North Pacific Fishery Management Council

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Meeting of the Bering Sea and Aleutian Islands (BSAI) Groundfish Plan Team

MINUTES

November 14-18, 2022
Hybrid Meeting: Seattle, Washington, AFSC

BSAI Groundfish Plan Team Members:

Steve Barbeaux	AFSC REFM (co-chair)	Kirstin Holsman	AFSC REFM
Kalei Shotwell	AFSC REFM (co-chair)	Phil Joy	ADF&G
Cindy Tribuzio	AFSC ABL (vice chair)	Andy Kingham	AFSC FMA
Diana Stram	NPFMC (coordinator)	Beth Matta	AFSC REFM
Caitlin Allen Akselrud	AFSC RACE	Andrew Seitz	UAF
Mary Furuness	NMFS AKRO	Michael Smith	AFSC REFM
Allan Hicks	IPHC	Jane Sullivan	AFSC ABL
Lisa Hillier	WDFW		

Introductions

BSAI Ecosystem Status Report

Bering Sea ESR

Elizabeth Siddon gave an overview of the Bering Sea Ecosystem Status Report (ESR) for 2022. In September the Team noted that there were mixed signals in the ecosystem, with physical indices indicating a return to cooler conditions but lower trophic level indices indicating conditions similar to marine heat wave years (i.e., large zooplankton and euphausiids). The author provided additional insight to address this discrepancy. In summary, while there is evidence of decline in large zooplankton indices, this is not as much of a concern during spring when large zooplankton are not as critical to food-web dynamics. Fall large zooplankton indices remain low but there was evidence that consumers may have been supplementing this low density with euphausiids which were not well represented in the Rapid Zooplankton Assessment (RZA).

The Team discussed rationale for aggregate indices. In the context of the ESR the utility is focused on the role of forage species as a guild or trophic level in the system where the portfolio effect of multiple species and the net change in that guild is the focal interest. Individual forage species population dynamics would be reflected in the forage assessment and to minimize duplication, that detail is not included in the ESR (and as such the forage index is only shown in the off-years of the forage assessment). The Team also noted the decline in pH in the Bering Sea model index and the importance of inclusion of an index of pH and the value of overlays of model estimates with in-situ sampling as part of a special project to collect pH measurements. The Team encouraged the continued collection of pH *in situ* measurements and comparisons to model estimates as this work is especially important for validating modeled historical hindcasts, as well as forecasts and projections under climate change. Such work could be expanded to other vessels that have capacity to collect carbonate data *in situ*.

The Team recommended that pH data be aligned with "survey replicated" dates and locations in the model to further skill evaluations.

The Team also discussed the requested advice by the author on how and when to include the Northern Bering Sea (NBS) information in the ESR, separate from the Eastern Bering Sea (EBS or combined). In the Aleutian Islands and Gulf of Alaska ESRs, sub-regions (e.g., East, West) are assessed separately and indices are collected that can represent dynamics specifically in each area. **The Team recommended continuation of display of NBS and EBS data separately** and encouraged the addition of composite indices (i.e., EBS, NBS, and EBS+NBS). The Team encouraged authors to include EBS and NBS (where appropriate) as well as EBS+NBS combined for all indices when available, and for authors to clearly label each index domain to facilitate sub-regional assessments.

Aleutian Island ESR

Ivonne Ortiz presented the Aleutian Islands (AI) ESR. During the presentation the Team had questions for the author and noted that much of the AI remained in an anomalously warm state in contrast to the return to cooler conditions in the GOA and EBS. It was noted that these warmer conditions may continue to differentially impact species in the AI. For example, the differential recovery rates for Steller Sea lions between the western AI (low population) and eastern AI (increasing population) may be due to a combination of factors including increased exposure to warmer conditions and storminess in the western AI. During discussion it was noted that other apex predators, and other marine mammals (e.g., harbor seals) were at lower abundance in this region as well. The Team also noted some differences with larger fish in the Western AI in recent years. The Team discussed the sablefish diet slide that showed consumption of squid and jellyfish and that the data were from an older database (2011/2014).

Combined AI and EBS ESR Discussion and recommendations

The Team discussed multiple issues that are relevant to both the AI and EBS ESRs. The Team commended the authors on the annual compilation of more than 40 curated indicators for each region and synthesis of complex interactions and responses of the ecosystem in a succinct and clear manner that facilitates an ecosystem level understanding of changes in response to pressures (especially climate change)**.** In particular, the Team noted appreciation for the synthesis slides that summarized trends based on evidence from multiple indices under different thematic topics (e.g., changes in seabirds). The Team acknowledged that diet sampling through the groundfish survey is an important component of understanding mechanisms for increases or decreases in species abundance and noted that stomach samples for sablefish, which have been increasing in recent years, is limited to years when special projects allowed for sablefish diet analysis. Following on the sablefish diet discussions, **the Team recommended collection of sablefish diets across groundfish survey regions in the next year(s) in order to help understand mechanisms for, and implications of, increasing abundance of sablefish in response to recent warm conditions.**

The Team discussed the process of collection and curation of indices by the ESR team and what role and assistance the Team could provide in terms of feedback on indices that were particularly useful or arose during assessment discussion. The Team recognized the experts on the ESR team and contributors should oversee the curation and development of indicators for each ESR but also noted that Team feedback may be useful for those discussions per the ESR team discretion (similar to each stock assessment author's discretion for their stock assessment). The Team noted a few recent indicators that are particularly useful such as oceanographic indices and the RZA which provide real-time estimates of oceanographic

conditions and ecosystem productivity. The Team discussed a process by which the Team would revisit indicators on the final day of the meeting to identify and discuss indicators that arose during Team discussions of the week and provide feedback to the ESR authors on those and potentially missing indicators (for future development).

In addition to this feedback the Team commended the noteworthy on salmon that summarizes multiple knowledge sources towards understanding the early indicators and potential mechanisms in Yukon River salmon declines. The Team commended the RZA and recommended continued inclusion and development of that rapid index. Additionally, the Team encouraged the continued standardization of baseline timeseries. The Team supported the upcoming ESR Center of Independent Experts (CIE) review and suggested a topic on how best to tackle the NBS, EBS, vs NBS+EBS.

During discussion the Team also noted that the zooplankton time series was missing from the EBS Report Card (due to lack of data during COVID). **The Team recommended adding the zooplankton time series back into the Report Card.**

The Team discussed the revised condition indices that now use a different, VAST-based condition index, but felt additional methodology regarding this transition was needed. **The Team recommended a short presentation next September to the Team to review the methods and tradeoffs in approaches. The Team encouraged collaboration with the NMFS longline survey team to develop analogous VAST indices.**

The Team recommended continuing to identify a common baseline for index or indicator averages and in particular to work with the contributors and the ESR team to establish some guidance for fixed baselines (rather than annually adjusting means). For example, drawing on methodology from climate science methods to identify a climatological baseline in order to establish biological baselines for the ESR.

EBS pollock

The Team received a presentation on the EBS pollock chapter from Jim Ianelli. During the presentation there was Team discussion about how the acoustic surveys, Acoustic Vessel-of-Opportunity (AVO) index, the BTS survey, and recent fishery CPUE all indicate increasing biomass/numbers and how to interpret those, especially given that not all indices indicate equal increases. Survey team representatives indicated that overall, the increase in pollock biomass appears to be spread shelf-wide. Even so, the authors presented arguments that the model is likely overestimating recruitment from the 2018 year class. Briefly, they presented a retrospective peel GIF that demonstrated how, as peels were removed, previous recruitment events (2009, 2012) initially showed up more strongly in the model than they eventually turned out to actually be, once new data came into the model. The Team engaged in discussion about the plausibility of this and its implications for B_{MSY} given that these age-4 fish should now be fully recruited into the survey and fishery.

The author indicated that managing the stock at the Tier 1 model recommended harvest levels would result in a high probability of the stock dropping below B_{MSY} and therefore recommended that the ABC be reduced from maximum permissible based on the Tier 3 model recommended ABC. In addition, the author recommended further reduction from maximum permissible ABC based on the high likelihood that the estimate of the 2018 recruitment was too high. To account for this overestimation the authors used the mean of the estimated number of age-0 recruits from the next two highest cohorts in place of the 2018

estimated age-0 recruitment number for calculating the 2023 and 2024 ABC in the projection model. This resulted in further reduction from the Tier 1 and unaltered Tier 3 ABCs. Concern was expressed about whether this additional reduction was warranted since using the unaltered Tier 3 ABC was already a substantial reduction from Tier 1. It was pointed out that the magnitude of the large 2018 year class should not be a surprise as fishermen have been seeing this cohort since 2020. The author responded by clarifying that the 2018 cohort remains at very high numbers in the altered Tier 3 model projection. The author stated that the proposed reduction better accounts for the likelihood that this cohort will be smaller than currently estimated, as was shown to have happened with other especially numerous cohorts initially estimated to be much larger. A Team member questioned whether the large 2018 recruitment estimate may have something to do with extra growth and/or predator avoidance that occurred in that warm year – noting that other large recruitment events were associated with warm years.

The Team discussed that there appeared to be a unique similarity between the EBS pollock and sablefish stock trends and assessments – namely that there was uncertainty in the magnitude of a potentially over-estimated year class and how they contribute to management advice. A Team member pointed out that the presented approach to computing a reduction from maximum permissible ABC seemed reasonable, but may not align with the SSC's approach for using the risk table.

Based on this there followed a discussion of how the risk table was used for reductions – that there was no consistent guidance for how authors should compute a recommended reduction. A Team member suggested having confidence intervals or other calibrated language around the information that goes into the risk table decisions, pointing out that this may be a good point of reference for the proposed CIE on the Ecosystem Status Report. Some Team members were wary of requiring authors to provide these bounds, as it would increase the authors' workload concerning the risk table, and this suggestion fell short of a Team recommendation.

The Team generally agreed that the Tier 1 model should be accepted but that both the potential to drop below B_{MSY} and the potential overestimation of the 2018 year-class warranted a reduction from maximum permissible ABC. The discussion focused on how to appropriately reduce from maximum permissible ABC and whether the author's recommended approach was appropriate. The Team noted that in previous years the authors had a number of valid arguments for reduction of ABC to the Tier 3 level that were accepted by the Team and SSC. There was some discussion on other potential means of adjusting the 2018 recruitment, but the Team agreed that the method employed by the authors was appropriate. **The Team recommended that the EBS pollock stock be included in any working group developed to investigate appropriate means of dealing with irregular recruitment and alternative harvest control rules**.

The Team accepted the author's recommended model, risk table values, and the approach to deriving the recommended risk table reduction from maximum permissible ABC.

EBS Multi-species Model

Kirstin Holsman presented an overview of the 2022 Climate-enhanced multi-species stock assessment for pollock, Pacific cod, and arrowtooth flounder in the EBS, which has been included as an appendix to the EBS pollock chapter since 2016. There is also a newer version called Rceattle that has been coded in TMB providing estimation of random effects and data weighing options with a split-sex model for arrowtooth flounder that the author plans to bring into this assessment next year. The current CEATTLE model products are provided to the ESR and will be available for use in the Ecosystem and Socioeconomic Profiles (ESPs) in the future. The author also provided some discussion questions for the Team to consider regarding different methods to explore for setting climate-informed ABCs, feedback on how to communicate these long-term outlooks, and alignment of the model with other stocks.

A member of the public asked about building in other forms of predation and the author noted that there are research arms of the CEATTLE model that consider northern fur seals and halibut with the purpose of providing context for some of the other managed groundfish species. The Team discussed options on how to use CEATTLE output to inform single species models such as incorporating estimates of predation mortality and aligning the contribution of this information for the timing of risk table discussions. The Team also noted that methodologies to provide climate advice from this model would be useful to include in the climate change working group.

The Team recommended that the contributions of the CEATTLE model align with the timing of the risk table evaluation to inform those discussions in the future. The Team also recommended that the methodologies described for providing climate advice be included in the climate change working group. Finally, the Team recommended continued work to align the CEATTLE results with the single species models and to transfer to the Rceattle version when possible.

Aleutian Islands pollock

Steve Barbeaux presented the assessment for Aleutian Islands pollock, a Tier 3a stock. The Team accepted the author's recommended model. **The Team recommended reevaluation of the assessment considerations category risk table score in the next assessment.** The Team encouraged including updated survey and fishery size composition data and agreed with the author's stated intention to reevaluate the model structure and assumptions in future assessments.

Bogoslof pollock

Jim Ianelli presented the stock assessment for Bogoslof walleye pollock, a Tier 5 stock. The Team accepted the author's preferred model (*M* estimated using the age-structured model applied to the acoustic survey biomass estimate) to derive ABC and OFL.

A Team member asked whether there were differences in recruitment between Bogoslof and other management areas, because growth seemed to be different between Bogoslof and the EBS. The author noted that historically the dominant year classes were similar among areas and that the conventional notion was that the central Bering Sea is linked to Bogoslof. An attendee noted that Bogoslof pollock appeared to be genetically distinct from pollock in other regions.

Pacific cod- EBS Ecosystem and Socioeconomic Profile (ESP)

Kalei Shotwell presented the Pacific cod ESP. Ecosystem indicators were reported as approaching average conditions in 2022, reflecting improvements in ecosystem indicators for Pacific cod (e.g. temperature, food availability) relative to recent years. In contrast, the socioeconomic indicators for 2021 and 2022 were reported to be below average, though the presenter indicated that there was room for improvement of these indicators, especially related to community conditions.

The Team discussed the development of a procedure to include new indicators in the ESP. It was noted that this is currently in development and contains considerations of how and who provides the new indicators and how it is reviewed. A new indicator would have to be submitted early in the year and reviewed in the spring for inclusion in the fall. The Team noted that AFSC is responsible for the ESRs and ESPs, and that the Team has input into the process.

The Team discussed the role of Pacific cod as a predator on juvenile snow crab and red king crab. The author pointed to the snow crab ESP as a good resource for information on this topic and noted that one recent analysis suggested that consumption of crab by Pacific cod was not sufficient in magnitude to fully explain the snow crab collapse. They explained that crab consumption in this analysis was estimated

using stomach samples collected during the summer bottom trawl survey. A member of the public suggested that Pacific cod stomachs collected in the fishery may provide useful data to test whether the findings in that analysis would hold if winter stomach data were also included. Given crab settlement timing in the fall, **the Team recommended the ESP team investigate options for cooperative research and communication with the fleet and observer program to collect Pacific cod stomachs in the fishery**, which operates year round. They noted these data could also be used to improve estimates of Pacific cod consumption on octopus and as an input to the CEATTLE model. Finally, the Team also identified the online Stomach Examiner's Tool as a useful source of stomach data.

The Team appreciated the ESP briefing, finding it useful for setting context prior to the full assessment presentation.

Pacific cod- EBS

The EBS Pacific cod stock assessment was presented by Steve Barbeaux, who assumed leadership of the assessment in 2022 following the retirement of Grant Thompson. Reviewers on the Team strongly supported the new document format with diagnostics and appendices hosted on GitHub, noting that it made reviewing models more efficient and promoted different levels of review among Team members. The Team made no formal recommendation on future formatting, citing uncertainty around the agency's GitHub policy. The Team applauded the author's effort to modernize the presentation of stock assessment results and encouraged them to pursue strategies to reduce the potential for link rot in the SAFE document, such as using GitHub's release feature.

The Team approved the author-recommended "New Series" model ensemble, which was similar to the accepted 2021 ensemble. The New Series included some minor housekeeping changes to inputs and data assumptions, including removal of the estimated ageing bias post-2007 in accordance with a recommendation from the Age and Growth Program, removal of the seasonal weight-length relationship, and an updated process for weighting fishery length composition data to be consistent with GOA Pacific cod. Notably, the recommended New Series ensemble retained the weighting scheme developed by CIE reviewers in 2021, which was recommended by the SSC. Risk was assigned a level 1 for all considerations, and the Team supported the author's recommendation of no reduction from maximum permissible ABC.

An audience member asked about the availability of data from Pacific cod fisheries in state waters managed by the Alaska Department of Fish and Game (ADF&G), which makes up ~10% of the catches. This fishery operates out of Dutch Harbor and fishes "Area O." Miranda Westphal (ADF&G Dutch Harbor) was identified as a good contact for authors, and the Team encouraged authors to work with the state on data collection needs.

The Team supported the author's recommendation to explore environmental linkage hypotheses through research track models. For example, Pacific cod in the CEATTLE model are modeled using a temperature-dependent stock-recruitment function, making this a reasonable starting point. The Team also suggested potential formatting changes to increase the interpretability of the phase plane diagram, including using color to identify below or above average temperatures in a given year (e.g. blue for cool, red for warm), or text size to represent relative size of fishery catches.

There was considerable discussion around implications of Pacific cod movement, pop-up satellite archival tags (PSAT) results, appropriateness of the current harvest control rule, and model uncertainties related to movement, natural mortality, and time-varying catchability. An audience member asked how the assessment would differentiate between changes in movement or mortality related to climate change. The author responded that there is ongoing work to help inform rates of movement out of the US EEZ including PSAT studies to provide information on where Pacific cod move to, even outside of the US EEZ. Higher parasite load in southern areas could also result in higher mortality, which may be related to

movement and environmental conditions. The Team identified the risk table as an appropriate section for the authors to synthesize implications of movement as it relates to model uncertainty, potentially through the use of sensitivity analyses.

The Team supported all of the areas of model development described by the author (e.g., adding fleet structure, exploring use of fishery age compositions, updating methods for modeling growth), however, the Team and authors agreed that the operational ensemble model would benefit from stability and that the addition of new models annually reduces transparency, increases review burden, and makes it difficult to separate changes in stock dynamics from changes in the model. From a planning and process perspective, the Team encouraged the authors to update the data gaps and future research section of the SAFE to include planned model development, to maintain a consistent numbering of models to know where a model came from, and to pursue new models through a research track prior to proposing them for use in the operational model ensemble.

The Team noted that the current assessment used two methods for combining the models within the ensemble: a mean of the point estimates and standard deviations from the joint distribution of the inverse Hessian. The Team noted that an upcoming CAPAM workshop on model weighting could inform best practices on how to weight and estimate uncertainty within an ensemble modeling framework.

Finally, the author highlighted the importance and influence of terminal year fishery length compositions on model results. The Team had some concerns about using a partial year of data and a question was raised about whether these data have been debriefed by the observer program. **The Team recommended the authors explore the sensitivity of the terminal year fishery size composition data that have not been debriefed or may not be representative of a full year of data.**

Pacific cod- Aleutian Islands

The Aleutian Island Pacific cod assessment, presented by Ingrid Spies, considered two age-structured models and a Tier 5 random effects model on survey biomass. These included the 2022 AI trawl survey index, which was the lowest ever observed and the first observation since 2018. There were some concerns about using the NMFS longline survey data because the survey does not cover the entire area of interest and was not designed to target Pacific cod. Fishery dynamics for AI Pacific cod are complex, with effort often involving a tradeoff between fishing in the EBS or the AI.

The Team thought that the age-structured models were overly optimistic in projections of spawning biomass, as seen in the retrospective patterns. This optimism in projections appeared to be largely due to assumptions about average recruitment. The Team discussed alternatives for determining average recruitment in the terminal year, projections, and for estimating biological reference points, such as using a subset of recruitment from recent years or defining regimes of average recruitment that may be estimated in the model. The Team noted that methods of establishing mean recruitment should consider model time series and the effects of changing baselines due to climate impacts on stock productivity and missed surveys.

The Tier 5 approach was considered by the Team to be a stable method. However, with this approach, current status was unknown, increasing the risk of falling below the true (but unknown) biomass target levels. This method is also very dependent on the availability of survey data and affected by long periods between surveys. The Team noted that the Bogoslof walleye pollock ABC was determined using Tier 5 methods, except that an option was presented to use the natural mortality estimated from an age-structured model, thus bringing results from the age-structured model into the determination of the ABC. A similar hybrid approach of using results from an age-structured model may be useful for AI Pacific cod.

The Team concurred with the author's recommendation to use Model 13.4, the Tier 5 model, for setting harvest specifications. **The Team recommended the author continue to present the age-structured**

models shown this year for future consideration. Even though these models were not used to set harvest specifications they provided the Team with valuable insight into the dynamics of the stock. Additionally, the availability of age data from the 2022 AI trawl survey may provide insights into recent population dynamics.

The Team recommended that this stock remain on an annual cycle and not be considered for reduction in assessment frequency when the Teams considers stock prioritization.

The Team recognized the importance of the survey to the assessment of this stock and recommended that an Aleutian Islands trawl survey be completed as part of its biennial schedule in 2024.

Yellowfin sole

Ingrid Spies presented the BSAI yellowfin sole assessment. The author presented three models for consideration: Model 18.2 which is the base model with updated data, Model 22.0 which is the base model but using a single-sex survey selectivity, and Model 22.1 which is Model 22.0 but using model-based estimates (from VAST) for the survey index data and age compositions for the EBS and NBS. Model 22.1 was the author's preferred model. There were no recommended reductions from maximum permissible ABC and the Team agreed with the author's recommendation.

The Team discussed the potential for a retrospective pattern in recruitment and would like to see how the model treats the new recruitment estimates as this seemed to be a recurring issue in many assessments. The Team suggested that it would be useful to track how these large recruitments show up in the fishery through the size compositions as age compositions are not available until a year after the survey occurs. The Team also discussed that the model-based (VAST) estimates were larger overall with smaller coefficients of variation than the design-based estimates and would like to see some clarification on why this occurred in future assessments. The Team noted that this inflation also occurred in EBS Pacific cod when the NBS was added to the model-based estimates. The Team discussed comparisons between the EBS only index and the EBS+NBS and suggested checking if there were any temperature-mediated growth changes. The Team also discussed potential documentation on the catchability estimate and suggested investigating potential implications of catchability compensating for the higher model-based estimates (VAST).

The Team recommended to include the recruitment retrospective analysis in the next full assessment.

The Team recommended a comparison of the EBS only and the combined EBS+NBS model-based estimates to determine if the inflation of the estimates was due to the VAST method or the addition of the NBS.

Greenland turbot

Meaghan Bryan presented the assessment for the BSAI Greenland turbot. The Team had substantial concerns regarding the sustained poor recruitment and degradation of size and age structure. In the risk table, the author identified uncertainties in the maturity curve that increased the risk of exceeding the true OFL and recommended a reduction from the maximum permissible ABC. **The Team recommended a 6% reduction from maximum permissible ABC, based on the lower range determined by a sensitivity analysis of maturity.** The Team commended the author, noting the effectiveness of presenting the sensitivity analysis in the context of the risk table as a method to inform a reduction from maximum permissible ABC.

The Team supported the author's recommended future research plans in support of the stock assessment, including revisiting trawl survey catchability and selectivity and pursuing data collections to update maturity. **The Team recommended the authors revise the interpolation method used to combine the BS and AI longline survey relative population numbers, either based on linear interpolation or new methods under development at the University of Alaska Fairbanks.** Additionally, the Team encouraged the authors to continue exploration of killer whale depredation impacts on longline survey abundance estimates and to present newly available sex-structured length composition data from the longline survey, which began in 2021.

Finally, the Team encouraged the author to update apportionment ratios in the next full assessment and to explore use of the two-survey random effects methodology in the *rema* R package to make use of both longline and bottom trawl survey abundance indices.

Arrowtooth Flounder

Kalei Shotwell presented the assessment for BSAI arrowtooth flounder. Arrowtooth flounder in the BSAI are Tier 3a in this assessment cycle and the author recommended no changes to the preferred Model 18.9. The stock is generally in robust shape with low exploitation rates and a population well above $B_{40\%}$. The Team questioned if removing length composition data when there were less than 300 samples and removal of pre-1991 data resulted in changes to $B_{100\%}$ and the author stated that it did not.

The Team questioned the author about changes in size-at-age and growth as well as about temperature dependent growth in the CEATTLE model. The author agreed that this would be worth closer scrutiny going forward. The Team also raised concerns about removing questionable historical data. The author noted that it was important to remove questionable and unreliable data from the model and the Team largely agreed with this decision with regard to running the assessment model. However, there was interest in keeping the old data available in the assessment in some form for climate-based models and for detecting changes in species assemblages over time. The Team supported the author's model choice and recommendation that no changes be made to the ABC.

Kamchatka flounder

Meaghan Bryan presented the full assessment of the BSAI Kamchatka flounder. For this Tier 3 assessment, the methodology was unchanged from last year. The author noted a likely relationship to the size of the cold pool that should be explored in the next assessment cycle. The Team expressed concerns about the selectivity curve, and **the Team recommended examining a single length-based selectivity curve in the next assessment cycle**. The identification of Kamchatka versus arrowtooth improved in 2008, and **the Team recommended exploring the model sensitivity to the proportion of arrowtooth assigned to Kamchatka prior to 2008.** The author indicated they would examine formalizing the data weighting approach for next year, and including ageing error, which was not included in this cycle. Due to these model considerations, the Team agreed with the author's ranking of assessment-related considerations at Level 2, but no reduction from maximum permissible ABC was warranted. The Team accepted the author's recommended model and the 2023 and 2024 ABCs and OFLs.

Northern rock sole

The Team received a presentation on the northern rocksole assessment from Cary McGilliard. The base model (18.3) was presented for acceptance. Two alternative models were also presented (22.1, which adds Francis weighting to the model inputs, and 22.2, which adds Francis weighting and also estimates female M). However, since these models were not presented to the Team at the September meeting and there was not substantial time to evaluate the performance of the alternative models in the current assessment cycle, the authors did not put them forward as the preferred alternatives. Instead, they were presented for the

Team to use as a means of deriving the reduction from maximum permissible ABC that was recommended from the risk table score of 3 in the "assessment-related considerations" category.

The Team agreed that the alternative models as presented appeared to provide an improved accounting for poor retrospective patterns, potential overestimation of the 2020 recruitment event, and recent biomass indices, but were reluctant to replace the base model for this Tier 1 stock as the alternative models had not received a thorough review. The Team accepted the authors recommendation to accept the base model with the risk table score of 3 in the "assessment-related considerations" and the associated recommended reductions from maximum permissible ABC. In order to ensure that the recommended ABC did not exceed the true (but unknown) OFL, the author recommended that the ABC be set equal to the lowest of the OFL's derived from the two alternative models presented. The Team noted that there was no set process for how to reduce ABC based on risk table concerns and commended the authors for coming up with a quantitative, defensible approach to deriving the value for a recommended reduction from maximum permissible ABC in light of concerns on the status quo model when time was limited for full vetting of new models.

The Team recommended the authors put Models 22.1 and 22.2 forward - with likelihood profiles and an evaluation of performance - as alternative models to the base model in the 2024 assessment cycle, to be presented in September 2024.

Flathead sole

A flathead sole partial assessment was presented for the BSAI. The Team accepted the updated projection model estimates for the Tier 3 stock.

Alaska Plaice

An Alaska plaice partial assessment was presented for the BSAI. The Team accepted the updated projection model estimates for the Tier 3 stock.

Pacific ocean perch

Paul Spencer presented the BSAI Pacific ocean perch assessment. The author presented a short summary of the Center for Independent Experts (CIE) 2022 review of BSAI Pacific ocean perch. Terms of Reference for the review reflected previous Team and SSC comments regarding evaluating natural mortality, investigating data weighting and the lack of fit to the most recent Aleutian Islands (AI) bottom trawl survey (BTS) data. The author presented results from the CIE regarding time-varying natural mortality and different data-weighting sensitivity model runs. However, none of these sensitivity analyses produced better fits to the AI BTS estimates. The CIE also recommended that fitting the model to AI BTS abundance indices rather than biomass indices might improve the retrospective pattern. The author presented two models: Model 16.3 was the base model with updated data through 2022, and Model 22 was the same as Model 16.3 but fit the survey abundance rather than biomass indices. Model 22 did not substantively differ from Model 16.3 and so the author recommended the base model with no reductions from maximum permissible ABC.

The Team discussed investigating the mortality rates by age particularly for the plus group as there were poor fits to this group in the eastern Bering Sea (EBS) slope survey. The Team noted that time blocks could be explored for the plus group or consider time-varying selectivity as there were younger fish in the AI BTS than the EBS slope survey. The Team also discussed the relative proportion of the EBS slope survey information into the future and encouraged the author to look at alternatives for estimating the apportionment on the EBS slope and comparing where the different surveys match up in the past for determining what the proportion should be moving forward.

The Team supported the author's recommended model with no reduction from maximum permissible ABC. The Team also supported the author's recommendation to investigate estimation of ageing error in future assessments.

Northern Rockfish

A northern rockfish partial assessment was presented for the BSAI. The Team accepted the updated projection model estimates for the Tier 3 stock.

Blackspotted and rougheye rockfish

Paul Spencer presented the BSAI blackspotted/rougheye rockfish assessment. The fishery and the survey have been dominated by small fish in recent years, and it was noted that the fishery selects fish about 10 years before they are mature. **The Team discussed the lack of larger fish in fishery composition data and recommended examining the NMFS and IPHC longline survey data to determine if larger fish may be in the population and not showing up in the fishery**. **The Team also recommended looking at the rate of blackspotted/rougheye to Pacific ocean perch in the survey tows over the time series.**

A major uncertainty with this stock assessment is the size of the 2010 year class, which is much larger than any other estimated year class. This has a significant effect on the projected ABC and reference points. The Team discussed various options for determining average recruitment for projections and determined that this would be a good example to include in future working group discussions on recruitment.

The Team continues to express strong concern with the level of catch and exceeding the MSSC in the Western Aleutian Islands area, and the subarea ABC for the Western/Central Aleutian Islands area. The Team also expressed concern with exceeding the BSAI ABC in 2021.

The Team agreed with the author's recommended assessment and finds that setting the ABC below maximum permissible ABC is well justified.

Shortraker rockfish

Kalei Shotwell presented the assessment for shortraker rockfish. The Team noted that it was helpful to see survey catch distribution across assessments in a standardized form. A GAP survey team representative present at the meeting stated that there is a sign-up sheet for authors who want the survey catch distribution figures next year.

A Team member questioned why the Southern Bering Sea (SBS) biomass estimate from the Aleutian Islands (AI) bottom trawl survey was considered separately from the AI portion of the survey. It was believed to be related to historical management that is not relevant today. There was some concern that this split was not biologically justified (shortraker habitat is not different in SBS than rest of AI). There was also concern that sample sizes were very small in SBS catches, so sometimes CVs were large. The Team encouraged the author to simplify and combine the SBS with the AI in the future.

There was some concern among the Team that VAST currently does not work well for data-poor rockfishes. The Team suggested that the author continue to use the *rema* approach until the appropriateness of the VAST approach can be investigated for shortraker rockfish. The Team accepted the authors' preferred model and the author's harvest recommendations.

Other rockfish

Jane Sullivan presented a full assessment for BSAI other rockfish. The Team appreciated the clear and easy to follow presentation. The Team accepted the author's recommendations for the 2023 and 2024 ABCs and OFLs and had no recommendations.

Atka mackerel

Sandra Lowe presented the BSAI Atka mackerel stock assessment, which had no change to the methodology other than using an updated recent five years for average selectivity in the projections. Discussions between the Team, the assessment author and the public highlighted differences between the fishery and survey, especially that the survey covers areas that the fishery cannot access and that the protocols for valid survey tows may keep the survey away from Atka mackerel locations with the biggest aggregations, although the survey likely samples at the periphery of these areas. The survey is an important source of information to this stock assessment and the recent four year gap in the survey increased the uncertainty in the stock assessment.

The Team agreed with the authors' preferred model, as presented, for determination of the ABC. No reduction from maximum permissible ABC was warranted. Given the continuing concerns about apportioning a majority of the ABC in area 541 given declines in the CPUE and increasing effort seen there, the Team agreed with using the weighted apportionment method presented by the authors. The Team encouraged future research on apportionment and determining methods that may incorporate fishery performance, such as duration or number of tows as a standardizing factor, other data sources, or alternative methods.

Skates

A skate partial assessment was presented for the BSAI skate stock complex. The Team accepted the updated projection model estimates for the Tier 3 Alaska skate component of the complex and rolled over Tier 5 estimates for the remaining portion of the stock complex.

Sharks

The Team received a presentation on the BSAI shark stock complex from Cindy Tribuzio. The author proposed alternative models for the other/unidentified sharks, spiny dogfish and Pacific sleeper shark components of the stock complex. Since the GOA shark stock complex assessment had previously been presented to the GOA Team and was conceptually the same (differing only in data inputs and resulting outputs), in the interest of efficiency and removing redundancy, the BSAI Team requested a brief summary from the GOA Team chairs of what occurred in the GOA Team.

For the other/unidentified shark and spiny dogfish components of the stock complex, Team members generally concurred with the GOA Team in that there was concern about using the 90th percentile for setting catch levels as there was not substantial justification for the decision nor was sensitivity testing included in the SAFE document. There were also time scale issues, specifically the catch time series in the GOA were relatively short potentially introducing bias. In the BSAI the time series was slightly longer with more outlier catches so there remains the issue of catch outliers for this stock complex.

Much of the discussion focused on the alternative model proposed for Pacific sleeper sharks, the Only Reliable Catch Series (ORCS) approach. The Team discussed ongoing Electronic Monitoring (EM) research and how that may help with reducing uncertainty in catch estimates in longline fisheries. The author indicated there was a postdoc working on the subject, but that conclusive results were not yet available. The Team further discussed whether the IPHC longline survey was an appropriate information stream to incorporate into the shark assessments as it was designed for halibut. The Team suggested that

determining whether the IPHC longline survey was an appropriate survey for sleeper sharks would require further investigation. .

The Team inquired on the author's confidence in the ORCS performance and how much the author thought the method would change in the future. The author stated that they thought the ORCS was a substantial improvement for this data-limited stock complex, but that it could be improved by refining attributes to make them more relevant to our FMP. The Team did not recommend the use of the ORCS for Pacific sleeper shark for this year, but thought the method was promising and encouraged the author to further explore and develop this and other alternative approaches for the next cycle.

In the document with the implementation of the ORCS approach the author set all risk table concerns at a Level 1 or 2, however as the Team did not accept the ORCS approach the author emphasized that their level of concern on the assessment category would rise to a Level 3, specifically for Pacific sleeper shark due to its low productivity and catch of immature animals. Specific concerns include that the weight of captured Pacific sleeper sharks has been underestimated because the animals are not weighed in longline fisheries, and Bering Sea Pacific sleeper shark catch consists of 1000s of small animals. Given these concerns the Team agreed that a reduction from maximum permissible ABC was warranted and that the ORCS method would be an appropriate means of making that reduction.

The Team recommended the status-quo management approach with a risk table reduction from maximum permissible ABC to accommodate for the high risk to the Pacific sleeper shark component of the complex.

The authors' proposed alternatives split each component of the complex and estimated a sub-ABC for each component. The Pacific sleeper shark sub-ABC was 30% of the total alternative proposed ABC. To determine the reduction to maximum permissible ABC for Pacific sleeper shark, the Team reduced the total status-quo ABC by 30%, essentially removing Pacific sleeper shark, and then added in the alternative sub-ABC for that species.

The Team recommended that the authors continue to explore the ORCS approach and to determine customization and weighting methods for the attribute table that are appropriate for the BSAI shark complex.

Octopus

A partial assessment was presented for BSAI Octopus. The BSAI Octopus stock assessment used a consumption model based on diet data of Pacific cod to estimate natural mortality for harvest recommendations. The Team noted that there was no schedule for updating the diet data and the current value was from 2016. **The Team recommended that the next author review the consumption model to determine if it is still relevant and applicable**.

Approve Harvest Specifications

The Team noted the compilation of the 2023 and 2024 harvest specifications and recommended their adoption by the SSC.

Adjourn

The meeting adjourned to a work session at 12:00 pm PST on Friday November 18, 2022.