SCIENTIFIC AND STATISTICAL COMMITTEE
FINAL REPORT TO THE
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
June 2nd – 4th, 2025

The SSC met from June 2nd – 4th, 2025 in Newport, OR. Members present in Newport were:

Sherri Dressel, Co-Chair *Alaska Dept. of Fish and Game*	Jason Gasper – Co-chair *NOAA Fisheries—AKRO*	Ian Stewart – Co-Chair *Intl. Pacific Halibut Commission*
Alison Whitman, Vice Chair *Oregon Dept. of Fish and Wildlife*	Chris Anderson *University of Washington*	Jennifer Burns *Texas Tech University*
Fabio Caltabellotta *Washington Dept. of Fish and Wildlife*	Curry Cunningham *University of Alaska Fairbanks*	Mike Downs *Wislow Research*
Robert Foy *NOAA Fisheries—AFSC*	Brad Harris *Alaska Pacific University*	Kailin Kroetz *Arizona State University*
Franz Mueter *University of Alaska Fairbanks*	Patrick Sullivan *Cornell University*	

SSC members that attended remotely included:

Martin Dorn *University of Washington*	Dana Hanselman *NOAA Fisheries—AFSC*	Chris Siddon *Alaska Dept. of Fish and Game*
Robert Suryan *NOAA Fisheries—AFSC*	Sarah Wise *NOAA Fisheries—AFSC*	

SSC members that were absent:

Andrew Munro
Alaska Dept. of Fish and Game

SSC Administrative Discussion

SSC Membership

Mike Downs and Patrick Sullivan have indicated they will be stepping down from the SSC at the end of 2025. The SSC appreciates the important contributions Dr. Downs and Dr. Sullivan have made to the SSC since their appointments in 2018 and 2021, respectively.

Should the Council extend a call for SSC nominations and choose to identify specific expertise in the call, the SSC recommends prioritizing the following:

- A social scientist with a background in anthropology, sociology, human geography, or a related field.
- A scientist with experience in stock assessment, fisheries population dynamics, and harvest control rules/harvest policy.
- If, or when, filling these positions, the SSC highlights it would be beneficial to identify an individual or individuals who also have experience working with Alaska coastal communities and expertise with Local Knowledge, Traditional Knowledge, and Subsistence (LKTKS) information in the context of management.

Overview of Executive Orders and May Council Coordination Committee Discussion

The SSC received a presentation from Diana Evans (NPFMC) that summarized key points from the Council Coordination Committee's (CCC) discussion on Executive Order (EO) 14276 (Restoring American Seafood Competitiveness) and EO 14192 (Unleashing Prosperity Through Deregulation), as well as considerations provided to Councils in responding to these directives. Ms. Evans noted that regulatory actions falling under EO 14192 will be subject to increased agency scrutiny if they are not clearly deregulatory. However, the SSC's discussion primarily focused on EO 14276, the perspectives about this EO shared during the CCC meeting, and NPFMC's process for responding to the EOs.

Implementation of EOs has occurred on a fast-moving schedule. The SSC has not had the opportunity to provide a comprehensive review but does offer some initial thoughts. As the process matures, the SSC looks forward to offering further scientific input on issues as necessary. In the interim, the SSC offers the following general observations in response to the presentation.

While EO 14276 is similar to the previous EO 13921 (Promoting American Seafood Competitiveness and Economic Growth), there are several important differences that were discussed by the SSC. These include aligning priorities in the face of fewer resources and the priorities established by the federal administration. Specifically, the CCC discussed, at the national level, language from the EOs that directs Councils to increase prioritization of stocks to focus effort on those that most require assessments and be less risk-averse. The SSC notes that the NPFMC and NOAA Fisheries have completed an extensive stock prioritization process for groundfish in the recent past, which may not necessarily be the situation across all Councils at the national level.

A key discussion point at the CCC was the likely reduction in NMFS resources, which would limit staffing and survey capacity for fishery assessment and management. The presentation also emphasized that Councils should become more comfortable with accepting increased risk and highlighted a national goal to increase fish harvest levels.

The federal management system in the North Pacific, through its Fishery Management Plans (FMPs), applies management practices that balance the risks of overfishing with statutory requirements for maximum sustainable and optimal yields, under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Rules to control total catch and prevent overfishing are established in the harvest control rules (HCRs), tier systems, and associated management measures described in the FMPs. These rules are complemented by the robust public advisory processes of the NPFMC, which considers the best scientific information available (as required under MSA) used to establish and manage annual catch limits.

Within the federal fishery management framework, risk has a very specific meaning with respect to the OFL and ABC. In setting these limits, the SSC considers the amount of information available and whether the HCR or ABC buffer adequately accounts for scientific uncertainty associated with the estimated OFL. **The SSC emphasizes that increased uncertainty due to reduced assessment frequency, fewer surveys, and reductions in other agency-funded work, combined with a simultaneous reduction in precaution, is counter to risk mitigation policies designed to prevent overfishing and the resulting negative long-term economic impacts on harvesters and communities.**

The SSC also discussed that enhancing the value of fisheries goes beyond only increasing the amount of catch, particularly in the context of the complex economic and community relationships among Alaska fisheries and markets. The presentation highlighted language in the EO 14276 indicating that "*actions should stabilize markets, improve access, and enhance economic profitability.*" Considering value is critical for these actions and is likely most pertinent to the TAC setting and management measures considered by the Council. The SSC notes that analytic efforts, such as expanding the sablefish MSE project to include fleet behavior, fleet cost structures, and price and market response (see D4 Sablefish IRA Workshop section of the April 2024 SSC Report), may be a valuable area of future development for informing TAC decisions. Engagement with economists and social scientists with expertise in processing, trade, and markets for North Pacific seafood may also help the NPFMC identify opportunities for increasing production and/or other measures of value for fishery participants and communities.

Identifying indicators/metrics to measure against EO economic and social goals is an important consideration for the NPFMC. These could be adapted from existing information sources or could be new products such as a dashboard or stand-alone reports. The SSC questioned whether there was coordination on these issues nationally, noting that some of the goals appear to be at a national level and effective application of them for NPFMC managed fisheries may be different. Finally, the SSC notes that management measures that consider large increases of harvest levels beyond what has historically occurred, particularly with reduced fishery independent surveys or important changes in harvesting patterns, will require modeling and analysis of the available scientific information to manage potential impacts within National Standard guidelines.

While the SSC is unclear how this process will unfold, particularly given reduced staffing and funding, identifying the most critical types of economic, social, and community information needed to comply with the MSA National Standards and guidelines may help prioritize resources to address needs related to the EOs. This is a topic that could usefully be a part of a rescheduled SSC agenda item on the inclusion and use of socioeconomic information in the Council process.

Future Meetings

The SSC considered ideas to alleviate scheduling issues for the December 2025 meeting due to the potential inclusion of Cook Inlet salmon harvest specifications. The SSC does not have the capacity to include groundfish, Norton Sound red king crab (NSRKC) harvest specifications, and Cook Inlet specifications during the December meeting. This would require a longer meeting and would result in a heavy review workload for SSC members with stock assessment expertise. The SSC recognizes the value of meeting concurrently with the NPFMC and other advisory bodies. However, of the options discussed, the most viable option from the SSC perspective is for the SSC to have a late January/early February in-person meeting and drop the April SSC meeting, should the Council wish to go down to four meetings in 2026. The SSC also discussed workload versus the reduction to four meetings and noted that if the number of informal meetings and workgroups increases due to the reduction to four meetings, that the overall workload may not decrease; having five time-certain scheduled meetings may actually be preferable and allow wider SSC participation as members would be more able to plan their annual schedule.

B1 Plan Team Nominations

The SSC received nominations for Dr. Meaghan Bryan for Gulf of Alaska (GOA) Groundfish Plan Team and Dr. Caitlin Stern for the Bering Sea and Aleutian Islands (BSAI) Crab Plan Team (CPT). The SSC finds these nominees to be well-qualified and recommends the Council approve their nominations.

C1 NMFS Observer Annual Report

The SSC received a presentation from Sarah Cleaver (NPFMC), Geoff Mayhew and Jason Jannot (NOAA-Alaska Fisheries Science Center [AFSC]; Fisheries Monitoring and Analysis [FMA] Division) on the Observer Program 2024 Annual Report (Annual Report) Deployment Performance Review (Chapter 3) and the NMFS Recommendations for the 2026 Annual Deployment Plan (ADP; Chapter 6).

The North Pacific Observer Program is the largest in the nation. In 2024, the Observer Program sampled 3,863 trips on 421 vessels and observers logged a total of 29,665 days on vessels and in plants. **The SSC appreciates the outstanding and sustained efforts of observers, electronic monitoring (EM) reviewers and program staff, to sample, summarize, and interpret this information and reiterates that the Observer Program and the data products it generates are essential for sustainable fisheries management. Adequate funding of the Observer Program is critical to the ongoing success of in-season management, stock assessment, and specifications setting processes.**

The primary purpose of the Annual Report is to determine whether the Annual Deployment Plan (ADP) met its monitoring objectives and to provide a guide for future ADPs. In June 2024, the SSC reviewed the Observer Program 2023 Annual Report, including an overview of substantial changes to the ADP and NMFS recommendations for the 2025 ADP. Since a full year of data had not yet been collected under the proximity allocation method for the partial coverage strata, the SSC supported its continuation in 2025 to ensure consistency in deployment and allow for a more comprehensive review of its performance in the future (taken up at this meeting). The last time the SSC evaluated the performance of partial coverage observer deployment was in June 2019. The sampling and estimation methods used by the Observer Program are well documented and vetted, but substantial changes to the stratification approach were implemented under the 2024 ADP which are reviewed by the SSC at this meeting.

The Performance Review was prepared by staff from the FMA/ Analytical Services Program of the AFSC and the Sustainable Fisheries Division/ Catch Analysis and Data Quality Branch of the Alaska Regional Office (AKRO) using catch and monitoring data from the 2024 calendar year. In previous Annual Reports, the Fisheries Monitoring and Science Committee has reviewed the performance analysis and provided recommendations. However, the Committee did not meet this year due to uncertainty in budgets and staffing. The SSC noted this change, along with the planned Center for Independent Experts (CIE) review in 2026 and supports some form of additional review of each annual report before it reaches the SSC.

The Observer Program, which relies on individual observers (OB) and EM, has used a stratified hierarchical sampling design as a deployment guidance with randomization implemented at five levels (trips, hauls, species, individual fish lengths (OB-only), structures and tissues (e.g., otoliths, genetics; OB-only). The SSC notes that in 2024, NMFS implemented changes to both the stratification definitions and the allocation strategy. Briefly, the new strata definitions combine hook-and-line and/or pot gear trips together into a single fixed-gear type. Strata were further defined by the primary Fisheries Management Plan (FMP). A complete list of the ten new deployment strata with associated coverage rates are provided on pages 49 – 50 of the Annual Report. The sampling rates for the partial coverage strata were determined using the proximity allocation algorithm designed to reduce data gaps and small sample sizes.

The four primary objectives identified for evaluation in this Annual Report include achievement of 1) deployment sea days, 2) coverage rates, 3) Chinook and chum salmon tissue samples, and 4) randomization and deployment of observers into the partial coverage category as specified in the 2024 ADP. The performance metrics that were selected to assess the efficiency and effectiveness of observer deployment included deployment rates by stratum relative to intended targets, and representativeness of samples. These reflect four mechanisms that can impact the quality of the data: (1) sample frame discrepancies, (2) non-response, (3) differences in trip characteristics, and (4) sample size. These metrics can identify places where observed results differ from ADP expectations, leading to further examination and consideration of management implications.

The SSC examined the performance of the partial coverage category and notes the following:

- Approximately 9% of the catch taken from the federal waters off Alaska is observed under the partial coverage category with 91% observed in the full coverage category.

- Effort allocation met expectations (within the range consistent with the sampling design) in six of seven strata. NMFS purchased 2,324 at-sea observer days in 2024; the total number of fishing trips in the observed strata was slightly (2.7%) lower than predicted and partial coverage expenditures were under budget by 16.7%. The number of EM FIXED BSAI stratum (eight vessels, 69 trips) sea days reviewed did not meet expectations (13.8% lower than predicted, 1,347 of 1,562 days) due to a temporary staffing shortage of EM video reviewers at Pacific States Marine Fisheries Commission (PSMFC).

- The Observer Declare and Deploy System (ODDS), which facilitates the random selection of fishing trips by strata, worked as intended. Logged trips met expectations in all partial coverage strata. Rates of trip cancellation improved over previous years. Within the same gear-type, cancellation rates and the proportion of inherited trips were much larger for strata that used observers for at-sea monitoring than those that used EM.

- In combination across all strata 43.9% of trips/deliveries and 48.4% of vessels were successfully monitored. This compares to 43.7% and 50.2% monitored in 2023.

- Data timeliness - the duration between the completion of a trip or delivery and when the data are available to analysts in the Catch Accounting System (CAS) – was as expected for both observed and EM strata. A coding error delayed fixed-gear EM data availability in CAS, so the analysts have reported Review Timeliness, which is the time from the end of delivery to completion of review (median = 33 days for EM FIXED and 26 days for EM FIXED GOA strata).

- Dockside monitoring met expectations and the sampling design in 2024 remained unchanged from 2023. A total of 2,121 pollock deliveries were monitored by observers for salmon in 2024. This includes 1,775 deliveries to Bering Sea ports and 346 in the GOA. Salmon monitoring covered 35.73% of EM TRW GOA (Exempted Fisheries Permit [EFP]) deliveries, meeting expectations.

- Temporal patterns were within expectations in all but one of the seven monitored partial coverage strata. The EM FIXED BSAI realized rate was 49.28% (74.29% expected) because of a temporary staffing shortage of EM video reviewers at PSMFC noted above.

- Spatial biases in the distribution of coverage were apparent in two of the seven monitored partial coverage strata. Fishing effort was either over- or under-represented in multiple locations in all strata, but patterns indicative of biases were apparent in OB FIXED BSAI and the EM FIXED BSAI stratum. The video reviewer shortage in the EM FIXED BSAI stratum contributed to this issue by over-representing trips taken early in the year which were spatially clustered.

- Spatiotemporal patterns met expectations (proximity index of ≥0.92) in all strata except one. The EM FIXED BSAI stratum (index = 0.64) under-sampled pot gear trips in the BSAI from mid-March to November due to a temporary shortage in reviewer capacity.

- Permutation tests comparing monitored and unmonitored trips indicate a modest "observer-effect" in two strata. Monitored trips in the OB FIXED GOA stratum were half a day (10.4%) shorter than unmonitored trips. In the EM FIXED BSAI stratum monitored trips were on vessels 14.0 ft (16.2%) shorter than unmonitored trips.

The Annual Report was well organized and clearly written, and the SSC commends the analysts for their responsiveness to previous recommendations for the partial coverage performance review. The SSC finds that under the current deployment plan, the program is generally meeting its anticipated goals. Further, the SSC supports all the NMFS Recommendations for the 2026 ADP.

The SSC concurs with the analysts' choice of performance metrics and agrees that these are informative with respect to difference from expectations.

The SSC continues to be concerned about the potential impacts of EM use over observers on species identification, bycatch, collection of biological data and tissue samples, interactions with marine mammals and seabirds, and the downstream effects on information support for management decisions. **The SSC recommends that going forward the analysts work with assessment authors to characterize and report EM-related changes in data quantity (sample sizes) and quality (e.g., precision and accuracy) of the biological data and catch metrics used in stock assessments, by-catch and Prohibited Species Catch (PSC) estimation.** The SSC suggests the analysts prioritize salmon, crab, and halibut PSC and Tier 6 stocks (e.g., sharks/ skates), which use catch information exclusively for management.

The SSC appreciates efforts by the analysts to capture program performance metrics in appropriate figures and tables and requests (as in Table 3-4) clear indication of whether program expectations were realized, not realized or unknown. We understand that in many instances these determinations may be qualitative or subjective. The SSC requests a brief written synopsis including tables or figures of performance metrics to allow a holistic look at program performance. Where possible the SSC requests input from the analysts indicating high-priority areas of concern relative to unachieved ADP objectives.

The SSC finds the permutation tests used to compare monitored and unmonitored trips effective and recommends the analysis be expanded to other metrics including depths fished, and catch rates of species of concern (e.g., PSC, Tier 6 stocks). The SSC also recommends the analysts include the full color ramp on maps of positive and negative differences in coverage rate expectations.

The SSC notes that the temporary staffing shortage of EM video reviewers resulted in failure to meet effort allocation and coverage rate expectations in the EM FIXED BSAI strata. This resulted in temporal and spatial biases, as well as reduced spatiotemporal proximity, and differing vessel lengths for monitored and unmonitored trips. While the outcome is unfavorable, the SSC views this situation as a confirmation of performance metric responsiveness. Understanding that staffing shortages may not be predictable going forward, the **SSC recommends that the analysts consider how to selectively review EM data to prevent outsized impact on one stratum, and consider how to representatively select trips for review to reduce temporal imbalance across the season.**

The SSC appreciates the efforts to develop a more robust approach to assessing the difference between monitored and unmonitored trips outlined in Appendix A and looks forward to seeing the results in future reports.

The SSC appreciates the continued efforts by the Office of Law Enforcement (OLE) to encourage compliance and concurs with OLE that the safety and security of observers remains the highest priority.

The SSC is pleased that a CIE Review is forthcoming in early 2026 and offers the following recommendations for incorporation in the Terms of Reference for this review:

- The proximity allocation method**,** including the criteria used to calculate the proximity indices, 200 km and 1 week, and whether these criteria are appropriate for use in all strata.
- Methods proposed for detection of observer effects from catch (Appendix A)
- Whether the current deployment is sufficient to provide the necessary analytical products and biological data to inform stock assessment and bycatch evaluation.

C2 Bering Sea Aleutian Islands Crab

The SSC received a report on the May 2025 Crab Plan Team (CPT) meeting from Anita Kroska (NPFMC) and the CPT co-chairs, Katie Palof (ADF&G) and Mike Litzow (NOAA-AFSC). The SSC appreciates the CPT's efforts to streamline their presentation to the SSC. Not all CPT agenda items were presented to the SSC, though they are detailed in the CPT report. Items on which the SSC provided comments are below. Table 1 includes the stock status determination criteria and Table 2 includes the June 2025 SSC recommended harvest specifications.

Table 1. Stock status in relation to status determination criteria for 2024/2025 as estimated by the most recent assessment. Dark grey areas indicate parameters not applicable for that tier. Values are in thousands of metric tons (kt). Status determination recommendations made by the SSC are based on the best scientific information available and final status determination will be made by NMFS Headquarters following SAFE review.

Chapter	Stock	Tier	MSST[1]	B_{MSY} or B_{MSY} proxy	2024/25[1] MMB	2024/25 MMB/ MMB_{MSY}	2024/25 OFL	2024/25 Total Catch	Rebuilding Status
1	EBS snow crab	3					19.6		
2	BB red king crab	3					5.02		
3	EBS Tanner crab	3					41.29		
4	Pribilof Islands red king crab	4					0.685		
5	Pribilof Islands blue king crab	4					0.00116		
6	St. Matthew Island blue king crab	4					0.129		
7	Norton Sound red king crab	4	1.00	2.02[2]	2.50	1.24	0.33	0.23	
8	AI golden king crab	3	5.632	11.264	11.09	0.98	3.725	2.34	
9	Pribilof Islands golden king crab[3]	5					0.114		
10	Western AI red king crab	5					0.056		

[1] MMB on 2/1/2025 for Norton Sound red king crab as estimated in the 2024 assessment and on 2/15/2025 for all other Tier 1-4 stocks using the 2025 assessments

[2] B_{MSY} proxy basis years for NSRKC are 1980 - 2024.

[3] PIGKC specifications are set on a calendar year basis.

Table 2. SSC recommendations for Eastern Bering Sea crab stocks. Stocks for which specifications are rolled over between assessments (St. Matthew blue king crab, Pribilof Islands golden king crab and Western Aleutian Islands red king crab) are also included. Biomass values are in thousand metric tons (kt). Dark grey areas indicate parameters not applicable for that tier.Tier designations in this table are based on the projected stock status in 2025/2026. Stocks for which the SSC recommended different harvest specifications from the CPT are bolded. Harvest specifications for SAFE Chapters 1 – 6 are set in October and Chapters 8 – 10 are set in June, in the year according to the assessment frequency cycle (see current SAFE Introduction). Chapter 7 was set in December 2024.

Ch.	Stock	Tier	F_{OFL}	B_{MSY} or B_{MSY} proxy	B_{MSY} basis years[1]	2025/2026[2] MMB	2025/26 MMB / B_{MSY}	Natural Mortality (M)	2025/26 OFL	2025/26 ABC	ABC Buffer
1	E. Bering Sea snow crab	3c									
2	Bristol Bay red king crab	3b									
3	E. Bering Sea Tanner crab	3a									
4	Pribilof Is. red king crab	4a									
5	Pribilof Is. blue king crab	4c									
6	St. Matthew blue king crab	4b	0.11	2.93	1978-2023	1.53	0.52	0.23	0.129	0.097	25%
7	Norton Sound red king crab	4a	0.18	1.96	1980-2025	2.15	1.10	0.18	0.284	0.199	30%
8	Aleutian Is. golden king crab[3]	3	0.52 (EAG), 0.39 (WAG)	11.264	1987-2021	10.48	0.93	0.22	3.166	2.374	25%
9	Pribilof Is. golden king crab[4]	5			1993 - 1998				0.114	0.085	25%
10	W. Aleutian Is. red king crab	5			1995/96 - 2007/08				0.056	0.014	75%

[1] For Tiers 3, 4 where B_{MSY} proxy is estimable, the years refer to the time period over which the estimate is made. For Tier 5 stocks it is the years from which the catch average for OFL is estimated.

[2] MMB is estimated on 2/1/2025 for Norton Sound red king crab and on 2/15/2025 for all other Tier 1-4 stocks, using the current assessments.

[3] AIGKC OFL and ABC are calculated by combining two separate assessment models for the EAG and WAG, as presented in the current assessment. Sub-tiers are set separately for each model and are detailed in the assessment document.

[4] PIGKC specifications are set on a calendar year basis.

General BSAI Crab Comments

The SSC continues to recommend that the CPT consider whether there is value in defining full and update assessments.

The SSC notes that a historical retrospective is different from a within model retrospective and requests that crab assessments include a plot comparing the model-estimated time series of mature male biomass from the current assessment with the time series from the ten previous assessments (i.e., historical retrospective).

The SSC recommended that the CPT provide GMACS version updates in each CPT report with information on changes between versions and that authors clearly identify which GMACS versions were used and a brief summary of the effects of version changes on the assessment.

The SSC recommends that each crab SAFE chapter include a clear description of the buffers used in harvest specification over the most recent five years, as a basis for comparing the current year's buffer recommendations.

Aleutian Islands Golden King Crab

The SSC received a summary of the Aleutian Islands golden king crab (AIGKC) stock assessment. The SSC thanks the stock assessment author for their work and responses to previous CPT and SSC comments. The SSC notes that additional detail, including specifics on how the comments were addressed and the conclusion drawn would be helpful when addressing comments (e.g. cooperative survey). There was public testimony from AIGKC fleet members/owners/representatives (David Capri and Cory Cole (F/V Trojan) and John Hillsinger (representative of F/V Trojan)) and a representative of the Aleutian King Crab Research Foundation (Cory Lescher) that focused on concerns about within-fleet and between-fleet gear conflicts that may impair habitat and may explain the declining trend in fishery dependent CPUE, which is used as the abundance index in the GMACS assessment models.

The AIGKC assessment is based on two separate models (the EAG and WAG) that are configured similarly and model results are summed to provide a stock-wide OFL and ABC. . However, ADF&G manages the fishery in two areas (east and west of 174°W longitude; EAG and WAG, respectively), with a harvest strategy based on model-estimated mature male abundance that splits the TAC and specifies a 15% maximum harvest rate for EAG and 20% maximum harvest rate for WAG. The retained catch and bycatch mortality to date were similar to other recent years. Fishery CPUE in 2024/25 continues to diverge between the two regions, with the EAG CPUE near the time series high and the WAG CPUE near the post-rationalization low.

The author presented two models for each of the two areas (EAG and WAG). The models represent updates to GMACS version 2.20.21 and include an average recruitment reference period updated to 1987–2021 for calculation of $B_{35\%}$.

The models compared in the SAFE report include:

- 23.1c: 2024 base model, with updated time series data, and alternative bias correction on recruitment deviations from 1960 - 1981; and

- 25.0b: Model 23.1c with non-equilibrium initial conditions, starting in 1981, equal emphasis on all likelihood components ($\lambda = 1$), and bootstrap estimated stage-1 effective sample sizes.

The author-preferred model for both areas was Model 23.1c. EAG models appear to be somewhat sensitive to size composition data weighting, yet the alternative weighting scheme explored here did not improve model performance. In fact, Model 25.0b increased the retrospective bias over the base model. Despite the simplified initial conditions and catch data weighting scheme, the author and CPT recommended remaining with the base model during this assessment cycle.

The SSC supports the author's and CPT's recommendation to use Model 23.1c for both the EAG and the WAG as the basis for harvest specifications and status determination. Results from these models indicate that AIGKC is not overfished. Directed fishing for AIGKC was incomplete at the time of the assessment and bycatch from the groundfish fisheries is still ongoing, so **overfishing determination for AIGKC based on a final total catch will occur at the October 2025 NPFMC meeting**.

While the specifications for the AIGKC stock are based on the combined areas of EAG and WAG, the SSC noted that in 2024/25 the EAG stock was above $MMB_{35\%}$, while the WAG stock was below $MMB_{35\%}$ when considered separately. As the SSC noted last year, the OFL calculation method in the current assessment does not appear to follow the method approved by the SSC and CPT in 2017. However, current OFL calculations are likely conservative compared to the method approved by the SSC and CPT. **Therefore, the SSC supports the recommended OFL calculation approach as specified in the current assessment**. **For future consideration, the SSC recommends returning to calculation of a single OFL and ABC for the combined model results (as in 2017).** The SSC recommends continued exploration into either a single-area or a two-area spatially explicit model, noting that a two-area spatially explicit model may serve as a bridge between previous separate model approaches and a combined model approach. The SSC notes that, if the model changes to a single-area or a two-area spatially explicit model, the specific method for calculating the OFL might change.

The SSC agrees with the CPT recommendation for continued use of the 25% buffer for this assessment and supports the resulting ABC.

The SSC supports the specific CPT recommendations for additional research and development of upcoming assessments. In addition, the SSC submits the following recommendations:

- The authors and CPT should provide a table reporting the historical OFL buffers used in this stock to inform future discussions on the incorporation of uncertainty (see General BSAI Crab Comments)
- The author and CPT should explore metrics to determine if changes in CPUE are due to changes in fishing behavior (e.g., changes in number of strings or number of pots per boat) as was suggested during public testimony.
- The author should explore mechanisms for examining the impact on CPUE from within crab fleet gear conflicts or fishing behavior as well as conflicts between crab fleet gear and the gear of the trawl fleet. The current bycatch data in the trawl fisheries may not be sufficient for this, but perhaps could be augmented with data on changes in effort or catch distribution changes.
- The author is encouraged to work with ESR authors on developing risk recommendations related to environmental changes. The SSC notes there have been long term environmental changes taking place in the Western Aleutian region.
- The author should create a timeline of the various model changes that have occurred as the models have evolved to map those changes to the historical retrospective changes (see General BSAI Crab Comments).

- A spatio-temporal model is encouraged. However, the inclusion of the interaction term between soak time and year may alias changes in relative abundance. Some rationale should be given as to including that interaction or this element should be eliminated.
- Keep the SSC informed about future updates on the results from skipper surveys for informing the stock assessment about changes in fishing behavior.
- Continue to work toward developing fishery-independent indices for this stock.

EBS Snow Crab Model Runs

The SSC received a presentation on the preliminary eastern Bering Sea (EBS) snow crab stock assessment, exploration of data and model updates, and proposed model runs for the fall 2025 assessment cycle. The model comparisons presented primarily explored the impacts of:

- Updating to the current version of the GMACS model
- Updated catch data time series from 1990-present
- Updated growth increment data
- Reference point calculations based on a functional maturity definition of 95mm, in place of the current morphometric maturity definition
- Utilizing a single time-invariant representation of the molt-to-maturity probability at size
- Assuming an alternative stacked logistic curve for survey selectivity

The SSC highlights its appreciation to the assessment author for their responsiveness to past comments, and specifically the exploration of alternative time-invariant parameterizations of the molt to maturity process, which resulted in only modest changes to model estimates.

SSC discussion considered the changes in model results arising from the change in GMACS model version that resulted in increases in abundance estimates across time, changes in biomass and fishing mortality reference points, and a change in the year of the most recent high in mature male biomass from 2018 to 2019. The CPT highlighted that, given the many changes to the GMACS model code between versions, it was impossible to isolate why these changes had occurred. **The SSC recommends that any time a model change results in substantive differences in model estimates or harvest recommendations, a clear description of what changes in model structure, data, or likelihood definitions produced the change is necessary.** However, in this case, the SSC does not request a more detailed description of the reason for the changes in estimates due to the updated GMACS version, in recognition of the more pressing challenges in addressing convergence issues and the ongoing discussion regarding the currency of management.

The SSC held an extensive discussion of the currency of management in the context of the current morphometric maturity definition for male snow crab, and the alternative functional maturity definition set at 95 mm. While the SSC recognizes that the current (status quo) morphometric maturity definition may lead to situations where the F_{OFL} would allow for removal of nearly all commercial-sized male crabs, and the State of Alaska TAC setting process defines an upper harvest rate threshold for commercially-sized snow crab, it remains concerned that changing the currency of management deviates from the intent of SPR-based reference points. Likewise, the SSC expressed concern in adjusting the currency of management based in part on declines in the abundance of male crab above the minimum industry-preferred size threshold, as it is unknown whether industry size preferences may change in response to future market conditions.

Given that the OFL is specified in the FMP, the SSC recommends that the author and CPT consider whether concerns about the currency of management could be satisfactorily addressed with a simplified ABC control rule that limits the exploitation rate for larger-sized crabs. The SSC notes that stock-specific ABC control rules have been applied occasionally for groundfish, such as for GOA pollock, and exploitation rates have been used to justify lower ABCs in BS pollock. The SSC supports the CPT's proposal to continue discussion of the most appropriate currency of management during its September 2025 meeting, including consideration of an ABC control rule as described above. However, **the SSC does not support bringing forward models in this assessment cycle for OFL and ABC specification that use >95mm as the definition of mature male biomass.** The SSC continues to pose the question of whether declines in industry-preferred size snow crab represent a conservation concern or a socioeconomic concern, given that current industry preferences appear to shield a portion of the morphometrically mature male population from exploitation.

Concerning the proposed model runs for the fall 2025 assessment cycle, **the SSC recommends the following models be brought forward:**

- **Model 25.3 that includes the updated GMACS version, updated catch data time series, and updated growth estimates, consistent with the CPT and author recommendations.**
- **Model 25.3 but with growth estimated externally using a mixed effects framework, with the estimated growth increments at size provided as fixed inputs to the assessment model.**
- **A simplified Tier 4 model, using the same method as Tanner crab and Bristol Bay red king crab (BBRKC).**

If convergence issues with Model 25.3 continue with updated data, the SSC recommends that Model 25.2 also be brought forward, which fits to updated catch data, but not the updated growth data.

The SSC concurs with the other CPT recommendations, specifically highlighting efforts to fit retained catch and total catch rather than retained catch and discards for males, and fitting to data from immature females, mature females, and total males.

The SSC offers the following additional recommendations for this stock:

- The maximin analysis should be completed assuming a Ricker stock-recruitment relationship, but including the same compensation ratios as the original Clark (1991) analysis.
- As the figures presented on the updated 1991+ catch data appear to indicate substantial differences in male discards, the SSC requests that the September document more clearly describe changes in the discard estimation and accounting process.
- Given the findings described in Mullowney and Baker (2021) from Canadian research indicating that the molt to maturity may occur at smaller sizes when lower densities of large males are present, it would be useful to determine if there is evidence for the same process occurring in EBS snow crab, and whether fishing mortality on the large males is consistently high enough to result in a strong effect. Further, it would be useful to evaluate whether clutch fullness may be related to size at maturity or the abundance of large-sized crab.
- Given that natural mortality events seem to switch among years and sexes depending on the model or input data, it would be prudent to investigate whether it is possible to estimate a direct link

between natural mortality and a bottom temperature covariate of appropriate spatial and temporal scale.

- To explore development of an ABC control rule, the SSC requests that a yield per recruit analysis be developed for snow crab. This analysis should graph the yield per recruit as a function of fishing mortality, along with associated reductions in various stock metrics, including mature male biomass and male biomass >95 mm. Show the $F_{0.1}$ fishing mortality rate (the fishing mortality rate where the slope of the yield per recruit curve is 10% of the slope at the origin).

The SSC appreciated the brief description of a proposed management strategy evaluation process for EBS snow crab, which is likely to help inform decisions about the appropriateness of ABC control rules or changes to the currency of management and the extent of conservation concern under current management practices. However, the SSC acknowledges that this MSE process is likely operating on a more protracted timeline than current tactical management needs.

Bristol Bay Red King Crab Model Runs

The SSC thanks the stock assessment author for being responsive to previous requests for model development and looks forward to the jitter analysis in September 2025 and further considerations for the one-step-ahead residuals that are used in some groundfish models.

It was noted that the CPUE in the 2024/25 directed fishery was higher than the last ten year average and the CPT recommended looking at the spatial aggregation of the directed fishery. The SSC agrees and recommends expanding that analysis to a spatial comparison of NMFS survey metrics, such as CPUE, average size, and sex ratio, relative to corresponding fleet metrics to the extent possible to see if increased fleet aggregation is influencing fishery CPUE and selectivity, or the retrospective patterns.

The seven model runs reviewed were based on an updated version of GMACS. A bridging model between the previous and current GMACS models was not provided as the changes to the BBRKC assessment were minimal.

Three initial models considered updated catch data from ADF&G (model m24.0c.1), 20% gear handling mortality for groundfish discards (model m24.0c.1a), and updated input files (m24.0c.2). Additional models based on m24.0c.2 incorporate a prior on NMFS survey selectivity based on the Bering Sea Fisheries Research Foundation (BSFRF) survey data from all years available (2007-08, 2013-16; 25.1a), only the BSFRF data from the "side-by-side" studies (2013-16; m25.1b), and doubled the range of the prior on NMFS selectivity (m25.1b2). The CPT noted the differences in selectivity curves and changes in M and F with the different BSFRF data considerations.

The SSC concurred with the CPT and author recommendation to bring forward Model m24.0c.2 and a Tier 4 "fall back" model for final specification in September 2025.

The SSC discussed the use of the most recent recruitment to inform projections as being the best practice for crab stocks. The SSC suggests that, without a formal analysis of which years to include, authors should provide a strong rationale before considering a truncated time series.

The SSC agreed with the CPT research recommendations with the following additions:

- A research model based approach to consider connectivity between the "Northern Unstratified Area" and Bristol Bay would benefit from waiting until genetic and tagging data are available to inform the spatial extent of the mating interactions between the areas.

- Develop additional size bins for the larger females across the entire time series.
- Continue to develop a common framework for using BSFRF data for snow crab, Tanner crab, and BBRKC.

Tanner Crab Model Runs and ESP

The SSC reviewed model alternatives and a draft ESP for setting harvest specifications for EBS Tanner crab in October 2025. The SSC thanks the authors for thoroughly reviewing recent and past CPT and SSC comments. The assessment author provided five models for consideration and recommended three to come forward in October 2025. The CPT recommended the author only bring forward two models to allow the author time to focus on transitioning this assessment into the GMACS platform.

The SSC concurs with the CPT and recommends bringing forward the base model (22.03d5) and the GMACS model (G25.05) in October. The SSC also recommends bringing forward a Tier 4 calculation similar to 2024 and consistent with methods used for BBRKC and EBS snow crab. The SSC agrees that focus should remain on transitioning this assessment into the GMACs framework and **recommends developing a list of clear milestones for the transition for the October meeting**.

A draft ESP was also presented and the CPT provided a number of recommendations to the stock assessment author. The SSC concurs with the CPT recommendations and looks forward to the final ESP in October 2025. **The SSC also discussed the utility of long-term indicators in the context of changing environmental conditions and recommends adding an indicator on the effects of temperature on size of maturity**. While long-term indicators provide historical context, they may not provide adequate context for future conditions. The SSC suggests continued evaluation of indicators and their overall utility.

Norton Sound Red King Crab Model Runs

The SSC welcomes new author Caitlin Stern (ADF&G) and commends the author on the impressive progress made on SSC and CPT recommendations since the previous assessment. The SSC appreciates the helpful document as a precursor to the final SAFE in November/December.

Model 24.0 was last year's accepted model. First, bridging analyses were completed to correct errors and transition to a new GMACS version that allows for the OFL calculation to be delineated by fishery. This series of models culminated in Model 24.0b as the base model for comparison moving forward. Nine additional models were brought forward that explored removing shell condition for males, multiple approaches to parameterize natural mortality, and finally, the inclusion of model-based indices of abundance.

Removing shell condition (Model 25.0) showed that use of these data appears to be a modeling complication that does not substantively impact model results or significantly improve any fits to the data. With respect to natural mortality, there have been many options explored with the goal of addressing the overestimation of the largest size class of males in this assessment over the years. The author presented two series of models, with (24.01b, 24.02b and 24.0b3) and without shell condition (25.0a, 25.0b and 25.0c), that explored two size-independent fixed Ms (0.23 and 0.18) and the size-dependent M as structured in the base model but with a fixed M = 0.23 instead of 0.18 for the smaller size class. These alternative models were similar in terms of overall results but there were tradeoffs among the fits to different model data components and some differences in the scale of the biomass estimates. Fits to the indices and summer commercial size compositions were worse in the size-independent M models and the change in the fixed M value for the size-dependent model did not have a large impact on fits to the size compositions. The models that

incorporated model-based indices (24.0b4 and 24.0b5) did not improve model fits to the survey time series and worsened the positive retrospective patterns.

Based on these results, the CPT recommended bringing forward 24.0b as the base model and 25.0a, which does not include shell condition for males, a fixed M of 0.23 for males less than 123mm and an estimated male M for those greater than 123mm. **The SSC concurs with the models to be brought forward but requests an additional model based on 24.0b that explores alternative parameterizations of selectivity or, if necessary, constraining F to address high values of F seen in 24.0b.** The SSC was generally not in favor of the latter option, as F is indirectly linked to the scale of the population and may lead to unrepresentative changes in reference points.

One of the more long-standing recommendations echoed by both the SSC and CPT for this stock is the development of model-based indices of abundance. The SSC appreciates the work put into this recommendation and concurs with the CPT suggestion that this be explored further in a research model framework. Given that selectivities are assumed to be the same across all three surveys in this assessment, the SSC suggests a single model-based index that includes all three surveys and a broad prediction grid reflecting the distribution of the stock could be a viable option for the future. The SSC supports the other CPT recommendations for this assessment.

Pribilof Island Blue King Crab Model Runs

The SSC thanks the stock assessment author for providing a well-written and detailed report and for addressing previous SSC comments.

This stock is in a two-year assessment cycle, with the last full assessment taking place in 2023. After the 2025 assessment, this stock will transition to a four-year assessment cycle, with the next full assessment scheduled for 2029.

This report addressed three topics: 1) comparison of abundance and biomass estimates derived from crabpack (new R package) with the data used in the 2023 Pribilof Island blue king crab (PIBKC) assessment; 2) dropping "corner stations" for the 2024 survey and future surveys; and 3) dealing with zeros in the survey time series, given that no mature males were caught during the 2023 and 2024 NMFS bottom trawl surveys.

The analyses comparing the abundance and biomass estimates from crabpack show slight differences in 1979 for both estimates and only in biomass estimates after 2015, supporting the use of the crabpack package for these estimates. **The SSC agreed with the author and CPT's recommendations to maintain the corner stations in the surveys pre-2024 for future assessments, as they provide historical data for estimates of abundance/biomass and size compositions.**

In terms of models and approaches used to address zeros in the survey time series, five *rema* models were explored (i.e., three models with lognormal error distributions and two models with a Tweedie distribution, all configured differently for handling zeros). Additionally, four sdmTMB models were evaluated to estimate the time series of MMB for PIBKC using a combination of delta-gamma and Tweedie distributions along with first-order autoregressive or random walk spatiotemporal random fields.

The SSC concurs with the CPT's and author's recommendation to bring forward the model and approach that uses a Tweedie distribution with a first-order autoregressive spatiotemporal model in sdmTMB for final specification in September 2025. The SSC also concurs with all CPT recommendations to improve and provide the appropriate diagnostics for the sdmTMB model.

The SSC supports all the requests outlined in the CPT report for the sdmTMB analyses.

The SSC appreciated the author's examination of the impacts of low abundance on survey sampling performance noting that the continued absence of crab detections degrades data to support modeling regardless of methods.

Pribilof Island Red King Crab Model Runs

The SSC reviewed model alternatives for setting harvest specifications for Pribilof Island red king crab (PIRKC). This is a Tier 4 stock and currently assessed on a triennial cycle. The author presented five alternative GMACS models based on the previous (non-GMACS) base model. In addition to the new base model (25.1), the author examined the inclusion of ADF&G pot survey data (Model 25.2) and a subsequent model (25.3) that downweights fits to size composition data and used growth data to inform priors on growth parameters. The final two models (25.3a, 25.3b) were only utilized to examine sensitivity of model outcomes.

The SSC concurs with author and CPT recommendations to bring forward models 25.1 and 25.3 for harvest specifications in October. The SSC is concerned that the changes to the new base model were not able to be fully tracked, and requests the author bring forward additional detail on the transition to the new GMACS version and diagnostics in the fall.

The SSC further recommends that the CPT discuss and bring forward a recommendation for a revised time interval (e.g., four years) and timing for future assessments for this stock with the goal of aligning it with the schedule for PIBKC.

Lastly, the SSC recommends that this assessment remain in the GMACs framework and not transition to a simpler (i.e., *rema*) method.

General ESP Updates

The CPT discussed a new approach to categorize ESP indicators into predictive and contextual indicators. Predictive indicators are those with statistically-significant relationships between an environmental or ecological observation and a population process such as recruitment or mortality. Contextual indicators do not provide a quantitative prediction, but are considered useful to highlight potential red flags, provide information on stock status or health, or help to inform a management concern or risk table category. ESP indicators which are considered neither predictive nor contextual would be moved to an appendix. These indicators would still be updated and evaluated periodically since indicators can move in and out of statistical significance as new data are added and mechanistic understanding improves. **The SSC provisionally supports this approach, but would like the opportunity to review an example ESP where this approach is applied before fully endorsing it.**

Contextual information will continue to be included in the ESP, and has the benefit of providing a holistic view of the stock's role in the ecosystem. Contextual information that includes socioeconomic indicators (such as the local quotient) was useful for understanding ongoing societal impacts. In addition, State of Alaska scientists emphasized the value of contextual information for informing the State's TAC setting process. The CPT requested more information on how indicators were initially identified and the relationships of ecosystem indicators with crab response variables. While the primary focus here is ecosystem indicators, the SSC notes that information on how fishery performance and socioeconomic indicators were chosen should also be included.

Socioeconomic Information

Discussion around socioeconomic information was brief, recognizing the need to reschedule the SSC agenda item/in-meeting workshop on inclusion and availability of socioeconomic information in the Council process. It was noted that the CPT asked for feedback specifically on socioeconomic indicators, emphasizing the need for a discussion at the CPT, SSC, and Council levels about what socioeconomic information is most useful. **The SSC agrees that more discussion is critical to clarifying how to include the best available economic, social, and community information across a range of Council decision-informing analytic products, including ESPs.** The Adak Community Allocation is a crab-specific example that was discussed by the SSC which has the potential usefulness of including pertinent economic, social, and community information in the AIGKC suite of SAFE documents that would allow for the assessment of the success and impacts of specific management measures, as described in the National Standard 2 guidelines.

Risk Tables

Public testimony was provided by Scott Goodman (BSFRF) who noted that the CPT process of developing buffer recommendations was complex and confusing, and that he hoped that risk tables would make the process more transparent to stakeholders. He emphasized that there will be differences between groundfish and crab in application of risk tables, and thought that there would be a benefit to developing a record of previous buffers for crab stocks. The SSC agreed with these points (see SSC recommendation in General BSAI Crab Comments).

The SSC appreciated the extensive discussion in the CPT report on how it was planning to implement risk tables in upcoming assessments. The SSC concluded that the CPT was generally headed in the right direction with risk table implementation, but wishes to stress several points. First, **it is important to emphasize that the goal is not to change current practices for setting buffers, but to provide consistent and continuing documentation on the factors that led to a buffer recommendation. The SSC recommends that both new and ongoing concerns regarding the stock should be recorded in the risk table, not just new concerns.** While there are no default established buffers for crab by tier level, there is a history of established practice in which larger buffers are recommended for tiers with greater uncertainty (i.e., Tiers 4 and 5), and, within a tier level, larger buffers are associated with stocks where the uncertainty or concerns are greater. The risk tables should help facilitate this established practice, which may require identifying important tier-related concerns in the tables.

Discussion on buffers at the CPT and the SSC tends to revolve around the issue of whether the buffer recommended last year should be continued or whether it should be higher or lower due to changes in uncertainty or concerns. Comparison of the concerns listed in the current risk table with those listed in previous assessment would facilitate this discussion and make it more transparent.

The CPT proposed that risk tables be prepared for all annual crab assessments. In addition to these assessments, the SSC recommends that risk tables be developed for SMBKC, PIBKC, and PIRKC, though these are a lower priority given limited resources. While there may be a lack of environmental information for these stocks, the other categories in the risk table can be readily filled out and would be useful in buffer discussions. **The SSC also endorsed the CPT plan to develop a table to track buffers, risk table scores, and buffer justifications** (also see General BSAI Crab Comments).

For groundfish, the SSC previously indicated its intent that reductions in ABC below the maximum permissible should be applied sparingly. The situation is very different for crab, where a buffer is used for every stock to reduce the ABC below the maximum permissible that is functionally at the OFL in the absence of ABC control rules. The CPT intends to include the uncertainty due to the tier level in the risk table, since this uncertainty plays a role in the buffer consideration. The SSC suggests that if the CPT follows this course, that the tier level concern be listed separately in the risk table.

Model-based Indices

The SSC appreciates the extensive spatiotemporal modeling work being done to develop model-based indices for crab stock assessments. The SSC supports the spatiotemporal modeling for snow crab that incorporated the northern Bering Sea data, and the use of sdmTMB models for NSRKC to address inconsistencies in the survey time series, both long-standing SSC requests.

For future analyses, the SSC recommends that to obtain a model-based index suitable for inclusion in an assessment model, best practice is the use of an independent identically distributed (IID) approach for the spatiotemporal structure to ensure that each annual estimate is independent, except in cases where substantial spatial imbalance in survey observations is present (e.g., combining EBS/NBS observations).

The SSC agrees with the CPT in prioritizing development of spatiotemporal models for NSRKC and SMBKC, since this would address immediate problems in these assessments. The SSC recommends that those working on spatiotemporal models collaborate closely with assessment authors to identify critical assessment needs, and to take advantage of the expertise using model-based indices developed for groundfish assessments.

D5 Subarea Apportionments

The SSC received a report intended to clarify the role of subarea apportionments (e.g., subarea ABCs) and confirm that subarea ABCs are not the ABC for the stock, and therefore are not annual catch limits (ACLs). **The SSC supports changing the naming convention for subarea apportionments to avoid confusion with ABCs.**

The SSC was limited in time for this agenda item so had an abbreviated discussion and were not able to address all questions posed. For this agenda item, the SSC's task was to consider whether, for some stocks, these apportionments could have flexibility in the face of fishery operational constraints if there was not a specific, well-supported conservation concern (termed "the grey area"). Three methods to achieve this were proposed:

- Method A: Dissolve subarea apportionments when there is no conservation concern.
- Method B: Allow limited annual flexibility in subarea apportionments, provided there is no conservation concern.
- Method C: Increase the use of "reserves" for choke species, which may require regulatory changes since reserves have not been used in the GOA recently.

The SSC notes that Method A has been slowly implemented for a number of stocks in the GOA over time as fisheries issues arose and more data were gathered for those stocks. Implementing Method B with the specified amounts of flexibility offers a biologically robust yet adaptive approach that tries to balance scientific uncertainties and operational realities, essentially adding guardrails to method A. **The SSC recommends that methods A and B are both suitable for future use. The SSC suggests that Option C would require more information from the AKRO or Council staff to consider, and so did not discuss it at this time.**

The SSC discussed whether flexibilities granted under this action would be ephemeral or lasting. **In the view of the SSC, Method A would be a more long-lasting action (i.e., once subareas are dissolved, they would likely stay that way), while Method B would be more flexible, and could be responsive to**

fishery issues arising from uncertain area apportionments. Method A would require some analysis by authors, while Method B could be based on expert judgement from the author, Plan Teams, and the SSC, given uncertainties about the level of stock structure or conservation concern.

The SSC notes that one of the central tenets of fisheries science is that **by default, harvest should be spread out in relative proportion to stock distribution, particularly when little is known about the spatial ecology of stock and stock structure.** This is meant to preserve biocomplexity, reproductive potential, and fishing opportunities, particularly if there is stock structure and in cases where stock dynamics may be uncertain. Adding some limited flexibility to spatial apportionment is unlikely to compromise the biological sustainability of groundfish stocks in Alaska. The SSC discussed whether this applied to all stocks or just non-target stocks. **The SSC generally does not favor changing survey-based apportionment broadly as it has been appropriate and successful in most cases. Opening up this flexibility to all targeted stocks could greatly increase the complexity of recommendations for scientists and managers.** Therefore, if the Council decides to recommend new flexibilities, **the SSC advises that they be used judiciously and focused on non-target stocks that have highly variable survey estimates, which may cause apportionments to fluctuate significantly between surveys, or where survey data quality leads to high uncertainty in subarea abundance indices**. Particularly, there have been issues with apportionments for non-target rockfish, driven by factors such as untrawlable habitats and annual survey variability.

The SSC recognizes that temporary deviations from strict biomass-based apportionment may not inherently pose biological risks for most stocks. **However, the SSC recommends that the added flexibility in Method B should be for addressing temporary fishery constraints and should not cumulatively shift subarea apportionments over time toward favored subareas**. In terms of choosing the amount of flexibility, it could be potentially high if it was in only one year, especially given the low F used for some of the non-targets. For example, some rockfish species have a very low annual recommended fishing mortality due to their life history, and could likely sustain a doubling of F in any one year. Determining the appropriate amount of flexibility for Method B was beyond the scope of this meeting, but could be tied to life history (longevity and movement), historically observed ranges of species distributions, or survey CVs.

A recent example of an apportionment challenge provided for discussion was shortraker rockfish in the GOA. In 2023, proposed changes to the method for calculating apportionments were identified as having the potential to constrain fisheries. The SSC delayed implementation of these changes, pending further guidance from the Council. **The SSC was asked under this agenda item for the SSC's understanding of the Spatial Management Policy and the Council's December 2024 motion, in the context of shortraker rockfish. In the absence of additional guidance at this meeting, the SSC understands its role in December for shortraker rockfish to be recommending the application of the best scientific method for determining apportionment without regard for potential constraints on fisheries. The SSC's understanding is that the spatial management policy would not be invoked, as this policy is only meant to be invoked for splitting areas into smaller subarea apportionments. In other words, the recommendation of different apportionment analytical methods or the introduction of new data would not invoke the spatial management policy.**

The SSC did not discuss the process for how to integrate method B into the annual Council process. **However, the SSC recommends that even if some change or flexibility is introduced into the apportionment process, authors and Plan Teams should continue to provide the information that has formed the basis for historical apportionments.**

D6 Harvest Control Rule Workshop

The SSC hosted a workshop to discuss and gather input on potential adjustments to the Tier levels used in the Groundfish and Crab FMP harvest specifications, as well as the resulting harvest control rules (HCRs) used to determine the OFL and ABC. The workshop highlighted current research related to these topics, with the goal of generating discussion to help develop a scope of work and inform a Terms of Reference (TOR) for a future workgroup. **The SSC supports development of a workplan by this workgroup and looks forward to providing input in the future as the work moves forward**.

The SSC received presentations from a multidisciplinary group of researchers working on projects that could be useful for evaluating HCRs in the context of a changing ecosystem in the North Pacific. The SSC appreciates the work put into the presentations and planning for the workshop, including work leading up to this workshop, past workshops, and the work of the Climate Change Task Force and outcomes of the most recent Scientific Coordination Subcommittee workshop (SCS8). This agenda item is designed to address the Council's requests from October and December 2024. The Council identified consideration of tier-systems, climate-informed biomass targets and climate-robust or forecast-informed harvest control rules as part of their Climate Workplan (December 2024).

The presenters covered a breadth of topics that evaluated different HCR shapes and optimum yield (OY) cap-based approaches. These talks highlighted modeling and simulation work that demonstrated ecosystem linkages and future states of potential yield, stock productivity, and associated levels of volatility. The SSC notes the extensive collaboration among researchers across multiple disciplines, which is essential for developing meaningful insights into ecosystem processes in a changing North Pacific environment. Without continued support for these efforts, significant progress would not be achieved. **The SSC highlights that continued support for staff and resources is essential to the success of these initiatives.**

The SSC discussion focused on input for the development of the TOR for a technical SSC/Plan Team/agency working group, and providing advice on issues the working group should consider in developing a workplan.

Terms of Reference

The SSC discussed items that would be helpful to include in the TOR to clarify the scope and expectations should a workgroup be formed**. The SSC has the following recommendations:**

- The range of, and scientific basis for, ocean warming scenarios should be clearly communicated and defined. The SSC recommends including the most likely scenarios to better understand likely near- and long-term ocean conditions, alongside bracketing scenarios that represent mild to extreme warming. In addition, timeframes for evaluating HCR scenarios should reflect both near-term periods relevant to current business operations and community concerns, as well as longer-term forecasts when appropriate.

- Include both groundfish and crab species in the analysis, with discretion left to the working group to determine whether a broader range of life histories would be appropriate. A suggested starting point would be to include Pacific cod and walleye pollock in both the GOA and the BSAI, Alaska sablefish, and snow crab and BBRKC in the Bering Sea. These species are of management interest and/or have life histories that have recently been affected by oceanographic events.

- HCR scenarios should be clear on what are adjustments to ecosystem caps versus adjustments to HCR shape or a combination of the two approaches, and the hypothesis being evaluated with each scenario. Analysts should consider comparisons with status quo and, to the degree possible,

whether buffers set below maximum ABC by the SSC (particularly for crab species) should be considered in the comparisons.

- At a minimum, the workgroup should consider both HCRs that are cap-like (declining fishing mortality rates at high stock size, such as HCR-5 or HCR-10) and those that have flat fishing mortality at high stock sizes (such as HCR-1, status quo), as well as scenarios like HCR-7, where the HCR varies according to an environmental covariate to provide insight into bridging from risk tables. The SSC notes that cap-like scenarios would need to consider constraints on fisheries and relevance to the OY.

- Clearly indicate which modeling platforms are being utilized, and explore where different approaches provide substantively different results (e.g., trends for GOA Pacific cod under high warming scenarios versus other scenarios).

- Communicating model assumptions and the uncertainty associated with model results to a non-technical audience will be critical for a shared understanding of the reliability of scientific information produced by the model. A communication plan that may include dashboards, infographics, and other materials would greatly help the SSC, Council, and public understand the implications and limitations of analyses.

- The SSC encourages a multi-disciplinary approach to the working group, that should include expertise in quantitative modeling and ecosystems, harvest control rule policies and management, social and economic dimensions, and other expertise as required.

Workplan Discussion

The SSC had a wide ranging discussion of topics that could be considered in developing a workplan. The SSC has the following suggestions and recommendations:

The SSC discussed the underlying trophic relationships and species-specific demographics contained within some of the modeling frameworks and their relationship with catch stability. These are complex interactions and may be based on theoretical relationships in some situations. Understanding key components of these relationships as they relate to control rule outcomes, such as stability versus volatility and risk of fishery closures, may provide critical insight into patterns observed in simulations under differing ocean conditions and control rule configurations. For example, under the ACLIM cap scenarios, the larger biomass being left in the water due to the cap may have population level effects that improve species resilience to changing ocean conditions. Conversely, if caps cause underharvest of some stocks it could lead to undesirable consequences like density dependent mortality (e.g., cannibalism) or predation on desirable stocks. Additionally, the modeling platforms likely vary in how these linkages are treated, so a better understanding of model assumptions and structure may be useful for assessing confidence in model outcomes.

Ecosystem linkages and changes in productivity are also important in the context of what happens when prevailing assumptions about stock status break down over time. The Pacific sardine was presented as an example, and the SSC notes that regularly revisiting the assumptions embedded in HCRs is crucial. Models may also be sensitive to changes in species compositions, such that taking a single species out of the multi-species context could result in stock-specific biomass changes (e.g., exclusion of arrowtooth flounder in a multi-species context could have downstream impacts across other groundfish species). Thus, including evaluation of assumptions about ecosystem linkages, how they change over time, and whether the HCR is robust to incorrect assumptions about those linkages will be important information moving forward.

The SSC encourages further exploration into multi-species and ecosystem linkages and highlighting those that might be useful for distinguishing among control rules and models.

The response of biomass and fishing mortality reference points to changes in stock productivity is another important element the workgroup will need to consider. Presentations highlighted issues such as truncated reference periods and species whose productivity is known to vary with environmental conditions. **The SSC recommends that the workgroup develop a small subset of HCRs to investigate sensitivities to these issues across stocks and to identify the pros and cons of modifying biomass and fishing mortality reference points used by the HCRs in context with changes in productivity, including extreme environmental events such as heatwaves.**

While species distribution models were not presented, the SSC noted that these models may be useful for understanding potential range shifts. For species like Bering Sea pollock, redistribution could increase the vulnerability of part of the stock to the Russian fishing fleet, potentially resulting in changes in fishing mortality.

The SSC discussed how to integrate economics into the workplan and emphasized that, should economic considerations be included, scoping be conducted to identify metrics of the economic outcomes that are most relevant for management. Understanding the range of impacts to participants is an important consideration for the workgroup, including whether economic tradeoffs exist among different approaches while meeting conservation goals. The SSC notes that science advice for setting the OFL and ABC is non-economic in nature, but in thinking about control rule policy and a changing environment, economic tradeoffs warrant consideration. For example, catch stability is an economic factor that may be desirable to the fishing industry, and tools would likely need to be developed to evaluate this within the context of the HCR work**.** The SSC suggests inclusion of simple metrics such as catch stability and total value ($) over time, in addition to reporting total catches, as performance metrics for evaluating HCRs in the simulations.

These economic linkages are not simple to map or evaluate, particularly in the context of economic risk. The SSC suggests that including metrics that distinguish between upside and downside risk may be useful. For example, worse than average revenue years may impose different or disproportionate costs compared to the benefits gained by similarly sized positive shocks. Characterizing the asymmetric impacts of gains and losses will be important to evaluating social and economic implications of risk profiles associated with alternative HCRs.

Finally, the SSC discussed that these modeling tools may allow exploration of issues related to how species may distribute across fisheries, and subsequently communities.

SSC Member Associations

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

At this June 2025 meeting, a number of SSC members acknowledged associations with specific agenda items under SSC review. Dana Hanselman is married to Dr. Kalei Shotwell, coauthor on a number of ESPs presented in C2 BSAI Crab. Jason Gasper is the first level supervisor of Cathy Tide and Phil Ganz (contributing authors to C1 Observer Annual Report). Chris Siddon supervises Katie Palof (BSAI CPT co-chair; assessment author for BBRKC and NSRKC), and is a second-level supervisor of Caitlin Stern (NSRKC assessment author) and Tyler Jackson (AIGKC assessment author). Dr. Siddon is married to Elizabeth Siddon, who is a contributor to crab ESPs and risk tables. Finally, Robert Foy is the third or greater level supervisor for Mike Litzow, Cody Szuwalski and all other AFSC members of the CPT and stock assessment authors of C2 BSAI crab including Shannon Hennessey and Brian Garber-Yonts on the Tanner Crab ESP. He is the first level supervisor for Jennifer Ferdinand, second level supervisor for Lisa Thompson, and third or greater level supervisor for Christian Gredzens, Jason Jannot, Andy Kingham, Geoffrey Mayhew, Gwynne Schnaittacher, and Mike Vechter (C1 Observer annual report).