Anchorage, AK. Members present in Anchorage were:

Sherri Dressel, Co-Chair *Alaska Dept. of Fish and Game*	Franz Mueter, Co-Chair *University of Alaska Fairbanks*	Chris Anderson *University of Washington*
Amy Bishop *University of Alaska Fairbanks*	Curry Cunningham *University of Alaska Fairbanks*	Martin Dorn *University of Washington*
Mike Downs *Wislow Research*	Jason Gasper *NOAA Fisheries–Alaska Regional Office*	Dana Hanselman *NOAA Fisheries—AFSC*
Brad Harris *Alaska Pacific University*	Michael Jepson *Independent Contractor*	Kailin Kroetz *Arizona State University*
Kathryn Meyer *Washington Dept. of Fish and Wildlife*	Andrew Munro *Alaska Dept. of Fish and Game*	Chris Siddon *Alaska Dept. of Fish and Game*
Ian Stewart *Intl. Pacific Halibut Commission*	Patrick Sullivan *Cornell University*	Robert Suryan *NOAA Fisheries—AFSC*

Members that attended remotely were:

Alison Whitman, Vice Chair
Oregon Dept. of Fish and Wildlife

Members absent were:

Robert Foy
NOAA Fisheries—AFSC

SSC Administrative Discussion

The SSC received a presentation from Diana Evans (NPFMC) describing protocols and other announcements for the meeting. Ms. Evans noted the two plan team nominations under consideration and that the Council would be considering an alternative WDFW SSC member at this December meeting as well.

IRA Funding Workplan

The SSC received an update on the IRA funding proposal from Diana Evans (NPFMC) that would request support for a staff position and for workshops and analytical work in support of ongoing Council projects to evaluate and enhance the Council's climate readiness. Specifically, the proposal would support two projects: (1) the Programmatic EIS (PEIS) that was initiated in June 2023 and (2) analytical work and workshops to further some of the research and management recommendations that were identified in the report on the February 2023 SSC workshop. SSC discussions focused on the second project and the associated timelines and workshops. Additional discussions regarding the Climate Change Taskforce (CCTF) workshop, which would help inform the PEIS and the Council's climate readiness, are included under agenda item D2.

The SSC supports the proposed projects, which are responsive to the IRA proposal guidelines, and appreciates the draft timeline. Given time constraints during the February and April SSC meetings, **the SSC suggests a short SSC only 'workshop' at the February meeting to identify and briefly outline case studies from the North Pacific to bring to the national SCS8 meeting**. The SSC further suggests a workshop in April that may be slightly broader to include sablefish experts that can help the SSC with scoping an analysis focused on including socio-economic information in a bio-socio-economic model for sablefish in a climate change context. The analysis could, for example, explore harvest control rules for sablefish that would optimize socio-economic benefits from the fishery (e.g. Maximum Economic Yield).

The SSC notes that the scope for this or other analyses that would be considered under the IRA funding would have to be limited to meet the constrained timelines. For example, an overhaul of existing harvest control rules (HCRs) is unlikely to be accomplished within the timeline of the IRA funding, but specific actions to enhance climate resilience or targeted modifications to HCRs for individual species or groups of species could be explored through the proposed discussion paper and subsequent analyses. The SSC suggests that sablefish analyses could also be extended to include spatial considerations such as spatial apportionments. Both the bio-socio-economic analyses and spatial analyses could result in recommendations that would be broadly applicable across stocks.

B1 Plan Team Nominations

The SSC reviewed the nomination of Dr. Lukas DeFilippo to the BSAI Groundfish Plan Team and Mr. Ethan Nichols to the BSAI Crab Plan Team. The SSC finds these nominees to be well-qualified and recommends the Council approve their nominations.

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 the 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 for each score be provided, even when that score indicates no elevated risk.

The SSC found 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 reference 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 representatives, 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 the characterization of fishing community engagement, dependency, and sustained participation 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 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 notes 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 temperatures at mid-depth and surface, combined with 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 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 even if only for a limited period of time (the SSC did not discuss this suggestion in the context of survey prioritization, 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, which 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 currently predicts a moderate warming in surface waters in 2024, 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 larvae 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 populations 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. 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: 2023 OFLs, ABCs, and TACs and 2024/2025 OFLs and ABCs are from harvest specifications adopted by the Council in December 2022 and December 2023 respectively as well as inseason actions; 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 above those initially set in 2022 however total catch remained < 2,000,000 t

Table 2. SSC recommended OFLs and ABCs for Groundfish in the Gulf of Alaska (metric tons) for 2024 and 2025. Bold font indicates where the SSC recommendation differed from the GOA Plan Team.

Species	Area	2023 OFL	2023 ABC	2023 TAC	Catch 11/9/2023	2024 OFL	2024 ABC	2025 OFL	2025 ABC
Pollock	State GHL	n/a	3,723	n/a	-	n/a	**4,769**	n/a	3,942
	W (610)	n/a	26,958	26,958	26,226	n/a	**38,882**	n/a	32,144
	C (620)	n/a	77,005	77,005	65,384	n/a	**90,937**	n/a	75,179
	C (630)	n/a	33,729	33,729	33,394	n/a	**50,587**	n/a	41,821
	WYAK	n/a	7,523	7,523	6,888	n/a	**5,565**	n/a	4,601
	Subtotal	173,470	148,938	145,215	131,892	269,916	**190,740**	182,891	157,687
	EYAK/SEO	15,150	11,363	11,363	0	12,998	9,749	12,998	9,749
	Total	188,620	160,301	156,578	131,892	282,914	**200,489**	195,889	167,436
Pacific Cod	W	n/a	7,464	5,225	3,630	n/a	8,745	n/a	7,638
	C	n/a	14,830	11,123	10,836	n/a	20,590	n/a	17,981
	E	n/a	2,340	1,755	417	n/a	2,937	n/a	2,565
	Total	29,737	24,634	18,103	14,883	38,712	32,272	33,970	28,184
Sablefish	W	n/a	4,473	4,473	2,723	n/a	4,699	n/a	4,719
	C	n/a	9,921	9,921	6,413	n/a	9,651	n/a	9,693
	WYAK	n/a	3,205	3,205	2,401	n/a	2,926	n/a	2,940
	SEO	n/a	5,602	5,602	4,582	n/a	5,320	n/a	5,343
	GOA Total	n/a		23,201	16,118	n/a		n/a	
Alaska-wide OFL and ABC	AK Total	47,390	40,502	n/a	22,746	55,084	47,146	55,317	47,350
Shallow-Water Flatfish	W	n/a	22,485	13,250	25	n/a	23,337	n/a	23,782
	C	n/a	26,769	26,769	1,002	n/a	27,783	n/a	28,311
	WYAK	n/a	2,677	2,677	6	n/a	2,778	n/a	2,831
	EYAK/SEO	n/a	1,606	1,606	0	n/a	1,667	n/a	1,699
	Total	65,736	53,537	44,302	1,034	68,121	55,565	69,354	56,623
Deep-Water Flatfish	W	n/a	256	256	24	n/a	237	n/a	234
	C	n/a	2,105	2,105	72	n/a	2,655	n/a	2,614
	WYAK	n/a	1,407	1,407	4	n/a	1,856	n/a	1,827
	EYAK/SEO	n/a	2,048	2,048	4	n/a	2,314	n/a	2,278
	Total	6,918	5,816	5,816	105	8,387	7,062	8,257	6,953
Rex Sole	W	n/a	3,236	3,236	23	n/a	3,367	n/a	3,363
	C	n/a	13,110	13,110	392	n/a	13,639	n/a	13,624
	WYAK	n/a	1,439	1,439	1	n/a	1,453	n/a	1,439
	EYAK/SEO	n/a	2,879	2,879	0	n/a	2,905	n/a	2,877
	Total	25,135	20,664	20,664	415	25,978	21,364	25,900	21,303
Arrowtooth Flounder	W	n/a	30,469	14,500	384	n/a	30,409	n/a	30,323
	C	n/a	65,000	65,000	8,780	n/a	64,871	n/a	64,688
	WYAK	n/a	7,886	7,886	35	n/a	7,870	n/a	7,848
	EYAK/SEO	n/a	16,130	6,900	49	n/a	16,099	n/a	16,053
	Total	142,749	119,485	94,286	9,248	142,485	119,249	142,074	118,912
Flathead Sole	W	n/a	12,793	8,650	30	n/a	13,273	n/a	13,521
	C	n/a	21,487	21,487	434	n/a	21,307	n/a	21,702
	WYAK	n/a	2,320	2,320	0	n/a	3,876	n/a	3,949
	EYAK/SEO	n/a	2,880	2,880	0	n/a	2,047	n/a	2,086
	Total	48,161	39,480	35,337	464	49,414	40,503	50,322	41,258
Pacific ocean perch	W	n/a	2,529	2,529	2,486	n/a	1,787	n/a	1,726
	C	n/a	29,940	29,940	25,941	n/a	28,757	n/a	27,768
	WYAK	n/a	1,370	1,370	1,366	n/a	2,110	n/a	2,038
	W/C/WYAK	40,308	33,839	33,839	29,793	n/a	n/a	n/a	n/a
	SEO	3,994	3,354	3,354	0	n/a	7,065	n/a	6,822
	Total	44,302	37,193	37,193	29,793	47,466	39,719	45,835	38,354
Northern Rockfish	W	n/a	2,614	2,614	388	n/a	2,535	n/a	2,446
	C	n/a	2,350	2,350	935	n/a	2,280	n/a	2,200
	E	n/a	-	-	0	n/a	0	n/a	0
	Total	5,927	4,964	4,964	1,323	5,750	4,815	5,548	4,646
Shortraker Rockfish	W	n/a	51	51	21	n/a	**34**	n/a	**34**
	C	n/a	280	280	263	n/a	**189**	n/a	**189**
	E	n/a	374	374	204	n/a	**424**	n/a	**424**
	Total	940	705	705	488	863	647	863	647
Dusky Rockfish	W	n/a	149	149	74	n/a	145	n/a	137
	C	n/a	7,647	7,647	3,415	n/a	7,365	n/a	6,979
	WYAK	n/a	90	90	1	n/a	84	n/a	81
	EYAK/SEO	n/a	31	31	1	n/a	30	n/a	28
	Total	9,638	7,917	7,917	3,491	9,281	7,624	8,796	7,225
Rougheye and Blackspotted Rockfish	W	n/a	180	180	101	n/a	197	n/a	**197**
	C	n/a	232	232	156	n/a	315	n/a	**315**
	E	n/a	363	363	176	n/a	525	n/a	**525**
	Total	930	775	775	434	1,555	1,037	1,566	**1,037**
Demersal shelf rockfish	Total	376	283	283	188	376	283	376	283
Thornyhead Rockfish	W	n/a	314	314	53	n/a	314	n/a	314
	C	n/a	693	693	91	n/a	693	n/a	693
	E	n/a	621	621	57	n/a	621	n/a	621
	Total	2,170	1,628	1,628	201	2,170	1,628	2,170	1,628
Other Rockfish	W/C (+ WYAK for 2024 and 2025 only)	n/a	940	940	940	n/a	**1,353**	n/a	**1,353**
	WYAK (for 2023 only)	n/a	370	370	54	n/a	**n/a**	n/a	**n/a**
	EYAK/SEO	n/a	2,744	300	32	n/a	2,421	n/a	2,421
	Total	5,320	4,054	1,610	1,026	4,977	3,774	4,977	3,774
Atka mackerel	Total	6,200	4,700	3,000	462	6,200	4,700	6,200	4,700

Table 2. Cont. SSC recommended OFLs and ABCs for Groundfish in the Gulf of Alaska (metric tons) for 2024 and 2025. Bold font indicates where the SSC recommendation differed from the GOA Plan Team.

Species	Area	2023 OFL	2023 ABC	2023 TAC	Catch 11/9/2023	2024 OFL	2024 ABC	2025 OFL	2025 ABC
Big Skate	W	n/a	591	591	117	n/a	745	n/a	745
	C	n/a	1,482	1,482	814	n/a	1,749	n/a	1,749
	E	n/a	794	794	189	n/a	341	n/a	341
	Total	3,822	2,867	2,867	1,120	3,780	2,835	3,780	2,835
Longnose Skate	W	n/a	151	151	66	n/a	104	n/a	104
	C	n/a	2,044	2,044	481	n/a	1,894	n/a	1,894
	E	n/a	517	517	631	n/a	538	n/a	538
	Total	3,616	2,712	2,712	1,178	3,380	2,536	3,380	2,536
Other Skates	GOA-wide	1,311	984	984	443	887	665	887	665
Sharks	GOA-wide	6,521	4,891	4,891	1,777	6,521	4,891	6,521	4,891
Octopuses	GOA-wide	1,307	980	980	154	1,307	980	1,307	980
TOTAL		**646,826**	**539,072**	**468,796**	**222,863**	**765,608**	**598,431**	**673,289**	**562,220**

Sources: 2023 OFLs, ABCs, and TACs are from harvest specifications adopted by the Council in December 2022, 2023 catches through November 9, 2023 from the AKR Catch Accounting System.

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 projection, catch report, and research assessment. **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 and 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 author- 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 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 concerns highlighted under the Fishery Performance category, indications 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 the 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, in which reductions from max-ABC are not intended to be annual. 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, 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 in recent years 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 these 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 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 Stock Assessment 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 recognizes that the September/October GPT and SSC reports did not specify that the implementation of time-varying growth had to remain the same as presented in September (annually varying), and acknowledges that specification such as this could help avoid confusion in the future. However, the SSC agrees 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 does 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 and 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 above for M. 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 recommended OFL and maximum permissible ABC 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 with no reduction from maxABCs.**

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, with no reduction from maxABC.

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 with no reduction from maxABC, as well as the associated area apportionments of ABC.

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, with no reduction from maxABC.

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, with no reduction from maxABC.

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 OFL for Northern rock sole for 2024 and 2025. **The SSC also concurs with the ABCs based on a 36% risk table reduction from maxABC in 2024 and 52% risk table reduction from maxABC in 2025** due to the same concerns that were identified in the 2022 assessment (concerns about diagnostics and retrospective patterns in the assessment) and the same method of reduction. Specifically, the reduced ABC was set equal to the OFL from the projected alternative model run (Model 22.1).

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, with no reduction from maxABC.

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, with no reduction from maxABC.

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 with no reduction from maxABC, as well as the associated area apportionments of ABC.

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 SSC concurs with the BSAI GPT and author recommended OFL for BS/RE for 2024 and 2025. The SSC also supports the ABC based on the same percent reduction from maxABC that was used for 2023 (the AI portion of the stock was reduced by 12% for an overall BSAI reduction of 11% from max), as well as the associated area apportionments of ABC.**

The Maximum Subarea Species Catch (MSSC) continues to be exceeded for this stock.

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 with no reduction from maxABC, as well as the associated area apportionments of ABC.

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.

C4 GOA SAFE and Harvest Specifications for 2024/2025

Walleye Pollock

The SSC thanks the authors and the GOA GPT for work completed on this assessment. This year, the assessment maintained the existing model structure but transitioned to a new modeling platform, Template Model Builder (TMB), and was therefore assigned a new model number (Model 23.0) to reflect this change. During the October SSC meeting, the authors showed that this change in platform did not lead to any substantive changes in model estimates. The author highlighted data conflicts from various surveys integrated into the assessment, noting poor model fits, especially in recent times, except for the AFSC summer acoustic survey. An Ecosystem and Socio-economic Profile (ESP) report card was included in the assessment indicating neutral ecosystem and socio-economic conditions. Further comments regarding the ESP are included in the General Stock Assessment Comments section. There was no public testimony.

The SSC appreciates the new ways the authors are looking at and handling the data. The SSC looks forward to the authors exploring any enhanced efficiency and statistical advantages of using the TMB platform such as modeling of weight-at-age, selectivity, and maturity-at-age. Since fishery weight-at-age is so variable, the SSC is interested in seeing if TMB can help use these data directly in the model. Additionally, current research on time-dependent selectivity within projections was presented for feedback. The SSC recommends some of these new options and developments be presented at the upcoming CIE review and hopefully the reports will be ready for September GPT review in 2024.

The SSC supports the use of Model 23.0 for W/C/WYAK, but is concerned by the dramatic increase in ABC of 56% which is immediately expected to drop down in 2025 to near the 2023 ABC. The risk table had an elevated level 2 in the stock assessment concerns category. The author and GOA GPT did not

recommend a reduction from maxABC as determined by Model 23.0. However, the recent mix of very low and just above average recruitments do not indicate that there should be that much new biomass entering the system and the very large 2012 year class should be diminished by now and in the less selected plus group. Therefore, the increase in ABC seems extreme, and the SSC is concerned about discrepancies between model predicted and survey trends (Fig 1.32). While the SSC recognizes that several indices increased substantially, the SSC recommends a reduction from maxABC for 2024 based on the above concerns. Specifically, the SSC recommends setting the 2024 ABC for W/C/WYAK halfway between the 2023 ABC and the recommended 2024 maxABC. **This represents an 18% reduction from maximum permissible ABC. The SSC recommends no reduction from maxABC in 2025 for the W/C/WYAK area. Finally, the SSC recommends the full Tier 5 maxABC for the SEO area in both 2024 and 2025, as well as the proposed area and seasonal allocations for the W/C/WYK area.**

Model considerations for the next cycle:

- The fits to the age compositions in recent years for older fish, such as ages nine and 10, consistently show negative residuals for the NMFS BTS and the ADF&G BT that could be induced by dome-shaped selectivity. The author has introduced OSA residuals instead of Pearson residuals and these appear to indicate negative residuals for the BTS and positive residuals for the ADF&G survey. The authors explained that this can happen, but the SSC would like more explanation on how to interpret OSA residuals, and continued presentation of Pearson residuals for consistency (also see the General Stock Assessment Comment regarding OSA residuals).
- Catchability for the BTS remains similar to 2022 and is tightly constrained by a prior, but the acoustic summer survey catchability dropped significantly between 2022 and 2023. This may be responsible for some of the scale changes occurring from 2022 to 2023. The author notes that the summer survey index is the only one fit well by the model, so the model responds strongly to changes in this index.
- A related aspect to the scale change is that the dome-shaped nature of fishery selectivity could suggest a higher F on the incoming middle-age recruitments since the 2012 age class in the plus group is acting as an SSB refuge.
- Check the recruitment that is set or estimated to be "1" in 2023. If there is no information due to lack of data for young pollock, perhaps recruitment in 2023 should be closer to mean recruitment.
- Continue to investigate the estimates of recruitment variability and the extremely low recruitment estimates in recent years.
- The SSC agrees with the GOA GPT to continue to present the 10-year standard used in AFSC assessments for retrospectives as it helps review bodies compare across assessments more readily.

Pacific Cod

The operational full assessment for Pacific cod in the GOA is an age- and length-structured model using the Stock Synthesis platform. The model treats the trawl, longline, and pot fisheries separately. Fishery independent information used in the assessment include the AFSC bottom trawl survey and AFSC longline survey. Catchability for the longline survey is time-varying and modeled with a temperature covariate.

Data that were updated for the assessment included 2022 and 2023 catch data, fishery size composition data for 2022 and 2023, AFSC longline survey abundance and size composition data for 2023, AFSC bottom trawl abundance and length composition data for 2023, and conditional age-at-length (CAAL) data for the 2022 fishery. The 2023 bottom trawl survey index increased by 53% compared to 2021, and the 2023

longline survey increased by 32%, suggesting an improvement in stock status, though both indices remain below their long-term average.

The model structure and assumptions for this assessment have been very stable, with the current base model having been used since 2019. Two models were presented for review. Model 19.1a is a strict update of last year's model with recent survey and fishery data, whereas model 19.1b implements a single change in the default minimum sample size for CAAL data from 1.0 to 0.001. This might not seem to be an important change *a priori*, but because the input sample sizes were adjusted downwards by a factor of 0.14, there were many sample sizes that were reset to 1.0. As a consequence, a much higher emphasis than was intended was given to relatively uncommon age categories in the objective function, and on the conditional age-at-length data in general. Correcting this problem is necessary even when the goal for the assessment is an operational update. This change resulted in increases in estimated recruitment and spawning biomass, with an average increase of around 5% in spawning biomass.

Overall, there were no other major issues with the model update, and the fits to new data were considered acceptable. Therefore, **the SSC agrees with the GOA GPT and authors to use Model 19.1b for 2024 and 2025 harvest specifications.**

The risk table analysis indicated a level 2 concern in the population dynamics category, given the persistent level of low recruitment. No other risk table categories indicated elevated concerns. The authors and GOA GPT did not suggest any reduction based on the risk table, and the SSC concurs. **The SSC supports the authors' and GOA GPT's recommendation to set ABC and OFL for 2023 and 2024 at the maximum permissible level under Tier 3b. The SSC also supports area-specific ABC apportionments, which were updated with new GOA trawl survey data.**

Estimated selectivity for both the bottom trawl survey and the longline survey showed patterns that seemed very unusual. For the bottom trawl survey, which modeled time-varying selectivity blocks, there was a shift from a strongly dome-shaped selectivity in the 1990-1995 time block to asymptotic selectivity in subsequent time blocks. The assessment did not provide a rationale for how a standardized survey could show such extreme changes in selectivity. For the longline survey, a strongly dome-shaped selectivity pattern was estimated for Pacific cod, in contrast to sablefish selectivity, which is estimated to be asymptotic for this survey in the sablefish assessment. In theory, the longline survey's depth range would have selectivity issues for smaller fish at shallower depths, not larger deeper fish. Again, there is no explanation in the assessment as to why this selectivity pattern should be considered a reasonable result.

The assessment reported an ongoing reduction in the magnitude of the estimated natural mortality during the 2014-2016 period of elevated natural mortality. It is important to continue tracking this phenomenon in future assessments. At some point, it may be feasible to reconsider whether it is necessary to model this period of increased natural mortality.

The SSC is encouraged by the collaborations between stock-assessment authors and the regional ecosystem team. The assessment document highlights "investigating environmental links to growth" but clearly other environmental factors are being explored with regard to their influence on different stock metrics (e.g., mortality, recruitment in addition to growth). In particular, the Risk Table slide in the GOA GPT presentation (Slide 20), visually highlights an apparent relationship between SST and recruitment. Additional information on the work shown in that slide should be documented for risk table considerations. Further, the SSC believes this to be an interesting line of research and would like to see it pursued, and the details shared with the SSC when available.

Specific additional recommendations:

- The SSC reiterates its encouragement for the authors to consider whether information from the IPHC setline survey and NMFS longline survey, alongside the NMFS bottom trawl survey, may

provide a superior basis for apportionment recommendations, perhaps through the use of an integrated spatiotemporal model or a multi-survey random effects model.

- The SSC supports the GOA GPT recommendation to work up the backlog of maturity data, and further to evaluate trends in maturity, as well as relationships between growth and maturity.
- The SSC requests the authors evaluate the utility of the 14 forecast recruitment deviations. It is not clear where they are used in the document and whether they affect the estimation of other parameters.
- **Given the increasing proportion of the pot fishery catch and the relatively low observer coverage in the pot fishery, observer coverage priorities for the different GOA cod fisheries should be reevaluated in the annual observer deployment plan by AFSC Fisheries Monitoring and Analysis program. These data inform the spatial distribution of the fishery and size and age composition, among others.**
- The SSC requests a thorough revaluation of the current modeling approach for survey selectivity and catchability, including alternatives to the current selectivity blocks in the trawl survey, and alternatives to a strongly dome-shaped selectivity in the longline survey, and whether selectivity rather than catchability is more appropriately modeled with a time-varying temperature covariate.

GOA Pacific Cod ESP

The SSC reviewed the GOA Pacific cod ESP report card. Physical indicators were average, lower trophic indicators were slightly above average, upper trophic indicators were average in 2023, and socioeconomic indicators were above average in 2022 due to high revenue per unit effort. Overall ecosystem conditions were neutral for Pacific cod, though there is concern that the ongoing transition to El Niño conditions will negatively impact Pacific cod.

The SSC appreciates the evaluation of indicators from the GOA R-CEATTLE model, and looks forward to continued evaluation of R-CEATTLE output in the GOA cod ESP, as well as other ESPs and the GOA ESR. The SSC requests that documentation of the GOA R-CEATTLE model be included in future SAFEs as a standalone chapter similar to the ESR reports and similar to our recommendation for the CEATTLE model in the EBS (see EBS pollock section).

GOA Flatfish

Deepwater Flatfish Complex

An operational update assessment was provided for the deepwater flatfish stock complex in the GOA. This stock complex is composed of Dover sole, Greenland turbot, Kamchatka flounder and deepsea sole and is assessed on a quadrennial basis. The last full assessment was in 2019. There was no public testimony.

Data updates included adding 2019-2023 fishery catches and length compositions, 2021 and 2023 AFSC trawl survey biomass and length composition, 2019 and 2021 AFSC bottom trawl survey CAAL, and the catch history of Kamchatka flounder from 2011-2023.

Greenland turbot, Kamchatka flounder and deepsea sole are assessed under Tier 6. Dover sole is assessed with an age-structured model under Tier 3. There were no changes to the Dover sole model (19.3) structure since the 2019 assessment, but the author made several minor modifications (19.3.1) including: (1) adjusting the variance estimates used to fit the bottom trawl survey biomass for years with missing data in the 700-1,000 m strata and (2) using Francis reweighting where the shallow trawl survey coverage composition relative weights are set equal to the full trawl survey coverage relative weights.

The author provided a bridging analysis of three model runs, all including new data through 2023: (1) Model 19.3 - the 2019 model with the updated data, (2) Model 19.3 with updated data but adjusting the variance for survey biomass estimates, and (3) Model 19.3.1, which used the model 19.3 with the new data and adjusted variances based on Francis reweighting. The bridging examination of spawning biomass, recruitment deviations, fishing intensity, and fit to the survey biomass index indicated that adding new data and minor model adjustments led to very small increases in the magnitude of recruitment and spawning biomass throughout the time series. The updates had little impact on the negative log likelihood for fits to the survey index and the author chose Model 19.3.1 because the adjustments were logical, minor changes.

The SSC concurs with the GOA GPT and author recommendation to use Model 19.3.1 for the Dover Sole portion of the deepwater flatfish assessment. Results from this model place Dover Sole in Tier 3a.

The ABC for deepwater flatfish is determined at the level of the complex by summing species-specific portions of the ABC. The ABC area apportionment methods were unchanged and are based on the proportion of survey biomass of Greenland turbot, Kamchatka flounder, and deepsea sole found within each management area from 2001–2021 and estimates of 2023 and 2024 biomass for Dover sole in each management area based on results from the REMA analyses.

The author scored Assessment Considerations at level 2 in the Risk Table because cohort-specific and spatial patterns in growth are currently not considered in the Dover sole assessment model and there are no fishery age data. Another consideration is the missing survey depth/area strata.

Catches of deepwater flatfish complex species remain well below the OFL.

The SSC concurs with the GOA GPT and author recommended OFL and ABC with no reduction from maxABC for the deepwater flatfish complex for 2024 and 2025, as well as the associated area apportionments of ABC.

The SSC supports the GOA GPT recommendation to further investigate how to account for the variance from unsampled survey strata going forward, given that future trawl survey sampling of the 700-1,000m depth strata is unlikely. This includes examining the impacts of the GOA trawl survey re-stratification planned for 2025.

The SSC suggests the authors consider a geostatistical approach to addressing survey gaps, and consideration of dropping the 700-1000m strata because very little biomass for this complex is observed at those depths.

The SSC requests that the author provide a biological rationale for using two time stanzas of M beyond just an improved fit to the data. Additionally, the estimates of M between males and females are very similar and may not need to be estimated separately.

The SSC requests that the authors investigate why retention of Dover sole has declined precipitously in the last three years.

The SSC supports the author and GOA GPT recommendation to re-evaluate the estimation of the historical catchability coefficient using data through 2013, to account for an apparent shift in catchability, as an alternative for consideration in the next assessment.

The SSC concurs with the GOA GPT recommendation to use 2011-2023 as the period for calculating average catch of Kamchatka flounder to determine OFL and ABC in future assessments.

The SSC has previously noted that the Dover sole model is currently borrowing an aging error matrix from the West Coast and looks forward to seeing a GOA-specific aging error matrix for the next full assessment.

GOA Rockfish

Pacific Ocean Perch

The SSC received an operational update assessment for GOA POP. No public testimony was provided. The SSC thanks the author for the assessment provided. This stock is fully assessed in Tier 3 in odd years. No changes were made to the underlying assessment model beyond the standard updates to the size-age matrices. Data updates included adding GOA bottom trawl survey biomass estimates for 2023, survey age compositions for 2021, fishery age compositions for 2022, final catch for 2021 and 2022, and projected catch for 2023-2025. The authors noted that survey data for 2023 was highly uncertain for POP, due to the presence of several very large hauls. Catches of POP remain low relative to historic highs, but are increasing. The area apportionment percentages for setting sub-area ABCs were estimated using the REMA framework based on the same assumptions used in 2021. **The SSC supports the GOA GPT recommendation to specify the OFL at the GOA-wide level to reflect the stock area.** Relative to risk table considerations, the author and GPT determined a level 2, or major concern, for Population Dynamics Considerations and Assessment Related Considerations, while Environmental/Ecosystem Considerations and Fishery Performance were set at Level 1. The SSC discussed that Population Dynamics Considerations may be better categorized as Level 1. The SSC notes that the negative retrospective bias noted under Assessment Considerations is not an immediate population concern as it would result in conservative advice. Nevertheless, the bias should be addressed in the next full assessment as it indicates structural issues with the model.

The SSC accepts the authors' and GOA GPT's recommended OFL and ABCs under Tier 3a for POP for 2024 and 2025, with no reduction from maxABC.

Research recommendations

- As the research on genetic structure of stocks proceeds, information on stock structure, or lack of it, for GOA POP should be updated.

- The SSC notes that comparing retrospective patterns across rockfish species may provide insight on common drivers (see the General Stock Assessment Comments).

- The SSC appreciates the work being done to address earlier GOA GPT, SSC and CIE comments. Please carry forward how all of these comments are being, or have been, addressed into the next full assessment report.

Shortraker rockfish

The SSC received an operational full assessment for GOA shortraker rockfish, which is assessed using Tier 5 methods biennially in odd years. Shortraker is a bycatch species with low exploitation that occurs predominantly in the sablefish longline and trawl fisheries, although longline catches have been declining in recent years as the fleet increasingly transitions to pot gear. The SSC received public testimony from Glenn Merrill (Glacier Fish Company), indicating that the apportionment recommendation from the GOA GPT would be unnecessarily constraining on the fishery and recommended the status quo apportionment method.

Two alternative models were brought forward for consideration in 2023:

1.) Model 19* is the accepted model from the last full assessment in 2019, with a few minor changes and updates to the data. It is a REMA model with a single process error, and a scaling

parameter for each of the three management areas. A coding error was corrected since 2019, which had little influence on model results.

The model was fit to the GOA bottom trawl survey biomass estimates, as well as the estimated relative population weights from the AFSC longline survey. The longline survey data were down-weighted by assigning a weight of 0.5 in order to offset the much smaller estimated uncertainty in the longline estimates relative to the trawl survey estimates, such that they provided a roughly equal contribution to the model. The model also includes length composition data from both the longline and trawl fisheries, the GOA bottom trawl survey, and the longline survey.

Following previous SSC and PT recommendations, the 1984 and 1987 trawl survey estimates were omitted, and the model was also transitioned from implementation in ADMB to TMB using the *rema* R package.

2.) Model 23.3 is identical to model 19* but applies a less subjective approach to adjusting the relative contribution of the longline index, where the indices were weighted equally but additional observation error is estimated for the longline survey. Parameter estimates and the estimated biomass timeseries were very similar to model 19*.

No risk categories were elevated in the risk table and the SSC appreciates the thoughtful discussion under each of the four categories **The SSC supports the author and GOA GPT recommendation to adopt model 23.3 and the resulting ABC and OFL, with no reduction from maxABC.**

One of the key challenges of this assessment remains the lack of validation for shortraker age estimates, which is preventing this stock from being assessed under Tier 4. The authors noted that there is ongoing age validation work based on an analysis of shortraker eye lenses. The SSC looks forward to receiving updates on that project, when available.

The SSC also highlights the data conflict between the longline and trawl survey indices across the Western, Central, and Eastern GOA sub-areas as an area of concern, and supports future research focused on resolving this conflict. The SSC supports the authors' investigation of potential methods of estimating survey selectivity within the model, and notes that drawing from external sources of information may also provide insight into potential drivers of spatial variability among the indices across regions. Specific areas for consideration were investigating the spatial overlap of the two surveys with the shortraker species distribution model output from the EFH evaluation, identifying whether there is any evidence for seasonal effects due to fish behavior relative to survey timing, and/or re-evaluating potential effects of hook saturation and competition with sablefish in the longline survey.

A new apportionment method was recommended by the author and GOA GPT this year, which included predicted biomass from both the trawl and longline RPW data, in contrast to the previous method which apportioned the ABC based on the percentage of predicted biomass using only the trawl survey data. The assessment model estimates biomass using both datasets, and logically it makes sense to use both datasets to predict the proportion of that biomass estimate that occurs within each subregion and to provide a balance in the data conflict. The addition of the longline RPW data in the apportionment process leads to a roughly 9% reduction in ABC for the central GOA sub-area, shifting the biomass primarily to the western sub-area.

Acknowledging that this may constrain fisheries within that sub-area, the GOA GPT recommended accepting the new apportionment method but applying a stair-step between the methods to alleviate some of the concern. The SSC received public testimony that even with the stair-step approach, the reduction in sub-area ABC would almost certainly result in fishery closure as the sub-area ABC has been a constraint even prior to sub-area reductions resulting from the apportionment method change. **As there is no**

immediate conservation concern, the SSC recommends the status quo apportionment method. The SSC acknowledges that this conflicts with the author and GOA GPT recommendation for this stock, and the SSC recommendation for GOA rougheye/blackspotted, which was to use both trawl and longline indices for apportionment.

Future spatial management for this stock was discussed in-depth at the GOA GPT and again during SSC discussion. For shortraker, subareas appear to be smaller than the spatial structure of the stock and, therefore, subarea ABCs appear to be overly constraining for the fishery despite a lack of conservation concern. Recent population genetics research, presented to the GPT in September 2023, found that shortraker do not exhibit signs of evolutionary-scale population structure, which is hypothesized to be a result of high larval connectivity because shortraker inhabit more offshore environments where larvae are less likely to be entrained in finer-scale oceanographic features. **The SSC concurs with the authors and GOA GPT that there is no evidence of conservation concern for this stock at a sub-area level at this time and that current subarea ABCs area may be overly conservative.**

Given that this was the initial rockfish species that involved spatial management of sub-area ABCs on the SSC agenda, the conversation expanded to encompass additional GOA rockfish species with potential spatial management issues. Notably, the rougheye/blackspotted complex, along with Other rockfish and thornyhead, are incidentally caught rockfish with varying population structure that are currently managed with sub-area ABCs (see the "GOA Other Rockfish" section for the specific discussion for that species).

The SSC highlights that areas used for rockfish harvest specifications in the GOA are rooted in management that occurred in the 1980s and 1990s, as public testimony noted, and are precautionary relative to uncertainty regarding stock structure and biology. Current management programs overlay sub-area ABC definitions, which makes changing the sub-areas complicated due to interactions with regulations and fisheries. The SSC also noted that the spatial management of rockfish, in general, is complicated given multiple species, biological diversity, numerous spatial areas, and variety of management issues (e.g., quota programs versus incidental catch in non-quota programs). From this perspective, addressing spatial management for several species simultaneously may make sense as it allows comparison of biological processes and management goals across species, which may better inform and potentially create alignment of sub-areas across stocks, and could facilitate public input on multiple stock issues.

The SSC expressed conceptual support for the GOA GPT recommendation urging the Council to consider implementing step 2 of the Stock Structure and Spatial Management Policy for shortraker and other rockfish. However, the SSC highlights that sub-area ABCs are consolidated into a GOA-wide assessment for status determination, and there is no conservation concern associated with the existing apportionment scheme. Consequently, the SSC was unclear if the spatial management policy applies in this context. **Should the Council wish to consider a change to the current subarea apportionment for shortraker rockfish before the SSC applies the apportionment method based on the longline and trawl indices, as was recommended by the author and Plan Team and was applied by the SSC for RE/BS (see next section), the SSC recommends the DSR spatial management paper could be used as an example to provide the type of information needed to inform this issue (economic- and management-related impacts of alternative spatial allocation of ABC, as well as the risks of localized depletion). Since similar issues apply to the rougheye/blackspotted complex, thornyhead and other rockfish, the SSC suggests considering all of these species/complexes in a single document or analysis. However, there may be no need to include other rockfish given SSC recommendations for this complex (see 'Other Rockfish' section).**

Rougheye/Blackspotted Rockfish

An operational full Tier 3 assessment was conducted for GOA RE/BS rockfish. This assessment is conducted every two years. The SSC appreciates the work by the authors, responsiveness to previous SSC recommendations, and the discussions at the GOA GPT on this assessment. There was no public testimony.

Recent survey trends for this stock suggest a decline in abundance, though this stock has historically shown high interannual variability and high uncertainty in the annual estimates. The 2023 longline survey RPN decreased 21% from 2022 and was the lowest on record, following a below average trend in RPN since 2020. The 2023 bottom trawl biomass increased 27% from 2021, with the last five out of six bottom trawl surveys being below the time series mean. However, uncertainty in the point estimates for both surveys show overlapping 95% confidence intervals for most years going back to 2013. Exploitation of this stock in the fishery has been low due to mortality being incidental in fisheries targeting other species.

The authors brought forward several alternative age-structured assessment models:

- Model 15.4: the base assessment model used in 2021 with updated catches, trawl and longline survey abundance indices, and fishery and survey composition data. This model was first approved in 2015.
- Model 15.4a: same as Model 15.4 but with the 1984 and 1987 bottom trawl survey data removed.
- Model 23.1: same as Model 15.4a but with the updated weight-at-age vector and age-length transition matrix, new M prior, new maturity curve, and new aging error matrix.
- Model 23.1a: same as Model 23.1 but with constrained priors on the bottom trawl survey biomass and the longline survey RPNs (Mean = 1.0, CV = 0.05) and no longer estimating σR.
- Model 23.1b (author recommended): same as Model 23.1a but with M fixed to the prior mean of 0.042.

Models 23.1a and 23.1b were introduced by the authors to address poor model fit when survey and fishery catch information were updated. These models consisted of adjustments to the SSC and GOA GPT requested models from September (15.4a and 23.1), with a bridging model (23.1a) to the author's recommended model (23.1b).

The SSC concurs with the GOA GPT and authors recommended model, 23.1b, for harvest specifications under Tier 3a. A key challenge in this model is stabilizing catchability (q) for both the trawl and longline surveys. Models 15.4 and 23.1 both showed an increasing trend for q in recent years, with values approaching or exceeding 2 for both the trawl and longline surveys. The authors indicate that a value of q over 2 for the trawl survey is implausible for this species and investigated potential reasons for this result. They concluded that high parameter correlation between catchability, M, and recruitment is a likely issue. The preferred model, 23.1b, fixed both recruitment deviations and M to their prior means to address estimability issues associated with confounding parameters. The resulting model improved retrospective bias compared to other model alternatives.

The SSC concurs with the GOA GPT's and authors' level 2 risk for assessment related concerns. This is supported by poor fit to the composition data, and lack of fit to the recent longline survey RPN as demonstrated by recent years missing upper 95% confidence bounds of the annual estimate. The SSC also notes the model has generally poor fit to survey trends, basically fitting an average value through the time series.

The authors recommended Level 2 for population dynamics considerations. The authors highlighted that the 2023 longline survey RPN was the lowest on record, and the recent period of below average values for both the trawl and longline survey indices. The SSC notes that confidence bounds around the annual longline RPN and trawl survey estimates overlap estimates from recent surveys, suggesting they are statistically similar. Additionally, the downward trends in both survey indices do not necessarily suggest unusual trends or large changes to abundance that would constitute an increased risk. The SSC suggests that a risk Level 1 for population dynamic considerations may be more appropriate.

The authors and GOA GPT recommended a stair step approach for setting the ABC buffer due to the risk table rankings and large increase in maxABC from the 2022 specification. The recommended maxABC reduction is calculated as a 50% step from the 2024 maxABC estimated last year to the 2024 maxABC from the recommended model for the upcoming year, with the same logic applied to the 2025 specification (50% step from the 2024 maxABC estimated last year to the 2025 maxABC for the recommended model for the upcoming year). This results in an approximately 20% buffer from maxABC for both 2024 and 2025. The SSC notes that without a stair step, there is a large increase in the maxABC from 2023 to 2024, an increase of about 68%. **Given this large increase, and the ongoing level 2 assessment concerns, the SSC concurs with the author and GOA GPT reduction from maxABC for 2024 and 2025.**

This assessment apportions the area-wide ABC to the western, central, and eastern GOA sub-areas. The authors brought forward several refinements in apportionment methodology that averages proportions of both the REMA-predicted biomass from the bottom trawl survey and the REMAa-predicted RPW from the longline survey to balance the data conflict between the two surveys. This method was supported by the SSC in October 2023. **The SSC supports the author and GPT recommended ABC apportionments.**

The SSC supports the author's plan for future work on the survey and fishery selectivity parameterization, and on weightings of compositional information. The SSC also reiterates its October 2023 recommendation to investigate methods to incorporate the effects of skip spawning.

Other Rockfish

The GOA other rockfish complex is assessed on a biennial schedule and comprises 27 non-targeted species that are divided into two sub-groups within the complex based on life history, spatial distribution, and fishery and survey characteristics. The two sub-groups are slope rockfish (20 species) and demersal shelf rockfish (7 species). The demersal rockfish species, however, will be moved into their own GOA-wide complex during the 2024 assessment cycle for implementation in the 2025 fisheries, per the October 2023 Council motion. Currently, the assessment of the other rockfish complex is composed of Tier 4 (sharpchin rockfish), Tier 5 (4 species) and Tier 6 (21 species, including DSR species). Biological reference points are calculated separately for Tier 4, Tier 5, and Tier 6 species and summed across tiers to set the reference points for the complex.

This year, an operational full assessment is provided for other rockfish. Public testimony was provided by Julie Bonney (Alaska Groundfish Databank), Todd Loomis (Ocean Peace, Inc.), and Ben Phillips (self). The public testimony focused on several areas: 1) the limitations that the sub-area ABCs impose on the catcher vessels, the challenges of sorting other rockfish from the targeted species catch, and support of ongoing research that indicates the survey underestimates the true biomass of other rockfish species, 2) support for combining the West Yakutat (WYAK) sub-area ABC with the Western/Central GOA (W/C) sub-area ABC and to make this change for 2024 fisheries, 3) in considering the Spatial Management Policy, one size might not fit all and the importance of examining fishery performance and effort through space and time, 4) incorporation of information from fishermen through "real time" data collection that can inform the process earlier rather than waiting until public testimony at Council meetings, and 5) concern over

increased pinniped predation particularly on salmon and rockfish. The SSC considered this information during its deliberations.

New data included in the assessment are 2023 GOA survey biomass estimates and updated total catch for 2003–2023. The GOA bottom trawl survey biomass estimates from 1984 and 1987 were excluded from the assessment, consistent with advice regarding changes in the survey time series. The assessment was transitioned to the REMA model for the Tier 4 (Model 15.2) and Tier 5 species, and the Tier 5 model (Model 23.1) implemented an alternative weighted M approach (M by species applied to their REMA biomass estimates from 2019–2023). In addition, twelve species were moved from Tier 5 to Tier 6 because of unreliable biomass estimates, resulting in 21 species in Tier 6 of this complex. The Tier 6 assessment was updated to be based on the maximum harvest from 2013–2022.

The estimated biomass of the other rockfish complex is stable. There is, however, considerable variation in individual species biomass estimates, mostly attributed to sampling variation as many of these species are patchily distributed and are poorly sampled by the trawl survey. Six species are the primary species observed in the survey and the catch: harlequin, redstripe, sharpchin, redbanded, silvergray and yelloweye rockfish. The 2023 biomass estimates increased compared to the previous survey for harlequin (260%) and redstripe rockfish (440%), declined for sharpchin (-7%) and redbanded rockfish (-22%), and remained the same for silvergray rockfish. It was noted that the large changes in biomass estimates do not seem biologically reasonable given the slow growth and low natural mortality of *Sebastes* species.

Previously, the SSC has recommended that the authors evaluate past research and investigate estimating catchability with a focus on key components such as harlequin, sharpchin and redstripe rockfish as well as incorporate, as appropriate, data from new ongoing studies. The authors highlighted two studies working to identify the differences between trawlable and untrawlable habitat: 1) the untrawlable grounds cooperative work (Science-Industry Rockfish Research Collaboration, SIRRCA) and 2) an AFSC RACE GAP project estimating groundfish densities in GOA untrawlable habitat using a camera system. The authors indicated that they would incorporate new data, especially for species such as harlequin rockfish, into future assessments. The SSC looks forward to updates as new data become available and are incorporated into the assessment.

Other rockfish catch in 2023 is below the ABC for total GOA; 77% of the harvest of species in the other rockfish complex is from the trawl sector and 45% of the harvest is harlequin rockfish (even though they are not caught in high numbers in the survey). In 2023, the catch of the other rockfish complex exceeded the area-specific ABC for the WG/CG sub-area for the third consecutive year. Catch, however, was well below the area-specific ABC in the Eastern GOA (EY/SEO). During the last full assessment in 2021 the SSC commented that catch discards had increased and were higher than would be expected given the full retention mandate of rockfish implemented in 2020. In 2023, discard rates dropped for the first time and the SSC is encouraged, as noted by the assessment authors, that staff at the AKRO are investigating operational reasons behind the discard rates and working with NOAA Office of Law Enforcement to increase education and outreach to improve compliance.

The SSC concurs with the GOA GPT and authors recommended OFL and maxABC. The SSC also appreciates the implementation of the risk table (all factors level 1 – no concern) and concurs that no reduction from the maximum ABC appears to be necessary. The GOA GPT recommended that in 2025, the W/C and WYAK sub-area ABCs be combined, which would be consistent with the recent changes to DSR. The rationale for this recommendation is that these non-target species are poorly sampled by the trawl survey, there are no major changes in fishing behavior, good species-specific catch data is available, and most of the biomass is in the southeast where trawling is not allowed. Further, recent analyses suggest there is little to no genetic structure in rockfish in general, and evidence of local depletion has not been observed. The GOA GPT recommended that the Council engage in the Spatial Management Policy for this stock.

After discussing this recommendation and considering related public testimony, **the SSC recommends that the Western Yakutat sub-area ABC be combined with the Western/Central GOA sub-area ABC for 2024.** This change is considered to be conservation-neutral and would reduce potential for discards if PSC-limits are reached, as has occurred for the past three years. Further, this will align with the ABC apportionment for GOA DSR when they are moved to their separate assessment for the 2025 fishery (Table 3).

Table 3. Illustration of changes to sub-area ABCs for GOA Other Rockfish and DSR for 2023–2025 fisheries. The 'other rockfish' complex in W/C and WYAK areas in 2023 and in W/C/WYAK in 2024 includes DSR.

	Sub-area ABCs		
Stock	2023	2024	2025
Other Rockfish	W/C WYAK	W/C/WYAK	W/C/WYAK
	EYAK/SEO	EYAK/SEO	EYAK/SEO
DSR			W/C/WYAK
	EYAK/SEO	EYAK/SEO	EYAK/SEO

Finally, the SSC appreciates the responses of the authors to previous SSC and GOA GPT recommendations and commends them for a well written and organized assessment, especially given the complexity of the number of species, multiple tier levels and updates to the models.

Skates

This was an update to the Tier 5 assessment for the GOA skate complex. There was no public testimony. There are three stock components to the skate complex: big skate, longnose skate and other skates. Longnose and big skates have GOA-wide OFLs with apportionment of the ABCs to the western, central, and eastern GOA. Other skates have GOA-wide OFLs and ABCs, and are primarily composed of Aleutian skate, Alaska skate, and the Bering skate.

This is a Tier 5 random effects model (REMA) on trawl survey biomass and a natural mortality rate of 0.1. The current assessment updated catch estimates from 2022 and 2023, and biomass estimates from the 2023 GOA bottom trawl survey. REMA models are run both GOA-wide and for apportioning the ABC into each of the three regulatory areas for big and longnose skates, and GOA-wide for other skates using the bottom trawl survey data.

Recent biomass trends for skate species appear to be stable, with other skates showing a plateau at low biomass levels after a decade-long decline. Overall fishery harvest is dominated by incidental catch and has been well below the GOA-wide ABC. All levels in the risk table are rated Level 1 (no concern). T**he SSC concurs with the author- and GOA-GPT recommended harvest specifications under Tier 5, including the GOA-wide OFLs for all three components, the GOA-wide ABC for other skates, and the area apportioned ABCs for big and longnose skates. The SSC concurs with no reduction from maxABC for all three components.**

The SSC offers the following for future work in the assessment:

- The SSC notes that recent tagging work suggests connectivity between the GOA and Bering Sea for big skates, and area-specific survey trends appear to be flat in the western GOA. **The SSC**

recommends the GOA and BSAI authors coordinate to update the stock structure template for these species and assess assumptions regarding M.

- The SSC recommends the authors include a table of apportionment percentages and tonnage.
- The SSC recommends the authors include information on retention percentages for each management area, noting recent increases in catch in the eastern GOA.

Harvest Projections

Shallow-water Flatfish Complex

The shallow-water flatfish complex consists of eight species and is assessed every four years. The last full assessment was in 2021. This year, a harvest projection was presented. A full assessment is scheduled for 2025. There was no public testimony.

Northern and southern rock sole are assessed separately from the other shallow-water flatfish in this complex using age-structured models and are managed in Tier 3. For these species, the standard projection models were updated with the final 2022 catch, and estimated 2023–2025 catches. Other shallow-water flatfish are assessed in Tier 5. For these species, biomass was estimated for each species using the GOA bottom trawl data through 2023 using REMA. The OFL and ABC for the complex are calculated as the sum of the Tier 3 rock sole assessment values and the Tier 5 other shallow-water flatfish assessment values. The 2024 biomass is a 0.8% increase from 2023 biomass. Area apportionment methods have not changed, and apportionment is estimated by fitting the REMA to the survey biomass summed over all species (including Tier 3 rock sole) by area and estimating the percent biomass by area. This was last done in 2021 and remains unchanged because this is an off-cycle year for the GOA bottom trawl survey.

The SSC concurs with the GOA GPT and author recommended ABC and OFL for the shallow-water flatfish complex for 2024 and 2025, with no reduction from maxABC, as well as the associated area apportionments of ABC.

Rex Sole

GOA rex sole is assessed every four years, and the last full assessment was in 2021. Rex sole is assessed using an age-structured model in two areas with distinct growth patterns (WGOA-CGOA and EGOA) and is managed under Tier 3. For this harvest projection, the model was updated with catch information for 2022–2023. The OFLs and ABCs are summed across the two areas. There was no public testimony.

The ABCs calculated for the Western-Central area (based on model estimates) are apportioned based on REMA predictions of the proportion of Western-Central survey biomass in the Western and Central areas, respectively, in 2024–2025. Likewise, the ABC calculated for the Eastern area (based on model estimates) is apportioned based on REMA predictions of the proportion of Eastern survey biomass in the West Yakutat and Southeast areas, respectively. The 2024 OFL and ABC are similar to the 2023 values. Area apportionment methods have not changed.

The SSC concurs with the authors' and GOA GPT's recommended OFL and ABC for GOA rex sole for 2024 and 2025, with no reduction from maxABC, as well as the associated area apportionments of ABC.

Arrowtooth Flounder

A harvest projection was presented this year for GOA arrowtooth flounder. There was no public testimony. GOA arrowtooth flounder is assessed on a quadrennial basis with an age-structured model in Tier 3a. The last full assessment was in 2021. New input data for the projection model included an updated 2021–2022 catch estimates and new estimated catches for 2023–2025. The biomass estimate for 2023 was 5% higher than 2021. Catches in all areas declined relative to 2022 except in the west Yakutat, which was unchanged. The OFL and ABC recommendations for 2024 and 2025 are almost identical to those projected for 2023 and 2024. Area apportionment methods have not changed and are based on the proportion of survey biomass projected for each area using the REMA estimates. Catches of arrowtooth flounder continue to be well below the ABC.

The SSC concurs with the author's and GOA GPT's recommended OFL, ABC (no reduction from maxABC), and area apportionment for GOA arrowtooth flounder.

Flathead Sole

The GOA flathead sole stock is assessed every four years and was last assessed in 2022. This year harvest projections were presented. There was no public testimony. Flathead sole is assessed using an age-structured model and Tier 3 determination. A single species projection model was run using parameter values from the accepted 2022 flathead sole assessment model, updated catch information for 2022, and estimated catches for 2023-2025. Projections are conducted using numbers-at-age for flathead sole from age 3-21+ and historical recruitment of age 3 individuals to calculate OFLs and ABCs. The ABC recommendation and OFL values are similar to those developed in 2022 for 2024. Area apportionment methods have not changed, and apportionment is based on the proportion of survey biomass projected for each area using the survey averaging with the REMA.

The SSC concurs with the author's and GOA GPT's recommended OFL, ABC (no reduction from maxABC), and area apportionment for GOA flathead sole.

Northern Rockfish

The SSC received a harvest projection for northern rockfish. This stock is assessed on a biennial basis and the last full assessment was in 2022. There was no public testimony. GOA northern rockfish are assessed using a statistical age-structured model and a Tier 3 determination. The harvest projections were made using updated catch data from 2022 and new estimated catches for 2023-2025. The projected total biomass for 2024 and the ABC for 2024 is a -3% decrease compared to the 2023 ABC from the last full assessment. Area apportionment methods using the REMA model have not changed.

The SSC concurs with the author's and GOA GPT's recommended OFL, ABC (no reduction from maxABC), and area apportionment for GOA northern rockfish.

Dusky Rockfish

The SSC received a harvest projection for dusky rockfish. This stock is assessed on a biennial basis and the last full assessment was in 2022. There was no public testimony. GOA dusky rockfish are assessed using a statistical age-structured model and a Tier 3 determination. The harvest projections were made using updated catch data from 2022 and new estimated catches for 2023-2025. The projected total biomass for 2024 is down 3% from 2023 and the ABC for 2024 is -4% decrease compared to the 2023 ABC from the last full assessment. Area apportionment methods have not changed.

The SSC concurs with the author's and GOA GPT's recommended OFL, ABC (no reduction from maxABC), and area apportionment for GOA dusky rockfish.

Catch Reports

The purpose of the 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, to identify if they are exceeded.

The SSC appreciates receiving catch reports for GOA DSR, thornyhead rockfish, Atka mackerel, sharks, and octopus. The 2023 catch for each of these stocks was below the respective OFLs, ABCs and TACs. Catch was similar or lower than 2022 catch except for demersal shelf rockfish. There were no concerns highlighted.

D2 Bering Sea FEP Climate Change Taskforce

The SSC appreciates the opportunity to comment on the BS Fishery Ecosystem Plan (FEP) Climate Change Taskforce (CCTF) proposal for Climate Scenario Planning Workshop to occur in 2024. The SSC is impressed by the forethought that has already gone into planning for this workshop and is excited to see this project moving forward.

The proposed CCTF work plan is for a scenario planning workshop during a dedicated three-day meeting in May in Anchorage, but Council staff informed the SSC that an alternate plan is being considered for a two-day meeting in concert with the June 2024 Council meeting in Kodiak. The goal of the workshop is to consider potential tools and solutions both within and outside the current management process to address climate impacts on marine resources and communities dependent on these resources in the North Pacific. The SSC agrees that this workshop is an opportunity to identify key topics and concerns that can be further explored in the Council's IRA-funded climate change initiative and in the planned programmatic EIS, and that the workshop should be regarded as an initial step in a larger process that will play out over several years.

Scenario planning is a tool used by many organizations to think systematically about what changes might occur in the future and how those changes could affect the decisions they need to make in the short to medium term. Scenario planning exercises on climate change were recently completed by the Pacific Fishery Management Council (PFMC) and the three Atlantic Councils. In these cases, a multi-year process was used with meetings to identify and refine the scenarios, facilitated meetings with various stakeholder groups, followed by a synthesis meeting. In contrast, the process envisioned by CCTF is a smaller scale project with a shorter timeline, albeit building on a number of previous and ongoing projects and workshops. Still, the SSC expects useful results will be produced from the planned CCTF workshop, given the focus on careful planning, development of pre-meeting briefing materials, efficient use of time during the meeting, and robust outreach activities following the meeting.

The SSC had extensive discussion on the two-by-two table of scenarios (matrix) proposed by the CCTF. The scenarios being proposed include low to high predictability as one axis, and contrast between a more reductionist approach, exemplified by single species management, and a more holistic approach, exemplified by multispecies ecosystem-based management, on the other axis. At least the second axis reflects policy choices that the Council could adopt. In the PFMC example, both axes represent environmental change, with one axis representing climate variability and the other axis representing long-term changes in abundance of marine resources. Although the CCTF approach departs from usual practice

with scenario planning projects, in which the scenarios represent external drivers, it seems workable. It does potentially constrain tools and solutions to those that reside on the continuum from single-species to ecosystem-based fisheries management, rather than other approaches to deal with climate change, such as improving community resilience or improving governance. The SSC encourages clear delineation between aspects of scenarios that cannot be controlled (e.g., environmental variability) and potential management actions.

Overall, the SSC found the scenario matrix somewhat complicated and difficult to understand and agreed with a public comment on this agenda item on the importance of simplifying the material as much as possible, particularly for a meeting as short as two days. There was confusion even within the SSC over whether the x-axis reflected an external driver, i.e. climate variability, or different management options that would result in either low or high predictive ability through strategic choices and investments in research and technology. One possibility that the SSC discussed was to focus the meeting on a set of case studies, rather than a two-by-two matrix of scenarios. These could be hypothetical future cases, or actual situations present in the North Pacific (e.g., Bering Sea crab, GOA Pacific cod) where climate readiness is on the forefront of our thinking. In those situations, ideas and options may not yet be readily apparent or not yet implemented, and the workshop would be an opportunity for current and potential stakeholders to actively participate in generating ideas and options (without necessarily being prescriptive).

The SSC considered ways to generalize the conceptual framework associated with potential responses to the impacts of climate change in the context of managing marine resources. One possibility is a three-dimensional matrix of controls, with axes corresponding to 'ecosystem' presenting the exogenous forcing factors (strong – weak), 'governance' (strong – weak) and 'socio-economic' (strong – weak) in the context of a particular stock or climate issues. Clearly distinguishing what management can and cannot control helps identify where actions can take place. Sometimes the positive solutions come from top-down governance, while other solutions come from economic diversity or stability or grassroots community capacity. If this type of three-dimensional approach is used, additional effort will be needed to make sure this complexity is clearly conveyed to all workshop participants. If a three-dimensional matrix seems too complex, an alternative is a two-dimensional matrix with the y-axis as an exogenous variable (ecosystem complexity, diversity, stability or variability) and with the x-axis as the controls (strong or weak) such as governance, economic capacity, or community capacity. Such a two-dimensional matrix can offer considerable flexibility for exploring different scenarios relative to system complexity and the strength of the controls available on the system and could be modified as needed. The goal is simply for a flexible organizational framework to judge the difficulty of the problem and the tools available.

The SSC discussed the pros and cons of a meeting in June associated with the Council's Kodiak meeting. An important benefit is that it would facilitate broad participation of the Council, the Advisory Panel, and the SSC and other stakeholders that normally attend Council meetings. The Council and the AP by design represent a diversity of stakeholders and perspectives, so their participation would be a good first step toward the goal of ensuring broad and inclusive participation. A potential shortcoming is that Council meetings are intense and time-consuming for many participants, and it may be difficult to find the needed attention and creativity required by the workshop. Development of multiple formats for outreach after the meeting could bring other groups that do not regularly participate in Council activities, or those for which the date and location limit participation, into the discussion. This may include communities with limited capacity that are among the most vulnerable to climate change related impacts to local fisheries.

The SSC suggests the following principles for workshop planning for consideration:

- Create opportunities for participation, input, and community building and develop a plan to evaluate participation, with particular attention to participation by more climate-vulnerable individuals, groups and communities

- Provide clear goals and definitions where possible to facilitate focusing on problems and solutions rather than discussion on specific definitions. For example, what is meant by climate readiness and climate resilience.

- Avoid being prescriptive and work towards ideas and options so that the Council can do the integration of those ideas and options into their own preferences for action. Being prescriptive too soon could hamper creation of ideas.

SSC Member Associations

At the beginning of each meeting, members of the SSC publicly acknowledge any direct associations with SSC agenda items. If an SSC member has a financial conflict of interest (defined in the 2003 Policy of the National Academies and discussed in Section 3) with an SSC agenda item, the member should recuse themselves from participating in SSC discussions on that subject, and such recusal should be documented in the SSC report. In cases where an SSC member is an author or coauthor of a report considered by the SSC, that individual should recuse themselves from discussion about SSC recommendations on that agenda item. However, that SSC member may provide clarifications about the report to the SSC as necessary. If, on the other hand, a report is prepared by individuals under the immediate line of supervision by an SSC member, then that member should recuse themselves from leading the SSC recommendations for that agenda item, though they may otherwise participate fully in the SSC discussion after disclosing their associations with the authors. The SSC notes that there are no financial conflicts of interest between any SSC members and items on this meeting's agenda.

At this December 2023 meeting, a number of SSC members acknowledged associations with specific agenda items under SSC review. Chris Siddon is married to Elizabeth Siddon, an editor of the BSAI ESR and a contributor to risk table considerations in multiple stock assessments. Dr. C. Siddon recused himself from any risk table discussions where Dr. E. Siddon contributed. Sherri Dressel (ESR contributor) and Philip Joy (SEO DSR author) are also supervised by Dr. C. Siddon. Martin Dorn is a former lead author on the GOA pollock assessment. Brad Harris supervised the postdoc leading the SIRRCA project referenced in the GOA Other Rockfish assessment. Jason Gasper is on the CCTF and is also married to Cindy Tribuzio, who is the lead assessment author for BSAI skates, BSAI Other rockfish and GOA sharks. Ian Stewart, Rob Suryan, Curry Cunningham and Dr. Dressel contributed to the ESRs. Dr. Cunningham's doctoral student contributed to the sablefish assessment and he is married to. Krista Oke, who contributed to the Pacific cod risk table considerations. Dana Hanselman is the first level supervisor of Groundfish Plan Team GOA co-chair Chris Lunsford and EBS ESR lead Elizabeth Siddon. Dr. Hanselman is also the second or greater supervisor of other Plan Team members and contributors, Dan Goethel, Pete Hulson, Jane Sullivan, Kristen Omori, Kevin Siwicke, Cara Rodgveller, Katy Echave, and Lukas deFillipo. Finally, Dr. Hanselman is also married to Dr. Shotwell, BSAI plan team co-chair and author of BSAI and GOA arrowtooth assessments, ESPs, and a contributor to risk table considerations in multiple stock assessments. Dr. Hanselman recused himself from risk table discussions where Dr. Shotwell contributed.