NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

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Meeting of the Bering Sea/Aleutian Islands Groundfish Plan Team

Plan Team Report

September 18-19, 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	Jane Sullivan	AFSC ABL
Allan Hicks	IPHC	Steven Whitney	NMFS AKRO
Lisa Hillier	WDFW		

Introduction

The Bering Sea Aleutian Islands (BSAI) Groundfish Plan Team meeting was held virtually via Zoom on Wednesday and Thursday, September 18-19, 2024. Roughly 120 people attended the meeting signing in remotely, but attendance varied throughout the meeting. All documents and presentations were posted to the Team's electronic agenda. All presentations are also linked in the header for each agenda item in this report.

Bogoslof Winter acoustic survey

The winter acoustic-trawl survey of the Bogoslof Island area was presented by Nathan Lauffenburger. The Plan Team is appreciative of the clear and concise presentation as well as the work of all involved in this survey.

There were questions from the Team about how many tows were normally taken and how flexible the survey timing is. Nathan said that ten tows are typical, and that ship availability and ship logistics have a big impact on the timing and duration of this survey. The Team asked if the bimodality of pollock from the survey might be due to only two tows being conducted. He noted that the bimodality probably represented the actual stock as both tows showed similar bimodal distributions.

Eastern Bering Sea acoustic survey and acoustic vessel of opportunity index

Abigail McCarthy provided preliminary results of the summer 2024 acoustic-trawl (AT) survey of eastern Bering Sea shelf walleye pollock. Nate Lauffenburger presented Acoustic Vessel of Opportunity (AVO) index information. The Team appreciated both presentations and had no further feedback.

Eastern Bering Sea pollock

Jim Ianelli provided a presentation on eastern Bering Sea pollock. A large portion of the presentation was focused on SSC concerns and included stock recruitment relationship (SRR) sensitivities. Jim provided a thorough examination of impacts of selectivity, time series length, temperature, choice of priors on steepness, recruitment curve form, and σ_R on the SRR. The Team voiced concerns on the estimability of σ_R in the current assessment model. Jim indicated σ_R estimates are well defined in likelihood profiles and are similar to those derived from random effects models. The Team discussed the highly sensitive nature of the SRR in this model and influence on management advice, contrasting it with the stability of advice under Tier 3 estimates. The examination conducted by Jim showed that F_{MSY} is not well informed for this stock and highly dependent on choices related to the SRR and other model priors. He showed that conditioning the SRR to satisfy the constraint that FMSY 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} (requirements for Tier 1 status) 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 given these results this stock should be managed as Tier 3.

The Team recommended that the SSC reconsider the tier designation for this stock and that for 2025 the EBS pollock assessment be reclassified as Tier 3 and management advice follow that tier designation.

As a research model Jim provided a preliminary examination of incorporating natural mortality arising from the CEATTLE multispecies model into the EBS pollock model. The approach resulted in a substantially different SRR which had much higher uncertainty. The differences in model results from the current model were not inconsequential and need further review. The Team agreed with the author that the approach is promising but needs more work before being considered for management.

In response to the SSC suggestion to consider excluding early CPUE data and foreign fishery data, Jim did model runs with these data excluded. The Team discussed the issue that these ages may be biased as they were aged using surface reads only, which has been shown to be negatively biased in older fish, Jim suggested that much of this historical catch was on younger fish and therefore the bias may not be pertinent. Upon examination of the results of the author's analysis which show little impact on removal of these data to model results the Team supported the author’s recommendation not to omit early CPUE data and foreign fishery data from the assessment.

In recognition of the SSCs concerns, the Team recommended that the author, in consultation with the age and growth laboratory, examine the age data from these early collections and evaluate possible aging bias due to the aging methods employed and evaluate possible impacts within the model.

In response to the SSCs request to consider possible alternatives to risk table adjustments from Tier 1 to Tier 3 Jim provided an analysis considering EBS pollock’s role in the ecosystem as forage and methods for moderating variability in management advice for this stock. The Team considered the analysis a good starting point in developing harvest control rules and management approaches that are not dependent on the SRR. The Team supports further exploration of approaches that take into account factors beyond the individual stocks dynamics which recognize the particularly important role this stock has in the Bering Sea ecosystem. It was recognized by the Team that the 2 million ton cap has restricted catch for this stock to well below ABC, however, it was noted that explorations of the impacts of fishing at the Tier 1 ABC in mass balance models have shown that such harvest would have resulted in substantial changes to the ecosystem.

Jim examined bayesian diagnostics through “no-U-turn sampler” (ADNUTS) in the context of the EBS model as a case study for making general recommendations on diagnostics for model evaluation. The Team discussed the need for more standardization in reporting methods and results so that reviewers can easily ascertain how the method was conducted and easily interpret the diagnostics.The Team also discussed that this method is well suited for model validation, but the approach is not yet suited for providing management advice as it needs further development on diagnostics for management calculations.

The Team recommended the continued development of consistent and standardized reporting of the Bayesian integration methods used including the diagnostics, and results. The approach used in the development of REMA was mentioned as a possible model to follow for the development and use of new methodologies.

The Team wanted to commend the author on their novel web-based approach to providing this year's contribution. The web-based interface allowed the author to provide content that was well organized, easily navigable, and interactive which enhanced the content and eased the review process. This approach also allowed access to a single PDF, Epub, and MS word version of the content (linked in the lower right corner of the main website page).

Alaska plaice

Lee Cronin-Fine reported on efforts to convert the existing AK Plaice stock assessment model (a standalone, ADMB model tailored specifically to AK Plaice) into a Stock Synthesis (SS3) approach. It was recommended that the author use the bootstrap method (Survey ISS package, Williams and Hulson, 2014) to determine input sample size (as currently done by the author) followed by a Francis re-weighting occurring within the R4SS package. This change was left to the author's discretion to implement either this year or next year depending on completion of other recommendations (see below). Team members requested to review the control files used in the SS3 assessment, specifically to understand how internal estimation of growth and weight-at-age parameters is occurring. This was extended as general best practice for all assessments conducted using SS3. Team members asserted that models 24.0 and 24.1 could not be ranked by likelihood due to the structural inconsistencies between them in terms of internal vs. external estimation (concurs with the author's assertion that model 24.1 should be favored due to the internal estimation of key growth parameters). Additional diagnostics were requested (specifically for model 24.1) to consistently evaluate the models and determine if this can be accepted as a new base model moving forward into November. Team members noted that the differences between alternative models were minor, but asked the author to conduct a retrospective analysis on these models for diagnostic purposes. The author stated that these diagnostics were applied in the bridging of these models and plans to present the appropriate diagnostics in November. **The Team requested that the diagnostics as outlined in the assessment protocols for the Base 3 model and Model 24.1be provided in the November document.**

Northern rock sole

Carey McGilliard presented alternative stock assessment models for BSAI northern rock sole after providing background and bridging information. During the presentation, team members asked several clarifying questions and noted some observations, of which the more substantive ones are described. The pre-1979 fishery selectivity is unreasonable, which may be explained by the lack of data in early survey catches, and/or early ageing procedures which may have changed over time. Many of the values in the trace plots for the Bayesian analysis were close to one (indicating convergence), which was surprising given the bimodality in some parameters. However, further discussion suggested that the bimodality was consistent across MCMC chains, as shown in the traceplots, therefore the parameters are exchangeable and the model was converged. A Team member asked whether environmental conditions have been incorporated into any northern rock sole models, and they have not been. The OSA residuals are generally rather large (>abs(3) are outliers) and the uncertainty surrounding these large residuals could be alleviated through tuning the models, such as Francis weighting. The Team discussed whether age data from observer program special project samples should be included in stock assessments as some of the age data used in the assessment may not have been from regular collections. The Team felt that age data from special projects are acceptable for conditional data, but not fishery composition data. There are cases when special project samples are the only available data, the inclusion of which can be brought forward by authors on a case-by-case basis.

The Team recommended the following models be provided for the November assessment:

- **The base model 18.3**
- **The author proposed model 24.2**

Longer term suggestions include fixing selectivity for earlier years, examining why One Step Ahead residuals are not standard normal, exploring input sample sizes using a bootstrap approach that is currently under development, updating maturity since it has not been examined for 20 years, and exploring other potential issues including ageing error.

Greenland turbot

Meaghan Bryan presented preliminary results of the Greenland turbot assessment. While discussing changes in the center of gravity of fishery catches, a member of the public noted that killer whale depredation has changed longline fleet behavior in recent years that could have also caused a shift in the locations of the trawl fishery, which used to avoid the longline fishery areas. The Team had some concerns regarding the early model start time, assumptions about SRR autocorrelation and q, and the lack of Francis reweighting in the candidate models. The authors showed that starting the model prior to data availability, the high estimates of recruitment in the 1950s-1970s are likely being driven by high catches in the early years. Similarly, SRR autocorrelation is likely being informed by the early catch data. A Team member suggested including a temperature covariate as an alternative to fixing SRR autocorrelation. Another Team member noted that it is common practice to include recruitment autocorrelation in assessment models, which is supported by observations for this species. Trade-offs between floating and fixing q were also discussed. Fish move out of the shelf survey area to the slope as they mature, which may affect both catchability and selectivity. The Team realizes that the lack of a slope survey presents challenges to this assessment. A Team member noted ISS reweighting is generally considered to be best practice; the author responded that this generally resulted in poor fits and problems with hitting selectivity parameter bounds, but could be further explored.

The Team recognized the tremendous amount of work the authors have undertaken to address poor fits to survey indices and re-evaluate model assumptions. The Team strongly supports the authors' future research plans, particularly updating the maturity schedule and exploring the most appropriate model start year, both of which could have large impacts on the model, and including revised fishery and longline survey length composition ISS when new methods for doing so become available. **For November, the Team recommended bringing forth models M1, M19, and M20, and if time allows, an option that applies ISS reweighting.**

Harvest projections

Melissa Haltuch presented harvest projections for the following stocks or stock complexes:

- BSAI northern rockfish
- BSAI arrowtooth flounder
- BSAI skates

The Team agreed with the authors' OFL and ABC recommendations for these stocks as shown in the documents.

The Team discussed the lack of the current survey information within the harvest projection documents due to the change in schedule from November to September. The current year survey biomass estimates were not available at the time the documents were created so they were not presented with the updates for each stock. However, the recent estimates for some of the stocks were provided in the survey presentations. The Team noted that presenting the biomass trends from the survey through the survey presentations would allow for identification of red flags that could then be discussed by the Team.

The Team recommended that presenters of the harvest projection summaries coordinate with the presenters of the surveys so that biomass trends for stocks with harvest projections were included in the survey presentations.

The Team discussed that the main difference in these harvest projections with the new schedule is that catch is now updated earlier than it has been previously. The Team noted that there was no formal evaluation of sensitivity to this change and supported potential Alaska Fisheries Science Center exploration to these earlier catch dates and subsequent catch advice. The Team also suggested that haul target may be better to use than trip target for some stocks when evaluating fishery trends.

The Team discussed what would happen if the catch unexpectedly changed or a red flag was identified in the ecosystem. The Team noted that this situation was unlikely as we chose these stocks for off-year cycles because they have low probability for large swings in catch. Also, if there was a severe ecosystem change, we would likely see that across many stocks. There is no formal process to revisit these documents in November; however an adjustment based on the survey data could still be made if a red flag was identified. The Team agreed that having these harvest projections were useful in September and does not require more than this for a given cycle.

Aleutian Islands Pacific cod

Ingrid Spies presented the Aleutian Islands Pacific cod stock assessment, which included a number of alternative model explorations to address SSC and Plan Team suggestions. Based on a thorough and systematic analysis five models were proposed to be advanced for consideration in November. These include a base Tier 3b model (24.0) and a model (24.1) with a modified timeblock structure (2 blocks, pre 2016, and a lagged "marine heatwave/thermal shift" block for 2016-present) and additional improvements including replacement of the vonBertlanffy with a Richard's growth curve, as well as two Tier 5 models 13.4 (base) and 24.2.

The Team commended the assessment team for their thorough evaluation of the sensitivity and bridging analysis of various components of the Tier3b 24.0 to 24.1 models and agrees with the conclusion that the updated model (24.1) represents significant improvements in model performance and structure.

The Team and Ingrid discussed the broader role of OSA and Pearson's residuals in terms of model diagnostics and supported the approach of focusing on Pearson's residuals to identify patterns in the residual while using OSA residuals to evaluate IID (independent and identically distributed) assumptions tied to residuals. The Team raised the possibility of a broader discussion around the interpretation of Pearson and OSA residuals across other stocks, suggesting this might warrant further exploration.

The Team noted the authors' preferred model (24.1) consistently predicts more large fish than observed, resulting in negative residuals for those larger than 115 cm. While this is an issue, it is minor due to the small size of the residuals. The Team noted that one possible solution might involve increasing the CV (coefficient of variation) for the larger size classes, though it may not be a critical concern.

Ingrid proposed a methodology for projecting that includes projections with the first, non-MHW mortality. Ingrid discussed the planned forecasting approach for Nov will be to run the forecast from the pre-heatwave base value of M, not avg of M timeseries, or the more recent M due to the following; (1) using the higher M in the forecasts can result in lower biomass targets but, non-intuitively, higher harvest rates during heatwave conditions, (2) additional support for this comes from the MHW forecasts that indicate continued cool (lower M) conditions going forward.

The Team supported this rational and additionally discussed that extra mortality caused by climate change is not "natural mortality" rather is a type of anthropogenic M, akin to F, caused by climate change so it is most appropriate to use the base "natural mortality" (0.417) during projections, and not additionally include the climate mortality of (0.162, i.e., 0.579- 0.417). There was mention of the potential utility of MHW forecasts, but in lieu of this the M block approach proposed by Ingrid utilizes a two-year lag, which acts as a smoother and is designed to buffer management against reactive adjustments to shifting

MHW conditions. Finally, Ingrid pointed out that the 2024 survey seemed consistent with current trends so results and stock status should be similar when presented in November.

The Team supported the author's plan to bring forward models 24.1 and 24.0, noting that the difference between the two models is that 24.0 does not have the M block which some Team members would like to see again in November with updated data. The Team additionally supported the author's plan to show Tier 5 models 24.2 and 13.4 for Nov.

The Team recommended presenting an additional bridging model 24.1a which has the time block on M but uses the von Bertalanffy growth equation instead of the Richard's curve, along with a description of why the Richards curve shows a very large improvement to model fit (if it is consistent with what was presented in the September model runs). The Team recommended the final full set of November models to include Tier 3b models 24.1, 24.1a (new), 24.0, Tier 5 13.4 and 24.2.

The Team expressed appreciation for the work and careful considerations tackled in this assessment especially around the challenge of time varying, climate induced mortality, and the careful consideration of how climate change impacts on a stock should be included in harvest recommendations.

Eastern Bering Sea Pacific cod

Steve Barbeaux presented the EBS Pacific cod assessment, which included a suite of alternative models with new bin sizes for length data, an updated ageing error matrix, new ageing bias estimates pre-2007, inclusion of conditional age-at-length data for the survey and fishery, static survey selectivity, and a change in the time-varying parameters in the Richard's growth model.

There was discussion about the increase in length bins from 1 cm to 5 cm. The Team asked the author whether he had considered refining bin sizes to allow for more precise estimates for sizes known to exhibit faster growth, for example. The author noted that he preferred the uniform length bins to keep data processing simpler and that the 5 cm bins appeared to perform very well for Pacific cod. He indicated that up to 10 cm may be appropriate. **The Team recommended the author consider the effect of the increase in length bins on spawning biomass and derived management quantities and pointed to Monnahan et al. (2016) as a helpful reference on the topic.**

There was considerable discussion about ageing error and ageing bias. First, there was a question about the choice of time series used to develop the new ageing error matrix and whether the pre-2007 period with bias warranted a separate ageing error matrix. The Team supported the authors plan to explore this in future assessment cycles. Second, the author also reminded the Team that ages estimated using Fourier-Transform Near Infrared Spectroscopy (FT-NIRS) will be incorporated into the model soon. This new data source will require a separate ageing error matrix, which is currently an active topic of research and development in the Age and Growth Program. Third, there was a question about the pre-2007 ageing bias. The Team's ageing expert, Beth Matta, clarified that while the period of ageing bias is pre-2007 and prior to a change in how "checks" (false otolith annuli) in the early years of growth were interpreted, the ageing bias wasn't fully identified until around 2012, when preliminary results of an oxygen-18 isotope study (Kastelle et al. 2017) were received by the Age and Growth Program, leading to further subtle adjustments in criteria. The new data used to estimate the updated ageing bias for the pre-2007 time period was made available by the Age and Growth Program in 2018. These data indicate a higher bias in the pre-2007 period than previously estimated. Finally, it was clarified that the current model and recommended models for November assume the same estimates of ageing error for both time periods but that bias is only applied to the pre-2007 period.

The inclusion of conditional age-at-length data resulted in reduced fits to the data, in particular the survey index, along with changes in the trajectory of the final year's spawning biomass. In an effort to understand the model's response to these new data, the author presented a profile of survey catchability (Q) and growth. Results showed an interaction between the two processes, for example, a Q=0.8 was associated with sizes at age-10 that were roughly 5 cm smaller than Q=1.6. The author hypothesized that variability in length-weight was not being accounted for in the model, and therefore the model was attempting to account for changing fish condition through the estimation of Q and relative survey biomass. The author plans to pursue alternative approaches before bringing forward model alternatives that allow for changes in weight-at-age over time, which could be through time-varying length-weight or an empirical weight-at-age model. The Team supported the authors' decision not to bring forward Model 24.2 with the conditional age-at-length data as an alternative for operational use this November. **The Team recommended continued development of models using conditional age-at-length and suggested the author consider an empirical weight-at-age approach or a time-varying length-weight relationship in future years.**

The Team supported the author's recommendation to present two models in November 2024:

1. **Model 23.1.0.d: the base model with updated data and an updated linear aging error for all years and updated ageing bias for years prior to 2007.**
2. **Model 24.1: 5 cm length bins, static survey selectivity, updated spline aging error for all years and updated ageing bias for years prior to 2007.**

The Team commended the author for providing a thorough and well-written document with links to code and model files. In particular, the Team found the author's visualizations for one-step ahead residuals and fits to composition data very useful.

Pacific ocean perch

Paul Spencer presented the BSAI Pacific ocean perch (POP) assessment update. Exploratory model runs based on SSC and Plan Team comments included stochastic initial age compositions, time-varying survey selectivity, and natural mortality rates other than what is in the current model. Estimation of stochastic initial numbers at age was explored in Model 24.1 and had little effect in fitting the fishery length comps and the AI survey biomass index.

Model 24.2 included an increased penalty for the dome-shapedness in the bicubic spline used for fishery selectivity and a lognormal prior on the AI survey catchability (mean=1, CV=0.15). Discussion focused on survey selectivity and catchability and a comparison of trawlable habitats in different regions. This assessment uses both the EBS slope and AI trawl survey data, and the author noted that combining them is problematic due to gear selectivity and the lack of overlapping observations. The author highlighted the multimodal pattern of fishery selectivity in recent years and discussion focused on reasons for this pattern including changes to the fishery fleet (sale of a large company), Steller sea lion restrictions, seasonal changes, and changes to fishery performance. **The Team recommended that the author explore the size distribution of POP over time in relation to seasonal changes and changes in the fishing fleet.** The author noted that increasing the penalty from 10 to 30 on fishery selectivity dome-shapedness across ages added stability to the model.

Model 24.3 is Model 24.2 with selectivity for the AI and EBS trawl survey modeled with time-varying double-normal curves. This model was motivated by SSC/PT comments, but the author noted that this change had very little effect.

The Team commends the author for a well-organized document and presentation. **The Team recommended, in concurrence with the author's recommendation, that last year's accepted model, Model 16.3, and Model 24.2 be brought forward in November for consideration.**

Black spotted/rougheye rockfish

Paul Spencer presented the results of his responses to three requests from the SSC and Plan Team and the associated preliminary model runs. First, the IPHC's Fishery-Independent Setline Survey (IPHC FISS) was incorporated into the assessment as requested by the SSC and this was presented as model 24.1. The model fits and diagnostics were degraded with this addition. Paul noted that there is no data available to inform an IPHC survey selectivity estimate. A Team member asked if selectivity could be "borrowed" from another survey (such as the AFSC longline survey) but the author didn't feel they are similar enough; a Team member then noted that the IPHC survey uses 16/0 hooks which may affect selectivity. The Team agreed with the author's recommendation to *not* include the IPHC FISS index for future models due to the lack of length composition data, lack of an acceptable method for determining selectivity, and the model's poor performance. **The Team recommended that the author bring forward Model 20 for the November assessment.**

Secondly, a comparison of size compositions between survey and fishery data was presented in terms of the cumulative distribution of lengths in each composition (survey vs fishery). This summary analysis indicated some differences in the medium size classes, but the largest fish seen in the fishery is similar to the largest fish seen in the survey across years. The Team acknowledged this trend noting that this type of comparison would be better if it had included some summary statistics, but did not recommend any additional analyses.

Thirdly, a comparison of the ratio of BS/RE to POP in the AI survey was presented as requested by the SSC. This was presented in terms of CPUE (kg/km2) and the results suggested that the decline in the bycatch rate is not due to increasing number of POP tows with no blackspotted/rougheye catch, but rather smaller sizes of blackspotted/rougheye being caught in the survey. A Team member pointed out that doing this analysis in terms of numbers of fish (not just weight) may better support this conclusion; however no recommendations were made about doing this.

Proposed harvest specifications

Steve Whitney presented the proposed 2025 harvest specifications and reviewed reallocations over specified TAC.

The Team recommended approval of the 2025 specifications for use in informing the proposed rule in 2025 and 2026.

Team discussions on other topics

Many of the assessments presented incorporated various model diagnostics. The Team appreciated the authors' efforts to incorporate this information and the AFSC for its continued research into model diagnostics.

The Team acknowledges that the application of model diagnostics is still developing with the NPFMC stock assessments. The Team requested that in tandem with the new assessment guidelines the AFSC provide a brief document or reference to assist Team members in understanding and interpretation of the model diagnostics specified in the new guidelines.