SCIENTIFIC AND STATISTICAL COMMITTEE
DRAFT REPORT TO THE
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
February 5th – 7th, 2024

The SSC met from February 5 – 7th, 2024 in Seattle, WA. Members present in Seattle were:

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

SSC Election of Officers

The SSC re-elected Sherri Dressel (ADF&G) and Franz Mueter (University of Alaska Fairbanks) to serve as co-chairs for 2024. The SSC also re-elected Alison Whitman (ODFW) to serve as vice chair. Dr. Dressel will lead the February, June and December meetings and Dr. Mueter will lead the April and October meetings.

SSC Administrative Discussion

The SSC extends a warm welcome to new alternate member for Washington Department of Fish and Wildlife, Fabio Caltabellotta. The SSC is appreciative to the Council for his appointment.

The SSC received a presentation from Diana Evans (NPFMC) describing protocols and other announcements for the meeting. Ms. Evans provided updates on the Council's Climate Resilience Proposal

for IRA funding and the upcoming Climate Change Task Force workshop at the June meeting. She also described work underway to evaluate information available and staff capabilities for advancing the presentation and incorporation of social and economic information in the NPFMC process. Ms. Evans introduced Abigail Harley, the new head of the Economic and Social Science Research Program at NOAA-AFSC. The SSC appreciates the opportunity to meet Ms. Harley and looks forward to working with her. Ms. Evans reported on the options for the SSC review cycle in 2024 and 2025 given the Council's April 2023 direction for no in-person Council meeting in February 2025. These included possible opportunities for the SSC to meet virtually or to have an in-person or virtual SSC workshop.

Robert Foy (NOAA-AFSC) provided the SSC with brief updates for AFSC, specifically the use of IRA funds for survey modernization, marine mammal charters, research and development of AFSC acoustics, opportunities to improve indigenous engagement and collaboration in research, and socio-economic studies conducted to better inform Arctic policy decisions.

C1 BSAI Crab

The SSC received a report on the January 2024 Crab Plan Team (CPT) meeting from Sarah Rheinsmith (NPFMC), Katie Palof (ADF&G), and Mike Litzow (NOAA-AFSC). The SSC also received oral public testimony from John Gauvin (Alaska Seafood Cooperative) under the Balance of the CPT Report section of the agenda item.

BSAI Crab SAFE and Harvest Specifications

The SSC reviewed the Norton Sound red king crab (NSRKC) SAFE chapter and information provided by the CPT with respect to the stock status information from 2023/2024 relative to total catch during the 2023/2024 season (Table 1). In addition, Table 2 contains the SSC recommendations for 2024/2025 harvest specifications. The remaining crab SAFEs will be reviewed, and harvest specifications set at the June and October SSC meetings. The 2025 NSRKC SAFE review is planned for the SSC in December 2024, if scheduling allows (see Balance of CPT section).

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).

Chapter	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			65.77		15.44		
2	BB red king crab	3			14.98		4.42		
3	EBS Tanner crab	3			48.77		36.20		
4	Pribilof Islands red king crab	4			3.88		0.685		
5	Pribilof Islands blue king crab	4			0.18		0.00116		
6	St. Matthew Island blue king crab	4			1.31		0.07		
7	Norton Sound red king crab[2]	4	1.20	2.02	2.40	1.19	0.31	0.2	
8	AI golden king crab	3			12.07		4.18		
9	Pribilof Islands golden king crab[3]	5					0.114		
10	Western AI red king crab	5					0.056		

[1] As estimated in the 2023 assessment.
[2] For Norton Sound red king crab, MMB on 2/1/2024 is estimated using the current assessment in January 2024. Stock status for NSRKC is determined in February.
[3] PIGKC specifications are set on a calendar year basis.

Table 2. SSC recommendations for NSRKC. Stocks for which specifications are rolled over between assessments (PIRKC, PIBKC, PIGKC and WAIRKC) 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).

Ch.	Stock	Tier	F_{OFL}	B_{MSY} or B_{MSY}proxy	B_{MSY} basis years[1]	2024/2025[2] MMB	2023/24 MMB / MMB_{MSY}	Natural Mortality (M)	2024/25 OFL	2024/25 ABC	ABC Buffer
1	E. Bering Sea snow crab	3b									
2	Bristol Bay red king crab	3b									
3	E. Bering Sea Tanner crab	3a									
4	Pribilof Is. red king crab	4a	0.21	1.71	2000-2021	3.88	2.27	0.21	0.685	0.51	25%
5	Pribilof Is. blue king crab	4c	0	4.20	1980/81-1984/85; 1990/91-1997/98	0.18	0.04	0.18	0.00116	0.00087	25%
6	St. Matthew blue king crab	4b									
7	Norton Sound red king crab	4a	0.18	2.02	1980-2024	2.5	1.24	0.18	0.332	0.233	30%
8	Aleutian Is. golden king crab[3]	3									
9	Pribilof Is. golden king crab[4]	5	-	-	-	-	-	-	0.114	0.085	25%
10	W. Aleutian Is. red king crab	5	-	-	-	-	-	-	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. MMB on 2/1/24 is estimated using the current assessment for Norton Sound red king crab.
[2] MMB is estimated on 2/1/2024 for Norton Sound red king crab and on 2/15/2024 for all other Tier 1-4 stocks, using the current assessments.
[3] AIGKC OFL and ABC are calculated by combining two separate assessment models for the EAG and WAG, as presented in the current assessment
[4] PIGKC specifications are set on a calendar year basis

Norton Sound Red King Crab

The SSC thanks the CPT and author for the NSRKC 2024 assessment and for being responsive to the SSC's requests. In particular, the timeline of previous recommendations and their responses provided an opportunity to inform future recommendations or clarify past requests. The SSC appreciated the detailed review of past survey efforts.

The assessment was updated to include the following new data from 2023: retained catch for the winter and summer commercial fisheries, carapace length compositions for the summer commercial fishery, total and retained catch for the winter subsistence fishery, standardized CPUE time series, and survey abundance and shell condition/size composition data from the 2023 NOAA Northern Bering Sea (NBS) and ADF&G summer trawl surveys.

The assessment provided results from three models (21.0, 23.0, and 23.1). Model 21.0 was the previously accepted base model with new 2023 data and assumed a constant M of 0.18 yr^{-1} for all length classes except the largest (>123mm CL), for which M was estimated at 0.61 yr^{-1}. Model 23.0 was identical in structure to 21.0 except that a single M was estimated and applied to all length classes.

Model 23.1, requested by the SSC, was identical to model 23.0, except that a prior on natural mortality (M) from the Bristol Bay red king crab (BBRKC) assessment was used. The results of this model were not brought forward for review by the CPT or SSC, as the author considered the results to be similar to the other models. The SSC considered this model as a potentially viable model for setting harvest specifications at this meeting, but the lack of detailed information on model fits, parameter estimates, and model output precluded its adoption by the SSC. Given that other red king crab stocks are data-poor, the SSC recommends using the prior distribution for M established for BBRKC in these assessments, including the NSRKC assessment, unless information is available for the particular stock that suggests use of a different prior. The SSC notes that empirical studies to inform the prior on M would be very useful. However, in the absence of empirical estimates, the prior developed for BBRKC is recommended.

The SSC agrees with the CPT and the author to use Model 21.0 for setting harvest specifications, which places the stock in Tier 4a. **The SSC also supports the CPT-proposed total catch OFL and a 30% buffer for the ABC, which is consistent with last year's buffer**. The SSC appreciates the CPT table providing a rationale for the buffer and the comparison to the previous assessments. **Results from Model 21.0 indicate that the NSRKC stock is not overfished and catch during 2022/2023 did not exceed the OFL, so the stock is not subject to overfishing.**

The SSC supports the CPT recommendation that the effort to complete the transition to GMACS be the top priority for this assessment. In doing so, the SSC emphasizes the need to provide bridging models between the current model and the GMACS version and looks forward to reviewing those. The SSC requests that the CPT and the assessment authors coordinate to ensure that the bridging models are available for review at the September/October 2024 CPT and SSC meetings.

The SSC also supports completion and consideration of laboratory maturity studies to further inform size at maturity for potential use in future assessments. This information would provide the basis to move NSRKC to Tier 3 in the future.

The SSC notes that empirical studies to inform the prior on M would be very useful but recognizes that such studies are logistically challenging.

In addition, the SSC has the following specific recommendations for the stock assessment author:

- Provide details on net mensuration data available for the ADF&G trawl net being used on different vessels with potentially different selectivity.

- Consider developing an index of abundance based on the multiple survey data efforts by further identifying the core stations among the surveys within broader grid cells instead of only those that overlap directly.
- Given the reliance of this assessment on the fishery-independent survey observations within Norton Sound, and the potential for differences in survey gear between NMFS and ADF&G operations, the SSC encourages the authors to explore whether differences in gears used during the NMFS triennial surveys (1976-1991), the ADF&G triennial surveys (1996-2014), and ADF&G annual surveys (2017-present) warrant consideration of time blocks for survey selectivity to account for these changes.
- The SSC highlights that spatiotemporal models can help to address spatial imbalance in sampling among years, not only for the development of abundance indices, but also for first-stage expansion of size composition data (see Thorson and Haltuch 2019[1]). The SSC encourages the exploration of VAST, sdmTMB or an alternative platform for addressing the interaction between variation over time in the areas sampled by Norton Sound surveys and the potential for spatial variation in RKC size structure.

Finally, the SSC notes the CPT-proposed change in the timing of the review of this assessment. SSC comments related to the timing of the crab assessment cycle are provided in the Balance of the CPT SSC report section.

Aleutian Islands Golden King Crab Model Runs

The SSC was presented with proposed models to be brought forward for the annual assessment of Aleutian Islands golden king crab (AIGKC).

The SSC appreciates the work by the assessment author and others to transition this assessment to the GMACS framework, as well as the detailed bridging analysis and responses to the May 2023 CPT and June 2023 SSC comments. The SSC also appreciates the efforts toward reproducibility and better documentation of historical data.

The models proposed by the author and recommended by the CPT were:

- Model 23.0a, to be used as the base model and updated from Model 21.1e2 (the base model from the June 2023 assessment), updated with data from more recent years, a new bycatch expansion adjustment, and a new CPUE standardization method using a GAM;
- Model 23.1: Model 23.0a, but utilizing a truncated size composition (i.e., first bin: 101 - 105 mm);
- Model 23.1b: Model 23.1, but utilizing two selectivity periods in the pre-rationalized directed fishery;
- Model 23.2 (EAG): Model 23.1b, but including the cooperative survey as an additional fleet (i.e., CPUE + size composition).

The SSC agrees with the recommendation by the CPT that models 23.0a, 23.1 and 23.1b move forward for consideration in setting the OFL/ABC in June 2024. The SSC believes that while Model 23.2 should be considered in future iterations of the assessment, it should not be reviewed in June 2024 to

[1] Thorson, J. T., and M. A. Haltuch. 2019. Spatiotemporal analysis of compositional data: increased precision and improved workflow using model-based inputs to stock assessment. Canadian Journal of Fisheries and Aquatic Sciences 76:401-414.

allow greater focus on setting harvest specifications. The SSC agrees that the time series for average recruitment should include all years except the last four.

The SSC continues to endorse the use of the GMACS assessment model. In the context of future development of the assessment, the SSC recognizes and appreciates the responses by the author to previous CPT and SSC comments. To facilitate tracking ongoing issues, the SSC requests the author and the CPT identify what research topics from that list might continue to be brought forward, and in what timeframe, in the context of the new assessment model.

A number of model development issues were brought up at the CPT meeting, and the SSC agrees that exploration of possible solutions to these issues be explored in the future. New input sample sizes were introduced in this cycle. When changing these, other data sources are inherently weighted differently. For future assessments, the authors could investigate the weight given to the tagging and size composition data, as these sources may be preventing an adequate fit to the indices, particularly because of the use of the extra variance for these indices. The authors could evaluate if the size-transition matrix could be estimated outside of the model with the tagging data to avoid having it compete with other data sources in the model.

The SSC notes that selectivities in the combined area model were very similar to the single area models, yet the $F_{35\%}$ was very different. Although not a priority for 2024, the authors should continue to explore how to appropriately project $F_{35\%}$ in a multi-area/fleet combined model in GMACS.

The authors discussed moving towards zero-inflated or hurdle models for CPUE standardization, some of which could be accomplished using the same R package (*mgcv*, zIP). **The SSC recommends that any new substantial standardization changes should be reviewed during the next cycle, not during specifications in May/June 2024.**

In addition to the model recommendations above, the SSC recommends that the authors consider how model elements interact and what they contribute individually and together in characterizing, or not, trends in the data. Simpler constructs of the GMACS model that were considered in the Simpler Modeling Workshop (March 2023) might be a useful starting point. Examples of data considerations include exploring why zeros unexpectedly occur in the data, and temporal or spatial variability in timing, selectivity, or other assumptions of the datasets informing the model.

Regarding projections, the SSC requests clear documentation of which elements are treated as stochastic (e.g., recruitment, mortality) and which are fixed (e.g., catchability, selectivity) even if they were represented as stochastic in the assessment model. Such choices will influence the uncertainty captured in the projections.

Balance of CPT Report

The SSC received a presentation on a number of additional items from the CPT report. The SSC also received public testimony from John Gauvin (Alaska Seafood Cooperative) The SSC thanks the CPT for their presentation and the information brought forward in their report.

The CPT presentation to the SSC included AIGKC model runs (see previous section in SSC report), CPT responses to SSC general comments, and an update on Council meeting timing and stock prioritization. Additional items were discussed in the CPT report but were not presented to the SSC.

The SSC had a number of general comments to crab assessment authors in the October 2023 SSC Report. These included requests for more information on the standard years of bottom trawl survey data in crab assessments, tracking SSC requests to assessment authors from previous years, developing risk tables for crab stocks, exploring the use of VAST across multiple crab stocks and having authors available for questions during the SSC review. The SSC thanks the CPT for their discussions and responsiveness to these requests. Further SSC recommendations follow.

The SSC supports revisiting the topic of VAST or other spatiotemporal model-based methods for the 2025 CPT modeling workshop, as this topic is relevant to several stocks and there have been some updates that might improve applicability to crab assessments. Further, the SSC requests that consideration be given to fishery-dependent VAST applications for CPUE standardization, in addition to fishery-independent datasets. Likewise, the SSC highlights the applicability of spatiotemporal models for first stage expansion of size composition data to address concerns about the impact of spatial imbalance in sampling if spatial variation in size distribution exists.

The SSC looks forward to seeing draft risk tables for the crab stocks being reviewed in October. The SSC reiterates that the risk table framework is intended to provide a clear and transparent basis for communicating assessment-related and stock condition concerns that are not directly captured in model-based uncertainty, the tier system, or harvest control rules (see *Preliminary Guidance and SSC recommendations* on risk tables in June 2021 SSC Report p.33). Also, the SSC recommends that crab assessment authors follow the same organization scheme as the groundfish assessment authors, where the full risk table is contained in each individual chapter and brief summaries are included in the SAFE introduction.

In response to the Council's change to the meeting schedule for 2025 (no in-person meeting in February), the CPT recommended changes to the annual review timing of the NSRKC stock assessment and the AIGKC model runs, and the SSC appreciates the CPT's flexibility on these issues. **The CPT proposes reviewing the NSRKC assessment at a virtual meeting in November, so that the SSC can review harvest specifications at their December meeting.** While expressing some reservations related to the chronically compressed timeline for the use of NBS survey data in crab assessments, **the SSC supports this change as proposed by the CPT.** The SSC notes that accommodation may need to be made with respect to other agenda items to include SSC review of NSRKC in December and that this schedule could be re-evaluated at a later date.

With regard to shifting PIBKC to a quadrennial (4-year) cycle, the SSC supports the shift in assessment timing. As this stock is overfished and under a rebuilding plan, the SSC proposes that this change begin after the October 2025 assessment. The timing of future assessments for this stock may need to be flexible as monitoring and the rebuilding plan continue.

The SSC supports the work completed at the modeling workshop and notes the significant progress that is being made. Further discussion of the application of GMACS to the NSRKC stock is provided in the NSRKC stock assessment section of this SSC report.

The SSC is encouraged by the CPT discussion on the currency of management and the exploration of alternative functional maturity definitions. The SSC agrees that the 95 mm carapace width threshold for functional maturity based on Canadian research is a viable option for further exploration in EBS snow crab model runs in May. The SSC reiterates its October 2023 request that a full yield analysis for snow crab be done to provide a basis for any changes in management procedures, including the relationship between fishing mortality and catch, MMB, and various definitions of functional maturity. The SSC highlights the fundamental importance of this issue for *Chionoecetes* crab stocks and looks forward to reviewing future proposed changes in methodology and analyses in support of those proposed changes.

Finally, there were multiple research updates provided in the CPT report, including RKC genetics, the potential for crab stock enhancement and related considerations, recent laboratory and field studies on crab, and development of snow crab and BBRKC species distribution models (SDMs). With respect to public testimony regarding the BBRKC SDM, the SSC encourages testifiers to continue to communicate with researchers using fishery-dependent data to ensure the data are being interpreted appropriately and to fully

understand the context of those data. With respect to laboratory and field projects exploring thermal tolerances and temperature-driven variation in growth, the SSC highlights the value of having comparative laboratory studies and observational studies in understanding the key processes driving population and growth dynamics. The SSC thanks the researchers and the CPT for providing these updates. The SSC finds these updates helpful and requests they continue to be elevated to the SSC through the CPT report in the future.

C2 Bristol Bay Red King Crab Closures Initial Review

The SSC received a second initial Environmental Assessment/Regulatory Impact Review (EA/RIR) presentation from Sam Cunningham (NPFMC), Mason Smith (NOAA-AKRO), and Sarah Rheinsmith (NPFMC) on alternatives and options for closures to the Bristol Bay Red King Crab Savings Area (RKCSA) and NMFS area 512. Oral testimony was received from Jim Armstrong (Freezer Longline Coalition, FLC), John Gauvin and Sarah Webster (Alaska Seafood Cooperatives), Jon Warrenchuk (Oceana), Scott Hanson (F/V Beauty Bay), Jamie Goen (Bering Sea Crabbers), and Oystein Lone (Peter Pan Seafood/Independent Pot Cod Harvesters).

The SSC thanks the authors for this comprehensive initial review draft, which has improved substantially since the June 2023 draft. BBRKC has been in a steady decline since the late 2000s, likely due to a combination of environmental and fisheries factors, provoking potential management actions focused "on reducing BBRKC mortality from groundfish fishing in areas that may be important to BBRKC and where BBRKC may be found year-round, which may help increase stock abundance and promote achievement of optimum yield from the directed BBRKC fishery while minimizing negative impacts to affected groundfish fleet operations as well as target and PSC species," according to the Council purpose and need statement. **The SSC finds that this document provides sufficient information to inform Council decision making for final action after addressing SSC recommendations.** The EA/RIR generally describes that the potential benefits to BBRKC stock are challenging to quantify given available data and the potential effects on groundfish fisheries are variable, depending on what alternatives and options are selected.

The SSC appreciates the addition of the requested CPUE-based reallocation of effort model in addition to the PSC rate allocation model presented in June, as requested. While there are some differences in the results of these two analyses, they broadly show similar outcomes. Of some concern is the increase in PSC predicted for Chinook and EBS snow crab that are already in depressed states at this time. If possible, the SSC suggests showing these in relative terms (e.g., % change) and, if possible, including confidence intervals calculated either analytically or through bootstrapping.

The SSC had an in-depth discussion on the CPUE-based model and the reallocation of effort. The extent and spatial and temporal distribution of effort displacement is critical to understanding the biological, economic and community impacts. The SSC notes that the analysis would have been more informative if the displaced effort had been constrained such that the resulting catch matches the annual total catch of target groundfish species. The SSC has significant concerns regarding the implementation of the CPUE model, which was intended to better capture where displaced effort might occur. Because of considerable differences in CPUE between the RKCSA and areas outside the RKCSA, the model as implemented results in biased estimates of RKC PSC. For example, when CPUE is higher outside the RKCSA, such as in Fig. 3-9, the displaced effort is higher than the effort that would actually be needed to catch the same amount of the target species, resulting in an over-estimation of RKC PSC. It is likely that on balance, both the PSC method and the CPUE method produce PSC increases that are higher than might be expected (the PSC method was intended to provide an upper bound on the potential PSC increase but the CPUE method was intended to better reflect actual displacement).

Public testimony also highlighted the potential benefits of incorporating greater temporal resolution into these models, such as redistributing displaced effort on a more frequent basis than seasonally, suggesting

that this could further refine effort allocation. The SSC suggests that the current approach captures dominant dynamics and recognizes that incorporating greater temporal resolution would require substantial effort, so does not recommend a change is needed before final review in June. However, the SSC encourages authors to include additional discussion of the limitations of the current resolution to the extent possible. If the Council recommends further evaluation of closure areas for RKC, a better understanding of how vessels may use a combination of timing and location to avoid impacting crab may be useful.

The SSC notes that the evaluation of effort and PSC displacement is heavily reliant on at-sea observer coverage. In the Pacific cod pot fishery, these rates have ranged from 7-17% since 2013, noting that vessels opting into Electronic Monitoring (EM) do not provide at-sea estimates of crab discards. The SSC also discussed that RKC PSC may include RKC from outside the BBRKC stock area. So changes in RKC PSC may affect RKC broadly across the Bering Sea, and is not only confined to the BBRKC stock area, which is relevant for overall PSC accounting and management.

Prior to final action, the SSC recommends the following:

- Adding a new model ("proportional model") where effort displaced from areas closed under Alternatives 2 and 3 is reallocated among all open areas in the Bering Sea in proportion to observed ("true") effort in those areas. This proportional redistribution model leverages revealed behavior that reflects effects of fish quality, travel cost and other factors that drive vessels' decisions but are not explicitly incorporated in the model. Ensure that any effort-based - predictions are adjusted for CPUE in the area where the vessel is displaced so that total predicted target catch approximately matches observed (i.e., "true") total target catch. The existing PSC method is scaled to target catch, but the recommended proportional redistribution model for CPUE requires effort be rescaled to attain observed target catch levels. The SSC acknowledges it will not be possible to exactly match total catch of all species, particularly for pot gear, so recommends focusing on total catch of the target, or an index of multiple targets, for each fleet.
- The SSC suggests the current CPUE-based prediction will not contribute substantially new insight beyond the proposed proportional model and the upper bound provided by the PSC approach. Therefore, if the proportional model is added, then the CPUE model can be dropped from the document. However, if the proportional model is not able to be completed, the existing CPUE model should be scaled so predicted total target catch matches observed target catch.
- Inclusion of a table that is similar to the table in the presentation showing the qualitative effects across fishery and PSC species in a stoplight diagram (Figure 1)

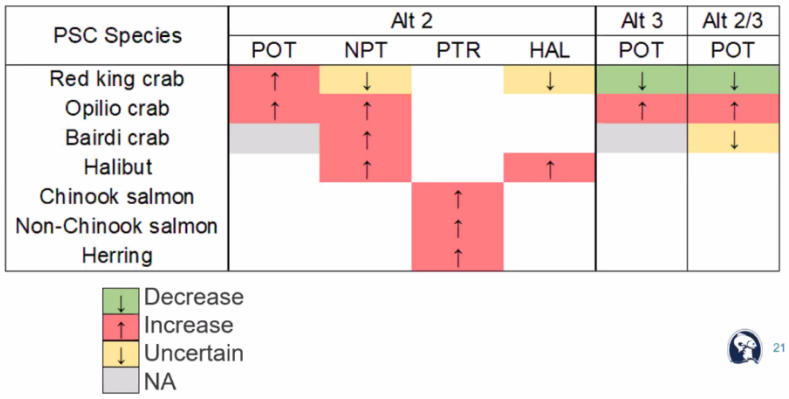

Figure 1: Slide 21 from C2 BBRKC Closure Initial Review staff presentation to the SSC (available on the February 2024 SSC eAgenda).

The SSC understands the desire for an action that supports healthy crab populations and healthy communities. **The document comprehensively discusses the potential benefits of various management measures for the recovery of the BBRKC stock, yet acknowledges the challenge in predicting their effectiveness due to limitations in current research and data.**

Concerning environmental and ecological impacts, the document suggests that the proposed management measures are unlikely to significantly affect the populations of groundfish or seabirds, and previous EFH analyses have shown minimal and temporary effects to habitat. EFH species distribution models indicate that the important habitat for most RKC straddles the RKCSA and area 512, with more adult females in Area 512 but that some distribution changes may be temperature-dependent. The SSC notes that such distribution changes should be considered in the written interpretation of static habitat maps due to the current highly variable climate. The SSC also discussed the benefits of closing groundfish fisheries in area 512, and the potential increase in Pacific cod predation on crabs if the removal of fisheries increases abundance of predatory cod. The description of RKC consumption by crab in the document is noted as an area for improvement, and **the SSC recommends adding any RKC consumption estimates by Pacific cod (in biomass or number) in the next iteration if possible.**

The document highlights the complexity of quantifying habitat importance for BBRKC, alongside the emerging concern over unobserved mortality rates, the magnitude of which remains uncertain. Despite the low bottom contact in area 512 and the decline in bottom contact in recent years inside the RKCSA, the SSC acknowledges that there are likely data limitations to quantifying the actual habitat disturbance in these areas. Lastly, the SSC acknowledges the probable economic impacts on fisheries displaced by these measures, including increased operational costs and the necessity to navigate other management constraints and PSC limits.

In discussion of the alternatives, several critical points emerge that warrant further discussion and clarification. First, there is a need for **clarification of the rationale behind the selection of the 50,000-ton threshold, as an explicit explanation in the analysis would lend support to this benchmark trigger. Additionally, the SSC recommends analysts explicitly consider the scenario under Alternative 3 that closes area 512 to pot gear and the RKCSA remains open, especially in terms of catch redirection from area 512 to the RKCSA.**

The document revisits recommendations made by the SSC in June 2023 regarding the application of LKTK on-ramps in Section 3.5. The SSC found this section informative, and notes that there is additional information that could be included or referenced to Section 3.5 from Section 3.3 (Historical Analysis of Groundfish Effort Distribution and Bycatch) given industry expertise on fishing locations and techniques provided in that section.

It would be useful to explore the communities engaged in or dependent on the BBRKC fishery that would be the beneficiaries of potential conservation aspects of the proposed action, were those benefits to occur. This would involve the compilation of sets of standardized social impact analysis (SIA) engagement and dependency tables for BBRKC catcher vessels (CVs), catcher processors (CPs), and shore-based and/or inshore floating processors. These would be analogous to those produced for the groundfish sectors potentially experiencing adverse impacts as a result of the implementation of the proposed action alternative(s). This would be separate from the examination of the likelihood of such outcomes and their overall implications. Despite the document's acknowledgment of its limitations in quantifying conservation benefits, **it is crucial to identify which communities or stakeholders would likely benefit if such advantages were realized, aligning with considerations under NS8 guidelines.**

Additional specific points of interest for the summaries in Section 4 include the role of Over 60 feet (O60) CVs in the BBRKC fishery, the increasing trend in groundfish tendering activities and the community affiliations and diversity of the fishing portfolios of those tender vessels, and the broader implications of these dynamics as highlighted in public testimony. Conducting an analysis of the members of the BBRKC

CV fleet that also participated in the O60 Pacific cod pot fishery in the form of a reciprocal analysis to that shown in Figure 3-6 could offer valuable insights.

The SSC recommends inclusion of a brief qualitative characterization of the nature and degree of overlap between the relevant varying sets of potentially affected groundfish fishing communities and the set of potentially affected BBRKC fishing communities under different alternative combinations. This would aid in understanding patterns of differential distribution of social and community impacts across the proposed alternatives and options. **Additionally, the SSC recommends a more detailed categorization differentiating shore-based and inshore floating processor segments of the processing sector, along with a characterization of the catcher vessel component of tendering activities associated with the relevant groundfish fisheries.** This could be done by splitting operating codes to more accurately reflect this segment which could help inform the distinction between permanent and transient processing capacity and activity within the relevant groundfish fisheries and the BBRKC fishery of the time series tables used in the analysis. Additional suggestions for improving the clarity of aggregations of communities (e.g., Seattle vs Seattle MSA and "Other") in the sets of SIA fishing community engagement and dependency tables have been provided to the authors.

The SSC also recommends:

- Maps of observed pot effort (partial coverage and non-EM) versus total effort for the Pacific cod fishery to complement existing effort displacement maps.

- Public testimony included concerns about hook and line (HAL) mortality being overstated in the analysis due to crab dropping off the gear before being brought onboard. A data summary showing the proportion of HAL RKC drop offs versus RKC brought onboard should be included in the analysis if available.

C3 Cook Inlet Salmon SAFE and Harvest Specifications

The SSC reviewed and received a presentation on the SAFE Report for the Salmon Fisheries of the Cook Inlet Exclusive Economic Zone (EEZ). Oral public testimony was provided by Kendra Zamzow (Matanuska-Susitna Borough Fish & Wildlife Commission), Roland Maw (United Cook Inlet Drift Association), and David Martin (Cook Inlet Fisherman's Fund). Written comment was provided by Ray Beamesderfer (Kenai River Sportfishing Association) and Audrey Salmon (United Cook Inlet Drift Association). Written comment at the January 19, 2024, SSC informational meeting on the Cook Inlet Salmon SAFE was provided by Jeff Fox (Cook Inlet Fishermans Fund) and David Martin (Cook Inlet Fisherman's Fund). Oral and written public comment highlighted several common areas of public concern, including: (1) the unsuitability of EEZ harvest management based on a preseason total allowable catch given the high interannual variability in return abundance, and supporting the use of escapement-based harvest policies with active in-season management, (2) failure to consider optimum yield (OY) as identified under National Standard 1 of MSA, (3) the lack of weak stock protection within the current harvest specification process outlined in the SAFE, and (4) the potential for substantial changes in harvester behavior resulting in increased exploitation rates within the Cook Inlet EEZ. Finally, public comment included a request to maintain status quo of one 12-hour drift gillnet fishing period per week, and the current conservation corridor allowing passage of fish to northern Cook Inlet salmon streams. **The SSC recommended harvest specifications for the 2024 season (Table 3). Stock status relative to the 2024 season will be evaluated in February 2025.**

Table 3: SSC recommendations for the salmon fisheries of the Cook Inlet Exclusive Economic Zone Area for 2024. Values are in numbers of fish. Tier designations in this table are based on the SAFE report and accepted by the SSC. SSC recommendations that differ from the SAFE are in bold. This table combines Tier 1 and Tier 3 stocks into a single table; therefore, some columns will have information that will be unavailable or not applicable. NA represents a calculation not applicable to this row/column combination. Dash lines indicate a value, if available, that is not used in the corresponding calculation.

Stock	Tier	MSST	Escapement goal, lower bound	S_{MSY}[1]	Preseason OFL	ABC Buffer	ABC
Kenai River Late Run Sockeye salmon	1	**3,030,000**	750,000[2]	**1,212,000**	**901,932**	0.478	**431,123**
Kasilof River Sockeye salmon	1	**555,000**	140,000[2]	**222,000**	**541,084**	0.694	**375,512**
Aggregate Other Sockeye salmon	3	163,000	65,000	-	887,464	0.20	177,493
Aggregate Chinook salmon	3	44,200	15,000	-	2,697	**0.10**	**270**
Aggregate Coho salmon	3	38,800[3]	19,400[3]	-	357,688	0.10	35,769
Aggregate Chum salmon	3	NA	3,500	-	441,727	**0.25**	**110,432**
Aggregate Pink salmon	3	NA	NA	-	270,435	**0.50**	**135,218**

[1] ADF&G report "Review of Salmon Escapement Goals in Upper Cook Inlet, Alaska, 2023" (McKinley et al. 2023) was published January 2024 and this publication includes updated estimates of S_{MSY} for Tier 1 sockeye stock based on the inclusion of additional brood year data since the previous analyses. These updated values of S_{MSY} were not available for the development of the 2024 SAFE.

[2] Not used for MSST calculations as per SSC recommendations.

[3] These values represent a correction made by NMFS following staff presentations at the SSC.

The SSC highlights its appreciation for the extensive efforts of the Cook Inlet Salmon SAFE team in providing a basis for status determination and harvest specifications for this salmon fishery, a challenge that requires adapting the escapement-based harvest policy used by the State of Alaska to comply with the requirements of the MSA framework for the new federal fishery in the EEZ. While acknowledging these challenges, it should be noted that management of salmon stocks under the MSA is a well-established process of the Pacific Fishery Management Council (PFMC), as well as in the East Area under the current salmon FMP, from which the Tier system and methods were adapted. The SSC suggests there is an opportunity to benefit from the lessons learned in MSA salmon management on the West Coast, which has not yet been realized. The SSC also acknowledges that developing a stock status determination and harvest specifications framework to inform the Council on the status of stocks under federal management in the Cook Inlet EEZ is an iterative process. This continuing process will inform Council decision making regarding both the conservation of salmon stocks harvested within the EEZ and harvest opportunity for fishery participants.

Based on its experience with the Groundfish Plan Team (GPT) and CPT processes, the SSC suggests that there is value in the longer-format and in-depth discussions that these processes provide for making substantive progress in improving the processes and models on which management is based. The SSC had some discussion about whether a longer-term focus, such as by a salmon plan team, or a shorter-term focus, such as a workshop format, might be the most helpful at this time given the timeline, early development status of this stock assessment, and the fact that much of the analytical run reconstruction and stock-recruitment analysis is conducted by experts at the State of Alaska. The SSC recommends that a workshop, or series of workshops, focused on further development of the Cook Inlet Salmon harvest specification and status determination methods in the context of continued in-season EEZ management would be valuable in further SAFE development. This workshop could include members of the NMFS SAFE team, ADF&G, SSC, and experts from the PFMC where issues related to federal management of salmon fisheries have been extensively considered.

The SSC acknowledges the extensive work by the State of Alaska to estimate stock-specific escapements, the age composition of returns to construct brood tables, and spawner-recruitment relationships to estimate reference points, such as the number of spawners that produce maximum sustainable yield (S_{MSY}) for Tier 1 stocks. This work provides the primary basis for defining status determination criteria (SDCs) in the SAFE. The SSC notes that this work has undergone internal and, in some cases, external review, including publications in the peer-reviewed literature, Marine Stewardship Council review of Alaska salmon fisheries and Responsible Fisheries Management certification review. The SSC encourages continued external review of this work as new analytical tools and technologies are applied and escapement goals are re-estimated during regular triennial review by the state, particularly in the context of changing environmental conditions that may affect stock productivity.

Based on its review of the 2024 Cook Inlet Salmon SAFE, the SSC highlights several concerns and provides guidance on specific aspects of the methodology outlined in the SAFE document. The SAFE document identifies tier designations for stocks and stock aggregates based on the availability of escapement, harvest, and total run size data. A key question is the tier designation for the Kenai River Late Run Chinook salmon stock, which was designated a stock of management concern by the Alaska Board of Fisheries in October 2023. This stock has available escapement information, and reconstructed brood tables and associated estimates of S_{MSY} based on large (>75 cm) salmon. However, the SAFE document highlights that harvest information for this stock within the EEZ waters is uncertain and has been somewhat minimal historically. The SSC supports the tier designations as presented in the SAFE document for 2024, which combines the Kenai River Late Run Chinook salmon stock within the aggregate Chinook salmon complex and using the escapement and associated minimum stock size threshold (MSST) for this stock as the basis for the overfished status determination of the aggregate. While Cook Inlet Chinook salmon stocks are currently in a depressed state and Gulf of Alaska Chinook salmon are under review for ESA listing, the risk of high harvest within the EEZ waters appears to be low. Relating to tier designations, the SSC discussed

whether the aggregate "other" Sockeye and aggregate Coho salmon should fall under Tier 2 or Tier 3. The SSC supports the designation of both stocks under Tier 3 and the use of the associated harvest recommendation and status determination process under that tier for the reasons outlined in the SAFE. These include the lack of consistent spawning data, uncertainty about the proportion of total annual run size represented by indicator stocks, and the inconsistent history and uncertainty about future operation of specific escapement projects.

With respect to Tier 1 stocks, the SSC is concerned about whether the use of the lower bound of the escapement goal range for both setting the preseason OFL and SDCs for Tier 1 stocks provides sufficient precaution, and whether this is consistent with the interpretation of this reference point. **The SSC recommends that OFL and MFMT calculations for Tier 1 stocks be based on the best available estimate for the spawning biomass that produces maximum sustainable yield over the long-term (S_{MSY}), as opposed to the lower bound of the escapement goal range, and that this be implemented for the preseason OFL and ABC specifications for the 2024 season.**

The MSST for Tier 1 stocks, used as the basis for evaluating the overfished determination under SDC, is currently set to 0.5 times the sum over a generation of the lower bound of the escapement goal range, a value which is less than half of the sum of the S_{MSY} estimates over a generation for these stocks. NOAA-AKRO staff highlighted that under NS1 guidelines, the MSST "should" and not "shall" be between half of B_{MSY} and B_{MSY}, or the appropriate metric for the stock size producing MSY. The SSC appreciates clarification from NOAA-AKRO staff on this point. While the SSC acknowledges flexibility in the MSST definition relative to S_{MSY} in this context, it recommends defining MSST=0.5*S_{MSY} (summed over a generation) or half of the spawning abundance expected to produce MSY over the long term, for Tier 1 stocks. This approach is consistent with how the MSST is defined in the crab and groundfish fishery management plans (FMP).

The SSC supports the multi-year determination of whether overfishing or overfished is occurring based on harvests and stock status levels as defined in the Salmon FMP for Tier 1 stocks. However, the SSC is concerned about the multi-year calculation of the annual preseason OFL in the FMP that allows previous underharvests (and overharvests) to be propagated forward. The formula in the proposed FMP was not used to estimate the OFL for the two Tier 1 stocks in the SAFE, with the explanation that application of this formula would have resulted in extremely large and unrealistic preseason OFLs. Instead, a preseason OFL was calculated using only current-year information. The SSC found that the single-year approach was not clearly explained and poorly justified in the SAFE, but nevertheless supports this method for preseason OFL calculation due to concerns with the multi-year approach, and because it is an annual catch level consistent with MSY as recommended by the NS1 Guidelines. Furthermore, it is concerning that the OFL formula as defined in the proposed Salmon FMP does not result in feasible values. It is apparent that this will usually be the case, given that harvests are constrained by ABC, which is lower than OFL in any given year. For the 2025 and future SAFEs, the SSC recommends continuing the use of the current year OFL calculation for Tier 1 stocks, rather than the multiyear calculation, because it reflects the best estimate of potential EEZ yield in the current year. It is clear that the implications of the Tier 1 OFL formula in the proposed Salmon FMP have not been fully considered, and, consequently, that consideration should be given to modifying the FMP to bring it into alignment with what was actually done this year.

For Cook Inlet salmon stocks defined under Tier 3 within the SAFE, including aggregate "other" sockeye, aggregate chum, aggregate Chinook, aggregate coho, and aggregate pink salmon, the SSC had extensive discussion about the current preseason and postseason processes for specification of OFL and ABC. With regard to the preseason OFL and resulting ABC, the SAFE proposed to: 1) identify the maximum historical EEZ harvest "over the time series", 2) multiply the maximum EEZ harvest value by the generation time, 3) subtract the observed EEZ harvest summed over that generation time to define the preseason OFL, and 4) apply a buffer (often equal to 1/generation time) to calculate a preseason ABC. For Tier 3 stocks, overfishing is assessed postseason by comparing the actual EEZ harvest summed across a generation with

the postseason OFL, which is the maximum historical harvest multiplied by the generation time of the species in years.

The SSC highlighted several concerns with this proposed Tier 3 methodology:

- While the SSC understands the intent of considering OFL across a generation to provide stability in the context of dynamic salmon stocks, this process can inadvertently lead to preseason ABC recommendations that are very large if small harvests have occurred in preceding years.
- The SSC felt that the use of the buffer as a tool to reduce the OFL to a reasonable and actionable ABC level was inappropriate, given the standard use of a buffer within the North Pacific as a basis to account for additional uncertainty not captured within the assessment process.
- The length of the time series over which the maximum harvest was identified was not clearly defined or justified within the SAFE document.
- There was no clear justification for using the maximum EEZ catch over the time series as opposed to a lower value such as the average catch over the time series.
- The proposed buffers for aggregate pink salmon and aggregate chum salmon were liberalized to 0.9 and 0.5, respectively, rather than using the standard methodology defined for other Tier 3 stocks of a buffer equal to 1 divided by the average generation time. The liberalized buffers for these data-poor stocks were not adequately justified, and led to proposed ABCs that were much higher than current catch levels.
- Given concerns regarding Chinook salmon conservation, the SSC is concerned that the current proposed buffer of 0.167 may not be sufficiently precautionary.

Given these concerns with the Tier 3 methodology, the SSC recommends:

- For the 2024 SAFE, the preseason OFL calculation based on the sum of maximum catch over the generation time as proposed in the SAFE should be used.
- For the 2024 SAFE, the aggregate coho salmon buffer should remain unchanged, the aggregate Chinook salmon buffer should be changed from 0.167 to 0.1, the aggregate pink salmon buffer should be changed from 0.9 to 0.5, and the aggregate chum salmon buffer should be changed from 0.5 to 0.25.
- For the 2025 SAFE, a separate process should be used to define the preseason OFL and postseason overfishing determination, wherein the preseason OFL is based on either the maximum or average catch over a defensible period of the catch history rather than the maximum catch multiplied by species generation time. Accordingly, the SSC requests that new buffers be proposed for each of the Tier 3 stock aggregates. A starting place might be the 0.75 buffers used for Tier 6 average-catch stocks in the groundfish FMPs, though alternatives should be considered.
- For the 2025 SAFE, the postseason OFL process should use the current methodology of evaluating across one generation to provide stability in status determination for the highly variable salmon life history.
- For identifying the representative catch as the basis for both the preseason and postseason OFL definition, the SAFE team should consider and justify: (a) whether the average or maximum catch in the time series is most appropriate, and (b) determine the most representative portion of the recent catch history to use for defining the reference point based on considerations of any past changes to the prosecution of the EEZ portion of the drift gillnet fishery and recent trends in stock productivity.

Specific to the Tier 3 aggregate pink salmon stock, the SSC requests clarification on whether calculations were done separately for even-and odd-year brood lines or whether they were assumed to be the same stock for the purpose of determining maximum catch. The SSC highlights that they represent genetically distinct lines and likely exhibit differences in return abundance.

The SAFE document highlights that the timeline for the federal management process in specifying preseason OFL and ABC does not currently align with that of the State of Alaska for run reconstruction and preseason forecasting. The SSC requests clarification from the State of Alaska on the feasibility of, and impediments to, reconstruction of brood tables and provision of preseason forecasts prior to the federal SAFE process. **In the absence of a reconstructed brood table for Tier 1 stocks as the basis for sibling-based preseason run size forecasts, the SSC supports the use of the ARIMA approach proposed in the SAFE.** However, the SSC requests that the SAFE include more information about the ARIMA analysis, such as significant model terms, model diagnostics, and plots of observed vs predicted values. The SSC also requests that the SAFE team provide a direct comparison of the retrospective performance of State of Alaska preseason forecasts for Tier 1 stocks with the ARIMA approach used in the SAFE. This comparison would help identify the potential value of sibling-based State of Alaska forecast estimates, and the value of run reconstruction and forecasting on a timeline consistent with the federal process.

Currently the SAFE uses a retrospective comparison of the preseason OFL with the postseason OFL as a basis for defining the buffer between OFL and ABC for Tier 1 stocks. Specifically, median symmetric accuracy (MSA) is used to quantify the performance of the preseason methodology for determining the OFL based on the ARIMA preseason forecast. While this approach aligns with prior SSC recommendations to scale the magnitude of the buffer based on retrospective performance, the use of a symmetric error metric for defining a buffer that reduces the ABC from the OFL (i.e. a unidirectional change) is problematic. As such, the SSC recommends that the SAFE team consider and propose alternative error metrics that scale the buffer according to the frequency that the preseason OFL exceeds the postseason OFL only. This would be more consistent with the intent of adding increased precaution when preseason methods routinely recommend harvest levels above what are later (postseason) determined to be at or below the level providing for the escapement producing MSY. Given the simple forecast framework, calculations using the P* approach, in which analysts characterize forecast uncertainty and the Council expresses its policy towards risk by specifying an acceptable probability of exceeding the true but unknown OFL, would be feasible and should be explored.

The SSC recommends the SAFE team reconsider the definition of the ‘buffer’ as a multiplier (m) by which to scale the OFL to obtain the ABC, where ABC = m*OFL. For consistency with other SAFEs and with the common use of the term, the SSC suggests defining the buffer as b = 1-m, reflecting the relative reduction in OFL.

The SSC supports the proposed SAFE methodology for estimating the harvest rate in State waters based on the ARIMA model applied to the time series of observed harvest rates. However, the SSC requests clear documentation of retrospective model performance for each stock or stock aggregate.

The SSC suggests that developing risk tables, or something similar, for future SAFE reports may provide a means of organizing and tracking uncertainty that is not captured in the assessment or harvest policy for informing ABC determination. This could be a potential item for consideration at a future workshop.

The SSC highlights the need for sampling catches from the EEZ to estimate the stock composition of the catch and collect other biological information. This will require obtaining genetic samples from stocks that are of conservation concern, in particular Chinook salmon which could be elevated to Tier 1.

Future SAFE reports should group all of the information relevant to a stock in the SAFE chapter for that stock, rather than placing tables and figures in an appendix. This will allow readers of the document to more readily access this information and follows more closely the structure of other Council SAFE documents.

This SAFE report notes that the EA/RIR for Proposed Amendment 16 to the FMP for the Salmon Fisheries in the EEZ Off Alaska provides information on the social and economic conditions of the sport, subsistence, personal use, and commercial fisheries, the fish processing industries, and communities in Cook Inlet and incorporates that document by reference, which is appropriate for use in the current year management process. **As the Cook Inlet EEZ management process matures, and consistent with NS2, the SSC looks forward to seeing a summary of scientific information concerning the most recent social and economic condition of the relevant recreational and commercial fishing interests, fishing communities, and the fish processing industries incorporated into the SAFE.** The SSC specifically looks forward to future SAFEs containing scientific information on pertinent economic, social, community, and ecological information for assessing the success and impacts of management measures or the achievement of objectives of the Salmon FMP.

D4 AFA Program Review Workplan

The SSC received a presentation from Jon McCracken (McCracken and Associates) on the workplan for the American Fisheries Act (AFA) program review. Oral public testimony was provided by Glenn Merrill (Glacier Fish Company/CV processor sector).

The SSC considers that the workplan reflects national NMFS guidance and the best practices that the NPFMC has developed through several iterations of LAPP program reviews. The workplan will document the factors underlying the social license for the structure of the AFA and the key pathways through which the AFA fishery contributes both to coastal Alaskan communities and urban coastal headquarters.

The primary issue raised by the SSC at this stage of workplan review is how to balance presentation of the full history of a now-longstanding LAPP program with more recent status and developments in the fishery. **The SSC recommends that data on the full history of the program be provided and suggests that key performance metrics be provided back to, or even before, 2002 to provide context on long term effects of the AFA.** These can be presented as graphical metrics, though may not require deeper discussion or analysis except as highlighted as program impacts in previous program reviews. An example of where longer-term data and additional discussion would be appropriate is the introduction of any new quantitative measures in this report that have not been included in past reports (e.g. some of the community-oriented measures proposed). In these instances, a full time series from pre-program to the present is needed to track the evolution over the program.

In characterizing the status and impact of the AFA, the SSC recommends that the analysts:

- Include an overview identifying major exogenous social or environmental factors that could influence recent outcomes (e.g., COVID). It may also be helpful to note the time periods of impact in figures.
- Provide a matrix tracking impacts of the implementation of the AFA across sectors and communities as identified and described in previous AFA program reviews.
- Consider the impacts of the CDQ program, which was enshrined through the AFA, on the pollock fishery. Describe how these have evolved over time, and now include CDQ group ownership interest in CVs, CPs, and seafood processing companies, in addition to CDQ quota share ownership and leasing.
- Rely on qualitative as well as quantitative information based on cooperative reports and other sources including LK/TK sources and other key informants.

- Seek data and information sources that provide a breakdown of information on measures of substantial engagement in and/or dependence on the pollock fishery that ensure the sustained participation of fishing communities that goes beyond the aggregate metrics in ACEPO to reflect ownership and processing.
- Track the redistribution of harvesting and processing access by community.
- Provide a qualitative discussion of reasonably foreseeable challenges faced by the fishery and its affiliated fishing communities in 2023/2024 that may not yet be observed in available data.

D5 SCS8 Case Studies

Under this agenda item, the SSC first received an update from Katie Latanich (NPFMC) on plans for the Climate Scenarios Workshop during the June Council meeting in Kodiak (June 5-6, 2024). Ms. Latanich emphasized that the workshop is intended to link various ongoing climate readiness efforts, includes fisheries in the Gulf of Alaska, Aleutian Islands and Bering Sea, and primarily serves as a forum to generate ideas for informing and supporting future climate readiness efforts. The workshop will use plenary and small-group breakout sessions to examine case studies and hypothetical ('What if'?) scenarios. The SSC notes that the format will require clear tools and guidance for participants to effectively work through case studies and scenarios to identify actionable items for the Council.

The SSC then discussed potential case studies to feature at the SCS 8th (SCS8) National Workshop in Boston, August 26-28, 2024. There was no public testimony. The SCS8 workshop provides another opportunity to explore tools and approaches for developing climate-ready fisheries at a national forum. The overall theme for the meeting is "Applying ABC Control Rules in a Changing Environment" with three sub-themes:

1. Advances in science to inform ABC control rules in a dynamic environment
2. Adaptation of reference points, control rules, and rebuilding plans to changing environments
3. Application of social science to achieve management goals under dynamic conditions

The SSC can make suggestions for case studies to the SCS8 Steering Committee, which may select one or two case studies from the NPFMC region. The format for the SCS8 workshop has not been finalized, but the national SSC workshops typically feature two to three keynotes (~30 min) and eight to ten case studies (~20 min) in plenary session, as well as small-group breakout sessions.

The SSC had a wide-ranging discussion both about specific case studies and about the overall objectives for presenting case studies. It was noted that case studies could focus on 'showcasing' approaches used in this region, advancing innovative tools and approaches, or presenting challenges in the Alaska region for feedback and discussion. The SSC suggests that there may be some benefit to a different format for the workshop that would allow more discussion time for unresolved challenges. This option should be explored by SSC members on the SCS8 Steering Committee with the workshop organizers and other Steering Committee members at the next SCS8 planning meeting.

Based on previous suggestions, informal input, and discussions at this meeting, the SSC compiled the following list of potential case studies that will be further vetted before submitting suggestions to the Steering Committee:

- Climate adaptive management targets in the context of snow crab (Cody Szuwalski), based on Szuwalski et al. (2023)[2].
- Recent ACLIM / CEFI results (ACLIM team)
    - Using climate-informed vs climate-naïve approaches in a multi-species context to determine reference points and evaluating stock status (Holsman et al, In Prep)
    - Pacific cod in the Eastern Bering Sea: environmental uncertainty in the context of a MEY based harvest control rule (Punt et al. 2024)[3].
    - Walleye Pollock: temperature effects on recruitment in the context of harvest control rules under a Tier 1 approach (J. Ianelli, P. Spencer et al, In Prep)
    - Multi-species / ecosystem modeling: Performance of harvest control rules in a size-structured, trait-based model of the Bering Sea (J. Reum et al, In Prep)
- Developing an ecosystem-level cap for the Gulf of Alaska using the Atlantis model (Alberto Rovellini, In Prep)
- Sablefish: socioeconomic impacts of the sablefish extreme recruitment event given associated sablefish product market conditions and exploration of different management measures and harvest control rules to improve fishery socioeconomic outcomes (AFSC, including economist).
- Other potential case studies suggested during discussion included:
    - Scientific information needs for fishing community planning to mitigate climate change impacts and support sustained fishing community participation in the Gulf of Alaska (Marysia Szymkowiak, AFSC)
    - Showcasing current processes used in the Alaska region to inform the assessment and management process about risks due to climate change and other environmental changes (risk tables, ESRs, ESPs)
    - A retrospective case study of climate change impacts, the associated management response, and what could have been done differently (e.g. GOA Pacific cod collapse)

A previous suggestion to use the CCTF Scenarios Workshop as a case study was discussed but was not further considered due to the compressed timeline between the June 2024 Scenarios Workshop and the August SCS8 workshop.

The SSC notes that a number of potential presenters for the proposed case studies have previously participated in and presented at these or similar national meetings and that there may be benefits to involving new participants that would bring new perspectives.

The SSC did not select or rank the above case studies at this point, but much discussion focused on the potential value of bringing forward a case study focused on sablefish under Theme 3 due to the unresolved challenges in this fishery. In particular, a case study could address the socio-economic consequences of

[2] Szuwalski et al. (2023) Unintended consequences of climate-adaptive fisheries management targets", Fish and Fisheries, https://doi.org/10.1111/faf.12737

[3] Punt et al. 2024. Capturing uncertainty when modeling environmental drivers of fish populations, with an illustrative application to Pacific Cod in the eastern Bering Sea. Fisheries Research, 272:106951, https://doi.org/https://doi.org/10.1016/j.fishres.2024.106951)

extreme size-based differences in sablefish per-pound prices and the implications of different size classes of sablefish in the context of size-based management options (see C6 Small Sablefish DMRs section) and alternative harvest control rules (such as an MEY-based rule). While there are ongoing efforts to advance this work through IRA funding, getting feedback and input from other regions that have more experience including economic and socio-economic considerations in assessment and management could be very valuable. This could perhaps be done most effectively through a modified format that would allow for short presentations followed by case-specific break-out discussions.

D6 Small Sablefish Discard Mortality Rate

The SSC received a presentation from Sarah Cleaver (NPFMC), Dan Goethel (NOAA-AFSC) and Chris Lunsford (NOAA-AFSC) on potential discard mortality rates (DMRs) and proposed simulation analyses in response to the Council's continued consideration of allowing the release of small sablefish in the fixed gear fishery. The SSC received oral public comment from Paul Clampett (Sablefish and Halibut Pot Association), Linda Behnken (Alaska Longline Fishermen's Association), Robert Alverson (Fishing Vessel Owners out of Seattle), David Bain (Orca Conservancy), Bernie Burkholder (vessel owner, Sablefish and Halibut Pot Association), and Kiril Basargin (K-Bay Fisheries Association). These comments provided the SSC with valuable perspective on historical and recent fishery conditions and practices (including specific pot gear configurations) as well as the critical importance of including price and some metric of landed fishery value in the pending analysis.

The SSC appreciates the review of the history of this item including supporting documents, and the opportunity to review the DMRs and analytical approach proposed for a new simulation exploring the potential effects of release of small sablefish in the fixed gear fishery. The document outlined a delineation between how management and stock assessment processes might respond to a potential change in sablefish release regulations and the proposed analysis, which is intended to inform specific aspects of biological and fishery outcomes. The SSC recognizes that these concepts are not entirely separable, but that only limited time is available to perform the analysis prior to the June 2024 Council meeting.

The SSC thanks the authors for their response to the 2021 SSC review and for further consideration of how to most efficiently tackle this difficult topic. The SSC recognizes that what is proposed is a simple, straightforward simulation approach to evaluating the effects of small sablefish release that will not answer every question, but it will provide more information than previous Yield-Per-Recruit (YPR) analysis and is tractable by June. The SSC discussion included three main aspects of the proposed work: 1) a working set of DMRs to use for the simulation, 2) the methods for the proposed simulation and the reporting of results, and 3) additional topics that may/cannot be addressed in the quantitative simulation but are important to the interpretation of results and future work.

It is unusual that the SSC is asked to identify the Best Scientific Information Available for a specific DMR to use without recommendations from analysts. **However, the SSC supports the general approach of using a base DMR assumption with low and high alternatives for simulation** and appreciates the information and feedback from the authors during the presentation**.** As DMRs are known to be very important to the population dynamics feedback, the SSC agreed that it is important to evaluate the effects of the DMR via a range of alternative values. This consideration is particularly relevant as these values will be utilized within the broader context of regulatory analysis. The SSC recognizes the lack of data and the assumptions that need to be taken into consideration to recommend DMRs. The SSC also recognizes that there are many uncertainties in potential future DMRs as well as changes in key factors such as whale depredation. The SSC highlights that, while recommending DMRs for this simulation analysis does not specify the value or range of values for future use in the stock assessment or management, a reasonable range of values can be provided to evaluate potential impacts. **After considerable discussion, the SSC recommends use of 12% as a lower DMR alternative**. This value represents the most relevant scientific

study (Stachura et al., 2012[4]), but was based only on hook-and-line fishing gear (which is generally expected to have a higher DMR than pot gear), and may not have represented realistic commercial fishing conditions, nor potential additional mortality due to whale depredation. **To partially reflect these additional factors that might increase discard mortality the SSC recommends a base value of 20%.** The SSC considered the rates of whale depredation currently used in the sablefish stock assessment, and considered how these might inform an upper bound on potential DMRs. **As a higher alternative to provide some contrast in the results, for comparability with historical studies, and to account for potential unknown future whale depredation, the SSC recommends using an upper value of 35%.** Although the SSC recognizes that there may be important differences between gear types, **at this stage the SSC does not recommend using different DMRs for pot and hook-and-line gear.** This is due to lack of gear-specific information and the practical consideration that the gear types are not currently separated in the stock assessment. The SSC noted that specific research on DMRs may be needed in the future and that this work would necessarily be gear specific.

The SSC acknowledges recommending in 2021 a DMR of 100% as the upper bound but finds this value implausible given extensive successful historical tag and recapture experiments and other information. To reduce the workload of the simulation it does not make sense to include a DMR of 100% in the work proposed for June. The 100% DMR value was in part motivated by the unknown and potentially high level of whale depredation on released sablefish. Observations from whale biologists and public testimony suggest that sperm whales are unlikely to be able to take a large fraction of released sablefish, while groups of killer whales associated with a fishing boat are likely to consume a large majority of these sablefish, a preferred prey item. A potentially very high depredation rate during interactions with killer whales, combined with the most recent estimates of the frequency of interactions between the sablefish fleet and killer whales, which is highest in the Bering Sea, suggests a reasonable upper bound on whale depredation of 10% that occurs in addition to other sources of discard mortality.

The SSC highlights that the lack of direct studies for estimating DMRs specific to sablefish in Alaskan waters presents a serious challenge for this current analysis. DMRs are difficult to estimate and require dedicated research to accurately characterize DMRs for each gear type and in the presence and absence of whale depredation.

The simulation proposed by the analysts would have eight different configurations: full retention plus three levels of the DMR (low, base and high) and two levels of mean recruitment. The SSC appreciates the need to keep the factors to be explored in this simulation to a manageable number. The SSC appreciated the description of the proposed simulation approach, building from that performed by NPFMC (2019)[5] and specifically addressing the SSC request from 2021: "Run simulations that include the sloping control rule using a recalculated $F_{35\%}$, $F_{40\%}$, $B_{35\%}$, and $B_{40\%}$ based on the relevant IFQ selectivity, and estimate future total ABC." The SSC identifies the iterative use of the harvest control rule in each year of the projection and the adjustment of the reference points to use the DMR specific to each simulation configuration as key extensions to the simple YPR analyses provided so far. The SSC highlights the importance of reporting and comparing the reference points calculated for each simulation in addition to the time series results of spawning biomass and yield (ABC).

The SSC recommends two specific improvements to the proposed methods for the simulation:

- The analysts proposed to simulate two levels of constant recruitment (1978-present and 2014-present). The SSC recommends a more dynamic approach in order to better simulate the transient conditions of higher and lower levels of small sablefish release that have initiated this analysis.

[4] Stachura, M., Lunsford, C., Rodgveller, C., & Heifetz, J. 2012. Estimation of discard mortality of sablefish (Anoplopoma fimbria) in Alaska longline fisheries. Fishery Bulletin- National Oceanic and Atmospheric Administration. 110. 271-279

[5] NPFMC 2019

Specifically, the SSC recommends comparing three alternative projections: random resampling from historical recruitments and doing a 'pulse' or 'shift' in recruitment, with one scenario going from high average recruitment (similar to the most recent decade) to low average recruitment (perhaps similar to the decade before that) half way through the projection, and one going from low to high in a similar fashion. The SSC recognizes this would increase the number of simulation configurations from eight to 12 (from two levels of recruitment to three) and in the case of resampling historical recruitments, it would require performing enough replicates to reasonably characterize the central tendency.

- The discussion paper did not include any mention of the use of size-specific prices to approximate gross fishery landed value. This extension was presented to the SSC during the meeting, but the SSC found it difficult to review with no specifics on the methods, resolution or quality of the price structure data provided. **The SSC recommends that it is critically important to include a calculation of the size classes of the simulated landings and an approximation of the gross revenue changes predicted from an altered landings size composition and the steeply graduated price structure.** The SSC notes that the prices used for some of the historical analyses were much less steeply graded across size categories than those reported in the 2021 analysis and during public testimony. The SSC also discussed the need to describe where price information is from, and what the support/number of observations that are used to calculate prices in each category is. The SSC also emphasized the need to include a status quo outcome, which may entail a TAC underage (it is not clear that is occurring/could occur in the current model). **The SSC further recommends that calculation of price and revenue should not be treated as a sensitivity and recommends a detailed comparison of gross revenue of the landings across all simulation configurations**. This recommendation reflects the public testimony highlighting that even reduced landings at a much higher price may represent a healthier fishery.

The SSC had an extensive discussion regarding additional considerations that may make the proposed simulation more realistic and more informative on the likely outcomes of potential Council action. The SSC attempted to balance the need for more complex approaches with our understanding of the ability of analysts to produce results for the initial review in June 2024. The SSC recommends that the following topics be discussed (but not formally added to the simulation) in the initial review paper:

- **The SSC recommends that the analysts consider the assumption of constant relative fishing mortality between trawl and fixed gear fisheries and whether it is consistent with recent observed fishery behavior during a period of higher recruitment and greater abundance of small fish.** The SSC recommends exploring an empirical relationship between trawl fishing mortality and stock size or recent recruitment based on historical data and to consider how the assumption of a constant ratio between these fisheries might affect the simulation results.

- **The SSC recommends a detailed discussion of how discard mortality would be managed and how these potential management options align with assumptions embedded in the simulation model.** The analysts expressed uncertainty about whether discard mortality would be accounted for via individual quota deductions or as a pooled source of mortality for the entire fleet. The SSC recognizes that these two approaches would create very different incentives for reducing discard mortality through avoidance (much stronger when deducted from an individual's IFQ) that could lead to changes in fishing behavior and ultimately changes in the selectivity of the fishery that could have stock structure feedback and affect the outcomes of a voluntary release regulation. For example, the current structure requires small fish caught to count against quota, creating a profit-maximizing incentive that balances returns from a particular catch composition against fishing costs. For a given cost, this incentivizes targeting areas with the highest *relative* abundance of large fish. However, if discarding is permitted and relatively costless, the profit maximizing incentive is to balance the returns from *retained* catch against the cost of harvesting both retained and discarded

catch. Depending on the returns from different size fish and the costs of fishing, a profit maximizing strategy could be to target areas with higher levels of smaller fish, and discard more, then in the status quo.

- The SSC notes that there are considerable uncertainties in the ability of current monitoring, accounting, and enforcement programs to adequately track and estimate potential discards under a voluntary release regulation. **The SSC recommends a detailed discussion of where potential data gaps may arise, and how these might be addressed via changes in at-sea monitoring and catch accounting methods.** Further, the SSC recommends a discussion of how stock assessment and management might proceed if these data gaps could not be addressed. The SSC notes that some of these uncertainties would be propagated through to the stock assessment for investigation via sensitivity analyses (e.g., different selectivity and retention curves where there are little or no data to inform them). These uncertainties could ultimately translate into increased ABC buffers. The SSC recognizes it is beyond this initial analysis's scope to quantify such outcomes but welcomes any discussion that can be provided.

- **The SSC recommends explicitly stating the fishery behavior assumptions that are used in the simulation, and providing a thorough discussion of how actual behavior might change in the presence of differing incentives and tools available to harvesters to alter times, locations and gear used to target sablefish. The SSC expressed concern related to the lack of justification for the human behavior assumptions implicitly embedded in the simulation model, noting the potential for a change in behavior to change discards.** This concern is based on evidence of substantial flexibility in the fishery. For example, just based on public comments, flexibilities include gear-switching, the different types of pots used, escape ring attributes, and depth. The SSC recommends that the analysts draw on local knowledge to better catalog and describe the potential flexibility in this fishery and, to the degree possible, comment on the relative likelihood of different behavioral responses to the proposed regulation. Furthermore, the SSC requests that the analysts include a discussion of how different assumptions about human behavior would alter predicted discards within the simulation model and associated model outputs.

- **The SSC recommends that it may be informative to explore alternative price structures (compared to simply using recent observed price by size category).** The SSC noted that discard choices are likely a function of price differentials between sizes as well as absolute prices. Such analyses could reflect the uncertainty in recent estimates as well as alternative hypotheses about how price might respond to overall yield and or change in the future and how discards might change under different price conditions. While the SSC ranks this as a lower priority for the June initial review, it notes that such considerations could be very important to the long-term outcomes of a voluntary release regulation.

- **The SSC recommends that the June 2024 initial review include a discussion of potential social and economic impacts that extend beyond gross landed value to aspects of the fishery such as effects on crew retention, use of different types of pots and the size of vessels that may be able to make such changes, different impacts among affiliated fishing communities and areas, etc.** For example, the SSC heard public comment that there are likely differences in discards and profit between pot catcher vessels based on vessel size and pot types that can be used by larger but not smaller vessels. Furthermore, the SSC heard that discards will likely differ by vessel type (e.g., freezer-longliners are more likely to retain catch). These vessel considerations should be included in any analysis in addition to more standard community impacts. The SSC suggests that this discussion should draw on local knowledge and may include qualitative as well as quantitative summaries of current fishery operations.

The SSC also received a brief summary of efforts to create an interactive tool to provide another evaluation of the effects of alternative DMRs, prices, selectivity and other contributing factors. The SSC recognizes

the value of interactive and simple tools but cautions that unless the results are reflective of the proposed simulation, it may be confusing to have differing approaches presented in parallel.

The SSC also discussed the potential value in exploring release of small sablefish in the context of a full Management Strategy Analysis. The SSC recommends that this type of closed-loop simulation is an appropriate tool for incorporating the range of differing objectives and uncertainties across the full complex system of fishery behavior, data collection and management actions. However, the SSC recommends that such an approach is beyond the scope of what is tractable given the current timeline for this analysis.

D7 Research Priorities

The SSC received a presentation on research priorities from Nicole Watson (NPFMC) and Chris Siddon (SSC Research Priorities Subgroup co-chair). Oral public testimony was provided by Cory Lescher (Alaska Bering Sea Crabbers) and Scott Goodman (Bering Sea Fisheries Research Foundation). The SSC did not discuss this agenda item due to time constraints. The discussion on this item was postponed to the April meeting.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires councils to develop "multi-year research priorities for fisheries, fisheries interactions, habitats, and other areas of research that are necessary for management purposes" (16 U.S.C. 1852(h)(7)). This includes research to support fishery management plans and associated regulations for fisheries requiring conservation and management to prevent overfishing, rebuild depleted fish stocks, and ensure sustainable fishing practices. The Council reviews its research priorities every three years.

During November 2023 through January 2024, the Plan Teams and the SSC Subgroup met to discuss new and existing research priorities and to receive public testimony on the ranking of those priorities and/or suggest additional priorities. Three lists were compiled for each group: the top five, a supplementary list of no more than ten, and critical ongoing monitoring research priorities. Additional details, descriptions, and rationale from each Plan Team can be found in the Plan Team reports on the SSC's February 2024 eAgenda.

The research priorities final review will take place at the April 2024 Council meeting. The presentation outlined the process the SSC will employ in April. The SSC Subgroup will present the candidate list of research priorities, the SSC will receive public testimony on prioritization, submit any new research priorities, and the SSC will finalize the top ten research priority list and have any further discussion.

The SSC appreciates the work of the SSC Research Priorities Subgroup, Plan Teams and contributions from the public.

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 February 2024 meeting, a number of SSC members acknowledged associations with specific agenda items under SSC review. Chris Siddon supervises Katie Palof (C2 Crab - CPT co-chair) and is a second-level supervisor for Tyler Jackson (C2 Crab - AIGKC assessment author). Robert Foy is the third or greater level supervisor for contributors to the following agenda items: AFSC members of the CPT, Mike Litzow (C1 BSAI Crab PT); Lukas DeFillipo (C3 Cook Inlet Salmon SAFE); Dan Goethel and Chris Lunsford (D6 Small sablefish DMR); and AFSC members of the CPT and GPT (D7 Research Priorities). Mike Downs worked on the Social Impact Assessment component of the EA/RIR for Amendment 16 to the Salmon Fishery Management Plan, which provides background information for the C3 Cook Inlet Salmon SAFE. Andrew Munro supervises Toshihide Hamazaki (C2 Crab SAFE - NSRKC stock assessment author). Dr. Munro was also involved with initial development of the methods for status determination criteria and ACLs for Alternative 2 Cooperative Management With the State for the Salmon FMP Discussion Paper. As this issue has moved forward, Dr. Munro has provided data, and review of different parts of discussion papers and EA/RIRs related to this agenda item. Finally, Dr. Munro was also the direct supervisor of Dr. Rich Brenner (co-author of C3 Cook Inlet Salmon SAFE) from 2015 through 2022, prior to inception of the C3 Cook Inlet Salmon SAFE, when he left state service for his current position with NOAA. Dana Hanselman is a first level supervisor of Chris Lunsford and second level supervisor of Dan Goethel (C6 Small sablefish DMR) and second level supervisor of Lukas DeFilippo (C3 Cook Inlet Salmon SAFE). Brad Harris supervises Felipe Restrepo, who conducted the FEM swept area and bottom contact analyses contributing to C2 BBRKC Closures. Finally, Jason Gasper contributed to C3 Cook Inlet Salmon SAFE and provided fishery data for C2 BBRKC Closures.