NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

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Meeting of the Bering Sea/Aleutian Islands Groundfish Plan Team

Plan Team Report

November 12-15, 2024

BSAI Groundfish Plan Team Members:

Steve Barbeaux	AFSC REFM (co-chair)	Kirstin Holsman	AFSC REFM
Kalei Shotwell	AFSC REFM (co-chair)	Andy Kingham	AFSC FMA
Cindy Tribuzio	AFSC ABL (vice chair)	Beth Matta	AFSC REFM
Diana Stram	NPFMC (coordinator)	Andrew Seitz	UAF
Lukas DeFilippo	AFSC ABL/EMA	Jane Sullivan	AFSC ABL
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Lisa Hillier	WDFW		

Introduction

The Bering Sea and Aleutian Islands Area (BSAI) Groundfish Plan Team (Team) meeting started at 1:00 pm PST on Tuesday, November 12th at the AFSC. Participation was both in person and offered remotely via Zoom. Roughly 35 people attended the meeting in person, with many more signed in remotely, but attendance varied throughout the meeting. All documents and presentations were posted to the Teams' electronic agenda. All presentations are also linked in the header for each agenda item in this report.

Assessment discussions and general recommendations

The Team thanked all the authors for the high quality and timely submission of the SAFE reports. The Team also commended authors that transitioned SAFE reports from previous authors (e.g., Alaska plaice, flathead sole, and Atka mackerel) recognizing the many challenges in this endeavor.

The Team notes that the development of one-step ahead (OSA) residual analyses has been a useful diagnostic for Tiers 1-3 assessments. During multiple assessments, however, it was mentioned that the standardized deviation of the normalized residual (SDNR) statistic, which should equal one if model assumptions are met, was difficult to interpret without confidence intervals. **The Team recommended that authors using OSA residuals and reporting SDNRs do so with an accompanying 95% confidence interval in order to make it clear when assumptions are violated.**

During assessment discussion, a Team member pointed out that there are currently no Ecosystem and Socioeconomic Profiles (ESPs) developed for the Aleutian Islands. Discussion followed that compared to other large marine ecosystems (LMEs) in Alaska, the Aleutian Islands receive relatively less monitoring and research. The recent marine heatwave in the Aleutian Islands, coupled with apparent biological responses for species like Pacific cod, Pacific ocean perch, and Atka mackerel, warrants further investigation and process studies to support ESPs for these stock assessments. Given that Integrated Ecosystem Research Projects (IERP) have been conducted for all LMEs in Alaska except the Aleutian Islands, the Team supported elevating the development of an Aleutian Islands IERP as a future research priority.

Data Loss Discussion

Throughout the week the Team noted the loss of data in 2024 that will affect stock assessments:

- The 2024 AFSC longline survey did not occur
- The sablefish fishery logbook data stream ended in 2023
- The 2024 AI bottom trawl survey was reduced by 22 vessel days
- The 2024 Northern Bering Sea survey did not occur (it last occurred in 2023)
- There has been no trawl survey on the EBS slope since 2016, which continues to impact several assessments (BSAI Greenland turbot, BSAI POP, BSAI blackspotted/rougheye, BSAI Kamchatka flounder, BSAI shortraker, BSAI other rockfish, and BSAI other flatfish)
- Reduction in Age and Growth Program staff resulted in a loss of regularly scheduled age data sets, including 2023 fishery data for BSAI yellowfin sole and 2022 and 2023 fishery data for BSAI flathead sole

Data losses in the BSAI spurred conversation in at least three assessments (AI pollock, Bogoslof pollock, and BSAI Greenland turbot) about the potential to lower from Tier 3 to Tier 5 and to introduce an age-structured model. Many ecosystem indicators were also not available for the ESR and ESP reports due to these same data losses.

BS/AI Ecosystem Status Reports

AI ESR

Ivonne Ortiz presented the Aleutian Island ESR. The Aleutian Islands ecosystem in 2024 showed signs of a gradient of poor productivity in the west to high productivity in the east, largely based on counts of Steller sea lion pups and non-pups and seabird reproductive success. Despite the overall relaxation of the multi-year warm conditions across the ecosystem groundfish condition remained poor across the ecosystem, which would not typically be expected in a year with relatively cooler conditions and fewer pink salmon. Rockfish continue to comprise the main biomass of pelagic foragers in the area, which means that overall pelagic forager biomass will respond more slowly to changes in the environment than when Atka mackerel and walleye pollock were dominant. Winter sea surface temperature was still among the ten warmest on record. Strong winds and storminess during the 2023-2024 winter through spring contributed to cooler conditions during late spring and summer and were accompanied by a deeper mixed layer in the water column, similar to the previous year. This also may have impacted the vertical distribution and availability of prey throughout the water column. The authors reviewed a comparison of conditions in 1991 to 2022. It appears that system capacity is slower bringing stability due to less fluctuation in deeper water areas ensuing a more stable albeit less productive environment.

With respect to specific indicators, the Team recommended the authors contact the state demographer to shed insight on the use of school metrics as an index of ecosystem health as this is also connected to educational funding disparities.

EBS ESR

Elizabeth Siddon presented the overview of the Eastern Bering Sea ESR. In general since 2021, the EBS has returned to average thermal conditions. The summer 2024 cool pool extent continued to be near historical averages, though the extent of the coldest bottom waters (≤-1°C and ≤0°C) was much smaller in 2024 than 2023 and similar to a 'warm' year. Persistent storms resulted in a deeper mixed layer while SSTs remained cooler despite the mixing.

The biomass of small-mouthed flatfishes remained below average with some species, like yellowfin sole, increasing and other species, like Alaska plaice, decreasing. The Rapid Zooplankton Assessment was

dominated by small copepods, with low abundance of large copepods and euphausiids, with some increased euphausiid abundance towards the north by fall. The condition of age-0 pollock has remained below average since 2014 and the condition of small (100-250 mm) and large (>250 mm) pollock has decreased and/or remained below average since ~2021. While individual fish condition has declined, the overall biomass of pollock increased as the 2018 year class continues to grow. Adult pollock were distributed over the northwest outer domain where large 'oceanic' copepods occur, which was reflected in the diets in 2024. Additionally, rates of cannibalism have been low between 2021–2024. Seabird reproductive success was mixed for both plankton-eating and fish-eating species at the Pribilof Islands. No major seabird die-off events were observed in 2024. The risk table level for EBS cod was raised to a level 2 noting that prey competition is high.

A new NBS report card was included in this year's ESR. The extent of sea ice has been steadily increasing in the northern Bering Sea (NBS) since 2018 and ice thickness increased dramatically to above-average in the Bering Strait region since 2021. Measures of pelagic productivity in the NBS (e.g., age-0 pollock, herring, capelin, and juvenile salmonids) have been mixed. There was no survey so less indicators were available to put forward. The report noted that the increase in ice extent in the NBS shows signs of better productivity in the NBS than the southern Bering Sea.

Multi-species Model

Kirstin Holsman presented the multi-species model assessments. The Team agreed with the author that having this topic as a presentation separate from the EBS pollock assessment, where in past years it has been presented as an appendix, is preferred. The Team asked about comparisons of the single-species mode in CEATTLE to the operational model for each species' assessment. The author noted that the two models should be similar, but not an exact match. Discrepancies in scale are due to differences in how each model is specified, for example, much of the natural mortality (e.g., predation) occurs on ages 1-3, whereas the operational assessment models assume constant natural mortality across all ages. **The Team recommended that the authors include a comparison of the single-species mode in CEATTLE to the operational single-species stock assessment models to evaluate differences between model results**. The author offered to include comparison plots in next year's presentation, noting that the comparison may have to use the previously accepted operational model for each species due to the timelines of stock assessment production. The author also noted that other predators are not currently in the model, and ageing error and selectivities could impact the deviations between the outputs from the CEATTLE and single-species assessment models.

The Team asked if CEATTLE includes estimates of catchability. It is fixed in the model so that selectivity can go above 1. The author added that CEATTLE does have an option to estimate catchability, however adding complexity can make the model less stable.

The Team discussed the CEATTLE model in the context of ESPs. A Team member noted that CEATTLE effectively confirms what is being done in the ESPs, however, it is somewhat duplicative. **The Team recommended the authors communicate with the ESP teams to explore the duplicative methods.** For example, comparing the covariates resulting from the importance analysis in the ESPs to covariates in CEATTLE.

The Team asked if the covariates were consistent between the single-species mode and the multi-species mode. The author explained that some are, but that may depend on criteria within the model. There are consistent covariates from year to year. A Team member noted that there is a large difference between CEATTLE and the operational model for EBS Pacific cod, noting the 2018 year class as an example, and asked how much is being forced by the model. The model fits the recruitment deviations, but spawner-recruit relationships are estimated outside of the model. It would be ideal to fit within the model, but that feature is not available at this time for the EBS. CEATTLE doesn't fit the EBS Pacific cod index well

after 2018, which may be a result of different weighting. The model does allow for either length or weight compositions input and has capacity for fitting covariate linked von Bertlanffy models to either length or weight within the model.The multi-species assessment configuration presented does not use that option (weight or length compositions as input).

The Team noted that the GOA arrowtooth flounder stock assessment is moving forward with the GOA CEATLE model (via the TMB formulation of Rceattle) as a model alternative for the next operational full assessment. The CEATTLE model fits well for EBS arrowtooth.

EBS pollock

Jim Ianelli presented on the EBS walleye pollock stock assessment. This year's model remains the same as last year's model and new analysis is focused on variability in the spawner-recruit relationship (SRR) and consideration for managing the stock at Tier 1. The presentation reviewed the results of analyses presented during the September Team meeting and recommendation to manage under Tier 3 instead of Tier 1 harvest control rules. The Team discussion on this matter has been summarized in the September Team minutes. In September, the author provided a thorough examination of impacts of selectivity, time series length, temperature, choice of priors on steepness, recruitment curve form, and $\boldsymbol{\sigma}_R$ on the SRR. In September, and during this meeting, the Team discussed the highly sensitive nature of the SRR in this assessment and influence on management advice, contrasting it with the stability of advice under Tier 3 estimates. The examination conducted by the author showed that F_{MSY} is not well informed for this stock and highly dependent on choices related to the SRR and other model priors. The author showed that conditioning the SRR to satisfy the constraint that F_{MSY} equaled the SPR rate of $F_{35\%}$ resulted in a curve that was close to that estimated from the 2023 assessment. The Team concluded that due to the highly sensitive nature of the SRR, the impact on F_{MSY} and the associated uncertainty of F_{MSY}, the reliability may be questionable. As a well-informed F_{MSY} is a prerequisite for Tier 1 status under the FMP, the Team determined that this stock should be managed as Tier 3.

The Team also discussed that there are differences in calculations between the Tier 1 and Tier 3 estimates of reference points and management values which in this case resulted in similar F_{MSY} values, but substantial differences in other reference points and management values.

The Team noted that the Tier 1 and Tier 3 calculations produced different numbers for quantities labeled the same and asked the author to verify that calculations and labels were correct in each table.

The Team supported the continued use of the current model (Model 23) for this year and supported the author's recommendation of managing the EBS walleye pollock stock under Tier 3. It should be noted that this change in management tier in no way reflects any change in the quality of the assessment or confidence the Team has in the assessment. This recommendation reflects the Team's understanding of the uncertainty in the stock recruitment relationship, particularly the uncertainty in the productivity of the stock defined near the origin of the stock recruitment relationship. This portion of the stock recruitment curve remains ill-informed as the stock has never been at low levels.

There was some discussion on the lower amount of observed fishing in the CVOA this year. A member of the public explained that this was a real pattern but agreed some of this may be due to increased electronic monitoring. They noted that their fleet (CVs) were more dispersed in the 2024 B-season. This was a voluntary measure to help avoid prohibited species catch including salmon and herring.

Questions arose as to why the multispecies model resulted in higher ABC and OFLs. The lead author of the multispecies assessment, Kirstin Holsman, noted that this was partly due to differences in how mortality is accounted for an overall increase in mortality in the multi-species model. The CEATTLE multispecies model currently does not account for bottom-up processes, this also likely contributes to a

scaling discrepancy between the two modeling methods. Kirstin indicated that there is currently an effort underway to include the bottom-up effects to the multispecies model. A member of the public noted that EcoState (a state-space extension to Ecopath-with-Ecosim) is available for EBS pollock and it incorporates both top-down (variable mortality from predation) and bottom-up (variable size-at-age from per-capita consumption rates) interactions. EcoState could then be discussed in the context of bottom-up interactions, or the expression linking individual growth to population-level consumption could be incorporated into the multispecies model CEATTLE.

Jim Ianelli noted there will be a Center for Independent Experts (CIE) review of this stock assessment in early 2025. As the terms of reference are currently being formulated there is an opportunity now for Council input into this process. The Team suggested that one area warranting further attention is the development of methods for projecting selectivity. The author tested the relative performance of 2, 3, 4, and 5 year running means and 5 yr running means performed best, hence their use. The Team and author discussed that further evaluations of alternative formulations in the selectivity used in the projections for harvest and biological reference points could be explored in the future. They emphasized the value of consulting with experts on forecasting methodologies, particularly for incorporating covariates into selectivity projections. This approach could improve the robustness and accuracy of future assessments. Another area of interest discussed was the movement of pollock across the Russian line and the potential for climate data to inform this dynamic. The Team proposed exploring how exchange rates between regions might vary under different climate scenarios. Acknowledging the range of potential exchange rates, they suggested that incorporating climate predictions into models could provide valuable insights into cross-boundary movements and their implications for stock assessment and management. This integration could better account for environmental variability and its impact on the stock's distribution and connectivity.

Bogoslof pollock

Jim Ianelli presented the update assessment for the Bogoslof walleye pollock. The winter acoustic survey was conducted this year and the random-effects model was applied to the available time series of data to estimate biomass for Tier 5 calculations. Discussion from the Team centered around survey loss. The survey schedule has changed over time and is currently on a biennial schedule but the last survey was conducted in 2020. The new cycle moving forward appears to be a four-year cycle but it was not clear where that decision was being made as this survey is conducted for treaty obligations as well as the assessment of Bogosolf pollock. The Team noted that recruitment signals may be missed if a four-year cycle is adopted as this is a fast growing fish and there have been some signs of recruitment working through the recent age data. The author mentioned that an age-structured model had been developed for this assessment in the past and had been updated in 2022.

The Team recommended, in agreement with the authors, that for Bogoslof pollock the Tier 5 method and resultant management values be adopted for this stock with no reductions from maximum permissible ABC.

Given concerns regarding the frequency of the survey, the Team recommended bringing forward the age-structured model in the next full assessment to incorporate the age data.

AI pollock

Steve Barbeaux presented the update assessment for Aleutian Islands walleye pollock. The assessment is on a 2 year cycle with the next full assessment planned for 2026. The author recommended model, Model 15.1, has been used consistently with data updates for the past 10 years. The Team and author discussed whether this stock would be a good candidate for going from a Tier 3 to a Tier 5. This stock had the highest total catch in 2024 since 1998, of approximately 5,000 t, well below the ABC or the TAC which

is capped at 19,000 t. There is little targeted fishing. The Team and author discussed reasons to explore a Tier 5 approach including that the ABC has been well above the catch or 19,000 t cap on harvest, the total catch has been much lower than either the cap or the ABC, and there haven't been recent age data from either the fishery or survey. The benefit of moving to Tier 5 would be to reduce the need for age data for the capacity-limited Age and Growth Program (thereby allowing for more age data for assessments where it is needed). The Team and author discussed that the drawbacks to this approach include that the bottom trawl survey is not a great index for this stock (and a Tier 5 model would rely more heavily on this index) and that a Tier 5 model would not be a good fit if there was a targeted fishery for this stock in the future. An alternative approach was also discussed that included using the length data instead for a Tier 3 Stock Synthesis model (there is more length data than age data) and that this would be particularly useful if there was no survey in this region in 2026 (as Tier 3 models have the potential to interpolate more effectively between missing survey years). The Team and the author discussed a convergence of events that might lead to limitations to the fishery based on a data limited assessment (Tier 5), this includes if catch rapidly increases from current levels, if the ABC in the future drops below the 19,000 t cap, or if the survey frequency changes (as noted previously). Should any of these occur the Team and author noted that they would favor a Tier 3 over Tier 5 approach. **The Plan Team recommended the author bring forward a Tier 5 model in 2026 to evaluate going to a Tier 5 from Tier 3.**

The Team agreed with the authors' recommended Tier 3 model (Model 15.1), risk table summaries and no reductions from maximum permissible ABC.

Eastern Bering Sea Pacific cod ESP

Kalei Shotwell presented the ESP for Bering Sea Pacific cod. This is an updated report card for 2024 following full ESPs provided in 2020-2021. The CEATTLE model and indicators were updated to 2024 results. This version used the updated results which made the timing of the production of the ESP somewhat challenging to produce in a timely manner. The parallel cod ESP for the GOA used projections instead of updated results which is more timely to consider. All indicators in the ESP were updated. There was a decrease from above average to average for ecosystem indicators. Three socioeconomic indicators were included. Ex-vessel value decreased due to a reduction in retained catch. The team will be considering additional value-added indicators in conjunction with the draft ESP to include next year. The Plan Team discussed the process for indicating red flags for the ESPs. The ESP team may consider a request for information (RFI) open option to provide input on anything resembling red flags that comes up that would warrant further attention and consideration.

Eastern Bering Sea Pacific cod

Steve Barbeaux presented a full assessment of the EBS Pacific cod stock. The models presented were:

- Model 23.1.0.d (base)
- Model 24.0: increased length bin size from 1 cm to 5 cm.
- Model 24.1 (author-recommended): increased length bin size from 1 cm to 5 cm, annually varying Richard's K instead of Richard's ρ for growth, and updated ageing error (linear to spline model). This model was tuned separately (Francis weighting + sigmas)
- Model 24.3: same as 24.1 but tuned separately and with constant survey selectivity.

The Team asked for clarification about the maximum age (age-14), which is used to inform external estimates of natural mortality. There were questions about the potential for fish older than age-12 and if there may be a better proxy for maximum age. The author stated that there are no fish older than 14 aged from the fishery or survey. There had been a single fish aged at 17 that had been noted in previous publications, but was re-aged and found to be much younger than initially estimated. The author also

raised points about specimens found in middens having similar age structure to the modern survey and that 1980s fishery data should be more carefully investigated. **The Team recommended the authors clarify this section of text in the stock assessment, specifically justifying the choice of maximum age assumptions in the natural mortality analysis.**

The Team discussed potential sources of conflict between the age and length data in the assessment model and asked the author about plans to develop an empirical weight-at-age (EWAA) alternative for this assessment. In addition to accounting for annual variability in growth (i.e., from changes in length-at-age or weight-at-length), the EWAA approach would have to provide a framework to explicitly model ageing bias external to the assessment. To inform this analysis, the author discussed the potential to use Fourier transform near infrared spectroscopy (FT-NIRS) to re-age otoliths from before 2012. The Team supports the authors' future development of EWAA to model growth variability, while accounting for ageing bias.

The Team discussed the merits of the author-recommended Model 24.1 compared to the alternative Model 24.3, which is 24.1 retuned, but estimating constant instead of annually-varying survey selectivity ascending width. It was noted that 24.3 exhibited knife-edge survey selectivity, which may indicate that a parameter is hitting a bound. Model 24.3 results in slightly improved fits to the survey index and age composition data, which is achieved by estimating a higher survey catchability and by adjusting growth. **The Team recommended a likelihood profile on the parameter for the survey selectivity ascending limb in Model 24.3 in order to diagnose the estimate of that selectivity parameter and relative influence of the data components on its estimate.** Examining the change in the estimated peak parameter across the profile may also be useful.

The Team discussed the assumptions used for catch projections in the context of annually-varying parameters. The EBS Pacific cod assessment uses the time-series mean for projections, and the Team asked whether a recent 5-year average, as is assumed in other assessments, may be more appropriate. It was noted that the AFSC has an internal working group investigating assumptions for time-varying parameters in projections. The Team expressed support for continued work on this topic (i.e., what time window to use for projections) and that future analysis include changes to population productivity triggered by climate shocks that can have both negative and positive effects.

In response to the Freezer Longline Coalition (FLC) comment letter, which questioned whether proposed changes in Model 24.1 were truly necessary, the Team discussed the benefits of Model 24.1 relative to the base Model 23.1.0.d. The Team determined that updates to the ageing error matrix (linear to spline) and growth (time variation on the Richard's K instead of Richard's ρ) were more biologically plausible and improved model fits. The Team views housekeeping updates to data inputs and structural assumptions in the model as standard best practice in stock assessment.

The Team recommended, in agreement with the authors, that for EBS Pacific cod that Model 24.1 be adopted with no reductions from maximum permissible ABC.

The Team highlighted the "what if" analysis in the Assessment considerations section that used an ABC from a different model in the projections as a useful and informative application of the risk table.

Aleutian Islands Pacific cod

Ingrid Spies presented the Aleutian Islands Pacific cod stock assessment, which included a subset of models the Plan Team and SSC reviewed in Sept/Oct and requested seeing again in November. This included Tier 3b models 24.1 (Richards growth curve and time block on natural mortality (M) starting in 2016), 24.1a (Model 24.1 with von Bertalanffy growth curve), 24.0 (no time block on M) and Tier 5 models 13.4 and 24.2. The author presented these models and found that model 24.1 was the best model for various reasons outlined in the assessment including that the Richards growth curve model (24.1) was

an improvement in model fit over the vonBertlanffy (24.1a). The Plan Team agreed with the conclusion that the updated model (24.1) represents significant improvement in model performance and structure over other models provided.

The Team recommended AI Pacific cod be managed under Tier 3 using the Author preferred model, Model 24.1, which includes a time block on M from 2016 - 2024. The breakpoint between 2015 and 2016 corresponds to a shift to warmer temperatures in the Aleutian Islands during the past decade, and the block continues through the present year due to lagged effects of the Marine Heatwave (MHW) on M.

In Sept/Oct. 2024, the author team proposed a methodology for projecting that includes projections with the first, non-MHW mortality. The Plan Team supported this approach and the rationale as laid out by the authors that climate driven increases in M represent anthropogenic additional mortality akin to F which can vary in uncertain directions from the present year in +1 and +2 forecasts. Therefore, the most parsimonious approach is to project forward with the baseline mortality and the assumed harvest rate. This avoids non-intuitive outcomes of assuming higher mortality during climate shocks which can result in lower biomass targets but, counterintuitively, higher harvest rates during heatwave conditions. Additional support for this approach comes from the MHW forecasts for the region that indicate continued cool (lower M) conditions going forward. Given that the MHW was a short-term climate event, the Team supported the author's approach of forecasting using the base M.

The Team discussed that we still don't know exactly the mechanisms of MHW induced changes to natural mortality, although various plausible hypotheses were proposed and should be explored in the future. The Team discussed that this does induce some uncertainty into the specific breakpoints in the timeblocks. Specifically, the Team felt the current time blocks are a good starting point but also encouraged the author team to explore alternative breakpoints via sensitivity evaluations, especially to identify the terminal break point (presently 2024). The Team supported the proposed model, but strongly encouraged continued evaluations on mechanisms to support time blocks (sensitivity to beginning and ending time blocks) as well as alternative ways to model M beyond time blocks (e.g., covariates). **The Team recommended continued exploration of covariate approaches to M.**

The Team discussed the positive merits of this model, though noted that there are remaining concerns, specifically around the difficulty that can accompany time blocks on M. The Team discussed that M can vary by a large amount just by changing maximum age from 14 to 13 and maximum age evaluations should be further explored. **The Team recommended that the author run a likelihood profile over M for next year on the base M to evaluate the sensitivity of the model to various M values.**

The Team noted increasing M often leads to increases in recruitment (which has implications for higher stock productivity in MHW years, a topic that might need additional research in the future). Alternatively if growth was allowed to vary the model might use that for adjusting M, but that flexibility is not yet in the model. The Team asked if it makes a difference to have a timeblock on growth and the author discussed that the author team had presented this approach in previously presented models and its effect was insignificant.

The Team discussed that the survey variability in weight could be time varying M but could also be that fish condition (weight at length) is changing over time. In response the author discussed that this was explored and that length weight residuals do not change sufficiently over time (which further supports the current model parameterization).

The Team discussed that this stock could be a good case study for the dynamic structural equation modeling (DSEM) work going forward which could leverage ESPs from other Pacific cod stocks or use dynamic factor analysis (DFA) in exploratory analysis, and bring in available regional ocean general

circulation model covariates via the Climate Ecosystem and Fisheries Initiative (CEFI). The Team encouraged the author to work with ESP teams to leverage existing ESPs or develop an AI Pacific cod ESP specifically.

The Team discussed that the 4°C-range experienced through the marine heat wave (MHW) might be an important range (within or not within optimal range of bottom temperatures 4-6°C) based on recent research indicating growth and spawning may have optimal ranges. The Team and author also discussed that the author used a lagged index (which was not used in the GOA Pacific cod time-block and MHW approach) and that the effects may be lagged due to differential impacts on age classes as AI changes have been more gradual. The Team noted that the western AI is trending lower and also is the warmest area, indicating a potential climate change driven trend.

The Team expressed appreciation for the careful and thorough evaluations of how to address the challenge of time varying, climate induced mortality, and for innovating an approach of how to include climate change impacts on a stock while avoiding some of the problematic and non-intuitive outcomes that can accompany climate-linked targets. The Team noted that there is need for a larger discussion for how to address shifting baselines under climate change and climate shocks and the Team feels the approach and framing proposed in this stock assessment is particularly valuable towards this challenge.

Yellowfin sole

Ingrid Spies presented an operational update assessment of the BSAI yellowfin sole stock. The Team discussed the incorporation of the One-Step-Ahead (OSA) residual approach for assessing fits to compositional data and asked about the potential to add confidence intervals to the standard deviation of the normalized residuals (SDNR), which has been included as a general Team recommendation. In particular, this assessment's low SDNRs may indicate over-weighting in the assessment. If effective sample sizes are too high, this will result in unexpectedly small residuals that will violate standard normal assumptions. The Team supported the author's plan to bridge to a Stock Synthesis model, which will provide for a more easily implemented and consistent data weighting approach.

The changes to the VAST model biomass estimates were discussed in relation to the lack of northern Bering Sea (NBS) survey data in 2024. Because VAST accounts for an unsurveyed portion of the population, the Team discussed how co-variation is pinned to old information and what that will mean over time. **The Team recommended that the author work with data providers to understand what is driving the VAST time series with trend projections in the southern and northern Bering Sea in years when there were no new data coming from the NBS and the relative influence of the AR1 assumptions in VAST.**

The Team recommended, in agreement with the authors, the use of Model 23.0 with no reductions from maximum permissible ABC.

Greenland Turbot

Meaghan Bryan presented the 2024 operational assessment for BSAI Greenland turbot, the first since 2022 due to its two-year assessment cycle. Four new models were evaluated, but the authors recommended continuing management under Model 16.4c with a 10% reduction from maxABC. This reduction aligns with the risk table evaluation, which identified Level 3 (extreme concerns) related to assessment considerations and Level 2 (increased concerns) tied to population dynamics and fishery performance. Key drivers of these concerns include stock status uncertainty, data losses, and persistently low recruitment. While catch has declined along with survey biomass, a public comment noted that an internal industry agreement between the freezer longline coalition and Amendment 80 bottom trawl fleet to partition the ABC may also explain the lack of targeting by the longline fleet in recent years.

The Team held an extensive discussion on model performance, particularly concerning selectivity and the use of timeblocks to account for periods of high recruitment. A visual breakpoint in trawl fishery length composition data around 2011 suggested possible impacts from new recruits entering the population. The author indicated that instability in alternative models stemmed largely from selectivity parameters and variance adjustments and plans to explore these issues further in the next full assessment. Acknowledging the severe data losses affecting this assessment, the Team noted efforts to document data losses across assessments.

Specific recommendations from the Team for future assessments included:

- **Using interpolated AFSC longline survey RPN data for all future models, following established best practices.**
- **Displaying survey mean length-at-age across all model runs to examine interactions with selectivity time blocks and Francis reweighting.**
- **Exploring later start years, closer to the 1977 regime shift, for potential insights into recruitment dynamics.**
- **Likelihood profiling over M and von Bertalanffy parameters to address retrospective bias in survey catchability (Q).**
- **Developing a Tier 5 REMA model to compare with Tier 3 models, given the data losses.**

The Team emphasized the importance of updating the maturity schedule, reiterating prior comments made in September. The authors' efforts to collect fishery samples this year were commended, but the Team suggested increased collaboration with the Fisheries Monitoring and Analysis (FMA) Division to enhance sample sizes. Greenland turbot is not predominant in the catch and has been a lower priority for biological collections, further complicating sample acquisition.

The Team supported continued investigation into model refinements, particularly regarding recruitment and selectivity dynamics. They endorsed the authors' management recommendations and highlighted the need to address persistent data limitations to ensure robust future assessments.

In agreement with the authors, the Team recommended the use of Model 16.4c for management of the BSAI Greenland turbot stock and given the issues highlighted in the risk table a reduction from maximum permissible ABC was warranted. The Team discussed whether the author recommended 10% reduction from maximum permissible ABC was sufficient or if a larger reduction might be warranted given the higher Mohn's ρ and risk table scores. In the absence of a quantitative framework for recommending ABC reductions, it was deemed that a 10% reduction is supported by precedence of past reductions in other stocks. In agreement with the authors, **the Team recommended a 10% reduction in ABC from maximum permissible.**

Area apportionment of Greenland turbot ABC between the Aleutian Islands and Bering Sea regions have been based on the mean proportion of combined biomass in the EBS slope and AI bottom trawl surveys from the previous 3 survey years in which both surveys were conducted. Although **the Team recommended this apportionment method continued to be used for this assessment cycle resulting in 15.7% apportionment to the Aleutian Islands region**, the Team expressed concerns that the EBS slope survey is no longer conducted and that this method may no longer be adequately characterizing the state of this stock in the two regions.

Kamchatka flounder

Meaghan Bryan presented an operational update assessment for Kamchatka flounder, addressing several areas of interest and future research. Growth is currently fixed in the model, but the author expressed

interest in exploring age and length data to evaluate potential regional differences and to consider fitting growth within the model in the future. The author also indicated plans to investigate implementing length-based selectivity. The assessment revealed a slightly higher Mohn's ρ value and a Level 2 concern for retrospective bias, which the Team discussed as potentially being related to fixed growth assumptions or periodic data effects. The Team also noted a relationship between ρ, consistent bias in catchability (q), and the possibility that fixed growth may be limiting the model's ability to accommodate the observed decline in biomass.

The Team recommended the use of the current model (Model 16.0b) and agreed with the Level 2 risk table value, citing the retrospective patterns identified by the author. They also agreed with the recommendation for no reduction from the maximum permissible ABC.

Additionally, the Team endorsed the author's plans to further investigate growth dynamics and selectivity in future assessments. **The Team recommended the authors explore why the model fails to capture the rapid decline of the shelf survey biomass for the most recent years.**

Northern rock sole

Carey McGilliard presented the results of the northern rock sole assessment, which is conducted on a biennial schedule and a full assessment was presented this year. The assessment was done with a statistical catch-at-age model implemented in AD Model builder and the models presented were:

- Model 18.3_new, which was the previously accepted model, updated with new data
- Model 24.2 which incorporates new data, updates survey input sample sizes, re-weights compositional data sources relative to one another, and estimates female natural mortality (in addition to male natural mortality, which was already estimated within the model previously).

There was discussion about whether fishery dynamics might account for the observation that the percentage of landed TAC has been decreasing in recent years. A representative of the fleet confirmed that fleet decisions between two sectors to avoid Prohibited Species Catch has indeed led to this observation.

The Team supports the authors' recommended model (24.2) and resultant OFL and ABC. The Team recommended clarifying when Markov Chain Monte Carlo vs. Maximum Likelihood Estimators are being used in the recommendation table and model diagnostics. Furthermore, the Team supported the authors' desire to explore:

- Sensitivity of model results to the maturity curve and the Stock-Recruitment relationship
- Re-parameterizing male natural mortality to be an offset from female natural mortality in the future to reduce correlation between these two parameters and simplifying the parameterization of time-varying fishery selectivity in early years where fishery age data are missing to further improve convergence of MCMCs.

Flathead sole

Maia Kapur presented the results of the assessment of the flathead sole/Bering flounder stock complex. This was an operational update with no changes in the current model which has remained the same, except data updates, since 2020. The model structure for this stock complex is a two-sex, age-structured statistical catch-at-age model in Stock Synthesis. Team discussion surrounded details of the assessment fit. Of particular concern was an extraordinarily large (> 60) Pearson residual that was not observed in the One Step Ahead (OSA) residual analysis as being an outlier. The Team asked whether this lack of indication was an artifact of the OSA method dropping the largest size bin to calculate the OSAs, but was

assured by the author that this was not the case. Further discussion focused on whether the large SDNRs were a cause for concern. The author was not overly concerned indicating that this may be related to data weighting. The Team again noted the need for more guidance in properly interpreting the results of the OSA residual analysis and the need for confidence bounds around the QQ residual plots (see general recommendations). It was noted that the issue with high SDNR values may be resolved if input sample sizes are updated using the recently developed bootstrap approach.

The Team agreed with the authors' recommended model, 18.2c (2020), and the authors' OFL and ABC with no reductions from maximum permissible ABC. The Team supported the authors' future research plans for the assessment, particularly exploring differences in growth.

Alaska plaice

Lee Cronin Fine presented the 2024 stock assessment for Alaska plaice, incorporating updates to input data and assessment methodology. As a Tier 3 stock, Alaska plaice has no directed fishery but is a bycatch species in groundfish fisheries targeting yellowfin and rock sole. This year marked a transition from a stand-alone ADMB model to Stock Synthesis (v.3.30.22).

Discussion highlighted the need for further investigation into population structure, particularly concerning the Southeast Bering Sea (SEBS) and Northern Bering Sea (NBS) components. While up to 60% of the biomass can reside in the NBS in some years, the NBS survey data were not yet incorporated into the assessment model. The Team emphasized that population connectivity between these regions could influence how abundance information is treated and raised concerns about the implications of excluding NBS data. **The Team recommended that future assessments include NBS biomass estimates, maps showing Alaska plaice distribution in surveys and fisheries, and analyses of distribution and movement patterns over time in response to environmental changes, such as the cold pool area.**

The author clarified that as in the previous model NBS data were excluded during the transition to Stock Synthesis to avoid introducing extraneous changes. The Team encouraged incorporating NBS survey data into future assessments.

After discussions, the Team supported the author's proposed model improvements for the next cycle, including transitioning from age- to length-based selectivity, using conditional age-at-length data to refine the age-length key, and expanding the use of fishery age data (contingent on resource availability from the Age and Growth Program). The Team expressed confidence in the author's discretion to pursue these enhancements.

The Team agreed with the author's recommended model, 24.1b, acknowledging adherence to best practices for transitioning stock assessment models from standalone ADMB to Stock Synthesis. The author and Team do not recommend further reductions from maximum permissible ABC.

Other flatfish

Cole Monnahan presented results from an operational update assessment for other flatfish stock complex. This is a lightly exploited complex made up of 15 different species and is managed under Tier 5 using a random effects (RE) model and estimates of natural mortality for rex sole (0.17), Dover sole (0.085), and all others combined (0.15). Biomass estimates used in the RE model come from the Eastern Bering Sea (EBS) shelf, EBS slope, and Aleutian Islands bottom trawl surveys. The Team noted the decline of Dover sole in the AI survey, however the 2016 EBS slope survey left that component of the stock complex at an all time high. Given the loss of the EBS slope survey, the **Team recommended the authors investigate the potential for use of the AFSC longline survey to supplement the EBS slope time series for the deeper water species.** The AFSC longline estimates could be used as an index to extend the EBS slope survey time series. This approach has been implemented for short-spined thornyheads in the other

rockfish complex assessment. It was also noted by the Team that the continued loss of the AFSC longline survey would make this recommendation moot, emphasizing the importance in the continuation of the AFSC longline survey and the continued issues with loss of data for the deep-water species for their proper management.

The Team agreed with the authors recommended Tier 5 model with no reductions from maximum permissible ABC.

Pacific ocean perch

Paul Spencer presented the operational full assessment for BSAI Pacific ocean perch. The author noted that while this is an operational full assessment, there ended up being no major changes to the model after evaluation of all of the alternative models. The models brought forward for consideration were:

- Model 16.3 (status quo): updated data from previous assessment.
- Model 24: same as Model 16.3, but with an increased penalty for the dome-shapedness in the bicubic spline and a lognormal prior on the AI survey catchability.

The author noted that the prior on catchability had been used in previous models, but not in recent iterations. The author explained that catchability had been stable in the model for a long time and when removed, did not impact the model (at that time). Model 16.3 now shows a fairly strong retrospective pattern, which is at least in part alleviated by the catchability prior in Model 24. The Team discussed fishery selectivity between the two models and asked the author if the continued estimation of bimodal selectivity in Model 24 in recent years was plausible or problematic. The author noted that when the penalty constraining dome-shapedness for fishery selectivity was increased, the composition data fit slightly better and the biomass index slightly worse. The Team noted that fits to the aggregate compositions were degraded in some cases. **The Team recommended that the author explore increasing the penalty to smooth out fishery selectivity. The team also recommended an exploration of the mechanisms for time-varying nonparametric fishery selectivity specifically related to changes in fleet dynamics.** A Team member asked that if you were to have had the selectivity pattern for the most recent years applied to the historic fishery, would it have resulted in a substantially larger historic population estimate. The author responded that it would be unlikely because if given the high fishing pressure and high selectivity, it is unlikely that there would be large numbers of old fish observed in the 1980s.

The Team asked if there was one thing that stood out that made the model fit better when composition data were removed. The author noted that the benefit of the sensitivity analysis was adding one data set back at a time and seeing when and where they interacted. He identified conflicts between the AI survey biomass and the age composition, potentially because both of those data were from the same source. The Team discussed if it could also be a parameter that's fixed in the model, such as M or the weight-at-age matrix. M has a prior on it, but the author noted he could look if it's changed between models. A Team member suggested that there may be annually varying factors that are not being captured in the model. The author noted that time varying M had been discussed during the CIE review, but was not a strong recommendation. Also, plots of size-at-age suggest stability over time. A Team member asked if that analysis was explored by area, as it appeared that the data conflict could be regional (e.g., strong effect of EBS slope composition data on AI survey catchability). The author was not sure if that was in the CIE and would need to review the report. They also noted that a stock structure document has not been completed for this stock. The author said that there used to be OFLs by area for this stock, but it was unreasonable to fit models by area. The author noted that it would be worthwhile to explore how correlated the data are from the different areas.

The Team noted that the model does not do well estimating the most recent year classes, likely because POP do not fully recruit into the survey or fishery until at least age-10. The biggest change between Model 16.3 and Model 24 is the constrained catchability, which resulted in a reduced biomass, essentially scaled by the change in catchability.

The Team appreciated the new diagnostics added to the document this year.

The Team discussed the apportionment of the ABC and asked if there are other potential indices that may be useful given that this stock still relies on the EBS slope. The author has not explored that, but noted that fishery CPUE is difficult to understand. Members of the public provided some information from the fishery side. First, vessels in the Bering Sea participating in this fishery are generally smaller, thus tows are smaller and that may impact CPUE. The TAC in the Bering Sea has been increasing and is released in stair steps. The fishery is a late fall fishery, occurring generally after pollock fishing is closed, which poses challenges to the assessment. Lastly, vessels targeted this stock are in a voluntary cooperative, which may result in a reduced CPUE.

The Team agreed with the authors recommended model (Model 24) with no reductions from maximum permissible ABC.

Blackspotted/rougheye rockfish

Paul Spencer presented an operational full assessment for BSAI blackspotted and rougheye rockfish, which operates on a biennial schedule with the last full assessment conducted in 2022. This assessment is a Tier 3 in the AI and a Tier 5 in the EBS. The assessment continues to overestimate recruitment in recent strong events. In addition to the overestimation of these recent recruitment events and year classes, there were additional issues with the assessment noted by the author including poor fits to the composition and survey biomass estimates. Therefore the Team agreed with the author's Risk Table score of 2 (increased concerns) for Assessment Considerations. There were also increased concerns (level 2) for Population Dynamics and Fishery Performance; however no reduction from maximum permissible ABC was recommended, in part due to the strong AI survey biomass estimates from the last three surveys, indicating that recent year classes are in fact large, albeit not as large as the model estimates.

This stock has been fished above the western Aleutian Islands maximum subarea species catch (MSSC) every year except one since the inception of MSSC in 2015. The Western/Central Aleutian Islands regional ABC has been exceeded for the past six consecutive years including 2024, and the combined BSAI ABC was exceeded in 2021, 2023, and 2024. There was substantial Team discussion centered on possible biological implications of this issue. It was noted that most of the catch comes from the trawl fleet, with ~85% coming from the POP fishery. A member of the public commented that much of the catch comes from rare large catches in single tows, and that the fleet cooperates to stay out of high-BS/RE bycatch areas as much as possible. It was noted that on an annual basis when ABCs are reached, the stock is placed in the prohibited species category, closed to retention and discarded, and catch managed under the stock-wide OFL.The Team expressed concern over the perception of the ABC when it is routinely exceeded as has been occurring. The Team observed that there are other bycatch only stocks across the two FMPs where ABC has been exceeded at the stock level (not the apportionment level). The Team noted that this information should be conveyed by the Agency to the Council that the BSAI wide ABC has been exceeded three times in the past 4 years (whereby the guidance is to reevaluate accountability measures if more than once in 4 years) and, in accordance with National Standard 1 and the BSAI FMP, accountability measures for this stock should be reevaluated by the Council. It should be noted that the Team continues to be concerned with high catch rates in the western Aleutian Islands, the reason for which the MSSCs were initially implemented.

In addition, the Team questioned the value of having discussions about reduction from maximum permissible ABC using Risk Tables for a bycatch only species when the maximum permissible ABC is being exceeded continuously. The Team noted that this is a growing concern and guidance is needed on the biological implications of exceeding ABC to help the Team interpret assessment outputs and make informed recommendations on the intent of the ABC compared to the OFL.

A Team member also noted that the ageing error matrix was last updated in 2017 and questioned whether agreement has changed over time. There is some tension between the fishery and survey in terms of identifying strong year classes that could be investigated further in coordination with the Age and Growth Program. The Age and Growth Program is also developing tools to rapidly distinguish between rougheye and blackspotted otoliths in mixed collections. Most of the stock in the AI is blackspotted but there are some rougheye in the eastern AI.

The Team agreed with the author's recommended Tier 3 (AI) and Tier 5 (BS) models with no reductions from maximum permissible ABC.

Shortraker rockfish

Kalei Shotwell presented the Tier 5 operational update for BSAI shortraker rockfish, which operates on a biennial schedule with the last full assessment conducted in 2022. During that assessment, the REMA model was introduced for this stock. The current model uses multiple substrata based on outdated microsatellite genetics data, which are aggregated to produce a single biomass estimate. However, newer full-sequence genetic analyses indicate little to no genetic structure within this stock. The authors plan to reevaluate the REMA model for the next assessment cycle and consider transitioning to a single-area model with a single (pooled) parameter for process error. **The Team supported this approach and recommended simplifying and combining strata for future assessments.** They also noted that while genetic differences may not be apparent, stock structure could still exist if there are regional demographic rates, age and length structure, or exploitation rates or history. This type of stock structure may be particularly relevant to slope rockfish, which are long-lived and highly sedentary, thus making them vulnerable to localized depletion.

The authors plan to collaborate with other rockfish assessment teams to implement recommendations from Sullivan et al. (2022) regarding updated life history information, particularly natural mortality rates. The Team supported these efforts and emphasized their importance.

Concerns were raised regarding the stock's vulnerability to reduced survey coverage. The Aleutian Islands bottom trawl survey reported the second-lowest biomass estimate in the time series, showing a 39% decrease with a high coefficient of variation (CV = 0.42). For a lightly exploited species with a long lifespan, such fluctuations in population are unusual and concerning. Additionally, the absence of the AFSC longline survey in the Aleutian Islands this year further exacerbated data gaps. The Team expressed serious concerns that continued reductions in survey stations and lapses in survey coverage could negatively impact the management of this stock. They emphasized the need for consistent and comprehensive survey data to ensure effective monitoring and management of BSAI shortraker rockfish

The Team agreed with the authors recommended model (Model 22_2024) with no reductions from maximum permissible ABC.

BSAI Other rockfish

Jane Sullivan presented the update assessment for Other Rockfish. This stock is assessed on a biennial cycle, and the last full assessment was in 2022. The assessment method remained unchanged from the last full assessment and Tier 5 projections were based on Model 22.

The Team discussed the reduced catch of non-SST Other Rockfish in the AI in 2024. Fewer dusky rockfish were caught in Atka mackerel target trawls, which occurred earlier than normal in 2024. The Team discussed a possible dusky stock structure concern. Recent research supports current management paradigms (splitting the BSAI and GOA); however, the ability to discriminate among regions was moderate to low, suggesting minimal stock structure over all.

The Team extensively discussed the recent decline in shortspine thornyhead (SST) observed in the AFSC longline survey. Hook competition is an unlikely explanation and anecdotal observations of fewer SST were noted by the 2023 survey crew.

The Team discussed the Risk Table and the author assigned level 2 to three categories. A reduction in the ABC from maxABC was not recommended by the author partly because there is already a reduction based on a Tier 5 and the lack of certainty around the one additional low point. The Team highlights that survey information is essential for managing the Other Rockfish stock and that as of November 13th the ABC has been exceeded for this complex.

The Team highlighted the importance of the longline survey replacing the EBS slope survey as a trend index and that there is a necessity for continued longline surveys in this region. The most recent observations are uncertain, and the future observations are required to verify the recent observed declines.

The Team agreed with the author's recommended Tier 5 Model 22 with no reductions from maximum permissible ABC.

Atka mackerel

Jane Sullivan presented the Tier 3 operational update assessment for Atka mackerel (Model 16.0b). The Team discussed the dynamics of the fishery, which appear to be largely driven by management actions, and which have included Amendment 80 and Steller sea lion closures. One of the authors noted that decoupling the biology of the stock from fishery management effects continues to be a challenge.

The Team noted that in general this appears to be a dynamic stock that experiences "high highs", and "low lows." While it has always rebounded from low biomass estimates in the past with strong singular recruitment events, there is no guarantee this will always occur. Ecosystem uncertainties, including recent warming in the Aleutians, are a cause for potential concern. The author noted this uncertainty in the Risk Table with a score of 2 for ecosystem concerns, but did not recommend a reduction from maximum permissible ABC. A Team member suggested that the authors consider such avenues as Integrated Ecosystem Research Project (IERP) for future research.

The Team recommended the continued development of an Ecosystem Socioeconomic Profile (ESP) for this stock to be brought forward with the next assessment. The author also noted that a CIE review is likely to occur in 2026, which will focus on addressing poor fits to the survey age composition data, possibly through the application of selectivity timeblocks, and exploring how adding new data changes fishery selectivity and F.

The Team discussed the random effects model apportionment strategy and noted that the 4-survey weighted average used in the previous assessment was intended as a stop-gap and that the intent had been to return to the random effects model approach. The Team agreed with the author that this is the most scientifically defensible and consistent method to determine apportionment.

The Team agreed with the authors' assessment (Model 16.0b), Risk Table scores, and harvest recommendations.