SCIENTIFIC AND STATISTICAL COMMITTEE
FINAL REPORT TO THE
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
September 29 - October 2, 2025

The SSC met from September 29th - October 2nd, 2025 virtually. Members present were:

Ian Stewart – Co-Chair *Intl. Pacific Halibut Commission*	Sherri Dressel, Co-Chair *Alaska Dept. of Fish and Game*	Jason Gasper – Co-chair *NOAA Fisheries—AKRO*
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*	Martin Dorn *University of Washington*	Mike Downs *Wislow Research*
Robert Foy *NOAA Fisheries—AFSC*	Dana Hanselman *NOAA Fisheries—AFSC*	Brad Harris *Alaska Pacific University*
Kailin Kroetz *Arizona State University*	Andrew Munro *Alaska Dept. of Fish and Game*	Franz Mueter *University of Alaska Fairbanks*
Chris Siddon *Alaska Dept. of Fish and Game*	Patrick Sullivan *Cornell University*	Robert Suryan *NOAA Fisheries—AFSC*
Sarah Wise *NOAA Fisheries—AFSC*		

SSC members that were absent:

Curry Cunningham
University of Alaska Fairbanks

SSC Administrative Discussion

The SSC received a presentation from Diana Evans (NPFMC) describing meeting protocols, potential changes to the SSC schedule due to the possibility of a government shutdown, highlights from the Council's B reports and other Council agenda items, and updates on future meetings. Under the B reports, Ms. Evans provided highlights from the Executive Directors report including that this is Executive Director David Witherell's last meeting and that the Council welcomed Nate Pamplin as the new WDFW Council member. The SSC thanks Mr. Witherell for over 30 years of work on behalf of the Council and wishes him all the best in his retirement. Ms. Evans shared that the Council has received funding for 2025 but that the Council will not appoint new (non-returning) SSC members for 2026 to fill the two seats open due to SSC members that will be stepping down after the December 2025 meeting. Ms. Evans highlighted documents posted to the Council website, the Council response to Executive Order 14276 (Restoring American Seafood

Competitiveness), Council agenda items that may be of interest to the SSC at this meeting, and the planned presentations by Alaska Fishery Science Center (AFSC) Director Robert Foy to the Council and SSC (these presentations were later cancelled due to the government shutdown). Ms. Evans informed the SSC that the Council made a motion in June stating that the Council does not intend to recommend harvest specifications for the 2026 Cook Inlet EEZ salmon fishery and requested that NMFS implement specifications under Secretarial authority and NMFS responded in a letter to the Council. At this point, a Cook Inlet salmon agenda item is not currently scheduled for the SSC in response to the June Council motion.

Finally, Ms. Evans also gave a summary of changes to the Council's annual meeting cycle, which included: moving from five to four meetings a year starting in 2026 (2026 meetings will be in February, June, October and December), and moving meeting times in the future. Specifically Council staff are exploring the cost and feasibility of changing annual meeting times starting in 2027 to the end of February, mid-May, early October and early December.

The SSC received information from Robert Foy (NOAA-AFSC) on contingency plans to complete groundfish stock assessments in 2025 if the federal government shuts down, which it did partway through the SSC meeting. Dr. Foy assured the SSC that there was a plan for how to move forward under a government shutdown and that it would be shared with Council leadership. Dr. Foy described that the plan includes a tiered approach to assessments where certain products are prioritized, depending on the length of the shutdown. He shared highlights of that plan, noting that, if the shutdown extends beyond 15 business days, there will be a dramatic impact on the ability of AFSC to produce assessments by current deadlines and may necessitate rolling over some or all preliminary specifications. The SSC thanks Dr. Foy for the update on the planned contingencies.

B4 AFSC Report

The SSC did not receive the AFSC presentation due to the federal government shutdown.

C3 BSAI Crab

The SSC received a report on the September 2025 Crab Plan Team (CPT) meeting from Anita Kroska (NPFMC) and the CPT co-chairs, Mike Litzow (NOAA-AFSC) and Katie Palof (ADF&G). Cody Szuwalski (NOAA-AFSC) presented the eastern Bering Sea (EBS) snow crab assessment. 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 were detailed in the CPT report. Items on which the SSC provided comments are below.

General Crab Comments

The SSC recommends continued progress towards making SAFE documents as consistent in structure and content as practicable. The SSC recognizes that assessments vary among stocks; however, documents that are as similar as possible will facilitate review and ensure accessibility to a wide audience.

The SSC notes that crab stock assessment authors currently use the overfishing limits (OFL) for catch projections. The SSC recommends that the authors and CPT provide a justification if catches are set to the OFL in projections, or use a more realistic estimate of future catches as is done in groundfish assessments.

BSAI Crab SAFEs and ESPs

The SSC appreciates the inclusion of socioeconomic indicators and their availability for use as contextual information in the total allowable catch (TAC) setting process. In the past, the SSC recommended spatial

overlap indices to improve records on quota-share distribution, active ownership, and how consolidation affects communities and active participation. Exploring additional socioeconomic indicators that illustrate spatial and temporal trends would inform understandings regarding the sustained participation of fishing communities.

As described in presentations received by the SSC, low vessel participation in the major crab fisheries has persisted across management areas, raising concerns about the engagement of community-based fleets. Shore-based processing participation has also contracted. While public testimony noted that, in some cases, communities and industry have been able to collaborate across regions to lessen the impact of consolidation of direct participation in the crab fisheries on some communities, the overall trends highlighted fewer opportunities for community-level participation and structural challenges in maintaining sustained participation in these fisheries for multiple communities.

To better capture specific fishing community outcomes of these conditions, the SSC recommends the following modifications to socioeconomic/community indicators in the major BSAI crab fisheries Stock Assessment and Fishery Evaluations (SAFEs), which could then be taken up in graphic format in the accompanying Ecosystem and Socioeconomic Profiles (ESPs):

- Augment the "Number of Active Vessels" indicator under "Fishery Informed Indicators" to include a count of active vessels by community to facilitate identification and documentation of changes in patterns of community engagement in and dependency on fisheries with changes in the number and location of vessels over time (e.g., incorporate counts of vessels by community of ownership address by individual Alaska communities and aggregate community categories such as the Seattle MSA, Other WA, Oregon, and Other States.).

- Similarly, add a "shoreside processing community" indicator to the set of Fishery Informed Indicators to facilitate identification and documentation of changes in patterns of community engagement in and dependency on fisheries experiencing changes in the location and/or number of shoreside processors participating in those fisheries over time (e.g., incorporate counts of shoreside processors participating in the relevant fishery by individual Alaska community of operation).

Together, these or similar vessel and processor community-based indicators would allow for annual tracking of changes on two key dimensions of the sustained participation of fishing communities, which would provide community context information for potential use in the TAC-setting portion of the fishery management process and complement other sources of community-based information, such as the Annual Community Engagement and Participation Overview (ACEPO), with time series and species-specific data not available elsewhere.

The CPT recommended including only post-implementation Crab Rationalization (CR) program fishery performance indicators (e.g., active vessels) in the ESPs, given the difficulty of interpreting pre-implementation CR data and its comparability to post-implementation data. While this approach may improve clarity in some ways, it risks obscuring the longer-term decline in sustained participation of fishing communities in the major BSAI crab fisheries. To address this disconnect, the SSC suggests that it may be useful to briefly summarize the description of patterns of changes in community engagement and dependency that accompanied the implementation of the crab rationalization program and its antecedents, including the vessel buy-back program, that appear in existing CR program reviews. This would provide an important part of the historic context of changing patterns of fishing community participation in the CR fisheries.

Ecosystem Status Report Preview

The SSC received a presentation on the Ecosystem Status Report (ESR) from Elizabeth Siddon (NOAA-AFSC) that provided an overview of climate metrics of conditions for all marine regions of Alaska, with the majority of the presentation focused on conditions potentially affecting Bering Sea crab stocks. The SSC appreciates the ESR authors' continued focus on presenting climate conditions most relevant to stocks under review for the October meeting. This year, in particular, highlighted the importance of year-round metrics to place ocean conditions of fishery survey months into context. Some observations to note include the Gulf of Alaska (GOA) and Aleutian Islands (AI) experiencing broad-scale warming patterns, with warming similar to prior heatwave years in some ways, but different in others. The southeast Bering Sea (SEBS) was warm through much of winter with sea ice not reaching below 60N latitude. The EBS cooled in June and July, the bottom trawl survey months, then warmed more extensively in August. The borealization index for the SEBS remained consistently at or above the long-term mean for the longest period. This coincides with patterns of a few key metrics defining that index, such as the cold pool index consistently below average, small copepods above and large copepods below average, along with other metrics with consistent positive or negative trends throughout the same period. pH continued its downward trend and could possibly become a concern for red king crab, while snow crab seem to be more resilient to ocean acidification.

The SSC appreciated the ESR authors' continued contributions to risk table development. The SSC recommends the authors work with ESR contributors to evaluate composite metrics of physical and biological indices that provide leading indicators of overall conditions or potential change. Composite metrics could include physical and biological indices separately to track specific environmental conditions and biological responses of interest, or in composite like the current Borealization Index. For physical climate variables, this approach could also potentially help understand individual indices that do not appear to be following typical patterns. For example, the GOA exhibiting less warming than might have been expected during a recent El Nino or effects of a consistently negative Pacific Decadal Oscillation index with July 2025 the most negative value of the time series, and seemingly contrary to the warming observed this summer. The SSC further recommends authors articulate uncertainty in metrics to the extent possible and identify which products are validated versus which are under development, description of base models and skill, and clearly identify modeled products.

Trawl Survey Updates

The SSC received a presentation on the 2025 EBS bottom trawl survey results relevant to BSAI crab from Mike Litzow (NOAA-AFSC, CPT co-chair). There was a northern Bering Sea (NBS) survey conducted in 2025 but those results were not available at the time of the CPT meeting. **The SSC commends the survey team and the crab assessment authors for providing survey data and updating model runs and assessment documents on the short timeframe necessitated by the timing of the survey and management.**

There was oral public testimony from Cory Lescher (Alaska Bering Sea Crabbers; ABSC), who provided comments on EBS snow crab and hybrids. The SSC appreciates their testimony.

Survey results for BSAI crab stocks were mixed. The SSC highlighted several survey results in their discussion. There were generally positive trends in Bristol Bay red king crab (BBRKC) in terms of the distribution of mature crab, but overall abundance remains low. Tanner crab results showed an increasing trend in the western management area, but abundance in the eastern area declined compared to 2024 across multiple sex-size classes. The recruitment pulse observed from the western area several years ago is now propagating through the population. The SSC notes the overall positive signs for EBS snow crab in the survey, including increases in abundance of multiple sex-size classes, though industry-preferred males are still low, shifts in stock distribution more similar to previous (pre-2021) distributions, and clutch fullness remains high, though there was some discussion that this metric might be unreliable when accounting for

functional maturity in the EBS snow crab assessment discussion. Additionally, St. Matthew blue king crab (SMBKC), Pribilof Island red king crab (PIRKC) and Pribilof Island blue king crab (PIBKC) generally continue to be in low abundance, though there was an increase in immature females for SMBKC observed at a single station. Finally, the SSC highlights an unprecedented and substantial increase in hybrid abundance observed during the survey, comprising 20% of all *Chionoecetes* males above 101 mm. Furthermore, there were atypical observations of high clutch fullness metrics for hybrid females, including an unusual bimodal distribution where most small females had ¾ - full clutches and larger females were more likely to have clutches ½ - full or less. These survey results spurred a great deal of discussion at the CPT, including a brief regulatory discussion where it was noted that landed hybrid crab is classified as snow crab.

While there are some positive signs for some stocks, the SSC continues to express general concern over the low stock status of many of our BSAI crab stocks.

The increased hybrid *Chionoecetes* abundance raises biological, assessment, and management issues, as highlighted in written and oral public testimony. These issues could not be addressed this year within the framework of the compressed crab assessment cycle. The SSC thanks the CPT for clarifying how the different data streams treat hybrids. Currently, hybrids are combined with snow crab in landing data but are separated from both snow crab and Tanner crab in survey data. Recognizing the tight turnaround time between receiving survey results and the September CPT meeting, the SSC supports the CPT proposal to include an agenda item during its May 2026 meeting and looks forward to further discussion on how and whether hybrid data are incorporated in assessments. **The SSC looks forward to the results of their discussion and agrees that the current approach needs to be re-evaluated.** At minimum, there needs to be consistency within the assessment process. The SSC highlights the disconnect between catch, which combines hybrids and snow crab, and survey biomass in the snow crab assessment model. The SSC also provided comments in the Tanner and snow crab assessments, soliciting input from assessment authors on the inclusion of hybrids in their respective assessments. **The SSC notes that having a potential response in place, even if the prevalence of hybrid crab in survey observations does not continue in the future, is critical to respond appropriately given the timeline for assessment and management for BSAI crab.**

BSAI Crab Harvest Specifications and SAFEs

Table 1 includes the stock status determination criteria and Table 2 includes the October 2025 SSC recommendations. The SSC endorsed the OFL and ABC recommendations of the CPT, with the exception of EBS snow crab (Table 2).

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	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[2]	71.40	142.79	60.08[3]	0.42	19.6	2.81	overfished
2	BB red king crab	3	9.26	18.69	19.74	1.06	5.02	1.20	
3	EBS Tanner crab	3	21.61	40.01	99.53	2.49	41.29	3.09	
4	Pribilof Islands red king crab	4	0.64	1.283	3.15	2.45	0.685	< 0.001	
5	Pribilof Islands blue king crab	4	2.07	4.15	0.075	0.018	0.00116	< 0.001	overfished
6	St. Matthew Island blue king crab	4	1.48	2.93	1.41	0.48	0.129	0.001	overfished
7	Norton Sound red king crab	4	1.00	2.02[4]	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[5]	5					0.114	Conf.	
10	Western AI red king crab	5					0.056	0.01	

[1] MMB on 2/1/2024 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 (corrected from the June 2025 SSC report).

[2] Snow crab was assessed as a Tier 3 stock in 2024; however, the status for that year reflects the Tier 4 assessment conducted in 2025.

[3] Snow crab MMB represents an estimate at the time of the survey, not at the time of mating.

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

[5] 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 MMB[2]	2025/26 MMB / B_{MSY}	Natural Mortality (M)	2025/26 OFL	2025/26 ABC	ABC Buffer
1	E. Bering Sea snow crab	4b	0.19	142.79	1982-2024	105.21[3]	0.74	0.27	**20.11**	**12.07**	**40%**
2	Bristol Bay red king crab	3b	0.37	18.52	1984-2024	16.84	0.91	0.23	5.85	4.68	20%
3	E. Bering Sea Tanner crab	3a	1.47	43.22	1982-2024	75.96	1.76	0.23	51.02	40.81	20%
4	Pribilof Is. red king crab	4a	0.21	1.283	2000-2024	2.586	2.02	0.21	0.4899	0.3674	25%
5	Pribilof Is. blue king crab[4]	4c	0	4.15	1980/81-1984/85; 1990/91-1997/98	0.162	0.04	0.18	0.00116	0.00087	25%
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[5]	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[6]	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 BMSY 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 2/15/2026 for all other Tier 1-4 stocks, using the current assessments (corrected from June 2025 SSC report).

[3] Snow crab MMB represents an estimate at the time of the survey, not at the time of mating.

[4] The F_{OFL} of 0 for PIBKC is indicative of a closed directed fishery due to stock status per the crab FMP guidelines.

[5] 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.

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

EBS Snow Crab

The SSC received an overview of assessment results and CPT discussions on EBS snow crab. The SSC thanks the assessment author and the CPT for tackling a challenging snow crab assessment. The SSC appreciates being able to interact with the author during his presentation of the snow crab assessment, and recommended that, when feasible, assessment authors give the SSC presentation for the major crab stocks.

Written public testimony was provided by Scott Goodman (Bering Sea Fisheries Research Foundation; BSFRF) and Gabriel Prout (ABSC). Oral public testimony was provided by Mateo Paz-Soldan (City of St. Paul), Edward Paulsen (self), Scott Goodman (BSFRF), and Frank Kelty (City of Unalaska). Testifiers stressed the dependency of local economies and the fishing fleets on the snow crab fishery and noted the contraction of processing capacity, with only two currently active crab shore-based processors, both located in Unalaska. These remarks highlight the need to include information on community engagement and dependency in ESPs, and to track the participation of processors and vessels associated with specific fishing communities. Testimony also focused on the divergence between survey indicators and assessment results and associated catch recommendations. One suggestion was to base harvest recommendations on modeling approaches that are tied more closely to the survey biomass estimates. Testifiers did not support the change in the maturity definition, pointing out that the region-specific information is not sufficient to support the change. They emphasized the need for stability and continuity in scientific harvest recommendations during snow crab rebuilding. Finally, they testified about the need to consider the implications of increased abundance of hybrid crab on crab biology and management, and highlighted the importance of flexibility and ongoing monitoring. The SSC appreciated these comments and took them into account in the snow crab deliberations.

Over the past five years, snow crab has been at its lowest historical level following a catastrophic heat-wave induced natural mortality event in 2019-2020. However, the SSC noted the continuing signs of stock recovery in the 2025 EBS bottom trawl survey. These included a 175% increase in abundance of mature females, approaching the average for the time series, and high levels of clutch fullness. There was a 34% increase in industry-preferred males, and increases in all other male size classes. A large cohort of crab that first appeared in 2023 has been consistently working its way through the population size composition. Despite these positive trends, both the CPT and author highlighted that the biomass of large male snow crab preferred by the fishery remains very low.

Based on the 2025 EBS bottom trawl survey, the CPT also highlighted that males underwent terminal molt to maturity at smaller sizes than average. The low abundance of large males following the population collapse is likely due to reduced competition for mating, hence maturing early may provide mating opportunities for these males that are not typically present. Early maturation has been seen previously when the leading edge of a population pulse reaches a size at which terminal molt is possible, as in the mid-1990s. It is unknown whether smaller size at maturity is a useful long-term indicator of trends in stock status due to high exploitation, or simply a sign of stock recovery after a large pulse mortality event.

The SSC acknowledges the work completed during 2025 to better inform the proxy values for B_{MSY} and F_{MSY} applied to this stock. An analysis was recently published (Szuwalski and Punt 2025[1]) that used the Clark (1991[2]) 'Maximin' approach to find the spawning potential ratio (SPR) and fishing mortality rates that maximize yield across potential levels of stock productivity (in this case, stock-recruitment steepness and size of crab contributing to reproductive output). The utility of this paper for snow crab assessment was not evaluated by the CPT, but results indicated that solutions were strongly influenced by the maturity assumption. When maturity is defined as morphologically mature male biomass, the stock is extremely

[1] Cody Szuwalski, André E. Punt. 2025. Spawning-biomass-per-recruit proxies for fisheries reference points under multiple axes of uncertainty. Fisheries Research (289). https://doi.org/10.1016/j.fishres.2025.107494.

[2] Clark, W.G. 1991. Groundfish exploitation rates based on life history parameters. Can. J. fish. Aquat. Sci. 48: 734-750.

resilient to fishing intensity, irrespective of the level of stock productivity, because smaller mature males are not targeted by the fishery. In contrast, when maturity is defined as functional maturity (> 95mm CW), the stock is very sensitive to fishing intensity.

The SSC also acknowledges that a previously requested analysis of the role of density dependence in the molt to maturity is in review in the Journal of Applied Ecology, and looks forward to seeing that work presented to the CPT and the SSC.

Two Tier 3 models were provided for consideration in this year's snow crab assessment: Model 24.1, last year's accepted model, and Model 25.3, which was last year's model with updated data inputs. Updated time series included survey indices and size compositions, bycatch data (biomass and size composition), and retained, total, and discarded catch (in numbers and biomass) and fishery size composition data, and finally additional growth increment data.

The June 2025 SSC minutes noted that there appeared to be substantial change in the male discard data and requested that these changes be better documented and justified. In response, the assessment author explained the changes could mostly be accounted for by a change in when discard mortality is applied. Previously, discard mortality was applied to the input data; in the 2025 model, discard mortality is applied within the model. Fits to the Model 25.3 were acceptable, although the model is unable to fit the sharp upturn in biomass in the 2025 EBS trawl survey. The estimate of immature female natural mortality showed a large increase and is now approximately twice as high as male immature mortality, but this change is likely to have limited impact on model estimates important for management.

The CPT had extensive discussion on the clutch fullness indicator, focusing on whether it is a reliable indicator of whether there are sufficient males in the population to fully fertilize mature females. Clutch fullness for snow crab has generally remained high, even in years post population collapse, except for 2020 when it dropped below 50%. The CPT discussed published work on Canadian snow crab indicating that females will extrude unfertilized eggs. However, experienced crab biologists at the CPT meeting were very skeptical that this is common. The SSC recommends research into the reliability of the clutch fullness indicator using histology or lab rearing experiments. The importance of clutch fullness as an indicator was noted by Orensanz et al. (1998[3]), "Absence of a trend in the per capita reproductive contribution of mature females implies no recruitment overfishing, even in the face of a stock decline."

In addition to the Tier 3 models, the assessment also provided results for "backup" Tier 4 assessment as previously requested by the SSC for all Tier 3 crab assessments. Results were reported using alternative REMA-smoothed survey biomass estimates using different male biomass metrics, including mature male biomass, male biomass >95 mm carapace width, and male biomass >101 mm carapace width. The target biomass was set as the average of the time series from 1982-2024 and the target fishing mortality was set as 0.27, the median of the prior on natural mortality used in the Tier 3 assessment. The result provided in the assessment simply multiplied the male biomass by natural mortality, as requested by the SSC. Full implementation of a Tier 4 crab assessment as specified in the FMP requires application of a harvest control rule.

For Tier 3 models, the assessment author jittered models with mature male biomass (MMB) and >95 mm carapace width as the maturity metric. The jittering analysis found two clusters of converged model runs where the OFL (using morphometric maturity) differed by about 5 kt. These two clusters appeared to be due to model indeterminacy around the magnitude of recruitment and the timing of the period of increased natural mortality. Given the lack of a survey in 2020, model indeterminacy between recruitment in 2018 and 2019 and the estimates of elevated natural mortality for 2019-2020 should not be surprising. The lack

[3] Orensanz, J.M., J. Armstrong, D. Armstrong and R. Hilborn. 1998. Crustacean resources are vulnerable to serial depletion - the multifaceted decline of crab and shrimp fisheries in the Greater Gulf of Alaska. Reviews in Fish Biology and Fisheries 8:117-176.

of a consistent return to a single likelihood value indicates a convergence problem, which was not resolvable this year. The SSC recommends that the assessment author explore strategies to constrain the model complexity during this period. For example, reducing the number of years with increased natural mortality may provide the model enough constraint to allow model convergence. More generally, the snow crab assessment would likely benefit from a decrease in flexibility to ensure convergence and stable, interpretable parameter estimates and results.

After jittering models with MMB and >95 mm carapace width as the maturity metric, the author then used jitter runs with the lowest negative log likelihood as the basis for harvest recommendations. There was an unresolved question about why the OFL in the jitter analysis differed from that reported from the model with >95 mm carapace width for the lowest negative log likelihood. As the estimation models are identical, a preferable approach identified by the CPT would be to do the jitter analysis for only one assumption for maturity, and use the estimated parameters in a model using the other maturity assumption. Additional issues with the jitter analysis were identified, specifically that an OFL value in Figure 21 has a lower negative log likelihood than the OFL recommended by the author and CPT. Table 13 also raises questions about what is actually being fit in the GMACS model; a significant number of parameters are either showing estimates of zero or are estimated identically to other parameters. If it is true that these parameters are active and being estimated, that would clearly cause some of the pathologies seen in the jitter analysis.

The SSC considered convergence problems with Model 25.3 to be severe enough to prevent its use for harvest recommendations. Due to this uncertainty, the SSC recommends the Tier 4 approach using mature male biomass as a fallback until the Tier 3 model's convergence and identifiability are clearly improved. Using REMA-smoothed survey biomass with natural mortality as the F_{MSY} proxy yields transparent and reproducible advice. The assessment did not apply the Tier 4 harvest control rule to the Tier 4 "fallback" assessment so the SSC requested the assessment author provide the OFL using the Tier 4 harvest control rules during the meeting. The SSC intends this be a temporary approach until an acceptable Tier 3 model can be developed. **The SSC reviewed the ABC buffers in 2022, 2023, and 2024 (25%, 50%, and 65%, respectively), and recommended an ABC buffer of 40% be applied to the Tier 4 OFL** as intermediate among the buffers. The Tier 4 assessment does not have the convergence issues of the Tier 3 assessments in 2023 and 2024, but uncertainty in the appropriate definition of maturity remains a major concern.

The assessment author and the CPT both recommended the >95 mm carapace width cut point for the maturity definition, as a continuation of the CPT recommendation last year. Last year, the SSC disagreed with the CPT recommendation and recommended instead continued use of mature male biomass as the appropriate metric of male reproductive output. After extensive discussion at this meeting, the SSC again concluded that the available region-specific information was not sufficient to support a change in the maturity definition. The SSC remains concerned about the lack of large crab in the population, but would prefer to not revisit the maturity question until the CPT feels there is new information to bring forward to understand snow crab mating dynamics.

Based on the recommended model, overfishing is not occurring for snow crab. Based on the Tier 4 assessment, the stock status in 2024/2025 is estimated to be 42% of the B_{MSY}, below the minimum stock size threshold, resulting in an overfished status for the stock. The stock size is estimated to be 74% of the B_{MSY} in 2025. Snow crab will remain under a rebuilding plan until it has rebuilt to the B_{MSY} level.

The SSC has the following prioritized recommendations for the next stock assessment (including several repeated from previous SSC reviews):

- Snow crab was declared overfished in 2021, but the SAFE did not include a section on "Rebuilding Analysis and Update." **The SSC recommends that this section be included in future SAFEs as appropriate.**

- The SSC recommends that morphometric maturity status be overlaid on the size distribution plots (Figure 9) to allow visual tracking of growth and the transition to maturity by cohort.

- As with a similar SSC recommendation for Tanner crab, **the SSC recommends consideration of different inclusions/exclusions of hybrids into the snow crab assessment (i.e., in survey and catch data) to evaluate sensitivity to these options and ensure an internally consistent approach.**

- **The SSC recommends that research be conducted to evaluate whether clutch fullness is a reliable indicator of female reproductive output, using histology or lab rearing experiments.**

- 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 *F0.1* fishing mortality rate (the fishing mortality rate where the slope of the yield per recruit curve is 10% of the slope at the origin). Initial analyses indicated that fishing mortality rates much lower than $F_{35\%}$ achieved a high percentage of MSY, indicating potential flexibility in specifying reference points. The SSC is still interested in developing a wider range of options for reference points for snow crab rather than entirely abandoning morphometric male maturity per recruit. For example, as an interim measure, adopting a more conservative F_{SPR} proxy (e.g., $F_{65\%}$) would keep the control rule tied to biology. It would also be of interest to explore a two-sex, fertilized-egg SPR analysis ("fathers matter") so spawning output reflects male abundance/size–dependent fertilization.

- **The SSC is willing to participate in a collaborative working group during spring 2026 to facilitate additional progress on the development of an ABC control rule for snow crab.**

- The SSC again requests an analysis of the probability of maturing/terminal molt which addresses the observation error in these data and the lack of a monotonically increasing curve. A hierarchical analysis that treats years as random effects might be a starting point. The SSC would also like to better understand the sampling design for the molt data and is concerned about the weighting of the spatial samples in the analysis; weighting should be based on abundance if the sampling rate differs by area (which it would, unless abundance were uniform and/or the targets were in direct proportion to abundance).

- The SSC requests that assessment authors investigate whether there is information outside the assessment model (e.g., larval or post-settlement data) or in the model, supporting estimated skewed sex-ratios at recruitment and the mismatch between recent large recruitments for males and females occurring in different years.

- The SSC requests an exploration of whether the estimated large differences in male and female recruitment years could be related to the lack of fit to molt-increment data.

- Geostatistical (e.g. VAST or sdmTMB) modeling of trawl survey data including both the NBS and EBS should be prioritized. This could help understand some of the inconsistent recruitment/growth trends observed in recent years as well as prepare for potential changes in stock distribution or productivity under future warming of the Bering Sea. Geostatistical modeling should evaluate alternative error distributions and other model configurations as appropriate.

- The SSC also reiterates its general comments from December 2024 suggesting that authors use likelihood profiles to describe uncertainty in model parameters and management quantities and use jittering analyses only to ensure that the results provided come from the model with the lowest negative log likelihood (the "MLE").

Tanner Crab

The SSC received a presentation on the 2025 stock assessment for the Tanner crab stock in the Bering Sea. Oral and written public testimony relevant to Tanner crab was provided by Scott Goodman (BSFRF), who noted the large increases in snow crab and the dramatic increase in the number of hybrids. Mr. Goodman noted considerable interest among stakeholders to account for hybrids within the relevant stock assessments. Written testimony from Gabriel Prout (ABSC) also highlighted the need to account for hybrids. The SSC thanks the assessment author for their extensive work documenting and addressing previous SSC and CPT requests. While the SSC appreciates the author's attention to detail, the SSC highlights that the SAFE and the included appendices are over 400 pages long, which makes review a daunting task. The SSC suggests additional streamlining of the material included in future assessment documents.

The Tanner crab stock has been a Tier 3 stock since the 2012/13 assessment cycle, given the informative nature of fishery, survey, and life history information for this stock. The SSC highlights that the Tanner crab fishery was open in both the eastern and western ADF&G management areas in 2024/25, and the TAC set for Tanner crab by the State of Alaska was significantly below the OFL.

Tanner crab biomass in the 2025 EBS shelf bottom trawl survey showed significant increases in male crabs in the western area, slight decreases in male crabs in the eastern area, and minor declines in females crabs in both areas. The increase in males was mainly due to smaller crabs, although there was also a slight increase in industry-preferred size crabs (>125 mm).

The author and CPT recommended Model 22.03d5 for harvest specifications. This is the same model as last year with updated data.

Model 22.03d5 generally exhibited reasonable fits to indices of abundance and removals in the directed and bycatch fisheries, successfully converged to the MLE, had a low retrospective bias in MMB, and had no parameters hitting bounds. A jitter analysis did not identify a solution better than that reported as the MLE. Results are consistent with the 2024 assessment, with fits to data components being nearly identical to the 2024 version.

The SSC supports using Model 22.03d5 for 2025/26 harvest specifications and supports the resulting author and CPT recommended OFL. The current biomass is above B_{MSY}, placing this stock in Tier 3a. Since the current MMB is above MSST, the BSAI Tanner crab stock is not overfished. The overall catch in 2024/25 was less than the 2024/25 OFL; therefore, overfishing did not occur.

The SSC appreciates that a Tier 4 model based on survey biomass was developed according to SSC guidance as a "backup," should the Tier 3 assessment prove unusable.

The CPT continues to recommend a buffer of 20% between OFL and ABC for this stock, which was also recommended by the SSC last year. **Since the major uncertainties and concerns about the assessment have not changed, the SSC continues to recommend an ABC buffer of 20% for Tanner crab.**

The main recommendation from the SSC is to continue prioritizing the transition of the Tanner crab assessment into the GMACS framework. If a CIE review of this assessment is scheduled for 2026, the SSC strongly recommends that both the current and GMACS results are presented to the CIE, even if the GMACS conversion is still in progress.

Additionally, the SSC recommends:

- **An analysis of different inclusions/exclusions of hybrid data into the Tanner crab assessment (i.e., in survey and catch data) to evaluate sensitivity to these options and ensure an internally consistent approach.** This is a lower priority for Tanner crab (see snow crab recommendations), but it may be helpful for the Tanner and snow crab assessment authors to work collaboratively on this topic.

- Addition of a section in the ESP on hybrids with a focus on their interaction with Tanner crab. This will hopefully provide a consistent place to track hybrids over time.

- Continue reviewing pertinent literature for any new information on the maturity and reproductive biology of Tanner crab and other crab species with determinate growth (i.e., have a terminal molt) and re-examining the appropriateness of estimating maturity within the model or using an alternative (e.g., cut-line, size at 95% maturity) to better inform Tanner crab management decisions as new information becomes available. The SSC suggests that this could also be a high-priority topic for the upcoming CIE review.

- The SSC supports further exploration of an index of how changing environmental conditions might affect size at maturity of Tanner crab and considers this a research priority for both Tanner and snow crab.

Bristol Bay Red King Crab

The SSC received an overview of the BBRKC stock assessment and CPT recommendations. There was no written or oral testimony specific to BBRKC.

The SSC thanks the stock assessment author and ESP authors for document updates and clear responses to previous CPT and SSC comments. In particular, the historical retrospective was very helpful in isolating the 2009-2018 years when biomass was overestimated. The historical buffer considerations appendix was very useful for considering consistency in the buffer discussion. The SSC also appreciates the author applying the new jittering analyses consistent with the CPT standard operating procedures.

Male and female abundance increased slightly from 2024 in the 2025 EBS bottom trawl survey. However, there continues to be no substantial recruitment since the early to mid-2000s. The BBRKC fishery opened in 2023 and 2024 after two years of closure. It was noted that the CPUE in the 2024/25 directed fishery was higher than the last ten year average and that female bycatch was substantially reduced from last year.

The stock assessment model has been implemented in GMACS since 2018. Data updates for this final assessment included groundfish fisheries bycatch data during 1986-2024; crab fisheries directed, cost-recovery, and bycatch data through 2024/25; NMFS survey data for 2025; and length composition data for directed and non-directed fisheries. In addition, the terminal year of recruitment for reference point calculations was updated to include 2024. Two Tier 3 model scenarios were compared based on CPT and SSC recommendations in May 2025. The base model, Model 24.0c, was the accepted 2024 model with new data and updated GMACS version as of May 2025 (version 2.20.20, 2025-01-30). Model 24.0c2 removes shell condition as a placeholder in the code and the ADF&G catch time series was updated. The author also provided a Tier 4 "fall back" model. A terminal year recruitment analysis with Model 24.0c.2 suggests the estimated recruitment in the last year should not be used for estimating $B_{35\%}$. Changes to model results after adding new data were minimal for both Tier 3 models and the retrospective patterns continued to improve in recent years.

The SSC supports the author and CPT recommendation to use Model 24.0c2 for harvest specification and the resulting OFL, placing BBRKC stock in Tier 3b. This stock is not overfished and total catch mortality did not exceed the 2024/25 OFL so overfishing did not occur in 2024/25. Even with recent low recruitment, the BBRKC stock is not approaching an overfished condition.

The SSC agrees with the CPT recommendations on jittering results presentation (only include results within a few likelihood units of the MLE), MCMC reporting (include MCMC trace plots and other diagnostics to allow evaluation of mixing success), and MCMC projection results (different fractions of F_{MSY}). **The SSC continues to recommend:**

1. Addressing increasing CPUE trends by looking at spatial aggregation of the directed fishery and 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.

2. Developing additional size bins for the larger females across the entire time series.

3. Developing a common framework for using BSFRF data for snow crab, Tanner crab, and BBRKC (planned for a January 2026 workshop).

4. Continued evaluation of the Northern District data in the stock assessment.

5. Consideration of Bristol Bay and Pribilof Islands genetics and movement studies and the incorporation of directed crab fisheries data from the State of Alaska observer program to inform the upcoming EFH 5-year review.

The SSC appreciates the authors' list of considerations for an ABC buffer and the CPT discussion on future use of the risk table with considerations for the assessment, population dynamics, ecosystem, and the fishery. **The SSC supports the author and CPT's recommended ABC buffer of 20%, based on continued uncertainty due to retrospective patterns, effects of cold pool distributional shifts, and lack of fit to recent NMFS female survey biomass**.

However, the SSC does not consider recruitment pulses, trends in biomass, low mature female abundance, or non-stationarity as part of the considerations for buffer determination as was discussed in the assessment and during the CPT meeting.

The SSC appreciates the ESP/report card format changes and the draft risk tables for considering where and how uncertainty is addressed in the stock assessment.

The SSC discussed some initial thoughts on how ESP, ESR, and risk table considerations may be used in the ABC buffer. The SSC agrees with the CPT that the ESPs and now risk tables have matured to the point of being useful for the buffer discussion and look forward to the recommendations from the May 2026 CPT meeting. The SSC would recommend that those discussions include the following:

- Providing socioeconomic indicators as context for TAC determination.

- Indicators of changes in fleet participation and community representation since the snow crab fishery collapse

- Consideration by the ESP authors on external forcing effects on the model from 2009-2018 when both historical and current model retrospectives show overestimation.

- Further explore potential bottlenecks in larval and juvenile survival, including impacts of acidification and predation.

Pribilof Island Red King Crab

The SSC received a presentation on a full stock assessment for PIRKC and recommendations for harvest specifications. There was no oral or written public testimony.

The PIRKC stock is assessed biennially, with the last full assessment completed in 2022. In this year's assessment, the author presented two models: Model 25.1, an updated base model using GMACS and updated survey/biomass data through 2025, and Model 25.2, which builds on Model 25.1 by incorporating historical ADF&G pot survey data from 2003, 2005, 2008, and 2011. In addition, both models included updated trawl survey and incidental catch data. Fishing-related mortality for this stock is very low due to the closure implemented in the Pribilof Conservation Area and closure of the directed fishery due to low blue king crab abundance. The SSC appreciates the author's work in incorporating these data into the assessment.

Due to the triennial schedule and multiple changes to GMACS over that period, formal bridging analysis to the new version of GMACS was not conducted. This may be an ongoing issue with this assessment due to the longer period between assessments. The base model (Model 25.1) exhibited differences in the model fit to survey biomass in the earlier part of the time series relative to the accepted model from the previous assessment (Model 22.1); however, the fits in the more recent time period were similar. **The SSC supports the CPT and author recommended Model 25.2, which incorporates ADF&G pot survey data, and the resulting OFL. The stock remains in Tier 4a. The SSC also supports the CPT recommendation for the status quo 25% buffer and the resulting ABC. The stock is not overfished and overfishing did not take place in 2024/2025.** The SSC looks forward to future work on the risk table for this stock.

Looking towards the future of this assessment, the SSC recommends the author work on tracking the impact of new GMACS versions on the assessment should important differences be observed in the future.

To better align this stock assessment with the PIBKC assessment, the SSC agrees with moving this stock to a four year cycle, as recommended by the CPT. However, along with the CPT, the SSC is concerned about recent declining survey trends. The Pribilof District red king crab survey catch showed continued low abundance with mature male abundance decreasing by 2% relative to 2024. The removal of the corner stations from the trawl survey likely impacted this assessment, as both the trawl survey CVs increased and the estimated number of mature male and female crab remains at the lowest values since 2005. Nearly all crabs that were observed in the 2024 survey were large males (>150 mm), which follows a long period of low recruitment since the mid 2010. The CPT had a robust discussion about these concerns and recommended that the survey biomass be monitored and compared against MSST from this assessment . **The SSC agrees with the CPT that survey biomass should be monitored annually in relation to MSST, and that adjustments to the assessment schedule may be necessary if the stock shows a more concerning decline.** However, the SSC notes a decision to move to a full assessment out of cycle does not necessarily need to be only tied to an MSST threshold if trends in truncated length composition worsen. **To help monitor the stock during the off-assessment years, the SSC recommends bringing forward trawl survey length composition information in the annual review, if possible.**

The SSC agrees with the CPT to request further work examining the impact of losing the corner stations on the indices of abundance, and methods to help mitigate this impact if possible. Coordination with ongoing work done for SMBKC and PIBKC on this issue may be useful to align approaches across assessments.

In addition, the SSC wishes to reiterate the recommendations raised in the SSC 2022 report, which are provided below. The SSC further notes that even when no progress has been made it is useful to know that the comments have at least been acknowledged and that some are still in the queue. This offers the CPT and SSC the opportunity to reevaluate, update and prioritize issues of concern over time. The SSC requests that author responses be provided to SSC comments made on previous full assessments and included in future SAFEs, as has become best practice in recent years.

From the 2022 SSC Minutes:

The SSC endorses the CPT recommendations that 1) the assessment author and other red king crab assessment authors (e.g., BBRKC) review the existing growth data and review potential additional sources of growth information, and 2) that the author examine whether the standard deviation around the growth increment is consistent with results from the tagging data for BBRKC.

In addition, the SSC encourages the author to consider the following avenues for further improvements to the model:

- *Explore covariates (e.g., temperature) associated with historical BBRKC tagging growth increment data towards selecting records that best align with Pribilof Island regional conditions.*
- *Explore the use of a molt increment growth transition matrix.*
- *Explore analyses of molting at length for males towards specifying PIRKC molting probability in the assessment.*
- *Examine catchability and availability of PIRKC in the NMFS survey to shed some light on divergent changes in abundance in recent years. Data collected during the Bering Sea Fisheries Research Foundation (BSFRF) selectivity studies around the Pribilof Islands in 2017 and 2018 may support this effort.*
- *Examine retrospective patterns in future assessments.*
- *Consider the use of Bayesian methods with relatively uninformative priors for population processes to better account for uncertainties.*

Pribilof Island Blue King Crab

The SSC received a presentation on the stock assessment for PIBKC and recommendations for harvest specifications. There was no written or oral testimony.

The PIBKC stock is assessed biennially. The last full assessment was in 2023 and therefore, a full assessment was conducted in 2025.

The assessment for this stock has historically used the R package *REMA* to implement a survey averaging random effects model to smooth NMFS bottom trawl survey estimates of MMB. However, surveys continue to show zero or very low catches of mature male PIBKC biomass in recent years. Consequently, in addition to exploring an assessment with the *REMA* model with non-zero constants replacing the zero survey catches, at least 14 alternative models were explored using the sdmTMB R package, three representing different combinations of model structure. **The SSC agrees with the CPT's recommended model fit to the survey MMB for setting harvest specifications for PIBKC.** This is Model ar1S_nullT_logDepth_km080b, an sdmTMB GLMM spatiotemporal generalized mixed model using Tweedie error with a log link, a k-means mesh with 80 nodes that included correlation barriers for the Pribilof Islands and the continental shelf.

The directed fishery has been closed since 1999/2000, and the stock was declared overfished in 2002. The survey MMB time series and related data for PIBKC were updated with results from the 2024 and 2025 NMFS EBS shelf bottom trawl surveys and the 2022/23-2023/24 crab and groundfish fisheries for retained and discarded catch. Status determination is based on the Tier 4 approach, while a Tier 5 approach is used for determining an OFL.

The B_{MSY} proxy for this stock is based on MMB at mating from 1980/81-1984/85 and 1990/91-1997/98. The projected MMB at mating for 2024/25 remains well below the MSST, placing the stock in Tier 4c. These recommendations do not differ from the last specification, and **the SSC agrees with the CPT-recommended OFL and ABC for 2025/26**. **The stock remains overfished with no signs of recovery. Overfishing did not occur in 2024/2025.**

Given continuing concerns for the stock with regards to lack of recruitment, the CPT recommended continuing with the 25% ABC buffer as used in previous years. The 25% buffer acknowledges the low status of the stock, the accommodations made in the rebuilding plan to set the OFL, and the current status of low bycatch in non-directed fisheries. **The SSC agrees with the CPT recommendation of applying a 25% ABC buffer. To better align this stock assessment with the PIRKC assessment, the SSC supports moving this stock to a four year assessment cycle, as recommended by the CPT.** The SSC also supports the CPT recommendation of using a 50% handling mortality as is seen in other king crab stocks.

The SSC appreciates the author's detailed responses provided to previous CPT and SSC comments. Even when no progress has been made, it is useful to know that the comments have at least been acknowledged and that some are still in the queue. This offers the CPT and SSC to re-evaluate, update, and prioritize issues of concern over time.

The SSC had the following additional comments:

In the 2023 assessment the author tried a few different approaches for dealing with the fact that no mature males were caught in the 2023 NMFS bottom trawl survey that consequently resulted in zero observations in the data disrupting the *REMA* analysis, which involves taking the log of the observations. The SSC suggested replacing the zero value with a small constant. However, with a continued stream of zero values as seen in subsequent surveys this simple fix is no longer a satisfactory approach to employ. The SSC valued the exploration of sdmTMB as an alternative approach. This method should continue to be explored. As was noted in 2023, the SSC again notes that while the Tweedie distribution is theoretically attractive and often recommended, this model can easily be over-parameterized. The sdmTMB package employs a number of other distributional options that might provide a better representation of the variation in the system while resulting in other practical advantages such as convergence and reduced runtime. The SSC recommends a careful selection of the appropriate distributional family for the sdmTMB modeling of this stock.

Related to the choice of which distributional family to use is the question of the type of smoother and other inputs (e.g. depth) to employ. The SSC valued seeing the range of alternative model runs based on the Tweedie distribution, while employing different assumptions regarding spatial, temporal (AR1), covariate, mesh, and barrier assumptions in Appendix A of the PIBKC SAFE. However, some concerns still remain regarding model structure and complexity. The Model ar1ST_nullT_logDepth_km080b appeared to represent the best choice among competing models using crossvalidation and the resulting goodness of fit metrics, but run time, signs of overfitting, accuracy of future predictions, and changes in the magnitude of retrospective analyses might all point to a different model or set of models to explore. The SSC recommends that for models that show minor improvements in the likelihood relative to the best fitting model that efficiency and accuracy in other metrics should also be considered, in addition to goodness of fit.

The SSC recommends a dedicated section of the SAFE report should be created that provides a brief update on the status of the rebuilding plan. The SSC further recommends that this section include a summary identifying those fishing communities participating in the fishery during the most recent years it was open (e.g., communities of ownership address of catcher vessels participating in the fishery and communities with locally operating shoreside processors that participated in the fishery) as contextual information relevant to taking into account the needs of fishing communities in the rebuilding process.

The SSC supports continued development of risk tables for this stock with the expectation that as the table develops, greater insight will be provided for management and in particular how environmental factors integrate with other elements of the system.

Overfishing Status Updates

The SSC received overfishing status updates for three stocks in off-years for full assessment reviews, including Western Aleutian Islands red king crab (WAIRKC), Pribilof Island golden king crab (PIGKC), and SMBKC. **Total catch mortality for each of these stocks was below the OFL, so overfishing did not occur in 2024/2025 (2024 for PIGKC because specifications are on a calendar year basis)**. Directed fishing for AIGKC was incomplete at the time of the assessment and bycatch from the groundfish fisheries was still ongoing in June, so an overfishing determination for AIGKC based on a final total catch is made at this October meeting. **Total catch mortality for AIGKC was below the OFL, so overfishing did not occur in 2024/2025. SMBKC remains overfished.** Both WAIRKC and PIGKC are Tier 5 stocks, and an overfished status determination cannot be made.

Risk Tables

Substantial progress was made by BSAI crab assessment authors to implement draft risk tables this cycle. While the CPT discussed the implementation of risk tables at their September 2025 meeting, they did not define a complete approach for crab and a follow-up discussion is planned for the May 2026 CPT meeting. The SSC appreciates the work that the CPT and the authors have put into making risk tables useful for BSAI crab stocks and how risk tables interact with buffer setting. The SSC looks forward to hearing the results of those discussions. The SSC finds the summaries of information in the risk tables to be extremely valuable, particularly the ecosystem category, and continues to request risk tables for PIRKC, PIBKC, recognizing these will only be updated in four years, for the next stock assessment.

While the CPT highlighted differences in the assessment of risk and the application of risk tables between crab and groundfish, the SSC strongly suggests that there are many parallels that should be considered for BSAI crab and that the structure of the risk table approach is sufficiently general to be applicable to both crab and groundfish. The SSC discussed the definition of risk and the implicit acceptance of a relatively greater risk through the adoption of the P* = 0.49 approach for BSAI crab, which implies that maxABC is essentially equal to the OFL. As for groundfish, the ABC may be reduced from its maximum value based on other considerations such as the potential for bias in estimated reference points (model uncertainty) or concerns about the appropriate definition of reproductive potential. The SSC continues to encourage the CPT to include groundfish experience when finalizing risk table guidance as some of the aspects under discussion have already been vetted by the GPTs. The SSC suggests the CPT consider evaluating buffers relative to the maxABC, rather than relative to the previous year, as a comprehensive assessment of risk is challenging when considering only year-over-year changes. Finally, the SSC is also concerned that renaming aspects of the risk tables might be confusing, given the stated goal of transparency.

Update vs Full Assessments

The SSC appreciates consideration of defining different assessment types and agrees with the CPT's recommendation to continue with the status quo of bringing forward full assessments on a stock's individual assessment cycle. The SSC appreciates the current level of monitoring that occurs at the CPT on an annual basis to track off-cycle stocks.

Skipper Surveys

The SSC appreciates the inclusion of skipper survey data and notes the high participation rates. The CPT found the skipper survey results valuable for contextual interpretation of fishery-dependent data. The SSC looks forward to continued inclusion of the skipper survey data and supports the CPT move to add future skipper survey questions relating to hybrids, retention size in the snow and Tanner crab fisheries, and perception of TAC size in the BSAI crab fisheries. The SSC also notes that the incorporation of the skipper survey represents an important milestone of progress toward the Council's stated goal of augmenting information utilized in the management process with local knowledge where appropriate.

C5 BSAI/GOA Groundfish Specifications

The SSC received a series of presentations from Kalei Shotwell (NOAA-AFSC, BSAI GPT co-chair), Jim Ianelli (NOAA-AFSC, GOA GPT co-chair), Diana Stram (NPFMC), and Sara Cleaver (NPFMC) that included items from the September 2025 Joint Groundfish Plan Team (JGPT), BSAI Groundfish Plan Team (BSAI GPT), and GOA Groundfish Plan Team (GOA GPT) meetings. The SSC received public testimony for BSAI/GOA groundfish specifications from Julie Bonney (Alaska Groundfish Data Bank) and Glenn Merrill (Northstar Fishing Company) and Sarah Webster (Alaska Seafood Cooperative) provided both oral and written public testimony.

Joint Groundfish Plan Team Report

The SSC received a presentation from Jim Ianelli (NOAA-AFSC, GOA GPT co-chair) and Kalei Shotwell (NOAA-AFSC, BSAI GPT co-chair) on the September 2025 JGPT meeting. Sara Cleaver (NPMFC) provided a presentation on spatial apportionment.

Data-Limited Methods Working Group (DLMWG)

The SSC notes the continued progress of the DLMWG in developing approaches for Tier 6 stocks. The JGPT recommended further exploration of the decision-tree framework for GOA octopus, including simulations and sensitivity analyses. **The SSC supports this direction and emphasizes the need to evaluate how these tools may eventually provide defensible and transparent stock status indicators for poorly sampled species.**

Ecosystem Status Report Climate Update

The JGPT received an Alaska-wide update on climate and oceanography. The SSC commends the ESR team for their continued excellent work to ensure ecosystem-scale information is available to support harvest specification discussions. The SSC appreciates efforts to link climate indicators with recruitment and phenology across multiple species and encourages testing of multivariate indices to synthesize ecosystem signals.

Ecosystem and Socioeconomic Profiles (ESP) and Dynamic Structural Equation Models (DSEM)

The SSC recognizes progress in embedding DSEM into stock assessments through the RCEATTLE platform. Early results for GOA pollock appear promising in reducing unexplained recruitment variability. **The SSC encourages continued exploration of applications to additional stocks and supports efforts to create structured pathways for including environmental covariates in assessment models.**

Surveys in the BSAI and GOA

- Ecosystem Surveys: The SSC notes the importance of indices of early life stages for pollock and Pacific cod in the GOA and recommends their inclusion in future presentations.

- Longline Survey: The SSC shares the JGPT's concern regarding alternating-year survey coverage (GOA vs. BSAI/AI) for sablefish and the potential for increased uncertainty in recruitment tracking. The SSC recommends exploring approaches to better integrate un-surveyed regions, including model-based spatial indices.

- The SSC suggests comparing longline and trawl survey rockfish catches (focusing on size-ranges captured by both surveys) to better understand the declines across many rockfish observed in the 2025 GOA bottom trawl survey results.

- Trawl Survey: Concerns that changes in the GOA trawl survey design may be impacting apparent guild-level biomass trends were raised in public testimony. See the SSC comments in the GOA GPT section below.

Harvest Control Rules (HCRs)

The SSC acknowledges the JGPT's extensive discussion of the June 2025 HCR workshop. The SSC agrees that the evaluation framework should focus on species sensitive to environmental change, particularly Pacific cod, pollock, sablefish, snow crab, and BBRKC. **The SSC supports the JGPT's recommendation to add Pacific ocean perch. The SSC concurs that future evaluations should incorporate demographic processes beyond recruitment (e.g., growth) and supports early 2026 review of candidate frameworks for when and how to use alternative HCRs in exceptional circumstances.**

The SSC appreciates the focus of the JGPT's discussions on developing a framework for when different HCRs could be triggered, which are envisioned as switching to alternative HCRs if and when they may be needed for a limited period of time. The JGPT envisions the ability to link the overarching framework with the risk tables and the ESP, which have already been discussed to a great extent. However, to move forward in this direction, the JGPT needs more time and a workshop to try to frame those ideas. **While the SSC supports the frameworking approach to invoke alternative HCRs in exceptional circumstances, the SSC recommends that the JGPT also consider an option to adopt long-term alternatives to the current HCRs based on their robustness to system shocks, short-term anomalies, and long-term trends related to climate change.**

Sablefish Management Strategy Evaluation (MSE)

The JGPT reviewed the September 2025 update of the Alaska sablefish MSE project. This work was developed to test the robustness of ten alternative HCRs under recruitment uncertainty and to evaluate whether management strategies can improve performance in both conservation and fishery outcomes.

The SSC commends the authors for the thorough analysis and notes that no single strategy clearly outperformed the current $F_{40\%}$ policy. Instead, the MSE suggests that hybrid approaches - for example, a $F_{45\%}$ threshold rule combined with a 'slow up, fast down' stability constraint and a harvest cap - may provide a more balanced pathway by moderating sudden increases in TAC during booms while still safeguarding spawning biomass during downturns.

The SSC supports:

- Expanded testing of hybrid HCRs that combine conservative thresholds, stability constraints, and harvest caps.

- Prioritizing conservation metrics in MSE reporting, with economic performance presented as complementary information.

- Further development of the spatial MSE to incorporate region-specific recruitment, selectivity, and movement dynamics.
- Continued stakeholder engagement and clear documentation of diagnostics and performance metrics.

Spatial Stock Assessment Model for Sablefish

Spatially explicit modeling of sablefish has long been a research priority due to their wide distribution, ontogenetic movement, and localized fishery pressures. The 2025 spatial model tested whether a five-region structure (BS, AI, WGOA, CGOA, EGOA), informed by conventional tagging and age-based movement, could improve understanding of sablefish dynamics and provide a foundation for future apportionment evaluations. This research model incorporated age-blocked movement, negative binomial likelihoods, and regulatory reporting changes. Notable preliminary findings include evidence that 1) recruitment hotspots were concentrated in BSAI and CGOA and 2) net eastward movement with age, consistent with current ontogenetic migration hypotheses. However, fits to composition data remained poor, and time-varying movement could not be reliably estimated with available tagging data. The SSC was impressed by the substantial progress and views the spatial model as an important research tool that is not yet suitable for operational harvest advice.

The SSC supports:

- Continued development of the spatial model with expanded tagging and ageing data.
- Exploration of environmental and climate drivers of recruitment and movement.
- Conditioning spatial models in MSE frameworks to test apportionment strategies and evaluate local depletion risk.
- Retaining the single-area model for harvest specifications until spatial models are fully vetted.

Inseason Management

The SSC notes the JGPT's discussion of increasing delays in in-season actions, which may require earlier initiation of closure processes but risk stranding harvest. **The SSC encourages continued communication between NMFS and industry to mitigate these effects.**

Halibut Discard Mortality Rates (DMRs)

The SSC notes that no changes were made to halibut DMR estimation methodology.

Sablefish Models

The SSC received a presentation on sablefish model development.

Sablefish in Alaska are assessed annually using age-structured population models, with a long history of complex dynamics and technical challenges. Previous assessments have been hampered by retrospective recruitment bias, data conflicts, persistent poor fishery composition fits, and changes in survey design, most recently the shift in 2021 to a biennial longline survey alternating between the GOA and BSAI, raising concerns about recruitment tracking and index extrapolation. To address these issues, the authors emphasized model refinements to reduce retrospective bias, modernize the modeling framework by moving from ADMB to R-TMB/SPoRC, re-evaluate natural mortality priors, and consider the role of trawl and

longline survey indices.

The analysts followed a stepwise model development sequence including the translation of the 2024 ADMB model into R-TMB/SPoRC (Model 25.0), incorporating split-sex age compositions (Model 25.8), applying an updated M prior consistent with tagging and longevity studies (Model 25.10) and removing the GOA trawl survey and using the revised M prior (Model 25.12). A suite of sensitivity models exploring time-varying growth, flexible selectivity, alternative likelihoods, and a spatial framework were also constructed.

Model 25.12 produced the most stable recruitment estimates, greatest improvement in retrospective bias, and biological consistency; however, poor fishery composition fits remained unresolved across all models. Dropping the GOA trawl survey reduced contradictory recruitment signals but removed scale information, leaving the longline survey as the dominant index. Dependence on the biennial longline survey design increases the unsampled area requiring extrapolation.

The analysts recommended bringing forward models 25.0 and 25.12. The JGPT supported the authors' recommendation and requested clearer reporting of Francis reweighting results, explicit presentation of effective sample sizes, and continued testing of flexible selectivity approaches.

The SSC commends the assessment authors for implementing a very thorough and well-structured stepwise approach to the analyses. **The SSC concurs with the JGPT and assessment authors that Model 25.12 and the continuity model (25.0) be brought forward for consideration in November. The SSC also recommends including biennial survey impacts on extrapolation in the 2026 CIE review.**

The SSC offers the following recommendations for continued sablefish model development:

- Document Francis reweighting and effective sample sizes across datasets.
- Compare empirical length and weight-at-age directly with model estimates.
- Continue evaluation of flexible fishery selectivity and alternative composition likelihoods.
- Continue development of spatial models and sex-specific mortality.
- Continue exploring approaches for using fishery composition data to inform removals only rather than population structure or recruitment.
- Explore inclusion of environmental covariates in R-TMB/SPoRC.
- Model proportions of age-groups by area using spatial approaches.
- Clarifying the likelihood for the prior on M on the scale of M, not logM, and the other likelihood component.
- Avoid using an ad hoc approach to down weighting anomalous size comp data points.
- Consider the reduced survey frequency in the risk tables.

Spatial Apportionment

The SSC received oral public testimony from Sarah Webster (Alaska Seafood Cooperative), Glenn Merrill (Northstar Fishing Company), and Julie Bonney (Alaska Groundfish Data Bank). Testimony supported the process for recommending groundfish spatial apportionments presented by Council staff and supported the change in terminology. Testifiers emphasized the benefit of additional flexibility in setting subarea TACs,

with the goals of accessing additional resources, dampening the impact of uncertain and variable survey results, and preventing non-target species bycatch from unnecessarily constraining target fisheries. There was a request for bottom trawl biomass estimates for all FMP species, as well as the survey biomass distribution by subarea, for the September plan team meetings. Public testimony also identified a number of stocks for which they suggested the Council consider subarea TACs that exceed BRDs.

The SSC thanks Council staff for the thoughtful presentation to clarify the role and process of spatial apportionments in the harvest specifications cycle. The introduction of Biologically-informed Recommended Distributions (BRDs), and the delineation between them and ABCs under the MSA (which are relevant to the OFL/ACL stock area), is a welcome step toward improving transparency and consistency in the specifications process. The SSC notes, however, that several aspects warrant further discussion to ensure the new framework balances biological precaution with TAC flexibility.

The SSC identified key parts of the presentation on the spatial apportionment process that differ from what the SSC has seen or discussed in December 2024 or June 2025:

- A proposed change in terminology from subarea ABC to BRD
- The presentation clarified that area-specific TACs may exceed individual BRDs (formerly called "sub-area ABCs")
- In the upcoming December harvest specification tables, ABCs and BRDs will be in different columns and the BRDs will sum to 100% of the ABC. For stocks identified by the Council in October, the SSC will describe the risk of exceeding the BRDs in a qualitative or quantitative way in the SSC Report text.

The SSC supports the proposed terminology change to BRDs, as it better reflects the intent of these apportionments as precautionary and biologically grounded, rather than regulatory ABCs. This distinction should reduce confusion regarding accountability measures when formerly called "sub-area ABCs" were exceeded. **The SSC also agrees that socioeconomic factors should remain under Council purview when TACs are set and not embedded in the BRD calculations.** Council staff should ensure that FMP and SAFE documentation clearly define BRDs and highlight their role as a biological starting point for TAC deliberations.

The SSC appreciates the effort to streamline the process and provide the Council with structured opportunities to identify stocks where flexibility may be appropriate. The outlined approach with Council signaling stocks of concern in October for PT/SSC discussion in November/December is pragmatic and should improve communication while not causing the SSC and Council to review this for every set of recommended BRDs in every cycle.

The SSC reiterates from their June 2025 minutes that harvest should generally reflect stock distribution, especially when stock structure and spatial ecology are uncertain. This approach helps maintain biocomplexity, reproductive potential, and fishing opportunities. **While limited flexibility in spatial apportionment is unlikely to threaten groundfish sustainability, the SSC cautions against broadly applying it to all stocks.** Survey-based apportionment has worked well in most cases, and expanding flexibility to all stocks would add unnecessary complexity. Instead, the SSC advises that any new flexibilities be applied selectively, focusing on stocks with highly variable or uncertain survey estimates that can cause unstable apportionments. The SSC also discussed focusing on non-target stocks with the potential to constrain fisheries but did not come to a clear consensus for advice. The SSC recommends that setting subarea TACs over BRDs should be for addressing temporary fishery constraints and should not cumulatively shift sub-area apportionments over time.

As this new process is developed, the SSC highlights that the appropriate role of the SSC is to quantify, or at least characterize, the associated risk with exceeding a specific BRD. This risk is a combination of the risk of local depletion related to potential stock structure and uncertainty in the area apportionments. With harvest generally distributed in proportion to stock distribution as a default approach, the SSC notes that the burden of proof should remain on reasons to deviate from this approach for specifying sub-area ABCs (or BRDs). To facilitate considerations of risk by the SSC when asked to provide appropriate levels of flexibility for BRDs, the SSC recommends that the GPT and SSC work toward developing general guidance after the current specification cycle on how to translate biological concerns and uncertainty in area apportionments into an acceptable level of flexibility. **The SSC supports developing a general and consistent approach using metrics of conservation concern (e.g. genetic structure) but highlights for the Council that a consistent quantitative approach will not be developed by this December.** Developing such guidance would help provide transparent and more consistent advice as stocks are evaluated on a case-by-case basis.

The SSC notes that there are unresolved questions about how the BRD/sub-area TAC process will work in this cycle. Nevertheless, the SSC considers the process to be sufficiently well developed and supports moving forward. The SSC recommends that the process this year be considered as a trial run that can be used to improve and refine the process in future years. The SSC notes the ability to make quantitative assessments about the appropriate level of flexibility in setting subarea TACs would be best supported by complex spatial modeling, information on movement rates, and genetic information on stock structure.

The SSC identified two groups of stocks, those identified by the SSC as having potential changes in apportionment methods that could result in changes to the BRDs between 2024 and 2025, and a second category of stocks for which the SSC received public testimony that may be relevant to the Council. The SSC did not evaluate the merits of the suggestions made during public comment, and the SSC is simply forwarding those suggestions for Council consideration. While changes in survey results between 2024 and 2025 could also result in changes to the BRDs between 2024 and 2025, the SSC did not specifically identify stocks for which there were large changes based on the Plan Team report because it was not clear what level of change would be meaningful for the Council. The SSC was informed by Council staff that the Council would receive the survey report directly and recommends that, in future years, bottom trawl biomass estimates and biomass distribution by subarea for all FMP species be presented at the September Plan Team meetings in order to more fully inform the Council.

Stocks with changes in BRD methods:

- BSAI Greenland turbot: a new spatial apportionment method will be brought forward in December as a recommended way to estimate BRDs for the Bering Sea and the Aleutian Islands. The new analysis resulted in 11.2% of the total biomass estimated to be in the AI, compared to 15.7% using the previous method.

- GOA shortraker rockfish: a new spatial apportionment method will be brought forward in December as a recommended way to estimate BRDs. Also, there was public testimony about potential for changes in subarea TACs to constrain, or continue to constrain, target fisheries for other stocks.

Stocks suggested during public comment:

- GOA skates complex: There was public testimony about potential for subarea TACs to constrain target fisheries for other stocks.

- GOA thornyhead rockfish: There was public testimony about potential for subarea TACs to constrain target fisheries for other stocks.

- GOA Pacific ocean perch: There was public testimony about an approach of increasing harvest in the areas of the GOA open to bottom trawling to balance underharvest of the resource in the Eastern GOA.

SSC Concerns/Suggestions:

- The process for determining whether a TAC exceeding a BRD is biologically defensible is not yet fully developed. To develop more explicit criteria, the SSC requests that stock assessment authors and the GPTs provide as much detailed information as is available (e.g., stock structure evidence, localized depletion risk, PSC concerns) to guide such evaluations.

- Deviations from BRDs may have cumulative impacts if large and repeated. The SSC recommends that assessment authors track and report in stock assessments both subarea TACs and BRDs and document both the scientific basis for determining that flexibility around the BRD is acceptable and the Council's objective when setting a subarea TAC above BRD, to support future evaluation of cumulative impacts. The SSC recommends that the added flexibility should be for addressing temporary fishery constraints and should not cumulatively shift sub-area apportionments over time toward favored sub-areas.

- Survey coverage, representativeness and uncertainty should be explicitly addressed in apportionment recommendations. Specifically, uncertainty of BRDs, particularly for areas with sparse data (e.g., Aleutians), should be quantified and communicated alongside point estimates in the stock assessment.

- New methods (e.g., *REMA*, VAST, spatio-temporal apportionment tools) should continue to be developed and brought forward for GPT and SSC review per the status quo.

- Stock structure templates, if these exist, should be made available to the GPTs (November) and the SSC (December) for stocks for which a discussion of sub-area TAC flexibility is requested by the Council in October.

Research recommendations

The SSC offers the following guidance and recommendations towards improving standardization, efficiency, and transparency in the BRD estimation and application processes. While assessment authors and the GPTs may be able to address some of these items to inform the December 2025 SSC review, the SSC recognizes that substantial additional work would be needed by the assessment authors to address these recommendations and should be considered long-term research objectives.

Survey Dependence and Data Requirements

BRDs, like sub-area ABCs, depend on spatially explicit survey biomass estimates, and as with sub-area ABCs, have high reliance on AFSC survey coverage, analytical resources, and the ability to produce robust subarea indices. The SSC notes that review of flexibility around BRDS may increase the need for spatially-explicit survey information at the same time as there are potential reductions in survey effort. The SSC recommends that in addition to annual documentation of overall survey coverage, sampling coverage by strata and subarea would strengthen the transparency of BRD inputs.

Habitat-based sampling Constraints

AFSC trawl surveys in the GOA and AI are limited to trawlable habitat, while fleets actively prosecute fisheries in areas classified as untrawlable. This mismatch risks underestimating biomass in some sub-areas and biasing allocations toward regions with more trawlable grounds. The SSC recommends analysts

document the extent of untrawlable (un-surveyed) habitat by subarea, including where fleets actively fish. They may include supplemental indices from longline, acoustic, or camera surveys that could be considered in BRD development.

Spatial Closures and Inter-BRD Dynamics

Many of the current spatial closures already serve as implicit apportionment measures. When BRDs are applied in addition, realized harvest patterns may diverge from recommended distributions. The SSC recommends an analysis to identify when closures materially constrain harvest distributions relative to BRDs.

Trade-offs: CPUE, EFH, and PSC

BRDs may shift catch into subareas where there is lower fishery CPUE, increasing the effort required to harvest TAC. The resultant increase in fishing effort raises costs, elevates the likelihood of adverse effects on sensitive habitats, and may reduce ability to avoid incidental catch of PSC species (e.g., halibut, crab, and salmon). The SSC recommends that CPUE and PSC rates be tracked annually in BRD areas with the analysts highlighting cases where BRDs may increase habitat impact or PSC-encounter risks.

BSAI Groundfish Plan Team Report

The SSC received a presentation from Kalei Shotwell (NOAA-AFSC, BSAI GPT co-chair) and Diana Stram (NPFMC) on the September 2025 BSAI GPT meeting. The SSC received written and oral public testimony from Sarah Webster representing the Alaska Seafood Cooperative on Council Agenda item C5d BSAI Blackspotted Rougheye Rockfish Accountability Measures. In oral testimony, Ms. Webster noted that the analysis was not on the SSC's agenda, indicated that there were parts of the analysis that would have benefited from SSC review and encouraged the SSC to alert the Council. During discussion, the SSC recognized that the SSC normally does not receive discussion papers and also acknowledged SSC meeting time constraints which limit the number of topics the SSC can review. Without having seen the discussion paper, the SSC was not able to speak to the degree to which a review would have been beneficial. **The SSC recommends the Council refer to past December SSC reports on BSAI blackspotted/rougheye stock assessments as they apply to their decision making on agenda item C5d BSAI Blackspotted/Rougheye Rockfish Accountability Measures.**

BSAI Bottom trawl survey

The AFSC successfully conducted the BSAI bottom trawl survey despite the challenging conditions to get the surveys on the water this year. Survey staff completed all 350 EBS stations and all but seven of the 144 NBS stations. The SSC commends the AFSC on the rapid turnaround of data products after the survey was complete and the work to continually improve current and developing products. **The SSC requests the survey team provide survey information for all BSAI FMP stocks next year if possible** (also noted in the Spatial Apportionment section). If that is not possible, the SSC supports continued coordination with GPT representatives on what key species to include.

EBS Pollock

Initial model runs and exploratory analyses for the 2025 assessment of walleye pollock in the EBS were presented, with reference to analyses presented to the CIE review team and to the Plan Team. There was no public testimony specific to EBS pollock. The EBS pollock assessment is a Tier 3 assessment as of 2024 and the stock is assessed annually.

The SSC recommends bringing forward the 2024 base model as implemented in RTMB, with two specific updates, in addition to routine data updates:

- Inclusion of updated estimates of survey biomass and age compositions from the Groundfish Assessment Program based on an updated modeling approach.

- FT-NIRS estimated age composition data for the 2025 fishery and surveys

While a full analysis of the impact of the updated survey data was not provided, the SSC considers this a straightforward improvement that implements models in sdmTMB for survey biomass and in tinyVAST for age compositions. This represents a more transparent and easier to implement approach. Differences between the old and updated biomass index and age compositions were minimal. Since the SSC has endorsed the use of model-based estimates for these data inputs for EBS pollock and other stocks, improvements to the modeling approach will generally be considered a routine data update, reflecting the use of best-available survey information, rather than a model change.

For the November assessment, the SSC further requests including an analysis of the impacts of replacing traditional ages with FT-NIRS ages on model results and management quantities in the assessment to document the transition to FT-NIRS. At a minimum, the model runs that were presented to the CIE, which use the FT-NIRS data in lieu of the traditional microscope ages (TMA) data for the period of overlap, should be included as an appendix to the assessment or by reference to a stable website (DOI).

The SSC appreciates the exploration of the impact of switching to FT-NIRS data that was provided as part of the CIE review document. The use of the FT-NIRS data has been broadly supported by reviewers including the Plan Teams, SSC and the CIE. However, the analyses revealed some potentially troubling issues with the FT-NIRS data as the age estimates appear to be less consistent across ages for a given cohort compared to traditional microscope ages, based on correlations between age-specific abundances for age a in year t and age a+1 in year t+1. This resulted in substantial degradation in fits to both the fishery and survey age compositions (increases in negative log-likelihood) when FT-NIRS data are used in the assessment, but relatively minor changes in reference points (https://noaa-afsc.github.io/EBS_pollock/doc/CIE.html#tbl-modfits). Using fleet-specific aging error matrices, which are supported by previous analyses of the FT-NIRS data, tended to result in a further increase in negative log-likelihood, particularly for the fishery data. Nevertheless, residual diagnostics for the age compositions (overall age composition and OSA residuals) under all three scenarios (TMA, FT-NIRS with aggregated aging errors, FT-NIRS with fleet-specific aging errors) were satisfactory.

The SSC offers these additional recommendations for the next assessment cycle or beyond:

The author explored model runs using a new AVO index with improved uncertainty estimates, but these were not recommended by the GPT for use in this assessment. A paper describing the updated uncertainty estimates is currently in review (Urmy et al.[4]). The SSC agrees that there are still some unresolved issues with the use of the point estimates from the new analyses and the issue should be revisited once the review is complete.

The author implemented an RTMB version of the assessment model and provided a complete bridging analysis. This required a minor change to the ADMB code (and the resulting outputs) to make results directly comparable between modeling platforms. All estimated quantities from the two versions showed negligible differences between versions. The SSC appreciates the bridging analysis, including the MCMC implementation, and supports the use of the RTMB version if it is ready for this assessment cycle. However, given the parallel development of two other models implemented in TMB that could be used for the assessment, the RCEATTLE model (G. Adams) and a spatial model (SPoRC, M. Cheng), the further

[4] Urmy, Samuel S., Patrick Ressler, and Alex De Robertis. 2025. "Estimating Uncertainty from Multiple Sources in Acoustic-Trawl Surveys." Unpublished Manuscript, May.

development of a stand-alone RTMB version may be redundant. Therefore, the SSC recommends that the author and BSAI GPT develop a longer-term strategy for transitioning to a new "post-ADMB" modeling platform that best meets the needs for future model development. This may include spatial considerations, the possible integrating of Russian catch and/or survey data in the future, and climate change considerations, among others.

The CIE review discussed the incorporation of Russian catch data into the assessment, which apparently are a considerable fraction of U.S. catches in recent years (25-40%). The SSC appreciates the review of the Russian pollock assessment approach and a comparison of recent assessment results between the U.S. and Russian assessments. **The SSC supports an analysis of the impact of accounting for Russian catches in the assessment in the next assessment cycle or this year, at the author's discretion.**

Other key recommendations from the CIE review included exploration of time-varying natural mortality, changes to how selectivity is modeled, changes in data weighting (in particular for age composition), and modeling cohort and temperature effects on weight-at-age. The SSC supports these recommendations and, while not prioritizing them in the context of other outstanding SSC recommendations at this point, highlights two specific recommendations.

- The SSC appreciates the initial explorations of incorporating M estimates from the CEATTLE model last year and in the CIE review documents that show some promise. The SSC notes that adopting the RCEATTLE platform for future development of the assessment model might facilitate integration of time-varying M and would be one consideration in developing a long-term strategy for this assessment.

- The SSC re-iterates its recommendation from last year to review the relative role of the recruitment penalty on estimation of the 2018 year class and provide some discussion of why this penalty seemed to be favoring a larger recruitment estimate in the likelihood profile.

Finally, the SSC re-iterates its support for the online version of initial model explorations in September/October to facilitate reviews, but requests that the document more clearly identify model alternatives proposed for the current assessment, including model numbers. The SSC also requests that a copy of the SAFE documents and presentations from both October and December be archived such that they are easily accessed in the future.

Yellowfin Sole

BSAI yellowfin sole is managed as a Tier 1 stock and is assessed annually. The SSC appreciates the authors' work on this assessment to clearly step through the proposed model runs.

The authors proposed several new model configurations for the yellowfin sole stock assessment for the BSAI, including investigating Tier 1 versus Tier 3 recruitment estimates. The three models considered are as follows:

- Model 23.0: The accepted model from 2024 written in ADMB. In addition, a deterministic model using SS3 and parameters fixed at values from the ADMB model was brought forward (mSS3deter) for comparison with the 23.0 base model in ADMB

- Model 25.0: This model used mSS3deter, with the modification of several features:

    - The EBS survey catchability incorporates the survey start date and removes EBS bottom temperature as an environmental covariate.

    - Data weighting for the survey age composition is based on the number of hauls from which otoliths were collected

- Model 25.0a: The proposed model for 2025, which builds on Model 25.0, except data weighting for survey age composition is based on the input sample size methodology used in the R package sampleISS.

The SSC supports the authors and GPT's recommendation to bring forward models 23.0 and 25.0a and move the stock from Tier 1 to Tier 3. The SSC appreciated the author's responsiveness to previous recommendations regarding examining the stock-recruit relationship and the use of Tier 1 versus Tier 3 harvest specifications. The authors evaluated these issues and highlighted the lack of information to inform stock-recruit dynamics at lower population levels. While data may be available prior to the regime shift in the mid 1970s, the SSC agrees with the authors' assessment that these data are not appropriate for use given the well-documented regime shift. Moving from the EBS bottom temperature covariate to the survey start date is also appropriate as it addresses collinearity issues associated with bottom temperature and the timing of the EBS trawl survey.

The SSC appreciates the work done to bridge from ADMB to SS3 and supports the BSAI GPT recommendation of including this work in the appendix of the stock assessment. The SSC agrees with the BSAI GPT that moving from ADMB to SS3 is appropriate and notes differences in fit between the platforms for the Tier 3 assessment were small. The SSC also agrees with the BSAI GPT recommendations to include the bridging analysis in the appendix of the assessment.

Finally, the SSC notes the long decline in the yellowfin sole population and highlights that this decline has also been observed for BBRKC due to generally poor recruitment. The SSC encourages future evaluation of ecosystem changes in the Bristol Bay region that may be driving declines of stocks in the region. This may be most appropriately done in the ESR, but the SSC encourages the authors to consider important environmental drivers relative to the assessment.

Greenland Turbot

The SSC appreciates the authors for producing a thorough preliminary assessment. The document was well organized and addressed many prior SSC recommendations. The table format for SSC recommendations was appreciated and presented complex material in a clear and accessible manner.

The SSC notes that the primary concern remains the unrealistic recruitment peaks estimated in the 1960s. These appear to be artifacts of early catch data rather than signals from composition data. While this is acceptable if these recruitments are excluded from reference point calculations, the SSC suggests placing greater emphasis on the 1977-start models, which appear more defensible. The authors were concerned that the model is challenged by determining whether the data indicate a formerly high stock size with low productivity or a lower stock size with high productivity. In response to these concerns, the authors brought forward additional models, in addition to the base model 16.4c.

The SSC notes that several cumulative changes were made to the Greenland turbot assessment model, each representing improvements consistent with best practices. These included use of the surveyISS package for bottom trawl input sample sizes (Model 25.1), fixing the stock–recruitment autocorrelation parameter (Model 25.2), and implementing the analytical solution in SS3 for survey catchability (Model 25.3). Building on these, the authors also explored models with alternative start years (models 25.4 and 25.5), which the SSC views as particularly important for avoiding unrealistic recruitment estimates in the early data period. The presentation at the BSAI GPT also mentioned exploring the use of the regime-shift parameter in SS3, but recommends against its application here, as it effectively substitutes for the recruitment problem by inferring population size during periods with little information beyond catch. The

SSC also requests some discussion of the value of using a stock-recruitment relationship in a Tier 3 assessment, which most commonly models recruitment with average recruitment and annual deviations rather than an S-R relationship (steepness = 1).

The SSC notes concerns regarding the use of EBS slope survey length compositions, which were collected under a different design and are not associated with biomass estimates. Their utility for informing recruitment is questionable without the associated biomass. The SSC also considered the Francis reweighting approach, which substantially down-weighted shelf and slope survey compositions. As these are key recruitment indicators, the SSC recommends caution in relying heavily on Francis weighting until sample-size based methods are improved. The SSC suggests evaluating whether Francis reweighting would perform differently if the slope length data were excluded.

The SSC also notes that the selectivity blocks may be overly complex and appear to be confounded with recruitment. Simplifying the selectivity structure, particularly under the preferred 1977 start-year models, is recommended. Retrospective bias is another minor concern. Mohn's rho exceeded 0.2 in the alternative models, which is not necessarily high but higher than the base model. The SSC suggests that as new models are explored, the potential increase in retrospective patterns is monitored.

The SSC acknowledges continued progress in addressing biological data gaps, and appreciates the ongoing work to improve maturity schedules. The new REMA approach to spatial apportionment is viewed as a step forward and is supported by the SSC.

The SSC concurs with the BSAI GPT and recommends bringing forward the base model, plus models 25.3 and 25.4 and emphasizes that the 1977-start models provide a stronger foundation for future management advice. The SSC specifically recommends exploring the exclusion of the 1979–1991 EBS slope survey length data from the models and testing using the older survey biomass estimates to see if that changes perception of recruitment. Model 25.4 suggests using an initial F and equilibrium age composition to set up the population age structure, and the SSC welcomes any discussion of other potential initial conditions when starting the model in 1977. For example, the model could be initialized by estimating the initial age structure if adequate age composition data are available.

BSAI Skates

The BSAI skate complex includes two components, a Tier 3 age-structured model for Alaska skate (*Bathyraja parmifera*) in the EBS and a Tier 5 random effects model for all other skates, and is assessed every two years. As the last assessment was in 2023, this stock is scheduled for a full operational model assessment in 2025. The SSC thanks the assessment authors who presented a number of related models that might be brought forward for consideration in future harvest setting recommendations for the Tier 3 Alaska skate component of the BSAI skate complex. The assessment authors noted that the model accepted in 2023 (Model 14_2d) had not appropriately converged because some parameters were on bounds and other parameters had very high relative standard errors. The authors consequently developed five additional models:

- Model 14_2d1 using an updated SS3; 25_0 fixed growth;
- Model 25_1, Model 25_0 with fixed catchability;
- Model 25_2, Model 25_1 with adjusted selectivity; and
- Model 25_3, Model 25_2 with catchability set to 1.

Only models 25_2 and 25_3 showed reasonable convergence with some selectivity parameters fixed. The 2025 models also corrected the recruitment bias adjustment, fixed growth at external estimates, and included other minor specification updates. Along with these five models, the authors forward Tier 4 and Tier 5 models for consideration this year. The SSC supports the authors interest in exploring length-based models for the next assessment cycle. **The SSC concurs with the GPT recommendation that the authors bring forward the base model (Model 14_2d) and Model 25_2 or Model 25_3 - at the authors' discretion, but in agreement with the authors' preference for Model 25_2 that uses catchability from Kotwiki and Weinberg (2005)[5]. The SSC also concurs with the GPT that Tier 4 (with selectivities if available) and Tier 5 model options be brought forward for consideration.** In exploring these options it might be recognized that it is much easier to wisely modify simpler models that converge than biologically more realistic models that don't converge. The SSC recognizes that once convergence is achieved as a starting point, a variety of alternative model formulations explored might result in similarly reasonable likelihood fits. When in that situation, other model behaviors (convergence times, run times, retrospective patterns, quality of and variation in predicted outcomes) might be used to determine the choice of the "best" model to use in practice beyond minor improvements in the likelihood. That is, efficiency and accuracy in other metrics should be considered in addition to goodness of fit. **The SSC supports the research priorities list recommended by the assessment authors as a high priority.** Additionally, the SSC recommends that the authors consider exploring a Bayesian framework to estimate growth parameters externally to better account for and quantify uncertainty in these parameters.

Northern Rockfish

The author brought forward the accepted 2023 assessment base model (Model 21) and nine additional models for consideration in the coming assessment (Models 25_1 to 9). These additional models broadly explore a split-sex representation of the population in combination with model structures incorporating time-varying survey catchability or selectivity. There was no public testimony.

The SSC thanks the author for their responsiveness to previous SSC requests for information on the influence of sex ratio and in response to challenges seen in the retrospective pattern by bringing forward these alternative model formulations. The author found that none of the alternatives provided sufficient improvements over the 2023 accepted base model to recommend adoption at this time. Furthermore, the BSAI GPT did not recommend additional research on time-varying catchability and did not recommend bringing forward this type of model in November. However, the BSAI GPT did recommend that the author bring forward both the 2023 base model (Model 21) and the split-sex model (Model 25.2) in November, while ensuring that all management outcomes and reference points be included. **The SSC agrees with the GPT that the author bring forward both the 2023 base model (Model 21) and the split-sex model (Model 25.2) in November, along with all relevant management outcomes and reference points.**

The SSC wishes to highlight recent years' discussions, which noted recent genetic work by NMFS that indicates high stock structure in Northern rockfish relative to other rockfish species. This information raises continued concern over potential risks to stock biomass and productivity from disproportionate harvesting. The SSC recommends that this stock structure information be included in the risk table for November and continued monitoring for potential effects due to spatial structure.

[5] Kotwicki, S. and K.L. Weinberg, 2005. Estimating capture probability of a survey bottom trawl for Bering Sea skates (Bathyraja spp.) and other fish. Alaska Fishery Research Bulletin. 11(2): 135-145.

Akta Mackerel ESP

The SSC received a summary of the BSAI GPT's evaluation of the proposed ESP for BSAI Atka mackerel from Diana Stram. The draft ESP had been presented to the BSAI GPT at their September 2025 meeting.

The development of this ESP builds on a request by the SSC and BSAI GPT in 2019 for an ESP; and reiterated at the December 2024 Council meeting. The need for the ESP remains grounded in the ongoing low spawning biomass for this fully utilized species, uncertainties surrounding key life history traits, concerns over effectiveness of surveys given nearshore rocky habitats, regional variation in productivity and spatial structure, and their importance as prey for Steller sea lions. Because this is a preliminary draft, it does not currently include status and trends, indicator synthesis, management implications, or a fully realized ESP; nor is it yet linked with an ecosystem SAFE.

ESPs are a valuable tool for synthesizing and testing ecosystem and socioeconomic linkages within the stock assessment process. Indeed, even though the draft presented was incomplete, the SSC wants to emphasize that it is very useful to see early versions of documents such as these and appreciate being able to provide feedback at this stage of the process. The SSC looks forward to receiving a more completely realized draft ESP in late 2026.

The SSC would like to thank the analysts for their creativity when crafting the proposed Socioeconomic and Ecosystem indicators, and notes that the data come from multiple sources, including EDR, trade data, and Commercial Operator's Annual Reports (COAR) data sets, among others. This represents a difference from the other ESPs that were presented at the meeting, and while some standardization is helpful, it may be that current ESPs might also benefit from the inclusion of some of the data sources presented here.

The three primary economic indicators proposed are the wholesale price per pound, wholesale value, and export value (all relatively flat since ~ 2015), and catch utilization, which has been > 95% across all three BSAI regions in 17 of the past 22 years. However, the socioeconomic indicators are heavily focused on data coming from the Amendment 80 (A80) fleet. While the A80 fleet harvests the majority of the Atka mackerel, it does not exclusively do so as there is also a more modest but still substantial catcher vessel/shore-based processor component of the fishery. The SSC suggests that information from the non-A80 participants should be included. This information would allow for better tracking of fishing community participation and levels of engagement in and dependency on the fishery that would be useful as context in the TAC setting process.

Included in the existing "Socioeconomic Value-Added Indicators" ESP section is an "Employee Count and Proportion of Employment by Community Indicator" that relies on data provided by the Amendment 80 sector as part of the Economic Data Report (EDR) program. The SSC appreciates the proposed use of this type of fishing community-linked data but urges caution in the use of this specific indicator, given a pending Council action that may discontinue the remaining EDR requirements for A80 fleet and other sectors.

The SSC recommends that ESP authors include alternate fishing community indicators for the Atka mackerel fishery. For the portion of the fishery that involves catcher vessels and shoreside processing plants, the SSC recommends the inclusion of vessel count by community and shoreside processing community engagement indicators analogous to those recommended in the earlier "BSAI Crab SAFEs and ESPs" section of this report.

For the catcher/processor portion of Atka mackerel fishery, the SSC recommends that the ESP authors consider including two fishing community engagement indicators. These include:

- A port calls or product transfer indicator that would reflect fishery related activity occurring in Alaska fishing communities with port calls being a proxy for the location of fishery resource landing taxes paid on product transfers and for potential local fishery support services activities related to the fishery.

- A community of ownership address indicator for the catcher/processor vessels active in the fishery that could serve as proxy for a range of other economic activities occurring in fishing communities in multiple states.

Another economic indicator proposed by the ESP authors is the export value; and currently the primary recipients are Japan, China and South Korea, with price trends varying by country. The potential impact of large tariffs by China were not considered as the analysis to date is retrospective.

The ecosystem indicators proposed include many of those used in and developed for the BSAI ESR, plus some additional ones, such as Steller sea lion counts, are under consideration. The SSC concurs with the PT that some multivariate indicators that synthesize contextual ecosystem time series and allow for assessment of how anomalous the current year is relative to past conditions would be helpful. Still we recognize that it is challenging to determine how to use contextual data in the DSEM and RCEATTLE modelling efforts that are moving forward. While there were no indicator report cards presented as part of this draft, they are planned for inclusion in the future.

The SSC concurs with the BSAI GPT recommendation that this is a strong preliminary draft that includes myriad useful indicators but also feels that some refinement of indicators may be helpful moving forward. The SSC looks forward to reviewing the next draft following the September 2026 BSAI GPT meeting.

BSAI Preliminary Groundfish Harvest Specifications and Halibut DMRs

The SSC recommends approval of the preliminary 2026/2027 BSAI groundfish specifications and apportionments as provided by the BSAI GPT. The SSC supports the BSAI GPT's recommendation to approve the Halibut DMR Working Group recommendation for proposed halibut DMRs for 2026/2027.

GOA Groundfish Plan Team Report

The SSC received a presentation from Jim Ianelli (NOAA-AFSC, GOA GPT co-chair), Chris Lunsford (NOAA-AFSC, GOA GPT co-chair) and Sara Cleaver (NPFMC) at the September 2025 GOA GPT meeting. The SSC received oral public testimony from Julie Bonney (Alaska Groundfish Data Bank) on the GOA bottom trawl survey results.

GOA Bottom Trawl Survey

The SSC received the GOA GPT report on the 2025 GOA bottom trawl survey. The survey consisted of 437 stations, which was a reduction in effort from previous years (17% fewer than last survey). This was the first year of a stratified sampling plan that follows NMFS areas instead of the International North Pacific Fisheries Commission (INPFC) areas. Large biomass trends, both positive or negative were observed for several species. Rockfish species as a group generally showed declining trends, but there were consistent increases for roundfish (except for sablefish) and flatfish. Sablefish declined from previous high levels.

The SSC noted a 26% decline in thornyhead biomass for the 2025 survey, following declines in estimated biomass since the mid-2010's, as noted in the December 2024 assessment for this stock. In the December 2024 Report, the SSC requested that the author or survey group bring forward the survey results for thornyhead in September 2025 for GOA GPT review, so they could request additional information or

assessments, other than catch reports for December 2025 if necessary. Given that this was not discussed by the GPT at the September Plan Team meeting, the SSC requests that the author and GOA GPT raise in their November Plan Team report any concerns they may have with the planned 2026/2027 final harvest specifications for thornyhead and, if they do have concerns, to bring any available trend information (e.g. survey changes, marked changes in size composition, changes in where the fishery is occurring) as context for the 2026/2027 specifications. The SSC further requests that the author and GPT comment on whether reconsidering the existing assessment schedule is warranted.

The SSC had a discussion with the AFSC survey group about whether changes to the survey impacted survey results. The survey leads noted that the observed changes were within the historical range and that the survey had small changes in the trawl footprint and depths covered. **The SSC recommends, to the degree feasible, further investigation into the impacts on the redistributed survey effort, particularly with regard to depth and areas survey compared with historical survey results. Similar concerns were expressed for the EBS survey, so these efforts should be coordinated as appropriate.**

The SSC also recommends the GOA assessment authors use the assessment modeling process to evaluate the consistency of the 2025 GOA bottom trawl survey data with other information used in the assessment. An increase or a decrease in stock abundance often has an accompanying signal in the size and age composition, while a change in survey catchability typically results in an abrupt increase or decrease in biomass that the model struggles to fit. Comparisons of the size composition between different surveys and the fishery may provide indications that certain components of the population are not adequately represented in the survey. As noted under the JGPT comments, the SSC recommends comparison of rockfish trends in the GOA bottom trawl survey and the longline survey for species captured by both.

The SSC also highlights the importance of this survey, which is also used to conduct a variety of special projects and data collections, including acoustics, environmental monitoring, genetics, diet studies, and specimen collections.

Acoustic Trawl Survey

The SSC received a report on the results from the winter 2025 acoustic-trawl survey work. Surveys were scheduled for the Shumagin Islands, Shelikof Strait, and Kenai Peninsula areas during February–March 2025, but mechanical issues limited the survey effort to Shelikof Strait, which was surveyed March 16–31, about a week later than planned. MACE staff are confident that the survey timing was still appropriate given the condition of spawning pollock. The length distribution of pollock was similar to that observed in 2024, although an age 1 year-class was present. Shelikof biomass in 2025 was slightly higher than that observed in 2024 (13%), and Chirikof biomass decreased from 2024 (16%). The Shumagin and Shelikof areas are scheduled to be surveyed in the winter of 2026.

Harvest Projections – Deepwater Flatfish

The deepwater flatfish complex is assessed every four years. The last assessment was in 2023. A harvest projection was presented this year and the next assessment is scheduled for 2027. The deepwater flatfish complex is managed in Tier 3a for Dover sole and Tier 6 for the remaining species in the complex. The standard projection model was updated for Dover sole using updated 2024 catch, and estimated 2025–2026 catches, resulting in small updates in specifications. **The SSC concurs with the GOA GPT and the author recommended ABC and OFL for 2026 and 2027, with no reduction from the maxABC.** No changes were made to the area apportionment method and resulting proportions. **The SSC concurs with the GOA GPT and author on the recommended apportionment.**

GOA Pollock

The SSC reviewed proposed model runs for the GOA pollock stock assessment. No public testimony specific to this pollock stock was provided. GOA pollock is a Tier 3 assessment on an annual schedule. The SSC appreciates the thorough documentation and clear presentation of preliminary explorations and proposed models for this assessment cycle.

The author recommended several changes to last year's base model including: (1) the use of updated Shelikof Strait and summer acoustic survey data as recommended by the MACE program, (2) an improved approach to estimating initial numbers at age for consistency with other assessments, and (3) the inclusion of additional priors in the model to stabilize estimation. The model that incorporates these updates (Model 23e) is the author and GPT recommended model. When fit to 2024 data, the impacts on biological reference points and management recommendations are minimal compared to results from the previously accepted model (Model 23d). These updates are either straightforward data updates based on best available information or incremental changes that improved the model. **Therefore, the SSC agrees with the GOA GPT to bring forward Model 23e in addition to last year's accepted model (Model 23d) for December.**

In response to a recommendation from last year, a model that excludes age-3 fish from the Shelikof Strait survey was also explored but was not recommended. The SSC agrees with keeping age-3 data in the model and supports efforts to further explore this issue next year as detailed below.

For the November model, the SSC highlights two GOA GPT requests and adds a recommendation regarding the age-3 data:

- Provide additional transparency on composition weighting by reporting the Dirichlet-multinomial parameters and / or the input and effective sample sizes.
- Include the profiles on M and catchability for the NMFS BTS.
- Include the figure on the impacts of leave-one-survey-out on estimates of SSB to clearly show what indices anchor the scale of SSB and where the fits are in tension. In particular, the SSC recommends including additional clarification and an expanded discussion of the poor fits and opposite trends between the Bottom trawl survey and the Shelikof acoustic survey results, especially in the context of a 100% increase in the trawl survey over the past couple years.
- At the authors' discretion, and if time allows, bring forward a model run with dome-shaped selectivity on the acoustic survey data. If that is not feasible, include a short appendix to the November SAFE showing both the model behavior with age-3 data removed and results from the brief analysis of dome-shaped selectivity that were explored during the GOA GPTmeeting to ensure that the results are documented.

The SSC provided the following recommendations for 2026 and beyond:

- Regarding the poor fit to age-3 data in the Shelikof Strait data, the author noted that he plans further exploration of a dome-shaped selectivity, rather than assuming full selectivity to the acoustic survey for younger ages. Selectivity is currently modeled as a descending logistic, but there may be a good rationale for dome-shaped selectivity (i.e. reduced selectivity at younger ages) because only a fraction of age-3 fish are fully mature, they may not all migrate to the known spawning areas, and they may therefore not be available to the survey. The SSC supports these efforts for exploration in November or in the next assessment cycle. The author considered initial estimates of age-3

selectivity to be unrealistic. To inform further development of dome-shaped selectivity in the model, the SSC requests a clear rationale for why they may be unrealistic, and a discussion of (1) survey selectivity relative to GOA pollock maturity schedules and (2) what is known about the migration of immature pollock to spawning areas and its implications for availability to the survey. For example, previous work by Ben Williams and others on spatial patterns in maturity should provide some insight as to maturity outside the routinely surveyed spawning areas that may be informative.

- The SSC notes several other unresolved issues, including persistent overestimation of the age-10+ group in the NMFS survey and the need for a strong prior on NMFS survey catchability with an unclear rationale, but had no recommendations on these issues at this time.

- The SSC previously requested further exploration of the DSEM model and suggested developing a simpler approach incorporating the most influential effects directly as covariates on log-recruit deviations into the base model. The author noted that a paper exploring this approach is currently in review. The SSC looks forward to reviewing the paper and to the development of model versions that include relevant covariates.

- The SSC last year also requested exploration of an Acoustic Vessel of Opportunity (AVO) index similar to the Bering Sea, but preliminary analysis by the MACE group suggested that this is unlikely to be feasible in the GOA without simultaneous midwater sampling to assess species and size composition. The SSC thanks the author for addressing this request.

- In addition, the SSC requests that the authors provide a discussion of the history of, and a rationale for, the use of dome-shaped fishery selectivity, as this differs from other pollock stocks (AI, EBS).

Finally, the author requested input on two other issues:

- Time-varying, age-based survey selectivity to deal with poor fits to age compositions. The author noted that this could possibly account for changes in growth and length-at-age, which vary considerably over time (therefore, if length-based selectivity is constant, age-based selectivity must vary.) The SSC recommends an exploratory model run for next year that does implement time-varying, age-specific selectivity. However, if selectivity is believed to be primarily a function of length in this stock, as suggested by the author, the SSC recommends some discussion of whether it is sensible to implement length-based selectivity in the model.

- Incorporating acoustic surveys of spawning populations from other areas besides Shelikof Strait. The SSC recommends consideration of model-based estimates of both a biomass index and age composition that make better use of the available data from these (incomplete) survey time series, for example in a state-space framework.

Rougheye/Blackspotted Rockfish

The GOA rougheye/blackspotted rockfish (RE/BS) stock complex is composed of two cryptic species with different life histories. The stock is assessed every two years, and the last assessment was in 2023. A full operational model assessment of RE/BS is scheduled for 2025. RE/BS is managed in Tier 3 and is assessed using a statistical catch-at-age (SCAA) model.

In response to previous GOA GPT and SSC comments, the author explored methods to account for skip spawning and incorporate maturity data not previously used in the assessment. The author investigated using otolith morphometric methods for improved species discrimination that was then used to validate

historical maturity samples. This evaluation confirmed that blackspotted and rougheye rockfish differ substantially in age and length at maturity, as well as in the frequency of skipped spawning events.

The author recommended moving this stock from Tier 3 to Tier 4 YPR/SBPR framework built on species-specific biology. The rationale being that Tier 4 better reflects species-specific biology, is tractable with available data, and avoids the unresolved scale/fit problems in the current SCAA model. These issues have resulted in reductions from max ABC in the past.

Three alternative models were brought forward for consideration in addition to the base model used in 2023:

- Model 23.1b – Base SCAA model
- Model 25.1a – Tier 4 model that uses species-specific biological-based maturity estimates
- Model 25.1b – Tier 4 model that uses species-specific functional maturity estimates
- Model 25.2 – Tier 5 calculations based on trawl survey biomass for the combined complex

The SSC concurs with the author and GOA GPT recommendation that these four models come forward in December.

While the species are modeled separately in the proposed models, the authors proposed using a complex-level fishing mortality rate based on blackspotted rockfish for F_{OFL} and F_{ABC}, such that each species meets or exceeds SPR target. This is a more conservative approach given that blackspotted rockfish have a lower reference fishing mortality rate based on the spawning biomass-per-recruit (SPR) target. **The SSC concurs with the author-proposed and GOA GPT-supported use of a complex-level fishing mortality rate based on blackspotted rockfish.**

The species identification is an issue for this stock complex with field misidentification of BS about 2% and 40% for RE. Correct species identification using the otolith morphometric model was 97% for BS and 86% for RE according to the referenced study. In addition, the SSC understands that ageing these species can be challenging with notable variation among readers. These uncertainties could have an influence on the data and information needed for the assessment models. While the author provided some evaluation of species misidentification, the SSC suggests that the authors provide in the SAFE an assessment of the potential impact of the uncertainty in species identification and age estimation on growth and maturity information and the assessment model results. This information will be useful for evaluating alternatives in December.

For future research consideration, the SSC noted recent research by the ADF&G Mark, Tag, and Age Lab that has developed methods for reconstructing hormone profiles (progesterone, estradiol, and cortisol)) from opercula to estimate age-specific reproductive parameters and stress trends (see Charapata et al. 2022[6]) and are successfully exploring utility in other species. These methods could be useful for obtaining a better understanding of age at maturing and occurrence of skip spawning in these species.

Pacific Ocean Perch

The GOA Pacific ocean perch (POP) stock is assessed every two years. The last assessment was in 2023; therefore, this stock is scheduled for a full operational model assessment in 2025. POP is managed in Tier 3 and is assessed using a statistical catch-at-age (SCAA) model. A new author took on this assessment and proposed transitioning the last accepted model (Model 20.1) from ADMB to RTMB (Model 25.0), which

[6] Charapata, P., D. Oxman, K. McNeel, A. Keith, F. Mansouri, and S. Trumble. 2022. Lifetime hormone profiles for a long-lived teleost: opercula reveal novel estimates of age-specific reproductive parameters and stress trends in yelloweye rockfish (*Sebastes ruberrimus*). Canadian Journal of Fisheries and Aquatic Sciences. 79(10): 1712-1728.

showed key outputs to be equivalent or near equivalent. The author also explored iterative model changes in a series proposed models that included reformulation of the negative log-likelihood for catch and survey biomass to the full form of the lognormal, using the gamma function to model fishery selectivity in the second time-block rather than the average of the first and third time-block functions, and applying Francis reweighting for compositional data to each of the alternative models. The GOA GPT discussed implementation of input sample size and iterative reweighting in the POP assessment.

The SSC concurs with the GOA GPT recommendation that the base model (Model 25.0), along with Model 25.2a with updated survey input sample size (ISS) using the bootstrap estimator in the surveyISS R package, be brought forward in December. The SSC requested that the bridging exercise comparing the base model in ADMB (Model 20.1) to RTMB (Model 25.0) be included in the SAFE as an appendix for completeness.

The SSC agrees with the GOA GPT recommendation that the author include a table of ISS for all fleets with the final adjusted sample sizes after reweighting, and an evaluation of the ratios of effective sample size (ESS) to ISS with interpretation of results, particularly when ESS/ISS is greater than 1.0.

The SSC supports the GOA GPT recommendation that the author investigate differences in the coefficients of variation estimates between the 2023 and 2025 model-based survey indices and if time permits, bring forward a model run using the model-based estimate; noting that the design-based estimate is currently used.

Finally, the SSC noted that while there was no public testimony during the consideration of proposed models for this stock, there was public testimony related to GOA POP during the spatial apportionment GOA GPT report item.

Arrowtooth Flounder

The SSC received the presentation on the GOA arrowtooth flounder model development and the new arrowtooth flounder ESP. This is an operational full assessment, assessed on a four-year cycle, with the last assessment in 2021. There was no public testimony.

Two models were presented for consideration in November:

1. Model 25.0, which is the 2024 accepted single-species TMB-based RCEATTLE model with male fixed M; and

2. Model 25.1, which is the model 25.0 but estimates sex-specific M instead of fixing M.

This report highlights significant changes since the 2021 assessment, including improved input data and updates to the assessment methodology by switching the model software from ADMB to TMB within the RCEATTLE platform. The bridging exercise between ADMB and TMB in RCEATTLE was presented and approved by the GOA GPT and SSC for this stock last September 2024 and was included in Appendix 7A.

New data inputs include survey biomass and standard error for 2023 and 2025, as well as age composition for 2021 and 2023, provided by the GOA bottom trawl survey; total catch biomass from 2022–2025, and fishery length composition data from 2021–2024. Other data improvements made by the stock assessment authors included removing survey data from non-standardized surveys (pre-1992), removing fishery length compositions prior to the establishment of the observer program (pre-1991), updating length-at-age transition matrices and growth curves, and updating the weight-at-age and aging error matrix.

A bridging analysis of these data improvements was provided by the stock assessment authors, resulting in similar trajectories across models. The fit to the GOA trawl survey biomass estimates was very consistent

across models, and the terminal year estimates were quite similar for all models. It is also noted that there is some lack of fit in the plus group, which will be further investigated by the stock assessment authors for the November assessment.

The stock assessment authors also proposed a research cannibalism-enhanced single species model that is the multi-species TMB based RCEATTLE cannibalism model; however, this model was not considered as an alternative model for November.

The SSC agrees with the GOA GPT and the author's recommendation to bring forward Model 25.0 and Model 25.1 for November.

Regarding the new arrowtooth flounder ESP, in December 2023, the SSC requested a review and recommendation of indicators for the ESP. The group was formed, but the June 2025 meeting was delayed until December 2025. Since the DSEM was newly developed this year, it's important to identify the best model after this review and integrate it into a comprehensive DSEM on the RCEATTLE platform, which is recommended for assessing this stock. The stock assessment authors should also consider using a research ecosystem model to inform management decisions and explore applying this model in off-cycle year projections. Additionally, it was noted that 60% to 80% of the 22 indicators have been unavailable over the past two years, which raises concerns. The SSC supports the DSEM causal model to explain variation in recruitment, compared to modeling it as independent and identically distributed (iid) or first-order autoregressive (AR1). It was also observed that there were too many latent variables without information from the full list, and the model did not converge; these were then reduced to a shorter list with the current information. It is also important to note that addressing unexpected outcomes is necessary, such as why the relationship between euphausiid recruitment and age-1 shifted to a negative one.

The SSC commends the ESP authors for their high-quality work. The SSC recommends considering variable selection or multiple candidate causal models along with a selection framework and supports the ESP team's approach to categorizing indicators as predictive/contextual/monitoring, which aligns with the CPT's approach. The SSC also looks forward to seeing more details in December on the socioeconomic indicators. Finally, the SSC endorses the GOA GPT's recommendation that the AFSC expert group on causal models develop guidance on evaluating DSEM fits within the context of interpreting ESPs as well as guidance on a framework for how these causal models can best be used in a management context.

Rex Sole

The SSC received a presentation on the model development for the rex sole stock in the GOA. This is an operational full assessment, conducted on a four-year cycle, with the last assessment in 2021. There was no public testimony.

The rex sole assessment is a Tier 3 two-area model (Eastern GOA and Western-Central GOA), with growth estimated separately in each area. This assessment was reviewed by a CIE panel earlier this year. The stock assessment author addressed all the CIE comments, which confirmed that this assessment was well done and met the requirements for management and status determination.

Two models were presented for consideration in November:

1. Model 25.0, the updated base model; and

2. Model 25.1, which is an alternative model that incorporates an updated ageing error matrix.

This full assessment includes a large amount of data updates for recent years, such as catch biomass (2022–2024), updated 2021 catch biomass, fishery length composition (2022–2024), updated 2021 fishery length

composition, fishery age composition (2021–2022), and GOA trawl survey biomass estimate and length composition data (2023). The stock assessment author bridged the 2021 base model to Model 25.0 (updated base model) with several housekeeping items, including the use of an alternative method for calculating fishery age composition (available in the CIE discussion paper), which has been approved and used in other assessments (e.g., pollock, Pacific cod and yellowfin sole), and updated the data inputs since the last model run. The SSC agrees with the GOA GPT that the bridging exercise should be included as an appendix to the main document in November.

Regarding the differences between models 25.0 and 25.1, the most notable variation in fits is seen with time-aggregated fishery age composition data, where the fits are slightly worse when accounting for ageing uncertainty (Model 25.1). There are also minor differences between the two models in the proportion of the population estimated to be in the plus group, as well as slight differences in the survey estimates catchability.

The SSC agrees with the GOA GPT and the author's recommendation to bring forward Model 25.0 and Model 25.1 in November/December for management. The SSC also supports the research priorities list provided by the author, recognizing the potential of bringing to November the following short-term priorities: sensitivity runs for steepness, sigmaR, age at 50% maturity, and alternative data weighting approaches.

Shallow Water Flatfish

The SSC received a presentation on the development of assessment models for the shallow water flatfish complex (southern and northern rock sole and others) in the GOA. This is an operational full assessment, conducted on a four-year cycle, with the last assessment in 2021. Both rock sole species are Tier 3 species and are assessed separately from the other shallow water flatfish in the stock complex, which are Tier 5 stocks. There was no public testimony.

Compared to the last full assessment in 2021, the authors recommended the following data changes for review in November:

1. For the northern rock sole, incremental data updates were applied to a two-area growth morph model. Model 21.2c used a revised survey length composition input sample size, and Model 21.2d applied Francis reweighting of Model 21.2c; and

2. For the southern rock sole, the 2-area growth model was changed to a single-area model based on the re-evaluation of the length-at-age data. For Model 25.1c, uncertainty in length-at-age was modeled as a CV, and Model 25.1d used a revised survey length composition input sample size.

This full assessment included several data updates, such as a new approach to estimating species-specific catch from the total rock sole catch data using the NMFS Observer Program data to split the aggregate rock sole catch; updated input sample size for the bottom trawl survey length composition data; re-evaluation of the length-at-age data; and evaluation of the uncertainty of splitting the other shallow water flatfish survey biomass into WGOA and C/EGOA regions (this analysis was presented in Appendix A). It is also noted that, since the two species were not distinguished pre-1997, and historical catch partitioning was averaged over the first five years of species-specific data (1997-2001), it is unclear whether the uncertainty was considered and how much the historical species composition assumption might affect the model. The SSC requests that the authors clarify this in the final assessment.

Regarding the spatial growth analysis and data updates, several hypotheses were tested, and the AIC results suggested substantial evidence for differences in growth between the western GOA and the central-eastern GOA for both species. It was also observed that models with the same t0 parameter, but different growth received significant support. However, the SSC notes that the t0 parameter in the von Bertalanffy growth model is considered a parameter lacking a true biological meaning.

The stock assessment authors also applied the "growthbreaks" R package on female and male length-at-age specimen data for both rock sole species to confirm if the separation between the western GOA and the central-eastern GOA was statistically detectable. Based on the results for southern rock sole from the "growthbreaks" analysis, the AIC results, and the minor qualitative differences in the von Bertalanffy growth estimates considered a single-area model (Model 25.1a) for southern rock sole. For the northern rock sole the two-area growth morph model approved in 2021 was retained based on the female growth breaks, along with the AIC analysis which strongly indicated different growth patterns between the areas.

For the northern rock sole, the SSC agrees with bringing the GOA GPT and the author's recommended Model 21.2c forward in December, along with the previous base model. The SSC supports the GOA GPT's request for the stock assessment authors to explain how, and if, a reweighting approach was done.

For the southern rock sole, the SSC agrees with the GOA GPT and the author's recommended models 25.1c and 25.1d to come forward in December, along with the base model.

Regarding priorities for the next full assessment, the SSC endorses the recommendations from the authors and the GOA GPT to assess model sensitivity to selectivity and its effect on growth, evaluate the model's ability to estimate natural mortality for both females and males, investigate inconsistencies in survey length compositions, and explore the possibility of including ages in the models.

GOA Preliminary Groundfish Harvest Specifications and Halibut DMRs

The SSC recommends approval of the preliminary 2026/2027 GOA groundfish specifications and apportionments as provided by the GOA GPT. The SSC also supports the GOA GPT's recommendation to approve the Halibut DMR Working Group recommendation for proposed halibut DMRs for 2026/2027.

For GOA stocks that will have Catch Reports in lieu of assessments in December, the SSC received information on catch data as of 9/14/25, GOA trawl survey biomass, and biomass relative to last year. These stocks were dusky rockfish, northern rockfish, thornyheads, demersal shelf rockfish, flathead sole, and sharks.

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 October 2025 meeting, a number of SSC members acknowledged associations with specific agenda items under SSC review. Robert Foy is the third or greater level supervisor for the following: Ebett Siddon and all other AFSC ESR authors (C3/5 ESR preview); Mike Litzow, Buck Stockhausen, Cody Szuwalski and all other AFSC members of the CPT and stock assessment authors (C3 BSAI crab); Jim Ianelli, Kalei Shotwell, Matt Cheng, Chris Lunsford, Ned Laman, Zack Oyafuso, Cole Monnahan, Steve Barbeaux and all other AFSC members of the GPT and stock assessment authors (C5 Groundfish). Dana Hanselman is the first level supervisor of GOA GPT co-chair Chris Lunsford and EBS ESR lead Elizabeth Siddon. Dr. Hanselman is also the second or greater supervisor of other GPT members and contributors, Pete Hulson, Jane Sullivan, Cindy Tribuzio, Ben Williams, Kristen Omori, Kevin Siwicke, Dan Goethel, and Katy Echave. Finally, Dr. Hanselman is also married to Dr. Shotwell, BSAI plan team co-chair, author of BSAI and GOA arrowtooth assessments and ESPs. Dr. Hanselman is also a co-author of BSAI and GOA arrowtooth assessments. Ian Stewart and Jason Gasper are members of the Halibut DMR working group report (C5 Groundfish). Dr. Gasper is also married to Cindy Tribuzio (BSAI skates assessment author) and is a member of the Data Limited Methods working group). Chris Siddon noted that he supervises Katie Palof (CPT co-chair, BBRKC assessment author) and Caitlin Stern (NSRKC assessment author). Dr. Siddon is also the second level supervisor of Tyler Jackson (AIGKC assessment author) and is married to Elizabeth Siddon (ESR co-author).