NORTH PACIFIC FISHERY MANAGEMENT COUNCIL

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SCIENTIFIC AND STATISTICAL COMMITTEE
FINAL REPORT TO THE
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
September 30 - October 2, 2024

The SSC met from September 30th - October 2nd, 2024, in Anchorage, AK. Members present in Anchorage were:

Franz Mueter, Co-Chair *University of Alaska Fairbanks*	Sherri Dressel, Co-Chair *Alaska Dept. of Fish and Game*	Alison Whitman, Vice Chair *Oregon Dept. of Fish and Wildlife*
Chris Anderson *University of Washington*	Amy Bishop *University of Alaska Anchorage*	Fabio Caltabellotta *Washington Dept. of Fish and Wildlife*
Curry Cunningham *University of Alaska Fairbanks*	Martin Dorn *University of Washington*	Mike Downs *Wislow Research*
Robert Foy *NOAA Fisheries—AFSC*	Jason Gasper *NOAA Fisheries—AKRO*	Dana Hanselman *NOAA Fisheries—AFSC*
Brad Harris *Alaska Pacific University*	Kailin Kroetz *Arizona State University*	Andrew Munro *Alaska Dept. of Fish and Game*
Chris Siddon *Alaska Dept. of Fish and Game*	Ian Stewart *Intl. Pacific Halibut Commission*	

SSC members that attended remotely were:

Robert Suryan *NOAA Fisheries—AFSC*	Michael Jepson *Independent Contractor*

SSC members absent were:

Patrick Sullivan
Cornell University

SSC Administrative Discussion

The SSC received a presentation from Diana Evans (NPFMC) describing protocols and other announcements for the meeting. Ms. Evans provided highlights from the Executive Directors report including the announcement of new and reappointed Council membership, the hiring of new Council Staff (Taylor Holman, Anita Kroska, Danielle Merculief, and Alaina Plauché), the arrival of the Council's first installment of IRA funding, and a new publication on "Fish Bycatch in the North Pacific Halibut and Groundfish Fisheries". The SSC looks forward to working with the new staff and new and returning Council members.

Ms. Evans also gave an overview of the staff paper on "Optimizing SSC agenda time" to provide more transparency about how decisions are made when setting the SSC agenda and to get feedback as to what other factors should be taken into consideration when it is necessary to prioritize SSC agenda time. The paper describes the reality that the SSC does not have sufficient time to get to all the issues that the Council asks the SSC to review. Staff have been discussing how to optimize SSC time, and several actions are already ongoing, including: developing specific guidance to the SSC about their task for each agenda item; more communication with the Plan Team chairs, both in advance of the SSC meeting about what to focus on in the presentation, and how to interpret SSC comments if the report is ambiguous; adjustments to the level of detail in the SSC report and in the SSC Chair's oral summary of agenda items. While these actions all have the ability to be effective to some degree, the greatest impact will be from being more selective about which items go on the SSC agenda. The paper outlined what types of documents the SSC has historically reviewed and the factors that are taken into consideration regarding Council and SSC priorities.

SSC members thanked staff for developing the paper and had several suggestions regarding additional considerations including: prioritizing limited access privilege program (LAPP) reviews when a fishery has changed greatly and resilience is more difficult to maintain; prioritizing workplans for such LAPP reviews; prioritizing topics that strategize for the future and recognizing that these may come in the form of workshops or workshop-type agenda items; ensuring that if formal reviews of the ACEPO or Economic SAFEs do not occur annually, the SSC is notified when they are available so members can still read and reference the documents; and, as harvest specifications are required, considering how the SSC might review full and update assessments differently for efficiency and streamlining. The SSC had discussion regarding whether it would be beneficial to split out socio-economic and biological agenda items, for example on the first day of the meeting, and then report back and meet as a whole SSC for the remainder of the meeting. While the SSC recognized that this might allow for extra agenda items, a number of SSC members voiced concerns since the strength of the SSC is its interdisciplinary nature and understanding the interplay between biological/ecological and socio-economic systems is critical.

B1 Plan Team Nomination

The SSC reviewed the nomination of James Thorson (NOAA-AFSC) and Sophia Wassermann (NOAA-AFSC) to the GOA Groundfish Plan Team (GPT). The SSC finds these nominees to be well-qualified and recommends the Council approve their nomination.

B4 Alaska Fishery Science Center Report

The SSC received an Alaska Fisheries Science Center (AFSC) report from Robert Foy (NOAA-AFSC) and Sarah Wise (NOAA-AFSC) covering updates on staffing, surveys, and the Socio-economics Program. The SSC was unable to take updates on the Alaska Salmon Research Task Force and Equity & Environmental Justice due to time constraints. Four vacancies at AFSC have recently been filled, including the AFSC Deputy Director, a new Chief of Staff position, REFM ESSR Program Manager, and the RACE Deputy Division Director.

The majority of the survey update focused around which surveys occurred this year, how to communicate changes in survey prioritization, and the many survey changes that occurred this past year and will continue to occur due to funding constraints and the need for survey modernization. Survey reductions occurred in the Aleutian Island (AI) trawl survey (due to budget constraints) and the Gulf of Alaska (GOA) winter acoustic survey due to mechanical and personnel issues. The GOA longline survey was not prosecuted this year due to the inability to find a contract vessel. Additionally, all the corner stations for the EBS trawl survey were not completed due to tradeoffs of testing new gear and tow durations as a first step of the modernization effort. Overall, the SSC was extremely interested in all these survey changes as surveys are the core data source for all stock assessments. The SSC wants to ensure that changes in data streams were (and continue to be) well documented and accounted for appropriately by all the stock assessment authors moving forward. Concerns were raised regarding potential bias and increased variability depending on how and where survey stations are dropped, modified, or shortened in duration (or length) and how changes in net configurations will influence species- and size-specific catch rates and their interpretation. Changes in survey design and sampling gear have the potential to create a break in the survey time series, reducing its value for stock assessment. The SSC emphasizes the importance of carefully-designed calibration experiments to maintain survey continuity.

The SSC also had a discussion about concerns regarding changes across the entire survey portfolio, and challenges with communicating and assessing changes. **The SSC recommends that stock assessment authors explicitly track and communicate any survey changes that impact their assessments and how (if needed) they have accounted for those changes.** While there may be minimal impact to stock assessments, a concise accounting will ensure that authors were aware of any changes and have reacted accordingly. Additionally, a table linking surveys with associated assessments and other products, such as ecosystem reports, would be a valuable communication and planning tool.

The SSC recommends the development of a time-series of spatial sampling metrics including the sampling gain (e.g., swept area), lag (distance between survey stations), and extent of the survey data used in the assessment as a relatively simple way to track changes in the information support underpinning each assessment. The SSC is interested to hear more details regarding the results from the first year of survey modernization and is considering survey modernization as a SSC workshop topic in the near future.

The SSC appreciated the quantitative analysis of regional-scale socio-economic status. The SSC noted that two different types of quantitative data were presented: (1) summary statistics from databases and (2) model outputs. The SSC found both valuable, but cautions that when presenting the regional model outputs, it would add clarity for the audience to include a short overview of the model, and discussion of its strengths and limitations.

The SSC noted that the summary statistic output (total regional federal fishery revenue, landings, average ex-vessel price, and average wholesale price) provided helpful information on the socioeconomic context that individual fisheries or FMPs are embedded within. The SSC encourages efforts to find a vehicle to

keep these types of statistics available and updated. For example, these statistics provide the important insight that current economic challenges in the region are driven by economic factors (market prices and input cost increases) and not a decrease in overall harvest. Additionally, the SSC noted that there could be benefit to other more disaggregated statistics (e.g., at management subarea scales such as Western, Central and Eastern GOA and potentially including state fisheries).

C1 BSAI Crab

The SSC received a report on the September 2024 Crab Plan Team (CPT) meeting from Anita Kroska (NPFMC), Diana Stram (NPFMC), and the CPT co-chairs, Mike Litzow (NOAA-AFSC) and Katie Palof (ADF&G). 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 suggests the following guidance for constructing and interpreting jitter analyses.

1) In a good jitter analysis, many models should fail to converge to the maximum likelihood estimates (MLE), which is indicative of exploring a broad region of the parameter space; conversely, if all models return to the MLE, the analysis was not a strong test. All those that do converge have to be at the MLE being used as the base, as there would never be a better solution than at the MLE. This is a one-sided test that doesn't indicate the model converged, only that a better solution was not found than the one reported.

2) The results of models that fail to return to the best solution (the MLE) are not useful for statistical inference; restarting those models from the local minima in which they stopped with a perfect solving algorithm would always return to the MLE, and so the results are an artifact of imperfect diagnostic tools.

3) Uncertainty in management quantities (e.g. small changes in the likelihood can correspond to large changes in biomass) is best expressed with likelihood profiles on key model scaling quantities, not unconverged model results.

The SSC would like to see additional residual diagnostics other than raw residuals for length composition data from GMACS models. The SSC encourages crab authors to collaborate with groundfish assessment authors regarding the use of One-Step-Ahead and Pearson residuals.

The SSC requests that the CPT consider whether distinguishing between full and update assessments, as in the protocol recently adopted for groundfish assessments, would be useful for crab assessments. Flagging an assessment as an update when the model from the previous assessment is carried forward with no or minor modification would reduce the effort required of the author, and potentially lead to efficiencies in CPT and SSC review.

The SSC suggests the CPT live link assessments and other documents in their report to facilitate review.

The SSC reiterates their request from previous reports, including the October 2023 SSC Report, that the CPT develop a process for ensuring that authors have provided a response to all previous (including at least, the last assessment) SSC recommendations, even those for which no work has been completed, so these requests can be more easily tracked over time.

Ecosystem Status Report Preview

The SSC received presentations by Elizabeth Siddon (NOAA-AFSC), Bridget Ferriss (NOAA-AFSC), and Ivonne Ortiz (University of Washington) previewing the Ecosystem Status Reports (ESR) for the Eastern Bering Sea (EBS), the Gulf of Alaska (GOA) and the Aleutian Islands (AI). The SSC appreciates the authors and contributors providing near real-time data that are within months to days of collection. This is only possible because of the dedication of the ESR team, the rapport they have fostered with data contributors, and the value placed on this information by all involved in the Council process. Presenters provided an overview of the Alaska-wide climate, showing a transition from El Niño conditions in early 2024 to anticipated La Niña in late fall, with projected near normal sea surface temperatures through March 2025 in all regions, except for cool temperatures in the eastern GOA and warm temperatures in the Western Aleutian Islands. The GOA had only a moderate response to the relatively strong El Niño, and there are no concerns for groundfish or their prey at this time. One concern requiring further investigation was that pink salmon had unexpectedly low returns. The SSC recommended investigating potential competitive interactions associated with changes in pink salmon abundance, in addition to potential bottom-up effects on upper trophic levels. The SSC also notes the importance of considering biomass in addition to numbers when evaluating the potential effects of the salmon populations on other ecosystem components.

For the AI, last winter was one of the ten warmest on record, but eventually cooled to the long-term mean, except for the western AI. Crab-relevant indicators in the AI show bottom temperatures near the long-term mean and no increases in crab predators, in particular only a 2% increase in Pacific cod biomass. The continued high abundance of rockfish is of little concern as they are not known predators of king crab.

For the EBS, specific to crab stocks, it was noted that oceanographic conditions of sea surface temperature, ice, and cold pool extent were near the long-term averages with no red flags, suggesting good conditions for both pelagic and benthic life stages of crab. There was positive news from most climate indicators, including rare occurrences of marine heatwaves during the past three years. However, it is important to note that conditions reflect cool conditions near long-term means, not cold conditions by historical standards. For example, SSTs during the past ten years have been unlike any prior period, and the cold pool extent continues a ten-year trend of remaining at or below the long-term mean. Another consistent pattern is warm fall conditions with continued late formation of sea ice, even though ice might reach average extent later in winter. The SSC noted that continuing declining pH levels have become an indicator to watch more closely, although current levels are not considered to impact crab populations.

The Bering Sea cold pool is broadly defined as bottom temperatures < 2°C; however, there were references to other cold pool temperatures with respect to juvenile snow crab in the ESP. The Groundfish Assessment Program calculates cold pool temperature proportions at 1°C intervals between 2°C and -2°C. The SSC recommends evaluating whether there is a benefit to quantifying specific temperature ranges within the broad definition of the cold pool when assessing conditions for different size-classes or species of crabs. The SSC also requests that when physical data from a model output (e.g., ROMS) are first used that comparisons with available in situ data be provided (spatially if relevant) to assess potential biases.

As anticipated and discussed at the October 2023 SSC meeting, although many physical indicators have returned to baseline and many biological responses are favorable, there are exceptions. For example, large copepod biomass in the fall has remained low following the heatwave years, chlorophyll-a is still below the long-term mean in some regions, and some fish condition metrics remain low, despite cooling in recent years. The SSC appreciates the ESR team's continued efforts to explore new ways to visualize data, make data available and discoverable, and consolidate data in more integrated ways. For example, the new wind, ice, and temperature integrated maps of the Alaska-wide climate overview are particularly informative.

Trawl Survey Updates

The SSC received a presentation on the 2024 EBS bottom trawl survey results relevant to BSAI crab from Mike Litzow (NOAA-AFSC, CPT co-chair). **The SSC continues to be impressed with the rapid turnaround of the survey data and commends the crab assessment authors for updating model runs and assessment documents on the short timeframe necessitated by the survey and management timing.** There was oral testimony from Scott Goodman (Bering Sea Fisheries Research Foundation; BSFRF).

The SSC notes that in addition to the standard survey, the bottom trawl survey is also comparing slope/shelf gear as part of the ongoing survey modernization efforts. These efforts required dropping corner stations around the Pribilofs and St. Matthew Island as well as dropping the northern Bering Sea portion of the survey this year, which has impacted assessments. In addition, AFSC and ADF&G survey and assessment staff decided that the reproductive status of the female BBRKC did not warrant a retow of Bristol Bay stations. The SSC commends AFSC survey staff for completing the bottom trawl survey in 2024, in addition to the fieldwork to increase efficiency and modernize the bottom trawl surveys. The SSC appreciates the AFSC efforts to update survey methods and design through their modernization efforts and looks forward to continued progress on this front. The survey modernization effort is discussed further under the SSC comments for B4 AFSC agenda item.

Survey results continue to vary among stocks. The mature male abundance of Bristol Bay red king crab (BBRKC) increased compared to 2023, but mature females did not change relative to 2023 (noting that both are within the confidence bounds). Overall abundance of this stock remains depressed relative to the long term mean. Pribilof Island red king crab (PIRKC) and St. Matthew blue king crab (SMBKC) mature males and females decreased relative to 2023. It was suggested during the CPT presentation that this is likely the result of lower sampling density due to corner stations being dropped. For the first time, no Pribilof Island blue king crab (PIBKC) were captured on the 2024 survey. The CPT noted this did not have an impact on the stock's rebuilding status.

The SSC was encouraged by positive trends in survey results for snow crab. Though overall abundance in some size-sex categories are still relatively low, snow crab abundance increased across all population components. In particular, the SSC highlights the large increases in small and legal males, and in both immature and mature females. The SSC requests consideration of the mechanisms behind such a remarkable increase in abundance of the large size class of immature crab not previously observed in the time series and potential relationships to water temperatures during hatching. Unusually, high density areas of snow crab were observed further south and closer to the longer term mean distribution than in recent years. The SSC requested that the survey authors consider the apparent lack of small snow crab in Pacific cod stomachs as presented in the ESR, despite high abundances of small snow crab.

Finally, Tanner crab also increased in 2024 in both management areas, with the abundance of total females in 2024 being the highest on record. Importantly, the survey is observing increased survival and growth to larger sizes, alleviating some of the concerns regarding previous cohorts that disappeared prior to recruiting to the fishery. The SSC recommends the development of maps and tracking indices of spatial overlap between Tanner crab and snow crab, as well as for hybrid crab.

With the continued depressed state of most crab stocks, the SSC continues to register concern for loss of data collection supporting the assessment of BSAI crab stocks. The loss of the survey corner stations requires additional consideration if this change becomes permanent. As mentioned during the CPT presentation, this might include survey modernization exercises, where they could be accounted for in changes to the survey design, but also could include exploration of model-based approaches that could account for changes in the survey footprint over time and comparisons of alternative design-based estimates over time.

The SSC notes that these various approaches are already under consideration by the survey team and the CPT. Finally, the SSC notes the survey results were presented from 1988 forward; however, some crab assessments include survey data prior to 1988. The SSC requests that the survey authors provide a clear overview of the survey's historical standardization and a summary of the years used by any of the stock assessments.

BSAI Crab Harvest Specifications and SAFEs

Table 1 includes the stock status determination criteria and Table 2 includes the October 2024 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 2023/24 as estimated by the most recent assessment. Hatched 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.

Ch.	Stock	Tier	MSST[1]	B_{MSY} or B_{MSY} proxy[1]	2023/24[2] MMB	2023/24 MMB/ MMB_{MSY}	2023/24 OFL	2023/24 Total Catch	Rebuilding Status
1	EBS snow crab	3	95.9	191.81	106.52	0.56	15.44	0.07	
2	BB red king crab	3	9.35	18.69	18.65	1.00	4.42	1.34	
3	EBS Tanner crab	3	20.00	40.01	88.21	2.20	36.20	1.09	
4	Pribilof Islands red king crab	4	0.85	1.71	3.88	2.27	0.685	0.004	
5	Pribilof Islands blue king crab	4	2.10	4.20	0.181	0.043	0.00116	0.001	**overfished**
6	St. Matthew Island blue king crab	4	1.48	2.93	1.41	0.48	0.066	0.005	**overfished**
7	Norton Sound red king crab	4	0.99[3]	1.98[3,4]	2.40	1.19	0.31	0.20	
8	AI golden king crab	3	5.77	11.54	12.72	1.10	4.18	2.76	
9	Pribilof Islands golden king crab[2]	5					0.114	Conf	
10	Western AI red king crab	5					0.056	0.001	

[1] MMB on 2/1/2023 for Norton Sound red king crab as estimated in the 2023 assessment and on 2/15/2024 for all other Tier 1-4 stocks using the 2024 assessments (this footnote is corrected from February 2024 and draft June 2024 SSC reports).

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

[3] Values are corrected from February 2024 and/or draft June 2024 SSC reports.

[4] B_{MSY} proxy basis years for NSRKC are 1980 - 2023.

Table 2. SSC recommendations for Eastern Bering Sea crab stocks. Stocks for which specifications are rolled over between assessments (Pribilof Islands red king crab, Pribilof Islands blue king crab, Pribilof Islands golden king crab and Western Aleutian Islands red king crab) or were set in February (Norton Sound red king crab) are also included. Biomass values are in thousand metric tons (kt). Tier designations in this table are based on the projected stock status in 2024/2025. Stocks for which the SSC recommended different harvest specifications from the CPT are bolded. Harvest specifications for SAFE Chapters 1 – 4 and 6 are set in October and Chapters 5 and 8 – 10 are set in June, in the year according to the assessment frequency cycle (see current SAFE Introduction for assessment cycle). Chapter 7 was set in February 2024.

Ch.	Stock	Tier	F_{OFL}	B_{MSY} or B_{MSY} proxy	B_{MSY} basis years[1]	2024/2025[2] MMB	2024/25 MMB / B_{MSY}	Natural Mortality (M)	2024/25 OFL	2024/25 ABC	ABC Buffer
1	E. Bering Sea snow crab	3b	25.07	191.81	1984-2023	96.77	0.50	0.28	**19.6**	**6.86**	**65%**
2	Bristol Bay red king crab	3b	0.33	18.69	1984-2023	15.43	0.83	0.23	5.02	4.02	20%
3	E. Bering Sea Tanner crab	3a	1.23	40.01	1982-2023	56.06	1.40	0.23	41.29	33.03	20%
4	Pribilof Is. red king crab	4a	0.21	1.709	2000-2021	3.879	2.27	0.21	0.685	0.51	25%
5	Pribilof Is. blue king crab	4c	0[3]	4.20	1980/81-1984/85; 1990/91-1997/98	0.181	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%

[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 2/1/2024 for Norton Sound red king crab and on 2/15/2025 for all other Tier 1-4 stocks, using the current assessments.
[3] The F_{OFL} of 0 for PIBKC is indicative of a closed directed fishery.
[4] 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.
[5] PIGKC specifications are set on a calendar year basis

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Ch.	Stock	Tier	F_{OFL}	B_{MSY} or B_{MSY} proxy	B_{MSY} basis years[1]	2024/2025[2] MMB	2024/25 MMB / B_{MSY}	Natural Mortality (M)	2024/25 OFL	2024/25 ABC	ABC Buffer
7	Norton Sound red king crab	4a	0.18	2.02	1980-2024	2.5	1.24	0.18	0.333	0.233	30%
8	Aleutian Is. golden king crab[4]	3	0.55 (EAG), 0.44 (WAG)	11.54	1987-2020	11.39	0.99	0.22	3.725	2.794	25%
9	Pribilof Is. golden king crab[5]	5	-	-	1993 -1998	-	-	-	0.114	0.085	25%
10	W. Aleutian Is. red king crab	5	-	-	1995/96 - 2007/08	-	-	-	0.056	0.014	75%

[1] For Tiers 3, 4 where B_{MSY} proxy is estimable, the years refer to the time period over which the estimate is made. For Tier 5 stocks it is the years from which the catch average for OFL is estimated.
[2] MMB is estimated on 2/1/2024 for Norton Sound red king crab and on 2/15/2025 for all other Tier 1-4 stocks, using the current assessments.
[3] The F_{OFL} of 0 for PIBKC is indicative of a closed directed fishery.
[4] 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.
[5] PIGKC specifications are set on a calendar year basis

EBS Snow Crab

The SSC received an overview of assessment results and CPT discussions on snow crab. Written and oral public testimony were provided by Scott Goodman (BSFRF), and oral testimony by Frank Kelty (City of Unalaska) and Cory Lescher (Alaska Bering Sea Crabbers). Testimony highlighted the importance of the snow crab fishery and the challenges caused by the closure of the fishery in recent years. Concern was raised over the apparent inconsistency between assessment results and observations from the 2024 survey. Also covered was a summary of recent and upcoming research projects, including the potential to use underwater photography (CamSled) to locate and measure mating crab.

While snow crab has been at its lowest historical level over the past four years, the SSC noted the positive trends observed in the 2024 EBS bottom trawl survey. These included a 47% increase in industry-preferred males, large increases in all other male size classes, and much larger increases in female abundance. Centers of abundance in the EBS appear to have shifted back toward the south in 2024, and length frequency data indicated a time series high abundance of immature female crab. It was noted that many of these immature female crab were relatively large, which is atypical for this species. Despite these positive trends, both the CPT and author highlighted the very low recent biomass of large male snow crab preferred by the fishery.

The SSC acknowledges the work completed during 2024 to better inform the proxy values for B_{MSY} and F_{MSY} applied to this stock, and to understand the implications of a change in the definition of mature male biomass (morphometric, > 95 mm, > 101 mm). This included an extensive analysis using the Clark (1991) 'Maximin' approach to find the spawning potential ratio (SPR) and fishing mortality rate that would maximize the yield across all potential levels of stock productivity (in this case, stock-recruitment steepness and size of crab contributing to reproductive output).

Two Tier 3 models were provided for consideration: 24.1, last year's accepted model, and 24.1a, last year's model with a corrected approach to the treatment of molting probabilities. Two additional calculations were made: 1) using >95 mm as the definition of mature male biomass (labeled 24.1b) and 2) using the results of the Maximin analysis to use $F_{45\%}$ instead of $F_{35\%}$ as the F_{MSY} proxy and $B_{45\%}$ instead of $B_{35\%}$ as the B_{MSY} proxy (labeled 24.1c). Two Tier 4 calculations used male biomass >101mm as the mature biomass and natural mortality as the proxy for F_{MSY}. The author's preferred Tier 4 calculation decremented the REMA-smoothed survey biomass estimate for natural mortality (using the prior mean) between the time of the survey and the time of the fishery and used the average biomass over 1982-2022 as the proxy for B_{MSY} and the basis for the harvest control rule. The second Tier 4 approach did not apply a harvest control rule or decrement for natural mortality.

The author recommended that the Tier 4 calculation be used for management. This choice was based on concerns over the performance of the Tier 3 model (underestimation of large males and wide range of model results from jittering analyses) and the implication that a very high fishing mortality rate would be applied to large males. Removing virtually all of the model-estimated industry-preferred male crab would be possible given that morphometric maturity and terminal molts for most crab are estimated to occur prior to reaching the size selected or preferred by the commercial fishery. The CPT disagreed with the author and instead recommended the use of the Tier 3 option (Model 24.1b), which would place emphasis on the reproductive potential of large males and result in a lower fishing mortality rate on that portion of the population.

The SSC had considerable discussion regarding the evidence for small males successfully contributing to reproduction for this species. Canadian research where mating was only observed for male crab >95 mm was noted to be weak and not necessarily applicable to the Bering Sea. Lab studies have shown that small male crab are capable of mating, but may be outcompeted if larger males are present. Long term declines have been observed in the biomass of large males, yet the clutch fullness observations suggest relatively high and consistent female fertilization. Ultimately the SSC concluded that it was premature to entirely

dismiss the reproductive potential of smaller males. **The SSC highlighted that more research is needed on the basic reproductive biology of snow crab, specifically addressing the question of whether small males can and do mate with large females and produce progeny that will be large males under the right environmental conditions. The SSC strongly supports the proposed collaborative research to explore in situ observations of mating crab using a camera sled.**

The SSC identified that the choice of reference points should be considered in two parts: the first focusing on accurately describing the biology of the species and the size of males important for mating and the second reflecting the appropriate harvest rate to provide for reproduction and fishery yield. **Noting the uncertainty in mating dynamics, the SSC disagreed with the author and CPT and instead recommended using the Tier 3 model 24.1a, with $F_{35\%}$ and $B_{35\%}$ as proxies for MSY to set the OFL. After a lengthy discussion, the SSC recommended a buffer of 65% between the OFL and ABC, reflecting the potential for very high fishing mortality rates on larger crab if the full OFL were removed from the stock.** The SSC recognizes that this buffer is larger than last year and based this increase on uncertainty in the reproductive capacity of small males, continued concern over issues with the Tier 3 model (recommendations below), the recent large mortality event from which the stock has yet to recover, and the potential for persistent truncation of the size/age structure of male crab. The SSC further expressed concern that the effects of a revision to the bycatch estimates included in the model were added after the CPT meeting and the full model results were not available. The SSC noted that the use of such a large buffer is a temporary solution, pending additional biological and assessment research. Based on the recommended model, **overfishing is not occurring for snow crab, and the stock is not currently overfished (MMB is above the minimum stock size threshold) but 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):

The highest priority would be to continue to refine the Maximin analysis as requested by the SSC in June 2024, specifically using values of steepness of 0.50, 0.67, and 0.80, and considering both the Beverton-Holt and Ricker stock recruitment relationships. The yield analysis also 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 suggested that some type of collaborative work during the spring, perhaps including SSC members and/or others might facilitate additional progress on this topic. The SSC is interested in developing a wider range of options for reference points for snow crab for consideration in the next assessment cycle.

For the Tier 4 fallback model requested by the SSC, the SSC recommends standardizing the approach to the Tier 4 fallback across BBRKC, Tanner and snow crab assessments so that the same methods are used for each including all mature male biomass, a B_{MSY} proxy based on the time-series of REMA-smoothed survey estimates and an F_{MSY} proxy based on the best estimate of natural mortality (from the Tier 3 model). As the SSC intends the Tier 4 calculation only as a fallback if the Tier 3 analysis fails to converge, no other Tier 4 calculations need to be included in future assessments.

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).

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. Explore 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) 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.

Tanner Crab

The SSC received a presentation on the 2024 stock assessment for the Tanner crab stock in the Bering Sea. Scott Goodman (BSFRF) provided oral public comment. The SSC supports BSFRF efforts to quantify interannual variation in the spatial overlap between Tanner and snow crab, and their ongoing research to evaluate crab management strategies in collaboration with University of Washington. 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 700 pages long, which makes review a daunting task. The SSC suggests that consideration should be given to streamlining 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 2023/24, and the TAC set for Tanner crab by the State of Alaska was significantly below the OFL.

Tanner crab biomass in the 2024 EBS shelf bottom trawl survey increased for both sexes and in both management areas. The increase in the western area was particularly striking (86% increase for large males, and 275% increase for mature females). The survey size-composition was consistent with a cohort entering the population that was seen previously in the 2021-2023 surveys, an important outcome since previous pulses of small Tanner crab observed in 2017-2019 failed to appear in subsequent surveys.

The author and CPT recommended Model 22.03d5 for harvest specifications. This model differs from the previous assessment by the inclusion of the 2018 BSFRF side-by-side (SBS) survey biomass size composition data and slight changes to 2013-2017 BSFRF data, and the inclusion of the 2023/24 fishery and EBS shelf survey data. The assessment author addressed the SSC's primary concern in June about parameters hitting bounds by fixing the two Dirichlet-Multinomial effective sample size parameters for the BSFRF size compositions near their upper bounds. While this addresses the immediate issue, fixing parameters is not a long-term solution, and evaluation of whether these parameters can be reliably estimated should continue.

Model 22.03d5 generally exhibited reasonable fits to indices of abundance and removals in the directed and bycatch fisheries, had a small maximum gradient at the MLE, indicating model convergence, a low retrospective bias in MMB, and no parameters hitting bounds. A jitter analysis was successful in identifying a MLE solution. Results are consistent with the 2023 assessment, but similar issues remain, such as overestimation of the abundance of large crab in the recent year and model predictions failing to capture multi-year high and low periods in the bottom trawl survey index. Due to Tanner crab maturing at sizes below those selected by the fishery, the F_{OFL} is relatively high, a situation that is similar to snow crab, though less extreme. If an approach is developed to address this problem for snow crab, consideration should be given to whether it is applicable for Tanner crab as well.

The SSC supports using Model 22.03d5 for 2024/25 harvest specifications. Concerning the reference time period for calculating B_{MSY}, the SSC concurs with the author's recommendation to use the entire recruitment time series since 1982, except to drop the most recent recruitment estimate. **The current biomass is above B_{MSY}, placing this stock in Tier 3a.** Since the current MMB is above MSST, t**he BSAI Tanner crab stock is not overfished. The overall catch in 2023/24 (1,090 t) was less than the 2023/24 OFL (36,200 t), 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 for some reason.

The CPT continues to recommend a buffer of 20% between OFL and ABC for this stock, which was 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 SSC appreciates the draft risk table in Appendix D of the SAFE, especially the thorough and detailed evaluation of potential factors for each category of concern. The draft risk table noted increased concern for population dynamics in part due to uncertainty in the quantification of reproductive output, but no elevated concerns for other categories. The SSC suggests this uncertainty is more associated with the stock assessment, rather than population dynamics. While there is some subjectivity and room for disagreement in the evaluation of factors, the SSC finds the process of comprehensively evaluating a broad range of factors that could potentially impact the stock and the assessment to be extremely valuable.

The SSC agrees with the assessment author and the CPT on the following priorities for improving the Tanner crab assessment in the coming year:

- Transition the assessment model to GMACS. This transition could be used as an opportunity to simplify the assessment, as noted previously by the SSC, although a parallel version of the status quo assessment within the GMACS platform will be necessary.
- Develop a consistent approach for using the BSFRF survey data to inform bottom trawl selectivity and catchability for Tanner crab, snow crab, and Bristol Bay red king crab, rather than fitting these data as a separate index.

The SSC reiterates several previous recommendations that remain unaddressed:

- Directly incorporate annual molt to maturity data, as implemented in the EBS snow crab assessment, if sufficient data are available.
- Explore differences in the spatial distribution of small male crab in the NMFS survey, to identify if the distribution of small crab encountered in 2003-2005 and 2008-2010, which successfully propagated to larger sizes, showed differences in habitat use compared with the cohort first observed in 2017-2019, which did not propagate to larger sizes. Likewise, the SSC recommends that a comparison of environmental conditions experienced by small crabs during these periods may help to elucidate why some cohorts appear to propagate and others do not.

In addition, the SSC notes that for a number of years, the author and CPT have expressed concerns that the recommended models are overly optimistic. **The SSC recommends exploring the reason for this characterization through exploring likelihood profiles and other diagnostics and sensitivities of important scale related parameters (e.g., natural mortality, catchability and mean recruitment).**

Bristol Bay Red King Crab

The SSC received an overview of the BBRKC stock assessment and CPT recommendations. The SSC received written testimony from Scott Goodman (BSFRF). There was no oral testimony.

The BBRKC fishery was open in 2023 after two years of closure. Survey results were minimally different from 2023 and any changes were within the confidence bounds. There has been no substantial recruitment since the early to mid-2000s.

The stock assessment model has been implemented in GMACS since 2018. The SSC appreciates the author's response to many of the previous comments, in particular the details about tight priors on M and catchability, which are important factors in the SSC's evaluation of uncertainty in the OFL.

Model inputs included updates to fisheries bycatch, crab fisheries catches (directed, cost-recovery, and bycatch), 2024 survey data, and updated length composition data for directed and non-directed fisheries. In addition, the terminal year of recruitment for reference point calculations was updated. Two model scenarios and a Tier 4 option were compared based on CPT and SSC recommendations in May 2024. The base model, Model 23.0a, was the accepted 2023 model with new data and Model 23.0c was the base model with removal of the 1975-1979 molt probability block so that molt probability was constant throughout the time series. It was noted that the timing of the MMB estimation was moved to the correct season in both models, per May 2024 CPT discussions. As requested by the SSC for BBRKC, Tanner, and snow crab stock assessments, a Tier 4 assessment was also provided as a fallback.

Results from both Tier 3 models were similar, with only small differences in the early part of the time series. Both models continued to have a concerning retrospective pattern, although it was noted that it is getting better and may have been due to anomalous survey data a number of years ago that are becoming less influential in the model. **The SSC supports the author and CPT recommendation to use Model 24.0c for harvest specification,** placing BBRKC stock in Tier 3b. **This stock is not overfished and overfishing did not occur in 2023/24.** Even when using recent (2013-2023) low recruitments for projections, the BBRKC stock is not approaching an overfished condition. **The SSC supports the CPT's recommended ABC buffer of 20%, based on uncertainty due to retrospective patterns, effects of cold pool instability, the very tight constraints on both M and Q, and lack of fit to the BSFRF data inputs in the model.** As described in the October 2023 SSC report, the SSC recognizes the importance of low biomass/abundance and recent recruitment, but notes that it is already accounted for in the model results and control rule application and so should not be 'double counted' in the consideration of the ABC buffer.

The SSC recommends that the authors revisit previous SSC recommendations from recent years that were not included in the SAFE. In particular, removing shell condition, considering the BSFRF data as a survey selectivity prior, expanding the size bins used in the model to include additional bins for large crab, and generation of standard Bayesian diagnostics of posterior distributions all remain important considerations in future models. The SSC also reiterates its request to evaluate whether crab biomass and fishing mortality in the northern district should be included. Regarding the CPT discussion on handling mortality in fixed gear, the SSC recommends the author revisit previous CPT discussions and rationale on whether 50% handling mortality is appropriate for both pot and longline gear and to provide additional information in the next assessment.

The SSC thanks the authors for the work on the BBRKC ESP report card. The indices presented are valuable for an understanding of ecosystem relationships to this stock. **The SSC recommends that future ESPs consider the following**:

- Provide clear units on ESP indices.
- Provide some discussion on the linkage from the indices being considered such as how the skipper survey data may be relevant to the assessment. Another example is clarifying how the shift in the salmon index relates to crab competition or predation.
- Consider where to best report indices that are reported in the ESR as being potentially important to individual crab stocks, as these may be candidates for inclusion into species-specific ESPs.
- Separate socioeconomic indicators into separate panels for the pre- and post-crab rationalization period, as recommended by the CPT.

St. Matthew Blue King Crab

The SSC welcomes the new author and thanks the CPT for their presentation on the SMBKC stock assessment. This assessment occurs every two years, with the last full assessment in 2022. The SMBKC stock was declared overfished in 2018, and there hasn't been a directed fishery since the 2015/16 season. A rebuilding plan has been in place since 2020, with no changes to fishing regulations, and recent analyses have focused on recruitment.

A significant change occurred in the 2024 NMFS bottom trawl survey, where the "corner stations" around St. Matthew Island were not sampled. These stations, added in 1983, are areas of higher crab density and have played a key role in estimating crab abundances. The decision to not sample these stations was made to prioritize survey modernization fieldwork, and their inclusion in future surveys is uncertain. The assessment showed that removing these stations reduced biomass estimates (19%) but didn't alter size composition significantly. The biomass estimates are now computed based on a single stratum, instead of high and low-density strata with corner stations. This change has introduced a consistent downward bias, possibly due to the exclusion of the corner stations, or a previous upward bias when they were included. This discrepancy deserves further investigation, highlighting the potential benefits of model-based estimates that incorporate historical corner station data to address any biases. For this assessment, using the corner stations prior to 2024 is acceptable, but this issue should be addressed in the next full assessment. This may include developing an integrated pot and trawl index, as suggested in October 2022. The expectation is that the removal of the corner stations should increase uncertainty but not introduce consistent bias unless they regularly have higher crab density than the parent station to which they are a corner of. **The SSC recommends that the producers of the crab trawl survey estimates should explore showing both high and low-density strata estimates without the corner stations, alongside the one-stratum estimate seen in this assessment, to better understand potential biases.**

Five model scenarios were presented to assess the impact of excluding the corner stations, with models without these stations generally estimating lower biomass and OFL values. The assessment team recommended a model (24.1) that retained the corner stations and adopted a higher natural mortality rate (M = 0.23), as it better fits the data and reflects the stock's current condition. The CPT maintained the 25% buffer for the ABC, concluding that while these changes likely introduced some bias, they did not increase uncertainty. **The SSC supported the recommendation from May to use the higher natural mortality rate and concurs with the CPT recommendation of Model 24.1. Since possible bias caused by the absence of corner stations in 2024 would be a downward bias, the SSC agrees that maintaining the 25% buffer is reasonable at this time.**

The stock remains overfished for the 2023/24 year, and although projections for 2024/25 indicate an increase in biomass, recent recruitment continues to be low. The stock is projected to be above the MSST in 2024/25 under both model configurations (with or without corner stations) but, even if the MMB exceeds the MSST in 2024/25 (a determination that will be made in October 2025), it will remain under a rebuilding plan until it reaches B_{MSY}. **Catch in 2023/24 was below the OFL, therefore overfishing did not occur.**

In Table 8, it was noted that the SDNRs (Standardized Deviance Residuals) and MARs (Mean Absolute Residuals) for the surveys are all listed as zero, which is likely not the case. The SSC recommends the authors re-evaluate these diagnostics if they are included in future assessments.

Overfishing Status Updates

The SSC received overfishing status updates for five stocks in off-years for full assessment reviews, including Western Aleutian Islands red king crab (WAIRKC), Pribilof Island golden king crab (PIGKC), Aleutian Islands golden king crab (AIGKC), Pribilof Islands blue king crab (PIBKC), and Pribilof Islands red king crab (PIRKC). Total catch mortality for each of these stocks was below the OFL, so overfishing did not occur in 2023/2024 (2023 for PIGKC because specifications are on a calendar year basis). PIRKC and AIGKC estimates of MMB are above MSST and are, therefore, not overfished. PIBKC remains overfished. Both WAIRKC and PIGKC are Tier 5 stocks, and an overfished status determination cannot be made.

Norton Sound Red King Crab Model Runs

The CPT chairs presented proposed models for the 2025 final assessment for Norton Sound red king crab (NSRKC). This is an annual Tier 4 assessment that uses three survey data sources - the NMFS EBS trawl survey, the ADF&G trawl survey and the NMFS NBS trawl survey - along with catch information from the summer commercial, winter commercial, and the winter subsistence fisheries. This assessment has substantial challenges, including higher than observed abundance-proportions of large crab, poor model fits to trawl survey abundance, model parameters hitting bounds, and unknown trawl survey selectivity, to name a few. In response to CPT and SSC recommendations, the author stepped back from these challenges and focused on transitioning the accepted model (21.0) to GMACS.

For the 2025 draft assessment, the author implemented Model 21.0 in GMACS (24.0). Model 24.0 data and configurations closely matched 21.0 but the two models differ in structure, selectivity parameterization, and likelihood calculation, so direct comparisons between them are not possible. Qualitative comparisons of modeled trawl survey abundance, summer commercial standardized CPUE, survey and fishery size compositions and MMB all indicate the models produce similar fits to data. However, the SSC noted and recommends that the authors consider why the GMACS model estimates higher MMB in the most recent years and results in a higher B_{MSY} and OFL. Natural mortality, molting probability, selectivity, and transition probability are also similar between the models and *post hoc* RMSE for abundance indices and negative log-likelihoods for length-shell compositions were also similar. Initially, the Model 24.0 OFL was nearly twice that of Model 21.0, but the author identified an issue with the GMACS implementation of the Tier 4 F_{OFL} in which each fleet was being assigned the full F_{OFL}, resulting in an erroneously large value. This was corrected by calculating the OFL using the SSC-adopted OFL formula for multiple directed fleets. This is not currently a feature of GMACS. Even after applying the correction, the Model 24.0 multi-fleet OFL (0.63t) is higher than the 21.0 OFL (0.58t).

The CPT recommended bringing forward Models 21.0 and 24.0 (GMACS) for final specifications, conducting retrospective and jittering analysis for Model 24.0 (see jittering guidance in General Crab

Comments), as well as plotting fits to the different trawl time series separately. The CPT also endorsed the continued use of the multiple directed fleets OFL calculations and recommended that GMACS be updated to include these calculations.

The SSC commends the author on the successful implementation of the model in GMACS and appreciates the substantial collaboration provided by Tyler Jackson (ADF&G-Kodiak).

The SSC recommends that Models 21.0 and 24.0 be provided for review in December and concurs with all the CPT recommendations and requests. In addition, the SSC requests further exploration of the scaling difference in the OFLs resulting from Models 21.0 and 24.0.

The SSC appreciates the author's effort to address previous requests for more information on the trawl surveys and gears and anticipates revisiting these as well as other latent responses to previous SSC recommendations once GMACS implementation is complete. The SSC requests that the author seek and incorporate editorial review prior to posting the draft SAFE document going forward. Finally, the SSC looks forward to seeing the VAST/sdmTMB model-based indices of the three trawl surveys planned for presentation at the January modeling workshop.

Aleutian Islands Golden King Crab Model Runs

The CPT chairs presented results from twelve GMACS models for the May 2025 AIGKC assessment for both the EAG and WAG, as well as two additional GMACS models for the EAG that incorporated the EAG cooperative pot survey. AIGKC is managed as a Tier 3 stock with a single OFL and ABC. The ADF&G manages the fishery on a two-area basis (EAG and WAG) with a harvest strategy based on model-estimated mature male abundance that splits the TAC and specifies a maximum harvest rate for EAG and WAG.

Previous CPT and SSC recommendations for this assessment include exploration of data weighting, addition of the cooperative survey, a combined EAG and WAG model, improvements to observer CPUE standardization and evaluating area specific size at maturity. This cycle, the author focused on data clarifications and updates, use of 1993/94 season catch and size comps in EAG and WAG, model initial conditions, data weighting and EAG models with cooperative survey data.

Models were constructed and examined in a stepwise process beginning with Model 23.1, the base model, which was accepted for specifications in May 2024. First, intermediate bridging models were developed to document potential changes in model performance associated with data changes and updates (23.1 update), and an increase in the number of seasons defined in the model from 5 to 6 to allow for output on June 30th of the terminal year (23.1 season). The progression from '23.1 Base' to '23.1 Season' resulted in no changes to model results. The software and season upgrades and addition of the updated total size composition and total catch time series (i.e., including additional pot types) resulted in the new version of the base model, Model 23.1.

Model 23.1 starts from an equilibrium size structure in 1960, with data to inform the model starting in 1981. Based on a CPT recommendation, Model 23.1c implemented a revised bias correction strategy for recruitments during the 1960-1980 "spin-up" period to address negative recruitment deviations. The author and CPT agreed that the correction was appropriate but did not resolve the issue, which stems from the difference in population scale between 1960 and 1981. A new model, 25.0, eliminated the "spin-up" period altogether and estimated the initial size structure starting in 1981. Overall, model results from 23.1, 23.1c, and 25.0 for recruitment and MMB were similar except that recruitment in the EAG for Model 25.0 was slightly higher. Following up on CPT and SSC concerns regarding potentially over-weighted size compositions in the model-fitting process, a series of models (25.0a, 25.0b, 25.0b2, 25.0c, and 25.0d)

explored different data-weighting approaches. None of the changes to data weighting resolved the poor fit to the post-rationalized CPUE indices in the EAG. The author and CPT agreed that 25.0b, which employed equal likelihood weighting, and size composition weights based on variability in data, was the best of the data-weighting models. However, they noted that there was some (unaccounted for) spatially or temporally varying process in the EAG post-rationalized period that was resulting in large additional variance and poor fits. Finally, for the EAG only, Models 25.1 (EAG) and 25.1b (EAG) included data from the AIGKC cooperative survey as an additional fleet. The author and CPT agreed that while the development of these two models improved the handling of the survey data, several issues had yet to be resolved before the data could be used in a model to set harvest specifications. The CPT provided recommendations for further exploration and agreed with the author that models incorporating the cooperative industry survey data were best kept on the back burner until the data conflicts were resolved.

The CPT agreed with the author's recommendation to bring Models 23.1c and 25.0b forward for setting specification in May 2025 and requested that a risk table be brought forward as well.

The SSC appreciates the author's responsiveness to prior CPT and SSC comments and considers the thorough and systematic model update and exploration of multiple model configurations to be exemplary.

The SSC concurs with the author and CPT recommendations to bring Models 23.1c and 25.0b forward for setting specification in May 2025 and to provide a risk table.

The SSC also supports the proposed future work outlined by the author and CPT, including simulation studies looking at time-varying parameters in EAG, revisiting the appropriate size at maturity to use for calculating management-related quantities, and examining spatial/vessel effects in the post-rationalization fishery data to identify potentially time-varying processes such as catchability or selectivity. In addition, the SSC supports future development of a model that includes the cooperative survey data (e.g. Model 25.1).

Risk Table Implementation

The SSC commends the progress made to develop risk tables for BSAI crab stocks. Draft risk tables are now available for three major crab stocks: EBS snow crab, Tanner crab, and BBRKC. The CPT noted some aspects of implementation merit additional discussion and is planning to develop a set of SOPs at their May 2025 meeting. The SSC acknowledges that the implementation of risk tables for crab stocks may necessitate alternative approaches to those used for groundfish, and guidance to crab assessment authors may differ as a result. One key difference identified during SSC discussion is the application of ABC buffers for each species group. Risk tables for groundfish stocks are used to identify if a buffer is needed to reduce the ABC from a maximum ABC based on factors external to the assessment model or tier, whereas for crab stocks, an ABC buffer from OFL is set based on an evaluation of uncertainty relative to the previous year and a general range of buffers for stocks in a tier. It would be helpful for the CPT to describe the basis for the current buffers and the SSC recommends that the CPT consider the approach in a situation where all risk table categories are normal or no concern. Increased communication with groundfish assessment authors would be helpful to develop the range of options that could be considered. The SSC also notes that there are multiple resources available to the CPT as they develop their SOPs, including the SSC's Risk Table Workshop report (June 2021 SSC Report Appendix A), Council motions, and previous SSC and GPT comments on the implementation of risk tables for groundfish stocks. Finally, the SSC suggests that, to the extent possible, the implementation of and process used to develop BSAI crab risk tables mirrors that of groundfish to maintain consistency among managed stocks and Council's goals for risk tables as defined in their December 2019 motion (collaboration and communication among stock assessment scientists and those in other disciplines and increasing transparency and consistency in the rationale for reducing the ABC

not already addressed in the stock assessment, tier system, and harvest control rules).. To address concerns over double counting uncertainty in the stock assessment and risk table process, the SSC requests that the CPT develop a table that lists where different types of uncertainty are accounted for in the development of OFL and ABC recommendations. This would help clarify the role of risk tables in the specification process.

The SSC looks forward to further discussions following the CPT meeting next May, and to the next iteration of risk tables for crab stocks in 2025.

BSFRF Research Update

The SSC appreciates the updates provided to the CPT on research conducted by the Bering Sea Fisheries Research Foundation (BSFRF) and their written and oral comments submitted under C1 BSAI crab. The research conducted by this group provides critical information needed to improve management of BSAI crab stocks and is currently incorporated into several assessments in a variety of ways. Current BSFRF work is focused on continuing their Collaborative Pot Survey, which occurred in 2023 and now 2024. Data analysis for the 2024 survey is ongoing. A third survey is planned for 2025. BSFRF also has several projects focused on snow crab, including a workshop aimed at increasing international collaborations and a pilot survey project in the Bering Sea with the primary goals of improving understanding male distribution and survey calibration efforts.

C3 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 2024 Joint Groundfish Plan Team (JGPT), BSAI Groundfish Plan Team (BSAI GPT), and GOA Groundfish Plan Team (GOA GPT) meetings. The SSC received no oral public testimony for BSAI/GOA groundfish specifications. Written comments were provided by Jim Armstrong and Chad See (Freezer Longline Coalition).

General Groundfish Comments

Harvest Projections

The SSC appreciates NMFS's responsiveness to the SSC's previous concerns regarding maintaining frequent stock assessments while balancing cost, staff time and review time. Given experience with harvest projections and considering the information gained versus author and review time, the SSC discussed the possibility of changing the process for harvest projections. Currently harvest projections are used during the period between full/operational assessment cycles ("off-years") that are on two or four year cycles. The harvest projection document only updates catch for the prior year and uses forecasted catch for the current and upcoming years. No updates are made to the operational model nor is new survey information included in the projections, although any new survey information should be considered during GPT deliberations. The updated catch amounts used in the harvest projections have historically resulted in small changes to the ABC and OFL. These changes do not pose a conservation concern. Therefore, the SSC offers the following recommendations and suggestions to streamline the off-year assessment processes:

- For stocks on biennial cycles: The time period between operational and harvest projections is short and new survey information is generally unavailable to inform changes in stock trends until the GPT meeting. **Therefore, the SSC recommends NMFS consider doing "catch monitoring" updates in the SAFE for off cycle assessment years and using the projected specifications from the full/update operational assessments to bridge the off cycle assessment period.**

- For stocks on four year cycles: The period between operational assessments is substantial and there is likely new survey and ecosystem information that would be available during that period. **The SSC recommends that NMFS consider conducting a harvest projection in the third year of the off-cycle (i.e. the mid-point, as year 1 corresponds to the last operational assessment) and a catch monitoring update for the remaining off-cycle years (years 2 and 4).** Additionally, the harvest projection document should be augmented with updated survey biomass trends if available in time and/or "red flag" metrics if available (see comment below). Apportionment methods would generally not be updated in off-cycle years; however, the apportionment of the ABC would be updated during the harvest projection, which is consistent with current methods.

- The harvest projection/catch monitoring schedule could be modified should concerns arise with the stock and/or new information becomes available that significantly informs an assessment.

- **For the harvest projection documents, the SSC recommends authors and the GPTs define a few basic/consistent metrics that would act as "red flags."** These could include the percent of the aggregate TAC and ABC utilized, current year's catch to date compared to previous years, the current survey estimate (if available) compared to previous years, and an explicit statement from the stock assessment author if they do or do not have any stock concerns.

- Authors and the GPTs consider the tradeoff of having unique methods for estimating catch for incomplete years versus having a simple, consistent method for all stocks. While the SSC recognizes that each stock is unique to some extent, variation in range of years used for averaging is considerable and not always justified in the documents. Furthermore, the sensitivity of projection outcomes are likely highly robust to these differences in incomplete-year catch estimate methods.

Plan Team Reports

The SSC greatly appreciates the steps taken by the GPT to clearly distinguish between full, update, and research models and to identify what model variations (base model and any alternatives) are recommended for review in November/December, as requested in the October 2023 SSC report. The SSC found the summary tables included in the GOA and BSAI GPT presentations that identified the topic/assessment and type of topic/assessment exceptionally helpful. To clarify assessment types in the GPT written report, the SSC recommends a similar or simpler table just noting the assessment and assessment type coming out of the GPT meeting, recognizing that full and update assessment types may change based on GPT decisions.

Joint Groundfish Plan Team Report

The SSC received a presentation from Kalei Shotwell (NOAA-AFSC, BSAI GPT co-chair) on the September 2024 JGPT meeting. There was no public testimony on the JGPT report.

Data Limited Methods Working Group

The data limited working group (WG) continues to make good progress. The JGPT agreed with all WG recommendations for moving forward and expects to see another update during the JGPT in 2025. It is likely the new methods will be presented for review with the GOA octopus stock assessment in 2025 and several other stocks in 2026.

ESR Climate Update

The JGPT received an ESR climate update similar to what the SSC received (see Ecosystem Status Report Preview under SSC comments for C1 BSAI crab for details).

Aleutian Islands Trawl Survey

A brief update on the AI trawl survey was presented. Most notable was the 20% reduction in survey stations due to budget constraints. Concern was voiced regarding the spatial extent of the unsurveyed stations; it was confirmed that stations were removed following a stratified random method, consistent with the survey design. The SSC recommends that changes in survey sampling be fully articulated especially to ensure stock assessment authors understand the potential implications to their assessments (see also SSC comments in B4 Alaska Fishery Science Center Report).

Age and Growth Update

An update from the Age and Growth lab was provided. The most notable topic was a general need for updated maturity data. The JGPT recommended the AFSC make maturity analyses a priority. The SSC endorses this recommendation. Additionally, **the SSC recommends that stock assessment authors spotlight their need for updated maturity data in the "Data gaps and research priorities" of their upcoming SAFEs if warranted**. The SSC should also think about the importance of maturity data as assessments are reviewed in December.

Halibut DMRs

The JGPT recommended adopting the 2025/2026 halibut DMRs as recommended by the DMR working group. The methods for estimating DMRs has been relatively consistent since 2016, with the exception of a minor change for the GOA hook and line sector.

EBS Trawl Survey

A brief update on the 2024 EBS trawl survey was provided. The JGPT discussion centered around the removal of corner stations and tow length reductions (30 min down to 15 min) as part of the survey modernization. Additional discussion regarding survey modernization is documented within the AFSC report (see SSC comments in B4 AFSC Report).

Ecosystem Surveys

The SSC highlights that AFSC ecosystem surveys provide a wealth of valuable information on production at lower trophic levels and changing environmental conditions and looks forward to their inclusion (in part) into the ESR that will be presented to the SSC in December.

REMA Diagnostics

The SSC recognizes the continued progress and availability of new validation tools for REMA. The SSC looks forward to seeing them incorporated into assessments at the authors' discretion.

Assessment Guidelines

The SSC appreciates the review of the assessment guidelines and the willingness to share internal documents to facilitate the SSC review process in December. The SSC also appreciates the responsiveness of NOAA staff for updating the language for the Risk Tables. The revised three levels of concern will be important for assessment authors, GPTs and the SSC when considering specifications.

BSAI Groundfish Plan Team Report

The SSC received a presentation from Kalei Shotwell (NOAA-AFSC, BSAI GPT co-chair) on the September 2024 BSAI GPT meeting. There was no oral public testimony.

Bogoslof Winter Acoustic Survey

The SSC appreciates the summary of the update that the BSAI GPT received on the winter acoustic-trawl survey of the Bogoslof Island area. It was noted that the survey was successfully completed even though weather reduced the survey from four days to two days and reduced the number of tows on targets from typically ten to two. Timing of the survey was good (60% of pollock in pre-spawning condition) and fish were densely aggregated in two locations. There was a 31% decrease in survey biomass from the last survey in 2020, but biomass was still near the post-1999 long-term average. The SSC had no feedback or recommendations.

EBS Acoustic Survey and AVO

The SSC appreciates the summary of the update that the BSAI GPT received on the EBS acoustic survey and acoustic vessel of opportunity (AVO) index. It was noted that the age compositions in the survey look promising with more age-1 (on par with 2013 year class) and age-2 fish. As with Bogoslof, there was a decline in biomass (25%) from the previous survey (2022), which is lower than the 2014–2016 highs, but still above the 2006–2012 lows. With now seven years of data to evaluate the AVO surveys, there is a very strong correlation (0.90) between biomass estimates from the acoustic trawl survey and acoustic backscatter from the AVO survey, and the SSC looks forward to future updates and further discussions on this topic.

Harvest Projections

The SSC received a summary report and reviewed harvest projections for three stocks at this meeting instead of reviewing harvest projections in December as in previous years. The BSAI GPT discussed having less complete current year survey information within the harvest projection documents due to the change in the BSAI GPT review schedule from November to September, but recent survey biomass estimates for some stocks were provided in the survey presentations. **The SSC agrees with the BSAI GPT recommendation that authors of the harvest projection summaries coordinate with survey staff so that biomass trends for stocks with harvest projections are included in the survey presentations.** For additional SSC recommendations on the frequency of harvest projections see "General Groundfish Comments".

Northern rockfish - BSAI northern rockfish is assessed every two years. The last full assessment was in 2023. This year, a harvest projection was presented. A full assessment is scheduled for 2025. Northern rockfish is assessed using an age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2023 catch and estimated 2024–2026 catches. The 2025 total biomass is a 1% decrease from the 2024 total biomass.

The SSC concurs with the BSAI GPT and author recommended ABC and OFL for the BSAI northern rockfish for 2025 and 2026, with no reduction from maxABC.

Arrowtooth flounder - BSAI arrowtooth flounder is assessed every four years. The last full assessment was in 2022. This year, a harvest projection was presented. A full assessment is scheduled for 2026. Arrowtooth flounder is assessed using a statistical age-structured model and is managed in Tier 3a. The standard projection model was updated with the final 2022 and 2023 catch and estimated 2024–2026 catches. The 2025 total biomass is a 1% decrease from the 2024 total biomass.

The SSC concurs with the BSAI GPT and author recommended ABC and OFL for the BSAI arrowtooth flounder for 2025 and 2026, with no reduction from maxABC.

Skates - BSAI skates are assessed every two years. The last full assessment was in 2023. This year, a harvest projection was presented. A full assessment is scheduled for 2025. The BSAI skate complex is managed in aggregate with a single set of harvest specifications applied to the entire complex. To generate the harvest recommendations, the stock is divided into two units. Harvest recommendations for Alaska skate *Bathyraja parmifera*, the most abundant skate species in the BSAI, are determined using an age-structured model and are managed under Tier 3. The remaining species (other skates) are managed under Tier 5 due to a lack of data. For the Tier 3 Alaska skate, the standard projection model was updated with the final 2023 catch and estimated 2024–2025 catches. The Tier 5 REMA model for Other skates was not updated and the harvest recommendations were carried over from the previous assessment. The 2025 total biomass for BSAI skates is a 3% decrease from the 2024 total biomass.

The SSC concurs with the BSAI GPT and author recommended ABC and OFL for the BSAI skate complex for 2025 and 2026, with no reduction from maxABC.

EBS Pollock

The BSAI GPT chairs highlighted results from a September document for EBS pollock. A large portion of the document was focused on SSC concerns related to the use of the risk table to frequently deviate from Tier 1 recommendations. The author provided new analyses and an extensive review of some of the past analyses that have been done for the EBS pollock assessment, focusing on concerns from the SSC including the sensitivity of the stock-recruitment relationship (SRR) and the continued recommendation of Tier 3 ABCs via the risk table. Key factors discussed included the influence of selectivity, time series length, temperature effects on productivity, priors on steepness, and different forms of the recruitment curve on SRR estimates.

The sensitivity of the SRR to model assumptions is a persistent issue that the author has responded to in different ways in previous assessments, but the overall sensitivity of the SRR to the choice of priors and temporal variation in response to the environment raises questions about the reliability of F_{MSY} estimates, which is a fundamental requirement for Tier 1 management. The analyses showed that F_{MSY} was not well informed for this stock and highly dependent on SRR choices. As a result, the BSAI GPT recommended that EBS pollock be reclassified under Tier 3 for 2025, and that the SSC reconsider its tier designation. It would be unusual for the SSC to recommend a Tier 3 designation in October. However, **the SSC recommends that Tier 1, 2 and 3 harvest recommendations be presented in December**, while only using a risk table buffer for unusual concerns not accounted for in the stock assessment model. The SSC welcomes other recommendations for consideration that could result in a more stable approach. Since the author and BSAI GPT did not recommend any specific model changes, the SSC expects any new analyses for the final assessment to be focused on justifications for tier designation.

The authors also examined incorporating natural mortality from the CEATTLE model into the pollock assessment. The multi-species model includes Pacific cod and arrowtooth flounder, and produces an additional natural mortality (M2) which is additive to the baseline natural mortality in the model and primarily affects the youngest ages. This exploration produced substantially different SRR results with greater uncertainty as additional natural mortality requires higher estimates of recruitment to fit data inputs. This was a valuable and interesting exploration of model sensitivity, but could benefit from additional refinement to evaluate whether it is a worthwhile improvement to the assessment model.

In response to an SSC recommendation, the authors conducted analyses excluding early CPUE and foreign fishery data. Despite concerns over aging biases, the results showed little impact on model outcomes and

the BSAI GPT supported keeping them in the model at the author's discretion. The SSC concurs and supports the BSAI GPT's recommendation, noting that the ages of mostly young fish in those data would likely be minimally biased by surface reads versus break and burn methods.

Additionally, the authors discussed a preliminary analysis of EBS pollock's ecosystem role as forage for other species, and alternative methods for moderating management variability. The SSC viewed this as a good starting point for developing harvest control rules independent of the SRR, recognizing the stock's critical role in the Bering Sea ecosystem. The SSC welcomes any further explorations of the consequences of catching or not catching the full Tier 1 ABC on the ecosystem.

For the November assessment, **the SSC requests that the author document the method used for determining the selectivity in the forward projections, and that an objective method be applied each year rather than an ad hoc choice of selectivity based on a previous year.**

Finally, the SSC very much appreciated the HTML based version of the October document and its usefulness in navigating the document, exploring external links, and obtaining the full document in different formats.

EBS Pacific Cod

The SSC was presented with an overview of model alternatives for the EBS Pacific cod assessment, introducing alternative models with changes to length bin sizes, aging error matrices, and new aging bias estimates for pre-2007 data. The authors also explored the inclusion of conditional age-at-length data, static survey selectivity, and updates to the Richard's growth model. The SSC viewed a number of the proposed changes as improvements and appreciates the authors' hard work, including updates to aging error and aging bias estimates. The SSC notes that the spline version of the aging error matrix may have fit better due to the added model complexity, but it does not seem logical that the aging error increases dramatically starting at ages 6-7 rather than linearly.

The BSAI GPT report discussed the increase in length bins from 1 cm to 5 cm. While the author preferred the simplicity of uniform bins and the improvement in run time, the BSAI GPT recommended further exploration of how this affects spawning biomass and management quantities. **The SSC concurs with this and recommends that the authors explore finer bin structure closer to inflection points of key processes such as selectivity and maturity, and areas of the growth curve where cod are growing quickly, rather than using 5 cm uniformly across the length range.**

Incorporating conditional age-at-length data led to changes in model fits and spawning biomass trends and had some unusual impacts that the authors were unable to reconcile prior to the BSAI GPT presentation. The BSAI GPT supported the author's plan to explore alternative approaches to account for variability in growth over time and proposed not to advance Model 24.2 for operational use this November. The SSC concurs with this recommendation. The SSC encourages further exploration of empirical weight at age.

The BSAI GPT endorsed presenting two models for November 2024 in addition to the base model: Model 23.1.0.d, which includes updated data and aging error (linear as opposed to splines as discussed above) and bias estimates, and Model 24.1, which also uses 5 cm length bins and static survey selectivity. **The SSC concurs with these three models being brought forward in November.**

At the authors' discretion, the SSC recommends an additioinal model similar to 23.1.0.d with static survey selectivity, linear aging error and an attempt to fit marginal fishery ages rather than conditional length-at-age. Including these fishery ages has been a long-standing request to the authors and

the SSC still believes this is a priority to better estimate selectivity and catch-at-age. The SSC learned at the meeting that there is ongoing post-doctoral research working on incorporating the marginal fishery ages, so it will be understandable if they are not able to be included in 2024.

The SSC also recommends that if capacity is available at the AFSC, the assessment would benefit from aging some historic ages with new aging criteria being used now.

Aleutian Islands Pacific Cod

The SSC reviewed preliminary model runs for the AI Pacific cod stock assessment. The authors proposed four models for consideration in November. These include Tier 3b models 24.0 (base) and 24.1 (with a timeblock for pre- and post-2016 to account for marine heatwave effects), as well as two Tier 5 models, 13.4 and 24.2. The SSC thanks the authors for the thorough bridging analysis and improvements made toward the author's recommended model 24.1, including a new estimate of natural mortality, estimation of initial fishing mortality to establish initial numbers at age, and revisions to the age and length bins.

One change that was unexpectedly impactful was the move to the Richard's growth curve. As the BSAI GPT noted, the change in likelihood between the model with the LVB growth and the model with the Richard's growth curves was quite substantial, given that the change represented the addition of one parameter only and the difference in shape of the two growth curves was fairly similar. **The SSC concurs with the BSAI GPTs recommendation to explore how such a large improvement in likelihood occurred despite similar growth curves.**

The presentation to the BSAI GPT highlighted disparities in the conditional age at length fits at larger ages, but this was not discussed in the document. The SSC would appreciate some written evaluation of this in the final 2024 SAFE document.

The BSAI GPT endorsed bringing forward models 24.1, 24.0, and Tier 5 models for November, recommending an additional bridging model 24.1a, which uses von Bertalanffy growth instead of the Richard's curve. **The SSC concurs with this recommendation and suggests an additional model run below.**

While the use of the Richard's curve resulted in the most dramatic change in the likelihood, an important new feature of Model 24.1 was the inclusion of a natural mortality block. The SSC appreciates the author's effort at incorporating climate related parameters, but the current parameterization assumes that there is a distinct mechanism identified for the natural mortality block and that it is consistent over time without an identified threshold for returning to baseline natural mortality. The temperature thresholds identified in Laurel and Rogers (2020)[1] point to hatch success having a narrow optimum temperature range. If hatch success was the main driver, then the SSC suggests it might be more appropriate to consider a recruitment covariate that utilizes bottom temperature predictions at the time of spawning based upon ROMS or future CEFI models. Additionally, if the higher mortality affects young ages or all ages, then the rationale for the two year lag becomes unclear. The higher temperatures in the AI are also lower than what were identified as high temperatures in the GOA. Regardless, future efforts could be enhanced by tying parameters to a specific covariate which would adjust to baseline when it returns to "normal".

[1] Benjamin J. Laurel and Lauren A. Rogers. 2020. Loss of spawning habitat and prerecruits of Pacific cod during a Gulf of Alaska heatwave. *Canadian Journal of Fisheries and Aquatic Sciences*. 77(4): 644-650. https://doi.org/10.1139/cjfas-2019-0238

Thus the SSC recommends one additional model "24.0b" which removes the block on M and uses the LVB growth model as a simpler but improved model from last year as an alternative. The SSC appreciates the climate related explorations and welcomes future efforts to include environmental covariates.

The SSC had these additional specific recommendations:

- Consider a prior for M that accounts for maximum ages beyond what has been observed in recent survey data, which likely reflect a truncated age structure.
- Check total catches as they were inconsistent between tables 2A.5 and 2A.6.
- Ensure that the "F ballpark" penalty is turned off in the final estimation phase. It appeared from likelihood profiles that this penalty was still turned on at the end of model runs. This is a convergence aid and should not be affecting model results at the end of convergence.

Alaska Plaice

Alaska plaice is managed as a Tier 3 stock and is assessed on a quadrennial schedule with a full assessment being conducted in 2024. For this assessment cycle, the author recommends transitioning from an age-structured model in ADMB to Stock Synthesis (SS3). The author explained the rationale and benefits of this change, which are all reasonable and support the transition. Four base models were used as bridging models to logically evaluate the new platform in comparison to the last accepted model. The author also explored two new model configurations in SS3. The first model (Model 24.0) includes updated survey age-composition input sample size using the general bootstrap framework in the "surveyISS" R package, updated survey length-composition input sample size, including age-1 and age-2 fish to the age composition data, updating growth parameter estimates, updating length-weight relationship parameters externally (as done in the base model), and updating old age CVs. The second model (Model 24.1) is the same as Model 24.0 except that the weight-at-age relationship is calculated within SS3 rather than externally. The SSC appreciates the work of the authors in documenting the transition from ADMB to SS3 and responses to previous BSAI GPT and SSC requests.

The BSAI GPT had several recommendations and requests for the author. Specifically, for the November Plan Team meeting, the BSAI GPT requested that the author provide the control files used in SS3, retrospective analyses, and additional diagnostics (as outlined in the assessment protocols) for the models being brought forward for consideration to help with evaluating the bridging and alternative models. The BSAI GPT recommended bringing forward models Base 3 (the model in SS3 most like the ADMB model accepted during the last full assessment in 2021), and Model 24.1.

The SSC discussed whether it was necessary for the author to bring forward the last accepted model in the ADMB programming platform in addition to the BSAI GPT recommended models in SS3. It was noted that a similar question arose last year with transitioning the GOA pollock from ADMB to TMB. Like that example (and as demonstrated by the author's analysis), it is not expected that this change in programming platforms should appreciably influence parameter estimates or model results (see October 2023 SSC report). Given that the author provided a detailed bridging analysis and the BSAI GPT review of the model platform change did not note any concerning differences, the SSC did not see the need to bring forward the last accepted model in ADMB with updated data in this instance. **The SSC supports bringing Models 'Base 3' (with appropriate model numbering) and 24.1 forward for comparison in December.** However, the SSC did note that the bridging models (Base 1- 4) only used the data through 2021; **therefore, the Base 3 model should be brought forward using updated data and appropriate model numbering.**

The SSC also supports the BSAI GPT recommendations and requests for the full assessment including provision of the SS3 control files, retrospective analyses, and appropriate diagnostics.

Northern Rock Sole

Northern rock sole is managed as a Tier 1 stock and is assessed on a biennial schedule with a full assessment being conducted in 2024. The authors brought forward four models, (1) the base model accepted during the last full assessment in 2022 (Model 18.3), (2) the base model with updated data and Francis data reweighting (Model 18.3_new242.1), (3) Model 18.322.1 with new data, Francis data reweighting, and the addition of the use of AFSC survey input sample size (surveyISS) R package for input sample sizes and calculating survey age composition data (24.1), and (4) Model 24.1 with estimation of female natural mortality with a lognormal prior (male M already estimated in all models) (Model 24.2). The SSC appreciates the work of the authors in response to previous BSAI GPT and SSC requests. The BSAI GPT recommended bringing forward Model 18.3 (base) and Model 24.2 for December. The BSAI GPT also recommended future research on fixed selectivity for earlier years, examination of why One Step Ahead residuals are not standard normal, exploration of input sample sizes using the ISS bootstrap approach, updates of maturity which has not been examined in 20 years, and exploration of other potential issues including aging error. **The SSC supports bringing models 18.3 and 24.2 forward for comparison in December and supports the BSAI GPT recommendations for future explorations.**

Greenland Turbot

Greenland turbot is managed as a Tier 3 stock that is assessed every two years. For this assessment cycle, the authors presented a large number of model runs that were conducted to evaluate the uncertainty in specific model assumptions and to develop a new set of candidate models for harvest specifications. These models included consideration of new methods for deriving the AFSC longline survey Relative Population Numbers (RPNs) and updated slope survey length data. Model m1 was the base model accepted during the last full assessment in 2022 (Model 16.4c) with updated length data from the EBS slope. Models m2–m15 were base model sensitivity analyses and models m17–m20 were candidate models considered for the full assessment. Model assumptions that were explored included fixed versus time-varying growth, autocorrelation in the stock-recruitment relationship, fleet-specific selectivity and time blocks, and survey catchability. The authors recommended models m18 and m20 as viable options to consider for harvest specifications.

The SSC appreciates the work of the authors in response to previous BSAI GPT and SSC requests. The BSAI GPT recommended bringing forward models m1, m19, and m20 for December. The difference between models m18 and m19 was the removal of the EBS slope survey time block in m19 and whether the SSR autocorrelation was fixed (m18) or not (m19). Model m20 removes the slope time block and has fixed SSR autocorrelation. The BSAI GPT also recommended including an option that applies the input sample size reweighting, if time allows. **The SSC supports bringing models m1, m19, and m20 forward for comparison in December (with appropriate model numbering) and supports the BSAI GPT recommendation regarding input sample sizes.**

Pacific Ocean Perch

Pacific ocean perch (POP) is managed as a Tier 3 stock and is assessed on a biennial schedule with a full assessment being conducted in 2024. The authors brought forward four models, (1) the (base) model accepted during the last full assessment in 2022 (Model 16.3), (2) the base model with estimation of the recruitment for the initial numbers at age as stochastic variables (Model 24.1), (3) the base model with an increased penalty for the dome-shapedness in the bicubic spline used for fishery selectivity and a lognormal

prior on the AI survey catchability (mean=1, CV=0.15) (Model 24.3), and (4) Model 24.2 with selectivity for the AI and EBS trawl survey modeled with time-varying double-normal curves (Model 24.3). The authors reported that estimation of stochastic initial numbers at age had little effect in fitting the fishery length compositions and the AI survey biomass index, and selectivity for the AI and EBS trawl survey modeled with time-varying double-normal curves had very little effect on model results. Therefore, the authors recommended Model 24.2, which restores a prior distribution on AI survey catchability as well as an increased penalty on fishery selectivity dome-shapedness across ages that adds stability to the model. The SSC appreciates the work of the authors in response to previous BSAI GPT and SSC requests. **The SSC supports the BSAI GPT recommendation to bring forward Model 16.3 (base) and Model 24.2 for comparison in December and the BSAI GPT recommendations for future explorations.**

Blackspotted/Rougheye Rockfish

The blackspotted/rougheye (BS/RE) rockfish complex is assessed using an age-structured model for the AI portion of the stock in Tier 3 and a Tier 5 random effects model for the EBS portion. This complex is assessed on a biennial schedule with a full assessment being conducted in 2024. The authors brought forward two models for the AI portion of the stock. The first was the base model accepted during the last full assessment in 2022 (Model 20), the second was the base model with the addition of the IPHC longline survey RPN estimates from 1996–2018 (Model 24.1). The author noted that there were no length and age composition data from the IPHC longline survey because lengths and otoliths are only routinely sampled for halibut, or through special project requests. Inclusion of the IPHC longline survey RPN data degraded the model fits and diagnostics; therefore, this model was not recommended by the authors. The BSAI GPT agreed with the authors and recommended bringing forward the base model (Model 20) for December. The authors also presented comparisons of size compositions between survey and fishery data to explore whether larger fish were present in the population but not in the fishery. Finally, the authors presented an index of the ratio of BS/RE to POP in the AI survey over time to evaluate whether the decline in the bycatch rate is due to an increasing number of POP tows with no blackspotted/rougheye catch. These comparisons suggested that the largest fish seen in the fishery is similar to the largest fish seen in the survey, across years, and that the decline in the bycatch rate is not due to increasing number of POP tows with no blackspotted/rougheye catch, but rather smaller sizes of blackspotted/rougheye being caught in the survey. The SSC appreciates the work of the author in response to previous BSAI GPT and SSC requests. The SSC recommends that the comparison of size compositions between survey and fishery data and the ratio of BS/RE to POP are presented in future assessments. **The SSC supports bringing forward Model 20 in December.**

Other Team Discussions

The BSAI GPT also discussed their appreciation for the incorporation of various model diagnostics in many of the assessments presented at their September meeting and the AFSC's research into model diagnostics. **The SSC supports the BSAI GPT's request that the AFSC provide a brief document or reference in conjunction with the new assessment guidelines to assist with understanding and interpretation of the model diagnostics specified in the new guidelines.**

BSAI Preliminary Groundfish Harvest Specifications and halibut DMRs

The SSC recommends approval of the preliminary 2025/2026 BSAI groundfish specifications 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 2025/2026.

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) on the September 2024 GOA GPT meeting. There was no oral public testimony.

Winter Acoustic Survey

The SSC received the GOA GPT report on the winter 2024 acoustic-trawl surveys conducted in the Shelikof Strait, Pavlof Bay, Shumagin Islands, and the Chirikof shelf break. Due to weather conditions, mechanical repairs, and family medical emergencies, the survey could not sample Morzhovoi Bay, Sanak Trough, and Marmot Bay.

Since 2019, the survey timing has shifted to early/mid March to avoid spawning and post-spawn pollock. The adjustment appears successful, as indicated by the low proportion of spawning or spent pollock. With the exception of Shumagin Island, overall survey numbers and biomass were higher than 2023, with much of the increase attributed to age 4 pollock. In the Shelikof Strait portion of the survey, the 2024 length distributions were similar to those of 2023, noting that age 1 and 2 pollock have shown low abundance since 2022; however, the survey typically detects them only at high abundances.

The 2025 survey is scheduled to occur in February for the Shumagin Islands, Pavlof Bay, Morzhovoi Bay, Sanak Trough, and Kenai/Prince William Sound; and in March for Shelikof Strait, the Chirikof shelf break, and Marmot Bay.

2025 Acoustic Survey Planning

The SSC received the GOA GPT report on survey priorities associated with discontinuing the biennial MACE GOA acoustic-trawl summer survey. This survey is designed as a pollock survey and has generally been conducted biennially 2013-2023, with the 2021 and 2023 surveys at a reduced resolution. The presentation outlined the resource challenges involved in balancing multiple surveys and research priorities while also responding to emergent research needs. These challenges include staffing shortages, gaps in expertise, and reduced vessel availability, all of which have compressed the time available to complete surveys.

The presentation highlighted both the pros and cons of discontinuing the survey. Pros include improved staff allocation across surveys, increased vessel availability for research, and enhanced support for winter pollock surveys. On the other hand, cons include the potential loss of some ecosystem-level data from this survey (other surveys collect this information as well), such as information from the ESP/ESR and indicators (e.g., forage fish and euphausiids). The survey has also had a limited influence on the estimate of pollock SSB in recent years.

The SSC appreciates the AFSC report and evaluation on potential impact to the pollock assessment. Losing surveys is a large concern of the SSC, and keeping vessel days in the GOA for research and the winter pollock survey should remain a priority.

Harvest Projections

Flathead Sole - The flathead sole stock is assessed every four years. The last assessment was in 2022. This year, a harvest projection was presented. The next assessment is scheduled for 2026.Flathead sole is managed in Tier 3a. The standard projection model was updated with updated 2022 and 2023 catch, and estimated 2024–2026 catches, resulting in small updates in specifications. **The SSC concurs with the GOA**

GPT and author recommended ABC and OFL for flathead sole for 2025 and 2026, with no reduction from maxABC. No changes were made to area apportionment methods and resulting proportions. **The SSC concurs with the GPT and author recommended apportionment of ABC.**

Pacific Ocean Perch - The Pacific ocean perch (POP) stock is assessed every two years. The last assessment was in 2023. This year, a harvest projection was presented. The next assessment is scheduled for 2025. POP is managed in Tier 3a. The standard projection model was updated with updated 2023 catch, and estimated 2024–2026 catches, resulting in small updates in specifications. **The SSC concurs with the GOA GPT and the author recommended ABC and OFL for 2025 and 2026, with no reduction from maxABC.** No changes were made to the area apportionment method and resulting proportions. **The SSC concurs with the GPT and author recommended apportionment of ABC.**

Rougheye/Blackspotted Rockfish - The rougheye/blackspotted rockfish (RE/BS) stock is assessed every two years. The last assessment was in 2023. This year, a harvest projection was presented. The next assessment is scheduled for 2025. RE/BS is managed in Tier 3a. The standard projection model was updated with updated 2023 catch, and estimated 2024–2026 catches, resulting in small updates in specifications.

The SSC concurs with the GOA GPT and the author's recommended ABC and OFL for 2025 and 2026, including a reduction from maxABC using the same method as the 2023 specifications. The SSC agrees that the recommended reduction from maxABC is appropriate, as the model specification concerns raised during the 2023 full assessment still persist. No changes were made to the area apportionment method and resulting proportions. **The SSC concurs with the GOA GPT and author recommended apportionment of ABC**.

Arrowtooth Flounder - The arrowtooth flounder stock 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 2025. Arrowtooth flounder is managed in Tier 3a. The standard projection model was updated with 2022-2023 catch, and estimated 2024–2026 catches, resulting in small updates in specifications. **The SSC concurs with the GOA GPT and the author recommended ABC and OFL for 2025 and 2026, with no reduction from maxABC.** No changes were made to the area apportionment method and resulting proportions. **The SSC concurs with the GOA GPT and author recommended apportionment of ABC.**

Northern and Southern rock sole/Shallow Water Flatfish - The northern and southern rock sole and the shallow water flatfish complex is assessed every four years. The last assessment was in 2021. A harvest projection was presented this year and the next assessment is scheduled for 2025. Northern and southern rocksole are managed in Tier 3a and the rest of the shallow water complex is managed as tier 5. The standard projection model was updated with updated 2023 catch, and estimated 2024–2026 catches, resulting in small updates in specifications. **The SSC concurs with the GOA GPT and the author recommended ABC and OFL for 2025 and 2026, with no reduction from maxABC.** No changes were made to the area apportionment method and resulting proportions. **The SSC concurs with the GOA GPT and author recommended apportionment of ABC.**

Rex Sole - The rex sole stock is assessed every four years. The last assessment was in 2021. A harvest projection was presented this year and the next assessment is scheduled for 2025. Rex sole is managed in Tier 3a. The standard projection model was updated with updated 2023 catch, and estimated 2024–2027 catches, resulting in small updates in specifications. **The SSC concurs with the GOA GPT and the author recommended ABC and OFL for 2025 and 2026, with no reduction from maxABC.** No changes were

made to the area apportionment method and resulting proportions. **The SSC concurs with the GOA GPT and author recommended apportionment of ABC.**

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 2023 catch, and estimated 2024–2025 catches, resulting in small updates in specifications. **The SSC concurs with the GOA GPT and the author recommended ABC and OFL for 2025 and 2026, with no reduction from maxABC.** No changes were made to the area apportionment method and resulting proportions. **The SSC concurs with the GOA GPT and author recommended apportionment of ABC.**

GOA Pollock

The SSC received a presentation on efforts by the GOA pollock stock assessment author to address recommendations from a May 2024 CIE review and proposed model runs for the November assessment. GOA pollock is a Tier 3 assessment on an annual schedule. The SSC appreciates the efforts by the author and the detailed document describing the rationale and impact of key changes on assessment model estimates.

The specific proposed updates to the assessment model structure and input data represented in models 23a-d, include:

- Updates to the calculation of winter Shelikof and summer acoustic trawl (AT) survey index uncertainty, and input survey and fishery age composition sample sizes, to more accurately capture interannual variation.
- Incorporation of a formal link between winter Shelikof AT survey catchability and the observed proportion of mature individuals encountered, as a proxy for environmentally-driven mismatches between survey timing and spawning aggregations.
- Removal of the age-1 and age-2 indices from the Shelikof AT survey, given their perceived unreliability based on the design and intent of this survey in targeting pre-spawning individuals, and the strong impact of these indices on recruitment estimates which has resulted in implausibly low recruitment estimates in 2015-2016, 2020, 2022, and 2023.
- Changing from Francis reweighting of effective sample sizes (ESS) for age compositions, to the use of Dirichlet-multinomial likelihoods to directly estimate ESS.

For November 2024, the SSC supports the GPT and author recommendation to bring forward the following models, with updated data:

- The status quo Model 23
- Model 23d that includes each of the updates described above

The change from Francis iterative reweighting of age composition effective sample sizes to the use of a Dirichlet-multinomial likelihood had substantial impacts on management quantities. **Thus, the SSC requests the authors also bring forward Model 23c for November to better evaluate those impacts.**

The SSC discussed the GOA GPT recommendation that models informing Shelikof survey catchability with the proportion mature covariate should "turn off the penalty" on random walk survey catchability. Survey catchability had previously been allowed to vary as a random walk across time with a penalty on annual deviations, which may not be necessary if the proportion mature covariate is included to inform interannual variation. The GOA GPT co-chair clarified that the recommendation was to not include any additional random walk variation with the new covariate link. **The SSC supports the GPT recommendation to not include additional random walk variation in Shelikof survey catchability when the proportion mature covariate is included.** The SSC is pleased to see the use of a mechanistic linkage derived from ecosystem surveys directly implemented into the assessment model.

Pacific Cod

The SSC received a presentation on the GOA Pacific cod assessment and proposed model runs for November 2024. The SSC thanks the authors for their efforts to explore several necessary updates to the model input data, as well as size bin structure. GOA Pacific cod is a Tier 3 stock and a full assessment will be brought forward in November.

Model changes reflected in models 2019.1c.1 – 2019.1c.7 primarily reflect necessary model housekeeping updates, including corrections to the calculation of the lognormal standard deviation for the AFSC Longline survey RPN index, the assumed model months for survey index and conditional age-at-length inputs, and AFSC longline survey length bin indexing. Further updates included changing the plus-group length bin from 116 cm to 104 cm in recognition of the extremely limited number of years in which lengths >104 cm have been observed, and turning off estimation of recruitment forecast parameters for consistency with the EBS Pacific cod assessment. **Overall, these changes had modest impacts on estimated quantities, improving fit in some cases, and the SSC supports their implementation.**

Additional model explorations included Model 2019.1d, which updated aging error parameters through 2023, applying aging error beginning at age-1 in place of age-3 and pooling reader-tester data for Pacific cod across the EBS and GOA regions. **The SSC supports the decision to pool reader-tester data across regions to increase the sample size, and remaining proposed updates to addressing aging error.** Model 2019.1e addressed the observed increasing variability in fishery length compositions by eliminating a previously-implemented filter removing hauls with <10 length samples, and by merging state and federal length composition data within month-area-gear combinations for consistency with the treatment of catch data. **The SSC supports these efforts to provide more robust catch length composition data to the assessment model.** Finally, the authors explored the influence of moving from the current 1-cm length bin structure, to 2-cm (Model 2019.1e.2cm) or 5-cm (Model 2019.1e.5cm). Part of the justification for this change was to make first-stage length composition using VAST computationally tractable, and to reduce overall assessment model complexity. Changing to the 5-cm length bin structure resulted in a decrease in estimated SSB across the time series and a commensurate increase in estimated recruitment.

The SSC supports the GPT recommendation to bring forward two models in November: status quo Model 2019.1b and the updated Model 2019.1e.5cm, each with updated data.

With respect to the choice of length bin structure, the SSC recommends that the authors continue to explore finer bin structure closer to inflection points of key processes like selectivity and maturity, and areas of the growth curve where cod are growing quickly, rather than using uniform 5 cm bins across the length range.

The SSC supports continued research to include both AFSC longline survey and bottom trawl survey observations within a REMA model for apportionment, including environmentally-linked scaling parameters.

Thornyhead Rockfish

The GOA thornyhead complex is managed as a Tier 5 stock and is assessed on a biennial schedule, with a full model being presented in 2024. The random effects (REMA) assessment model is based on shortspine thornyhead caught by the bottom trawl survey and the longline survey. The author brought forward three models. Model 22 is the base model that included estimation of three area-specific process errors, one shared scaling coefficient, and additional observation error parameters for each survey. Model 24.1 estimates three area-specific process errors and a shared scaling coefficient but changed the methodology for estimating additional observation error parameters for each survey. Model 24.2 was the same as 24.1 but uses a single shared process error, as recommended for exploration by the GOA GPT and SSC. The SSC appreciates the work of the author in response to previous GOA GPT and SSC requests.

The SSC supports the GOA GPT recommendation to bring forward Model 22 and Model 24.2 in December.

Arrowtooth Flounder Research Models

GOA arrowtooth flounder authors presented a research track model to begin addressing previous GOA GPT and SSC recommendations by bridging the current ADMB model to TMB, which can be run as either a single- or multi-species model. Transitioning the model to TMB may improve parameter estimation and account for both the impacts of cannibalism and fishery removals. The authors brought forward four models: Model 1 was the current operational single species ADMB model from the 2021 SAFE with updated catch through 2023. Model 2 was a TMB single-species model with fixed natural mortality using CEATTLE. Model 3 was a TMB single-species model that estimated sex-specific natural mortality using CEATTLE. Model 4 was a TMB multi-species model using CEATTLE that included sex- age-, and time varying natural mortality due to cannibalism from arrowtooth flounder (Model 2) and sex-specific residual mortality (Model 1). **The SSC supports the GOA GPT recommendation that the bridging exercise was sufficient to go forward with the TMB single-species model using CEATTLE in 2025.**

Demersal Shelf Rockfish CIE Review

The SSC received an update on the CIE review of the yelloweye rockfish research model (Bayesian surplus production model) for the Southeast Outside management area and subsequent work done by the outgoing assessment author in response to the CIE review. **The SSC appreciates the efforts of the previous assessment author and supports continued exploration of this research model for SEO yelloweye as time allows, however, recognizes the large amount of work (management strategy evaluation) that would be needed to implement this model for harvest specification.**

Demersal Shelf Rockfish Update

Demersal shelf rockfish (DSR) will be assessed in 2024 for the first time as two stock complexes with separate OFLs and ABCs for the WG/CG/WY and EY/SEO, per the October 2023 Council motion. DSR is on a biennial assessment schedule with an update assessment in 2024. For yelloweye rockfish in EY/SEO, the 2024 assessment will use Model 22.2, the accepted model from 2022. There are assessment author changes for the 2024 DSR assessment, due to the previous lead author taking a new position. The SSC was also informed that there is not sufficient funding for an ADF&G ROV survey in SEO at this time and there will be limited data available to inform future assessments. **The SSC appreciates the update and supports the authors obtaining DSR CPUE and length data from the IPHC survey as practicable and possible for the two agencies.**

Dusky and Northern Rockfish Apportionment

Both the dusky and northern rockfish assessments currently use design-based survey abundance estimates with REMA to apportion the ABC among GOA management areas despite using a model-based index of abundance (VAST, delta-lognormal version) in the assessment model. The authors provided a comparison of design-based estimates versus model-based VAST estimates for apportionment. Dusky apportionment was compared across WGOA, CGOA, and EGOA. Northern rockfish apportionment was compared across WGOA and CGOA. For northern rockfish, the EGOA is not included in the apportionment model because <1% of biomass occurs in this region. Conventional practice has been to allocate 1 t of the EGOA northern rockfish ABC to the Other Rockfish complex for the EGOA during the specifications process. The authors noted the apportionment based on design-based and model-based methods differ, but neither represent biological concerns considering the highly variable survey estimates. Authors also noted in some years there are substantial differences in apportionment of ABC between Western and Central areas.

The SSC appreciates the authors' work to address consistency in methods between the assessment and apportionment. Before changing apportionment methodology, the SSC recommends the authors explore implementing both model-based index standardization and temporal smoothing within a single VAST model for apportionment. Specifically, the SSC recommends consideration of a VAST model parameterization that assumes the annual intercepts (year effects) are structured as an AR-1 process, and the spatiotemporal random effects (annual spatial fields) are assumed to follow a random walk. The SSC recommends bringing back the current design-based apportionment (for northern rockfish this includes comparing the single shared process error and different process errors for the WGOA and CGOA as requested by the GOA GPT), model-based index standardization (VAST apportionment presented at this meeting), and model-based index standardization and temporal smoothing in December. If that is not possible due to time constraints, the SSC recommends using the currently implemented design-based apportionment in December and bringing back the comparison of three methods at a later date.

The SSC supports the GOA GPT's recommendation for the authors to further evaluate and recommend an allocation method to further subdivide the EGOA allocated ABC into West Yakutat and Southeast subareas when using VAST since the current allocation method for the design-based estimator is not easily replicated in the model-based framework.

Dusky Rockfish Model Runs

Dusky rockfish is managed as a Tier 3 stock and is assessed on a biennial schedule with a full model being presented in 2024. Dusky is assessed with an age structured assessment model, implemented in ADMB and based on a generic rockfish model. The author brought forward three models. Model 22.3a (base model) incorporates a model-based (VAST) trawl survey biomass index with a normal error distribution. In Model 22.4a, trawl survey biomass was fitted using a lognormal error structure, which aligns with the common assumption in assessment models. Model 22.5a is the same as Model 22.4a with a change in the recruitment years used for computing the mean for the projection model. The model start-year was changed from 1979 to 1977, to follow the conventional year range. This affected estimates of $B_{100\%}$ and $B_{40\%}$.

The SSC supports the GOA GPT recommendation to bring forward the base model (22.3a) and Model 22.5a (includes both model changes described above) for comparison in December.

Northern Rockfish Model Runs

Northern rockfish is managed as a Tier 3 stock and is assessed on a biennial schedule with a full model being presented in 2024. Northern rockfish is currently assessed with an age structured assessment model implemented in ADMB. The author brought forward three models. Model 22.1(base model) incorporates a

model-based (VAST) trawl survey biomass index with a normal error distribution. In Model 22.1a, trawl survey biomass was fitted using a lognormal error structure, which aligns with the common assumption in assessment models. Model 22.1b used input sample sizes (ISS) that incorporated growth variability and aging error. **The SSC supports the GOA GPT recommendations to accept these as improvements to the base model for December.**

The author also brought forward a bridging analysis to convert the northern rockfish model from ADMB to RTMB. The SSC supports the GOA GPT recommendation for further evaluation of small differences in the bridging between ADMB and RTMB in December. Therefore, **the SSC supports the GOA GPT recommendation to bring forward the base model (Model 24, the last full model accepted by the SSC for northern rockfish, Model 22.1b, with the model and data corrections described above and converted to RTMB code) and Model 24.a, which has priors placed on the selectivity parameters and freely estimated M.**

Rockfish Spatial Management

The SSC received the GOA GPT report on this discussion paper. The SSC appreciates the discussion paper and notes the paper was informative in laying out the apportionment processes and mapping management allocations to the apportionments of the ABC. The discussion paper also provides useful background on when rockfish species have been put on PSC status, current status of biological knowledge, and generally the difference between an overall ABC corresponding to the area-wide OFL versus sub-area apportionments of the ABC.

The SSC notes the GOA GPT concerns about the role of assessment authors in setting apportionment methods. The SSC highlights that current apportionment is precautionary for stocks with limited stock-structure information, and there currently is no conservation concern. However, flexibility in apportionment across areas or changes to areas may be possible for some stocks as described in the discussion paper.

GOA Preliminary Groundfish Harvest Specifications and halibut DMRs

The SSC recommends approval of the preliminary 2025/2026 GOA groundfish specifications and apportionments as provided by the GOA GPT. The SSC supports the GOA GPT's recommendation to approve the Halibut DMR Working Group recommendation for proposed halibut DMRs for 2025/2026.

C3 Sablefish ESP

The SSC received a presentation from Anna Henry (NPFMC), Rusty Dame (NOAA-AFSC), and Kalei Shotwell (NOAA-AFSC) on the description of the new socio-economic sablefish indicators intended for use in the 2024 Ecosystem and Socio-economic Profile (ESP) of the Sablefish stock in Alaska. Oral public testimony was provided by Megan Williams (Ocean Conservancy), who also spoke on behalf of Linda Behnken (Alaska Longline Fishermen's Association). The SSC considered this public comment in making its recommendations. No written public comments were received.

The SSC thanks the authors and appreciates the development of the indicators in a transparent/open process that was responsive to a December 2023 SSC request, which was supported by the Council. The SSC noted that the development of socio-economic indicators is a part of an ongoing and evolving larger effort to coordinate the inclusion of socio-economic information in the Council process as appropriate and relevant into multiple Council decision-informing analytic products. The SSC looks forward to hearing of further progress on this initiative in an update scheduled for the December 2024 Council meeting. The SSC

acknowledges that the development of the ESP framework in the North Pacific has received national recognition, which has led to their adoption in other regions, as was evident at the recent SCS8 meetings.

The SSC recommends the authors make clear that ESPs, including this one, have multiple audiences. Assessment authors, Plan Teams, and the SSC can use ESP indicators that inform the status of the stock for possible reductions from maximum permissible ABC through the risk table process. For any fishery performance indicators that can be used in the risk table to inform the status of the stock, the SSC recommends referring to them by descriptive names (e.g., catch per unit effort, local knowledge, traditional knowledge) rather than in general terms as "socio-economic information" to avoid confusion and/or create the impression that the Council policy to not use socio-economic information in setting ABCs has been misunderstood. The Council can use ESP information, including the proposed socioeconomic indicators, to inform their TAC-setting decisions. The SSC has asked for the inclusion of socio-economic indicators in its role of reviewing analyses for best scientific information available for management decisions such as TAC setting.

With respect to the specific newly added socio-economic indicators, the SSC was supportive of the general usefulness of those indicators. The SSC agreed with the analyst that these indicators may not be appropriate for all species. Instead, the SSC supports flexibility in tailoring indicator selection to species.

The SSC appreciates the continued effort to bring forward in-season data on social and economic conditions associated with fisheries and synthesize the observed outcomes for use in the Council process. While in-season data provides timely characterization of the social and economic conditions within the fishery at the time of TAC setting, it has not been widely applied because it does not reflect end-of-season dynamics. The SSC appreciates the analyst's efforts to find sources of in-season data, check the outputs against established data, and develop a replicable process to provide this information in a low-cost manner in the future. The SSC also supports strategies to use analyst time efficiently while providing timely information. For example, the SSC supports using bullet point summaries within ESPs to characterize socioeconomic conditions. The potential to use Restricted Access Management (RAM) summary data on regional TAC utilization was discussed, and the SSC supports efforts to scope other data sources that may be developed for other uses but could be leveraged as a low-effort input to ESPs.

The SSC had some specific recommendations regarding refinement of the suite of new indicators to be included in future sablefish ESPs. The SSC recommends that the authors develop narrative text, if not additional graphic indicators, that allow for the identification and inclusion of relatively small communities that are substantially dependent on or substantially engaged in the sablefish fishery. These communities may be the most vulnerable to adverse circumstances in the fishery and are not currently identified in the ESP, due to the tendency of regional quotient to highlight larger communities. The SSC also recommends that the authors consider adding value and harvest volume for trawl fisheries to Figure 1, noting that this would be an aggregate across size classes because value by size-grade information is unavailable for the trawl sector.

The SSC also recommends the authors consider developing indicators such as an average community diversification over time, similar to one developed for the California Current ESR, which measures whether communities were diversifying their portfolio of landings over time or becoming more dependent on fewer species. In calculating that particular index, diversity indices for all fishing communities are necessarily calculated and therefore individual indicators at the community level are generated that could be used to create indicators useful in a variety of documents (i.e., ESRs, ESPs, SAFEs, and ACEPO).

C5 Crew Data Collection – Initial Review

The SSC received an initial review analysis of a uniform crew data collection protocol and instrument across North Pacific managed fisheries. The presentation was led by Michael Fey (AKFIN) and Sarah Marrinan (Council staff). Public testimony was received from Chad See (Freezer Longliner Coalition) and Rebecca Skinner (Alaska Whitefish Trawlers).

The SSC is strongly supportive of efforts to collect data that describes crew participation and dependence in a consistent, comprehensive way. This initiative follows EDR processes that have been curtailed or discontinued because their administrative burdens exceeded their analytical value. However, crew data was identified as one of the most important social and economic data gaps by the Social Science Planning Team, and the SSC notes that crew surveys in both the Northeast and Southeast regions have coordinated efforts to develop a standard set of questions to better understand crew as fishery beneficiaries affected by Council actions, and to streamline the Paperwork Reduction Act process. Designing a successful crew data collection process—one that stakeholders acknowledge supports the Council in its mission—requires careful consideration of the record keeping and reporting burden, agency administrative burden, and ways the data will be used in monitoring and to inform future Council decisions.

The SSC appreciates the efforts to ensure that crew data being considered could be linked to current databases that are foundational to Council analyses. The analyst has clearly demonstrated the feasibility of using crew license data in Council analyses across the federally managed fisheries.

The SSC appreciates the analysts' effort to bring additional information on costs and benefits at this stage of the process. New contributions include a completion cost analysis, demonstration of the utility of crew data where EDR programs have made it available, and a novel consideration of how crew data can improve the equitable distribution of fishery disaster assistance. However, the structure and information provided do not achieve the SSC's June 2023 recommendation to include "a clear mapping between goals of the crew data collection and the specific questions posed, instrument used and pathway to Council documents." Specifically, this document does not provide clear comparisons of the reporting and administrative costs with analytical benefits of collecting different resolutions of crew data that are sufficient to allow the Council to identify which, if any, crew data elements have informational benefits that exceed their collection costs. **The SSC emphasizes that scientific best practice requires identifying the target data elements in advance of developing an instrument to collect them, and therefore the SSC finds this analysis is not sufficient to inform the Council for final action.**

The SSC notes that the costs and benefits of collecting crew data vary based on the data elements and resolution collected. For example, the collection could target only the total amount each vessel paid to its crew each year; this requires minimal additional recordkeeping for vessels (total compensation is a line on tax forms), but may also have limited analytical value. Targeting compensation per crew member requires decomposing this total among individuals, but only minimally increases reporting burden (individualized amounts are on 1099s), and may increase analytical value. Linking individual crew compensation to individual effort requires additional information on days worked for each crew member, which vessels may not currently track, increasing reporting burden, but the additional information may also increase usefulness. Each of these elements might further be disaggregated by fishery, increasing reporting burden but allowing inclusion in fishery-specific monitoring and analysis. Additional information could allow tracking of crew across years, at additional reporting costs. Since the recordkeeping and reporting costs, agency administrative costs, and informational contributions to monitoring and analysis vary based on which elements are collected at which resolution, consideration of the costs and benefits of a crew data collection program hinges critically on these choices.

To support identification of desirable data elements such as those described above, **the SSC recommends that the information in this document be reorganized and supplemented to more explicitly represent how the costs and benefits of collecting crew data vary based on the data elements and resolution collected. This is necessary for the Council to provide guidance on target data that strikes the desired balance between cost and benefit**. The SSC recommends, as a first step, developing a list of data elements about crew and alternative resolutions at which they could be collected (e.g., vessel, fishery; year, day working); these elements could be listed as rows in a table, with incrementally increasing granularity. This list could be informed by experience with EDRs, but also through consultation with analysts and the public, and drawn from Council actions where the SSC, AP or Council have noted insufficient crew data in the past. Then, for each alternative target element and resolution, characterize the incremental reporting and record keeping cost, administrative cost (this may not vary much), assumptions that would be required to aggregate this information in a usable form, and the specific analytical benefit(s). This would clarify for both the Council and the public the costs and benefits of alternative crew data collections. The examples provided in Appendix 1 reflect three alternative collection approaches, but the SSC recommends expanding this set and restructuring the discussion of costs and analytical benefit to emphasize differences among them.

In assessing the costs and benefits for each data element and resolution, the SSC suggests considering the following:

- Much of the information and analysis necessary to characterize costs and benefits is already present in this document, but needs to better reflect the differences in costs and benefits of including specific elements.

- In characterizing the analytical benefits of each set of data elements, seeking to identify specific types of Council actions where crew data would have had probative value will be more meaningful than identifying generally where it could be reported or included. The existing analysis of how crew data from EDRs has appeared in Council reports and RIRs for Council actions is useful in this regard, but needs to be associated with incremental data elements.

- The SSC appreciates the thought that has gone into storing and linking potential crew data to other databases to support Council documents and encourages inclusion of additional detail on this process. This would both serve to highlight the feasibility of data analysis and also provide a structure through which to identify any assumption that will be required to create non-confidential aggregates that can be used in Council documents.

- One of the impacts of implementing a uniform crew data collection would be the loss or change in information available to EDR fisheries that collect crew data, and those analytical benefits and costs should be reflected.

- Different fleets may experience different costs for reporting the same information. A particularly important distinction is between large, corporate owned vessels and small family owned vessels, who will have dramatically different recordkeeping practices and relationships with their crew members. It may be helpful to explicitly describe the requirement of a crew license for a crew member that is not paid (potentially a family member) and implications of zero pay for aggregate or community statistics.

- Some elements will have alternative ways of accessing them, rather than asking vessel owners to report directly as part of this collection. For example, the crew license number could be used as a key to access basic demographic information from the crew license database. The costs and likely feasibility of these alternative approaches should be characterized alongside those of direct collection.

- The SSC supports the current effort to create a durable ID for crew members and notes that this would provide additional benefits from crew data collection.

Following Council guidance on the target data elements, the SSC recommends a data collection process that follows best practices for data collection implementation. **Key elements of best practice include partnering with experts in designing data collections to draft and refine the data collection instrument itself, drawing on national efforts to design crew information surveys (which may expedite PRA analysis), and thorough beta testing of the instrument across the range of respondents.** The latter step is critical to ensure the instrument collects meaningful uniform data; given the majority of respondents will be small operations, the EDR experience with industrial fisheries may not have encountered all circumstances a uniform data collection will face. Finally, the SSC recommends including some discussion on how these types of data are protected from revealing confidential business information through policy and procedures.

D2 Climate Funding

The SSC received presentations on climate related action items from Katie Latanich (NPFMC) and Diana Stram (NPFMC). The SSC received public comment from Linda Behnken (Alaska Longline Fishermen's Association).

Climate Scenarios Workshop Report

Katie Latanich (NPFMC) presented a report on the Climate Scenarios Workshop, held June 5-6, 2024 both in person in Kodiak, Alaska, and virtually. The workshop was well attended, with over 200 participants. The report compiles ideas from the workshop and synthesizes potential next steps for the NPFMC to consider.

The SSC highlights the immense effort and planning involved in organizing the workshop. The workshop was a unique opportunity to bring together broad representation and perspectives on a critical challenge facing Alaska. The facilitated breakout sessions were especially useful for focusing an amalgam of expertise, knowledge systems, and perspectives on climate-related issues and challenges. This approach both identified specific issues and generated a rich ecosystem of ideas to address many complex issues. The challenge now is to transform ideas into appropriate and meaningful future actions.

The SSC was impressed with the amount of information clearly synthesized in the workshop report. The report provided a comprehensive review of the issues discussed during the breakouts, and offered a marketplace of ideas from which to select for use in future potential actions. Based on the workshop report, the SSC offers several strategies for advancing the process, including refinement of objectives and ideas, integrating various climate-related activities, creating actionable items, and enhancing communication, all of which will be part of an iterative process.

In considering how to refine the workshop's marketplace of ideas into potential future actions and aligning with necessary processes, three elements in the report were particularly helpful:

- Key messages: These provide a synthesis of key issues, potential solutions, and knowledge gaps discussed during the workshop.
- Baseline: This section provided a discussion on issues to consider in planning and identifying existing pathways, gaps in information and considerations of community vulnerability.
- Staff discussion and ideas for next steps.

An important topic described in the staff discussion section of the report is establishing a clear understanding of the issues to be addressed by formulating tangible actions that can be evaluated against anticipated outcomes. **Specifically, it is essential in this process to identify specific issues/objectives we aim to address (i.e., what is the problem we are trying to solve) and align them with specific and actionable steps, all while taking resource constraints (such as funding and staffing) into account.**

A step toward answering these questions and leveraging the workshop would be to refine the "key messages" into tangible and specific statements about the issue being addressed (e.g., tangible problem or objective statements). Some groundwork has already been laid in the staff discussion and baseline sections of the workshop report. This could be expanded to create more precise and meaningful identification of objectives that could be acted upon through alignment of viable solution-orientated ideas from the workshop and other sources such as the SCS8 workshop, LKTK work, and CCTF. This will require further integration across "key messages" to align them with objectives. For example, separate key messages defined as bycatch management, dynamic in-season management, and rapid response capability, all focus on the similar issues of increasing flexibility, responsiveness, and precision in management, but still remain somewhat ambiguous (e.g., management of what and responsive how?). But through an iterative refinement process, these issues could be evolved to target specific and tangible objectives and associated actions.

As part of this exercise, identifying coordination pathways and data streams such as subsistence and fishery dependent data streams, and building on existing networks will be important to identify early in the process (e.g., Leo Network, Skipper Science, Gravel-to-Gravel, fishery dependent data sources). The CCTF has done work in identifying knowledge sources and this is an important source of information moving forward.

Development of this type of planning framework would allow easier identification of potential scope associated with the issues/objective (e.g., Council's purview or not, is it climate resilience related), onramps or implementation gaps, and linked to the specific ideas to address objectives, based on workshop results. Metrics could also be designed around common understanding about whether actions are meeting objectives and informing where adaptive responses are required. Further, this type of exercise could inform baselines in terms of better defining where we are currently at in regard to a specific objective versus where we need to go, and could be done so in a way that it can be viewed across different topics. For example, some elements related to the key message in Section 3.7 of the report, 'Harvest Specifications and TAC, and Risk,' have elements being developed as part of the IRA funding package (Objective 3), which is more specifically discussed and refined in the SCS8 discussion paper.

Guidance from this type of iterative planning exercise could be organized into a table, aiding in the identification of issues/objectives and associated processes/pathways for action (see https://www.pcouncil.org/documents/2022/03/h-3-a-supplemental-ewg-report-2.pdf/ for an example starting point). It would also help delineate the scope of initiatives and track refinements and metrics, and identify resource needs. Additionally, complementing this planning tool with communication strategies would allow for clear illustration and tracking of numerous climate-related initiatives.

This is especially important due to the complexity and diversity of this issue and the large number of climate related initiatives that may or may not interact. Having a communication strategy will significantly assist the Council's audience in managing expectations and recognizing anticipated actions.

Climate Science/SCS8 Discussion Paper

The SSC received a presentation from Diana Stram (NPFMC) on the SCS8 meeting and next steps. The SSC thanks the attendees and everyone who contributed to the presentation, and looks forward to the full SCS8 report. The SSC was also excited to hear that IRA funding has arrived for, among other things, an analyst to support and extend ongoing work on a sablefish MSE that is relevant to the next steps identified in this report and was outlined in the April 2023 SSC report. The SSC also appreciates the update from SSC member Curry Cunningham about how related work is continuing to move forward.

Priority areas and next steps

The report identified two main priority areas related to next steps: (1) Consider to what extent, and whether, to revise groundfish harvest control rules (HCRs) to be more climate-resilient; and (2) Compile social and economic information to meet the needs of using the best scientific information available (BSIA) and informing Council decision-making.

The SSC generally supported the next steps outlined related to groundfish HCR revisions and questions around how to improve their climate resilience. The SSC noted several factors to consider with regard to robustness of HCRs to climate change:

- Shape: where the inflection point is and the slope of the HCR.
- Identification of stock size targets under a changing climate: work is needed to build a shared understanding of past decisions, current issues, and challenges to moving forward.
- Consideration of system-level and species-level productivity: current knowledge regarding these processes to understand the changes that are happening and how to incorporate changing dynamics into OY ranges and HCRs, or in the management process more generally, should be assessed.
- Recognition of the potential for climate-induced changes in the spatial distribution of marine fish populations and the implications for allocation of ABC or TAC to management areas.

Although the SSC supports moving forward regarding groundfish HCRs, the SSC notes that **there is a similar need to be thinking about crab HCRs**. Furthermore, there are examples within the crab fisheries related to changes in stock size targets. However, there has been some variability in the crab analyses with regard to setting targets and criteria used to justify a change. The SSC notes the crab fisheries provide examples of potential approaches, but these fisheries also highlight the value of planning in advance with the goal of developing an approach that is applied consistently.

The SSC also has additional recommendations regarding next steps in the process of providing information to the Council to support development of climate-resilient HCRs:

- Systematically take inventory of the status quo, identity issues with the current system on a species-by-species basis;
- Review existing literature and ongoing research on management approaches to climate change impacts in the North Pacific and elsewhere as appropriate;
- Consider group-specific reference levels reflecting heterogeneity across species, which could include life history traits in developing the groups; and
- Identify changes that can be implemented more rapidly without a FMP change.

With regard to the second priority - compiling social and economic information to inform Council decision-making – the SSC generally supports the proposed next steps. The SSC appreciates the efforts to identify the appropriate vehicles and timing to present social and economic data and the presentation of the new ESP indicators, and looks forward to reviewing a more comprehensive plan in December. The SSC also supports the plan to develop a figure to depict information about where social and economic data will be presented (in terms of reports/products) and potentially the timeline with which the information will be available during the year relative to the TAC setting process. The SSC highlighted several issues not raised in the presentation for consideration during the scoping of next steps:

- **Local knowledge/traditional knowledge could provide information on the current state of fishery socioeconomics and skipper surveys could be a valuable tool to solicit local knowledge.** A common challenge with social and economic data is that there is a lag in reporting, which local knowledge and traditional knowledge can help overcome. For example, the South Atlantic and Mid-Atlantic have directed questions when they bring their AP together to elicit more timely information about the status of their fisheries.
- **The SSC also encourages further work to explore what the scope of the problem is with regard to community vulnerability.** For example, which communities are vulnerable and what is the specific nature of their vulnerability?

Workshop

SSC input was solicited on whether a future SSC workshop might be a useful venue to further explore topics presented. The workshop could explore which of the proposed mechanisms and tools should be pursued in the short-term. **The SSC generally supported and would participate in a workshop on this topic, but expressed concerns over the capacity to organize such a workshop in the near term. However, a limited workshop to provide guidance on priorities that could be pursued by analysts or working groups would be helpful.**

Additional considerations around climate-resilience

The SSC had a discussion around: what is the problem that is being addressed? And highlighted several additional considerations that were not raised in the document but which the SSC encourages be considered as next steps:

- The importance of considering potential increases in productivity in the system overall and for individual stocks, in addition to stock collapses (decreases in productivity).

- Continuing to jointly consider both ecological and policy changes when thinking about next steps. Given likely increases in variability from a biological perspective, yet industry/community calls for socioeconomic stability to build resilience, an understanding of social and economic conditions, opportunities, and constraints could be used to develop insights into management and policy approaches that the Council could consider to support social, community, and economic resilience.

- Continuing to explore biological and management considerations around apportionment and sub area ABCs.

- Additional preparation to understand species range changes. Tools to prepare are available and include model-based survey analyses. Fundamental to progress is recognition that the relevant ecology boundaries may not match management or sociopolitical boundaries.

- The importance of linking general ideas to actions as climate resilient management policy requires action and specifics to operationalize.

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 2024 meeting, a number of SSC members acknowledged associations with specific agenda items under SSC review. Chris Siddon noted that he supervises Katie Palof (CPT co-chair, BBRKC assessment author) and Caitlin Stern (SMBKC 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). Andrew Munro supervises Toshihide "Hamachan" Hamazaki, NSRKC proposed model runs author (C1 BSAI Crab). Ian Stewart and Jason Gasper are members of the Halibut DMR working group report (C3 Groundfish). Dr. Gasper is also married to Cindy Tribuzio (BSAI GPT Vice chair, BSAI/GOA assessment author, and is a member of the Data Limited Methods working group). Robert Foy is the third or greater level supervisor for contributors to the following agenda items: Ebett Siddon (C1 ESR preview); Cody Szuwalski, Mike Litzow, and AFSC members of the CPT and AFSC crab stock assessment authors (C1 BSAI crab specs); Kalei Shotwell, Jim Ianelli, Steve Barbeaux, Chris Lunsford, and AFSC members of the GPT and AFSC groundfish stock assessment authors (C3 Groundfish); Sarah Wise (B4 AFSC report). Dana Hanselman is the first level supervisor of Groundfish Plan Team GOA co-chair Chris Lunsford and EBS ESR lead Elizabeth Siddon. Dr. Hanselman is also the second or greater supervisor of other Plan Team members and contributors, Pete Hulson, Jane Sullivan, Kristen Omori, Kevin Siwicke, Cara Rodgveller, and Katy Echave. Finally, Dr. Hanselman is also married to Dr. Shotwell, BSAI plan team co-chair, author of ESPs and BSAI and GOA arrowtooth assessments. Dr. Hanselman is also a coauthor of BSAI and GOA arrowtooth assessments.