Crab Plan Team
REPORT

May 14-16, 2024; Anchorage, Alaska

Plan Team Members in attendance:

Katie Palof, **Co-Chair** (ADF&G-Juneau)	Cody Szuwalski (AFSC–Seattle)
Mike Litzow, **Co-Chair** (AFSC-Kodiak)	Erin Fedewa (AFSC-Kodiak)
Sarah Rheinsmith, **Coordinator** (NPFMC)	Ethan Nichols(ADF&G- Dutch Harbor)
André Punt (Univ. of Washington)	Ginny Eckert (UAF/CFOS-Juneau)*
Andrew Olson (NMFS-Juneau)*	Krista Milani (NMFS- Dutch Harbor)
Ben Daly (ADF&G-Kodiak)*	Tyler Jackson (ADF&G-Kodiak)
Brian Garber-Yonts (AFSC-Seattle)*	William Stockhausen (AFSC-Seattle)
	Vacant, quantitative expert

Members absent: William Bechtol (UAF-Homer)

Council Updates

Sarah Rheinsmith provided Council updates regarding risk tables, Council decision making surrounding the Bristol Bay red king crab (BBRKC) closure agenda item (February 2024), upcoming agenda topics at the Scientific and Statistical Committee (SSC) (research priorities on May 17), and Council (unobserved mortality working group report being provided in June). The SSC has asked that stock assessment authors and the CPT develop and review draft risk tables during the final assessments in September for eastern Bering Sea (BS) snow crab, BS Tanner crab, and BBRKC. In the future, these risk tables should be used to help inform the buffer between the overfishing level (OFL) and acceptable biological catch (ABC) for these three stocks. Sarah stated that the Council took no action on the BBRKC initial review draft, but that the Council wanted to stay informed on any new research regarding movement and spatial dynamic patterns of BBRKC that may help guide future management decisions. If any new research results become available, an agenda item to review them should be added to a CPT agenda and would be included in the CPT report to the Council. This would provide frequent updates to the Council.

Additionally, Katie Latanich provided an update on the upcoming climate scenarios workshop occurring June 5-6, 2024. This workshop is meant to help generate ideas to improve climate resiliency in federal fisheries, identify tools that can be used when considering management policies, and to help inform the public on the Council's current climate policies. The workshop is open to anyone who has interest and will be available both virtually and in person.

Past climate work includes a 2022 report from the BS Climate Change Task Force (CCTF) and a SSC workshop conducted during 2023. These two initiatives resulted in some ideas and recommendations for building plans for climate resilience and were used to help to develop the upcoming climate scenarios workshop.

The June workshop will focus on four hypothetical, but plausible, climate scenarios and some past studies. Each scenario will contain two areas of uncertainty; predictability (how severe climate change impacts might be and what level of control do we have over this) and level of ecosystem based management (EBM). Predictability looks at the severity of climate change impacts and the ability to predict those outcomes. Typically, there is no control over this aspect. EBM looks at the management policies that can be implemented in response to climate change and can be used in discussions on evaluating overall climate readiness. Four scenarios studies will also be reviewed during the workshop to help ground the discussions surrounding the hypothetical scenarios.

The four scenario are; 1) moderate EBM, high climate change, moderate predictive capabilities, 2) advanced EBM, low climate change, strong predictive capabilities, 3) advanced EBM, high climate change, weak predictive capabilities, and 4) sector and stock specific management, extreme climate change, weak predictive capabilities. During the workshop there will be four breakout sessions to discuss each scenario where all attendees (in person and virtual) may participate. The CPT asked how predictive ability is defined. Katie stated that they tried to keep the definition very broad and high level for the public and that it included understanding what is happening in the environment now and how effective our tools are for using that information to predict the future state. The CPT discussed estimation of the state of a system versus prediction. Prediction is more difficult whereas estimating the state of a system is something that can be done using available and emerging tools.

The workshop report will be completed in September, and provided to the Council in October 2024. Katie stated that if the CPT wanted to review the report at the September meeting that could be accommodated.

ESP Updates

Kalei Shotwell provided an update to the Ecosystem and Socioeconomic Profiles (ESP) process. She provided a brief overview of definitions, products, uses of the process, and the timeline. The timeline includes a full ESP review in May. Two challenges with the timeline include limited staffing to conduct full ESPs for species that don't yet have ESPs, and that statistical updates in ESP report cards do not get to assessment authors in time for them to consider use in their models. Therefore, the timing of delivery of ESP products is proposed for adjustment, and in the future, ESP statistical updates will be presented in May, and report cards in September.

An Importance Methods Project is evaluating statistical methods to score effects of individual ecosystem indicators (but not socioeconomic indicators). The importance result for ecosystem

indicators identifies their Bayesian informed effect, inclusion probability, and relative importance that is included in the report card. The report card orders the indicators by category.

The CPT asked a question regarding challenges with climate change and how some ecosystem indicators and their relationships with stocks may vary over time. Kalei responded that they are examining how ecosystem indicators vary over time and identifying how time-varying indicators might be included in stock assessments. The stationarity or non-stationarity of an indicator will be evaluated with the proposed indicator importance methods, including looking at varying time periods. CPT discussion addressed how to define these time periods while cautioning the likelihood of spurious relationships in shorter time series, and this is a work in progress. Shortening the time series also increases the number of parameters, so this should be done carefully. These may be useful when there are gaps in the survey time series. However, it should be kept in mind that model output is not data. The CPT discussed that the EBS snow crab stock may provide an historical example of how ecosystem indicators might have informed changes in the system before or during the decline.

ESP development is being coordinated nationally across NOAA regions. The AFSC has 17 ESPs and the other regions are developing them. The coordination project has teams from each NMFS region and Headquarters that meet and are developing a commonly used guide for development of ESPs. ESPs are used across the country in the EBFM Policy and Roadmap, the NOAA Fisheries Initiatives, the Climate, Ecosystem Fisheries Initiative, and Regional Action Plans & Modeling. The CPT commented that the NPFMC is unique relative to other Regional Councils in terms of the way buffers between OFL and ABC are set. The ESPs are generated using a similar process but how they are used in management varies.

The ESP process integrates well with climate readiness efforts. Climate vulnerability assessments can help identify which stocks are a priority for ESP development. ESPs can help identify thresholds and bottlenecks that may influence survival in a changing climate. Ocean models can help inform which indicators may be informative. ESPs can provide graphics and a standard template to convey climate readiness.

Model projections of future Bering Sea bottom pH using two different IPCC models were presented as an example of how to use information from climate projections in the ESP. The CPT noted that the two IPCC models used in the example are extreme cases and may not be useful to inform management because these are bookends, and unlikely to happen. The CPT suggested that some more realistic scenarios might be more informative.

The CPT discussed indicator projections, the objective of doing the projections, and how the Council might use this information in management decision making. The group asked if there is a uniform way of how the relationship between the indicator and a stock might change over time and whether longer projections or more short-term forecasts might be more helpful. The longer-term, more extreme projections can be useful in a broad strategic approach. More plausible scenarios and shorter time frame (e.g. 5-year) may help with management decisions.

Two projects are being supported by the national coordination effort. A submission tool for ESP data provided by AKFIN and an R package are in development.

Kalei and Brian Garber-Yonts addressed socioeconomic ESP development. The SSC and Council have consistently provided feedback and concern on how to use the socioeconomic indicators. The current plan is to focus on socioeconomic indicators for groundfish and circle back to crab. The National ESP project is addressing new socioeconomic indicators.

Kalei proposed a change to the ESP process to the CPT. Because of limited staff capacity, they are not able to create new ESPs for stocks that do not yet have them. She proposed to produce a generalized ESP report card that is created through an automated process. The generalized report card would include a simple set of indicators that can be automated. She presented the complete lists of ecosystem & socioeconomic indicators and then highlighted those that can be automated and that would be included in this generalized ESP. These include ecosystem indicators (bottom temperature, SST, wind stress, sea-ice, corrosivity or pH index, chlorophyll a, juvenile CPUE, adult condition, center of gravity, predator biomass) and socioeconomic indicators (CPUE, effort, bycatch, centroid of the fishery, price and fish condition in the fishery).

The CPT cautioned that risk tables are incorporating indicators without clear links or mechanistic relationships between indicators and crab stocks. The CPT discussed the need for a structured process on how these indicators should be used so that buffers are not adjusted due to changes in indicators that aren't directly linked to stock productivity with a robust statistical relationship.

The CPT discussed the proposed list of indicators to be used in creating a general crab ESP for crab stocks that currently lack a stock-specific ESP, and supported this approach. Since there are no plans to develop a stock-specific ESP for Tanner crab, the generalized ESP would be helpful and is needed for Tanner crab. Kalei responded that it may take some time to get this process started, and it is unclear if it would be ready for this fall. The CPT indicated that the risk tables and ESPs are useful in TAC setting. The SMBKC ESP is not scheduled for this year, and it may serve as a good test case for the creation of the general ESP.

Brian Garber-Yonts requested guidance from the CPT on socioeconomic indicators that are useful to OFL determinations for crab stocks as well as information on how ADF&G is using the socioeconomic information during TAC setting. The CPT discussed that the fishery performance indicators may or not be informative. Price – the most current possible price information is important as it may inform future effort. However, in the case of crab, the stocks are fully exploited, and so price doesn't necessarily inform effort. Spatial information on where the fishery is operating may be informative. CPUE could be useful, as effort is probably a function of retained catch. The CPT noted that we will review the ESPs for BBRKC and snow crab at the September plan team meeting, and likely receive an update from the larger ESP group on capacity for future ESPs, and the development of a generalized ESP.

Survey update

Mike Litzow (AFSC) gave a presentation on the EBS bottom trawl survey, focusing on survey modernization efforts, updates to the length-weight (L-W) regressions used in abundance biomass conversions, and crab chela height (CH) sampling protocols. For 2024 the EBS bottom trawl survey will be conducting side-by-side comparisons of 15 and 30 minute tow durations to collect the data for calculating calibrations needed for reducing the current 30 minute tow duration to a proposed 15 minute duration. A focus for this side by side comparison in 2024 is increasing sample size for positive catch BBRKC stations. The CPT discussed 15 and 30 minute tows and the large differences between CPUE and size-selectivity in the historical side by side comparisons that are available. Survey modernization efforts in 2024 will also include side-by-side comparisons of the shelf gear (83-112) and slope gear (Poly Nor'Eastern) . This comparison will take place at regular shelf stations and at slope stations up to 400 m depth. The ultimate goal of this work is integration of the upper slope and shelf into a single integrated survey. Slope - shelf gear comparisons will be focused in two areas, one just north of the Aleutians and the other at the far northwestern corner of the EBS survey grid, and information from the northern area may be useful for evaluating snow crab abundance on the upper slope. Modernization work also includes revisiting legacy data processing decisions for improved understanding to make survey data processing transparent and repeatable. The number of available sea days is a critical consideration for survey modernization and for the 2024 survey, corner stations will not be sampled to make sea days available for the modernization effort. This decision was made with consideration of the low impact of dropping corner stations on the Tanner and snow crab assessments, and sampling strata of high-density strata will be replaced with a single stratum to improve overall spatial coverage of fishery management areas. Survey modernization is being conducted by the AFSC with a set process for continual information sharing and consultation with ADF&G. Changes to the survey are planned to be gradually implemented in the coming years, with an incremental change from 30 minute tows to 15 minutes planned as the first change, with the first 15-minute tows planned for as early as 2026. The CPT supports survey modernization efforts and looks forward to hearing an update at the September CPT meeting.

Currently, only L-W data from 2000-2009 are used in abundance-to-biomass conversions and the CPT discussed a proposal on utilizing a sliding window approach using the most recent 10 years of data. Advantages with this approach is there would be minimal effect on estimated L-W relationships and this would allow for changing biomass at abundance to better be reflected in the survey moving forward. However, it was discussed that caution is warranted on what assumptions are being made with this approach as there are likely time-varying differences, forecasting concerns, and the need to align L-W relationships across catch, survey, and population matrices in assessments. The CPT recommended this topic be further explored at the January 2025 modeling workshop, along with consideration of how L-W regression parameters will be used in projections for computing OFLs from the results of stock assessments.

In October 2023, the SSC requested more information on sampling design for *Chionoecetes* CH data collection due to concerns with not accounting for spatial weighting of the samples used in further analyses (e.g., maturity ogives for assessments). The survey protocol for CH measurements, which is used in estimating morphometric maturity, samples snow and Tanner crab across carapace width (CW) size classes in 5 mm bins to provide representative samples across each species size range. Recent research by Richar and Foy (2022) was presented that serves as the basis for using CW and CH morphometry to estimate maturity for Tanner crab. The log-transformed data showed a clear cutline to identify mature and immature crab.

Observer program changes

Ben Daly (ADF&G) provided an Observer Program update on *Chionoecetes* hybrid data collection. Legally, retained hybrids are classified as *C. bairdi* or *C. opilio* based on legal definitions in State regulation*,* and hybrid data do not inform management. Currently the Observer Program distinguishes hybrids as *C. bairdi*-type or *C. opilio*-type in offload data and only as *Chionoecetes* hybrids in sample pots*.* Challenges associated with high turnover rate of observers and the subjective nature of hybrid classification have prompted internal discussion on the need to continue hybrid data collection. Ben noted that the proportion of hybrids in the snow crab and Tanner crab fisheries and dockside samples tends to be fairly low (< 5%), although the proportion varies inter-annually, and has reached ~40% in some years. The CPT expressed concern with inconsistencies in how hybrid data are utilized, noting that retained catch lumps hybrids as *C. bairdi* or *C. opilio,* whereas total catch is estimated by splitting out hybrids. The CPT requested an updated presentation during the September CPT fishery update that includes the following:

- A measure of uncertainty included in hybrid proportion time-series plots
- An assessment of trends in the proportion hybrids and the location of the fishery (i.e. plot relative to the centroid of the fishery)
- A comparison of hybrid proportion in the NMFS bottom trawl survey, dockside, and observer datasets using legal and industry preferred males only
- Expanded observer datasets to include count pots in addition to measure pots

Tanner Crab proposed model runs

Buck Stockhausen (AFSC) presented proposed models for the 2024 Tanner crab final assessment in September. The proposed models included ones based on the current assessment model framework (TCSAM02) and several based on the GMACS model framework. New data used in model explorations included minor updates to the BSFRF survey data from 2013 – 2017 and the addition of 2018 data, which required a new analysis of side-by-side survey selectivity. Buck also presented empirical estimates of the probability of having undergone terminal molt, which were subsequently used in the GMACS models. Lastly, John Richar provided Buck with VAST model-based indices for the NMFS trawl survey which were used in GMACS explorations. The last two changes only impact the preliminary GMACS runs.

Buck responded to an SSC comment requesting a comparison of survey abundance and catch of GOA Tanner crab with that of the EBS. Time series of abundance by size group and stock (GOA, EBS), and associated cross-correlations were plotted and discussed. The CPT acknowledged the analysis and did not recommend any follow-up relative to the 2024 assessment.

- Three models were evaluated using the bespoke modelling framework (TCSAM02), which has been used to provide management advice since 2017:
  - 23.02b – the accepted model from the 2023 assessment
  - 23.03c – model 23.02b with updates to BSFRF data from 2013 - 2017
  - 23.03d – model 23.03c, with additional BSFRF data for 2018

Models 23.03c and 23.03d each have two parameters at bounds, relating to the overdispersion parameters of the Dirichlet multinomial error distribution for BSFRF size composition (males and females). Differences in fit to data were negligible among models. The CPT recommended that model 23.03d be considered the base model for the 2024 assessment and that only it, updated with 2023/24 data, be presented during the final assessment.

Buck also evaluated seven GMACS models. G24.02 was presented as the base GMACS model, with differences in assumptions from TCSAM02 including:

1. G24.02 starts in 1982 and populates initial numbers at size as parameters instead of estimating recruitment during a spin-up period beginning in 1948 - pre-1982 data (1975-1981 survey data, 1965-1979 foreign fishery data, 1973-1981 groundfish bycatch data, 1980-1981 retained catch data) are ignored;
2. There is no period of high natural mortality estimated through 1984;
3. Growth and the probability of having undergone terminal molt are estimated outside the model;
4. Selectivities are specified as ascending logistic functions instead of ascending normals;
5. Groundfish bycatch is partitioned into trawl and fixed gear fisheries after 1989; and
6. No BSFRF index or size-composition data are included.

Subsequent GMACS models included:

- G24.02a – G24.02 + fishery catch data are not aggregated and fishery size compositions are fit by sex;
- G24.03 – G24.02a + NMFS survey selectivity estimated from the BSFRF side-by-side data fixed to the mean over time;
- G24.04 – G24.03 + NMFS survey selectivity estimated from the BSFFRF side-by-side data fixed to annual pre-specified values;
- G24.05 – G24.03 + probability of having undergone terminal molt fixed to annual estimates determined outside the model;
- G24.06 – G24.03 + NMFS survey selectivity fixed to annual functions and probability of having undergone terminal molt is varied annually, but fixed outside the model; and
- G24.07 – G24.06 + VAST estimates as NMFS survey index.

The CPT noted that model G24.03 is the most similar parameterization to TCSAM02 model 22.03d in terms of survey selectivity and terminal molt. All of the GMACS models converged, though with most having some fishery selectivity parameters at bounds. Overall, the GMACS models fit the data adequately and there were few differences among models. The GMACS models appeared to be more slightly rigid than TCSAM02 22.03d and did not fit more extreme observed values as well. Several GMACS models estimated anomalously large spikes in fishing mortality for the RKC bycatch fleet during several years, despite appearing to have converged successfully. The CPT was puzzled and didn't offer any solutions. Buck highlighted that all of the GMACS models estimated an initial number of mature males at a very small size (< 30 mm CW), and the CPT recommended that the reference group for estimating initial conditions be changed to avoid the issue. GMACS was updated during the meeting to allow the reference size-class for specifying initial conditions to be set during model specification.

The CPT recognized the amount of work Buck had accomplished in responding to SSC requests to transition to GMACS, but requested that a more complete bridging analysis be undertaken for presentation to the modeling workshop in January 2025. Some features of TCSAM02 will need to be incorporated into GMACS for the CPT to make a more direct comparison between models. The CPT recommended that only TCSAM02 model 22.03d be brought forward to the September final assessment.

GMACS update

André Punt gave an update about recent changes made to GMACS. At the January 2024 CPT meeting, it was decided that GMACS structure should be re-evaluated, as various pieces have been added over time via a "Frankenstein" approach. Recent major changes included updates to how parameters are specified. Most parameters (i.e., growth transition, molt probability, maturation, selectivity, catchability, additional variance) can now be time-blocked, allowed to change as a random walk, and have the ability to be linked to an environmental parameter. Other major changes include reorganizing the .ctl file so that the order of inputs is more natural, putting all natural mortality-related parameters in a natural mortality section, fixing the retrospective analysis (still cannot estimate SEs for retrospective analysis cases), Buck Stockhausen added an alternative data input scheme and a power growth function. A new pre-specified selectivity option was added as well as a bias-ramp for recruitment (fixes drops in biomass just prior to the start of the fishery, such as with AIGKC).

For all major updates, André re-ran the assessment using the GMACS_in and GMACS_out files to make sure the outputs are still correct and to check that files are still working. Andre also made updates that tidied up labeling of outputs in the GMACSALL.OUT, GAMCS_in.* and GMACS_out* files. The maximum gradient is now reported to the GMACSALL.OUT file, and the growth/molt probability section of the CTL file has been reorganized to be more straightforward and accommodate terminally molting crab and maturity as separate processes.. Other changes include allowance for a maturation probably matrix to be able to be entered, and for maximum selectivity can be specified by size-class, changed the projections and OFL sections to use the generic seasons.Buck made changes to allow for immature indices to be entered.

Katie Palof described an ADF&G workshop on size structured models and GMACS that was held in February 2024 in Juneau. The workshop was led by André and was a great opportunity for new GMACS users. There was a question about whether GMACS has been implemented for all stocks. It was noted that all stocks with size-structured models have been implemented in GMACS, although not all stocks have an accepted GMACS model in use at this time. There was discussion about how GMACS will be updated/maintained beyond a reliance on André's involvement. The intent of GMACS was to allow various people to actively make changes without damaging other assessments. There have been improvements in this area as individuals other than André have contributed to recent updates. There was a question about whether the goal for September should be to move assessments to the updated version of GMACS. The CPT recommended that authors attempt to use the updated version to verify consistent results are observed between GMACS versions.

Toshihide "Hamachan" Hamazaki provided an update on the NSRKC GMACS transition and outlined his thoughts on specific steps to make the transition happen. A side-by-side comparison is needed followed by a determination about whether the GMACS assessment is acceptable. Hamachan discussed specific configurations to be made in GMACS to reflect the current assessment. There was some discussion about timing of summer trawl survey abundance relative to the timing of the fishery catch, and it was noted that there is an ability in GMACS to implement inter-annual variation in survey timing via a season timing input. There was a question about setting criteria for determining whether the transition is acceptable (i.e., "how close is close enough?"), and it was noted that the CPT-SSC should sign off on the NSRKC assessment in GMACS. It was noted that an exact replication in GMACS is not possible for NSRKC given how catch and discards are removed in the current bespoke model, but we should try for results as close as possible. Differences can be discussed by the CPT, as has been done for other assessment GMACS transitions. It was noted that NSRKC assessment in GMACS was in good shape in January 2024. The CPT recommended that a side-by-side comparison be presented at the September 2024 CPT meeting.

AIGKC final 2024 SAFE

Tyler Jackson (ADF&G) summarized the May 2024 assessment of Aleutian Islands golden king crab. As in previous years, this assessment was conducted separately for the eastern Aleutian Islands (EAG) and western Aleutian Islands (WAG) regions (east and west of 174^0W). The assessment differs from the 2023 assessment in that the landings and discard time-series as well as the data on size-composition were updated (documented in the January 2024 assessment report). The bycatch data were entered into GMACS as bycatch without discard mortality applied, and discard mortality was accounted for in the model projection. Compared to the January 2024 analyses, the models examined by the CPT had directed fishery retained and total catch, retained and total catch size compositions, and CPUE data for the 2023/24 season as well as for the 2023 groundfish fisheries. Some of the models considered for the assessment excluded size-composition data for sizes smaller than the lower limit of the first size-class in the model, as recommended by the SSC in June 2023. Unlike previous assessments, the directed fishery was complete by the time the assessment was conducted, but the total catch from all

fisheries was not final as the groundfish fisheries were still ongoing. It was noted that the estimates of groundfish bycatch can vary substantially among years (Tables 1 and 2 of the assessment report), which may be related to the extrapolation algorithm from observed to unobserved effort.

The CPUE indices for 1995-2023 (observer) and 1985-1998 (fish ticket) were updated based on revised standardization models. The changes to the CPUE standardization approach were restricted to improved diagnostics (influence plots and DHARMa residuals), and a comparison between the Tweedie and negative binomial distributions. The assessment author reviewed the basis for the fish ticket index indices, the results of which seemed anomalous in January 2024 and found that the excess zeros were due to inclusion of personal use and deadloss.

The assessment considered three models, all implemented using GMACS:
- Model 23.0a. The base model from the 2023 final assessment (22.1e2) with updated time-series data and CPUE indices, and the groundfish bycatch input to GMACS without mortality applied.
- Model 23.1. Model 23.0a with truncated size-composition data, i.e. excluding data for crab < 100 mm carapace length.
- Model 23.1b. As for model 23.1, except there are two selectivity periods during the pre-rationalized period (1985-1996; 1997-2004).

As expected, dropping the data for crab < 100 mm carapace length led to better fits to the remaining size-composition data, and for the EAG to a more logistic-shaped selectivity curve for the fishery. Allowing for two logistic selectivity curves for pre-rationalized period (rather than a single one) led to markedly improved fits to the size-composition data. The strong retrospective pattern evident for the EAG in the May 2023 and earlier assessments, and a focus for past CPT and SSC comments remains, and will be examined during the 2025 assessment.

The CPT endorsed the author-suggested Model 23.1 for both areas. This model is clearly an improvement on Model 23.0a because it drops size-composition data for crabs smaller than the lower limit of the first size-class and uses updated catch and CPUE data. The author plans to undertake substantial updates to the assessment, and the CPT agreed that there was little benefit in changing assumptions about selectivity, except as part of the broader model exploration process. The CPT agreed that the mean recruitment used to calculate $B_{35\%}$ should be updated from 1987-2017 to 1987-2020 based on the variance plot for recruitment deviations.

The CPT has the following recommendations (in priority order) for the May 2025 assessment.
- Use the standard convention for model numbering, i.e. the models for the May 2025 assessment, will be 25.xx and not 24.xx.
- Document why the 1993 bycatch and total catch size-composition data are not included in this and past assessments.
- Explore reasons for the retrospective pattern for the EAG.
- Consider models for the EAG and WAG that allow for the bias-correction in recruitment, especially given there is virtually no information in the data on the sizes of the recruitments before 1985.

- Include the EAG cooperative survey data (index and size-composition) as an additional fleet.
- Fit models that assume that the size-composition data are Dirichlet-multinomial distributed instead of Francis weighting the size-composition data.
- Explore the reasons for the implausible values for groundfish fishing mortality in some years for some of the retrospectives and some of the jitter runs.
- Consider starting the model in a non-equilibrium state around 1981.
- Revisit estimation of size-at-maturity given the addition of new data
- Continue exploration of CPUE standardization, including investigation of models with block:year interactions and using geostatistical methods.
- Explore time-varying catchability (e.g. as blocks) rather than the use of additional variance to reconcile the trends in CPUE and those in abundance. Given the known difficulties estimating time-variation in catchability, this could be explored as part of a simulation study – with initial discussions at the January 2025 modeling workshop.

SMBKC proposed model runs

Caitlin Stern (ADFG) presented results from several proposed models for the St. Matthew Island blue king crab (SMBKC) assessment in September 2024. The assessment is conducted on a biennial basis and the last full assessment occurred during 2022. There has been no directed fishery for this stock since 2015/16; the stock was declared overfished in 2018 and has been under a rebuilding plan since 2020. The stock decline was attributed to adverse environmental conditions affecting recruitment to the population rather than to any fishery-related effects and the rebuilding plan does not impose any fishery-related restrictions.

Previous assessment model issues included the inability to reconcile conflicting trends in abundance in the NMFS EBS bottom trawl and ADFG pot surveys and relatively poor fits to both survey datasets in recent (2010+) years. While the NMFS survey is conducted annually, the ADFG survey has been conducted with varying frequency (triennially from 1995-2013, annually 2015-2018, most recently 2022). The pot survey is conducted on a fixed grid with finer resolution (5 nmi) than the NMFS survey (20 nmi); it also extends into nearshore areas that are untrawlable. The last two pot surveys (2018, 2022) have seen a marked reduction in abundance in the nearshore areas relative to older surveys. However, the 2022 survey represented the first increase in survey CPUE (across all three size classes in the assessment model) since the decline began in 2010, although it was not clear whether these changes were statistically significant. The next pot survey will be conducted in 2025 and included in the 2026 assessment. Caitlin noted that she is working with Jon Richar (NMFS) on developing a single survey index using a spatio-temporal approach (e.g., sdmTMB) to better reflect the information in the two surveys and resolve the discrepancies, but she did not discuss any details because this analysis was not complete.

Caitlin presented results from seven models for the CPT to consider using for the 2024 assessment. Since the assessment was conducted in 2022, Caitlin updated the 2022

assessment model ("16.0 2022") with indices and size compositions from the 2023 NMFS EBS bottom trawl survey and the 2022 ADFG pot survey, which she referred to as "16.0" and identified as the base model for further comparisons. Addition of the new data did not change fits to the earlier data or estimated trends in MMB or recruitment in any substantial way. For model 16.0a, Caitlin regenerated the historical ADFG pot survey time series using an improved, transparent approach to data processing and identified and corrected a slightly erroneous value from the 2016 survey. Model 16.0b corrected an error in the timing of the calculation of MMB in the assessment model. In GMACS, the calculation for MMB occurs at the start of the "mating" season to which it is assigned, but it was erroneously thought that the calculation occurred at the end of the season. Although the intent in previous models had been to calculate MMB on February 15, the result of the season mis-assignment was that the effective date was October 15. The two changes introduced in models 16.0a and 16.0b were combined in model "24.0". Following CPT discussion on whether this model was considered to be structurally different from 16.0 in a substantial way, it was agreed that the change in timing of the MMB calculation was not enough to justify a major number change and that "24.0" should be re-numbered as "16.1". Models 16.0b and 16.1 fit the data very similarly to the previous models but exhibited slightly lower estimates for MMB than 16.0 and 16.0a, as one would expect given the change in timing of the calculation of MMB. Recruitment estimates were very similar across all the models.

The remaining three models explored different characterizations for natural mortality (M). The value for M in the 16.x models was pre-specified, based on the default value for BBRKC, to 0.18 yr^{-1} for all years except 1997/98. For 1997/98, M was estimated to account for a presumed mortality event. Model 24.0a estimated M using a tight prior on a mean of 0.18 yr^{-1}, rather than pre-specifying it, while 24.0b used a less-restrictive prior. When estimated, M was higher than the fixed value of 0.18 yr^{-1}; with the less restrictive prior, M was estimated at 0.31 yr^{-1}, while it was estimated at 0.20 yr^{-1} using the more restrictive prior. For Model 24.0c, the value of M was fixed to that estimated in 24.0a. The CPT noted that this was an improper use of the estimate from 24.0a: one could either estimate M for the assessment (as in 24.0a or 24.0b) or pre-specify it based on an external estimate (i.e., the value of M used in the BBRKC assessment). One could not legitimately estimate M for SMBKC in one model and then set it in another model that might get adopted and propagated into the future. After discussion, the CPT recommended that, if a fixed value for M were to be used, it should be based on the value from the previously-accepted BBRKC assessment.

Caitlin presented a likelihood profile on M for model 16.1, which indicated that fits to the indices improved substantially as M increased from 0.1 to 0.5. Andre Punt noted that increasing M allows the model to respond to changes with less inertia (more quickly). The lack of inertia in the model was also identified as the cause of the poor retrospective patterns in peels 7-10 (2015-2012), although no patterns were evident in peels 1-6 because the survey indices were not changing substantially during 2016-2023. The CPT also noted that the results for B/B_{MSY} from model 16.1 suggested the possibility that the stock could be found to be above MSST at the September 2024 assessment.

The CPT recommends adopting model 16.1 as the base model for the 2024 assessment. It also recommends evaluating a model, 24.1, which builds on 16.1 as its base but uses a fixed value for M from the 2023 BBRKC assessment (i.e., 0.23 yr^{-1}).

The CPT also noted that the 2024 NMFS trawl survey will not include the "corner stations" in its sampled locations. To gauge the effect of this on the assessment, the CPT recommends that a version of 16.1 be presented in which the corner stations are dropped from all previous years, although this model would not be used for management.

Caitlin discussed avenues for future work, including increasing the number of size bins included in the model and reiterated the development of a single index combining the NMFS and ADFG survey data using spatiotemporal approaches. The CPT noted that increasing the number of size bins will require changing the size-transition matrix, which may be problematic if the original tagging data used to construct the current matrix can't be found. The CPT discussed the possibility that these data could also be used to estimate natural mortality. With regard to using geostatistical approaches to combining the trawl and pot surveys, CPT noted the difficulties associated with combining data from gear with different selectivity and catchability characteristics in this type of framework. One suggestion was to consider applying geostatistical methods to each dataset separately.

The CPT also made the following recommendations:
- For future models in which M is pre-specified, use the value from the accepted BBRKC assessment
- When presenting fits to the ADFG pot survey indices, join the model-predicted values (not the data values) using lines to aid inter-model comparisons
- Do not present years with no data as years with 0's in tables (e.g., Table 6)
- Plot likelihood profile values as offsets from the minimum, not as absolute values

Snow Crab proposed model runs and currency of management

Cody Szuwalski presented the CPT with snow crab updates. These included detailed responses to SSC and CPT comments, a more in-depth description of the model that was accepted in 2023, and work on determining a more appropriate "currency of management" for snow crab.

Cody focused this round of model development on the changes made during the last assessment cycle and the currency of management discussion. New models were not presented this round. Rather, the author prioritized obtaining feedback on the conceptual framework for the changes that were implemented last cycle that drastically affected the reference point calculations based on the federal control rules. Both CPT and SSC comments have highlighted the importance of implementing the biology of the stock well in the model, which was what the author focused on with the currently accepted model, but this creates reference point calculations that allow for removal of almost all of the large males from the

population and a stock status that is unrealistically optimistic given the recent population crash. Last fall when faced with these issues, the CPT discussed many alternatives to reference points (changing to Tier 4 OFL calculations, adjusting the definition of MMB, etc.) but ultimately the SSC decision was to use the OFL from model 23.3a and apply a large ABC buffer to account for uncertainty in this process.

Model 23.3a, which was accepted in fall of 2023, includes large changes in the treatment of both survey selectivity (i.e., vulnerability, since this includes availability and not just gear selectivity) and molt to maturity (i.e., terminal molt). These are critical processes in the modeling of *Chionoecetes* crab population dynamics. The logistic selectivity function that was estimated in the model prior to 2023 resulted in an under-estimate of the abundance of smaller crab, which led to an under-estimate of terminal molt probability for smaller crab (i.e., smaller crab continued growing to a larger than realistic size before undergoing terminal molt). Mis-estimating the probability of terminal molt is a critical flaw in modeling this population, since terminally molted crab cease growing and those completing the terminal molt below industry-preferred size are protected from interaction with the directed fishery.

Narrative of the population model. Cody provided a summary of the model both for the public and for the CPT and SSC members to understand the structure of model 23.3a more completely. Highlights of the discussion of this summary include a better understanding of the probability of terminal molt calculations from survey data for chela height vs. carapace width, how the BSFRF data were used as a prior on selectivity in the model, and how the survey data are processed before inclusion into the model as mature or immature crab. Specifically, the changes in maturity for this model included inputting annually-resolved estimates of probability of new shell male crab in different size bins having undergone terminal molt (maturing). Accepted models before 2023 estimated this probability as one vector for the entire time series, however this estimated vector of terminal molt probabilities was greatly different from the data that were collected. The result of this change was the addition of many small, terminally-molted males that are now included as part of the mature male biomass. The SSC made some suggestions on alternative ways to utilize theses data, but the author and CPT feel that utilizing the raw survey data was best at this time and refer the SSC to the explanation of the data and process in the documentation for more details on this.

Currency of management. One request of the SSC was to explore yield curves, based on Clark (1991, 1993) for snow crab. Cody used his male-only research model, which has some simplifications compared to the management model (detailed in his report and presentation), for this exploration. The results of the yield analysis under a sensitivity to steepness and *F* suggested a maximin (the fishing intensity, expressed as a % of unfished biomass, that maximizes the minimum of the yields over all of the yield functions considered) of 55% (compared to the 35% SPR in the crab FMP) when applied to the morphometric definition of mature male biomass. Cody also calculated this value for different size cut offs for mature males (e.g., the maximin for a 95 mm currency of management was 28%).

The CPT had an extensive discussion of this yield analysis and how it might be used for decision-making under the current harvest control rules. During this discussion the CPT noted

that it could be possible to apply the Clark (1991, 1993) approach where the minimax solution is taken over stock-recruitment steepness and the component of the population that drives density-dependence (i.e. morphometric males, males larger than 85mm, males larger than 95mm, etc). This would involve defining fishing intensity as the percentage reduction in industry-selected biomass-per-recruit, computing yield functions as given values for stock-recruitment steepness and the component of the population that drives density-dependence, and finding the fishing intensity that maximizes the minimum of the yields over all of the yield functions. This approach recognizes that the MSY proxy needs to account for uncertainty in both stock-recruitment steepness and the component of the population that drives density-dependence. This differs from the original approach for selecting F35% to determine a B_{MSY} proxy for crab stocks, which only accounted for the uncertainty in stock-recruitment steepness. Use of the approach discussed by the CPT may lead to stock status being defined in terms of the size of the component of population vulnerable to fishery expressed relative to a B_{MSY} proxy also parameterized in terms of this population component.

Cody also provided trends in mature male biomass (MMB) and B35% for a few different interpretations of what could be defined as mature male biomass. The CPT had a very extensive discussion on this approach. Canadian snow crab managers apply their harvest control rules to males larger than 95mm CW based on studies they have performed on functional maturity. However, the CPT was not comfortable with changing the definition of MMB without clear evidence on issues of reproductive potential (e.g., are large crab contributing more to the reproductive potential?). There was also discussion of how changes to the definition of mature males would fall in line with the intention of the MSA and crab FMP. In particular, CPT discussed the idea of aligning the currency of management with a size slightly smaller than the industry-preferred size (currently 101 mm CW) in order to account for the effects of discard mortality on slightly smaller crab, especially considering the very high discard rates that were observed in the fishery in the years prior to the population collapse. A possible definition of crab ≥ 95 mm CW as the currency of management was again suggested under this rationale. However, it was pointed out that this definition may be arbitrary and not supported by a rigorous analysis of sustained yield.

Ultimately, the CPT recommended that the author bring forward model 23.3a for specifications in fall of 2024. The CPT also requested alternative reference points for this model using different definitions of mature male biomass for comparison to help shape understanding of the stock but agreed that – at this time – the CPT does not feel comfortable moving to another currency of management for this stock for setting management specifications. The CPT recognized that this means the reference points being calculated from model 23.3a will likely suggest that removing all the large, legal animals in the population is consistent with achieving MSY and results in a population status that is not reflective of the current state of the stock as indicated by survey trends. The CPT hopes that providing the reference points for different portions of the male biomass will assist it in explaining these model results better to stakeholders and members of the public.

Along with model 23.3a the author will also bring forward a draft risk table for snow crab and any additional yield analysis he can perform between now and September, which may include

those suggested during this meeting. If a 2-dimensional yield curve analysis is successful and can provide insight into an appropriate harvest level under all definitions of mature male biomass, the CPT can recommend adjustments to SPR 35% as per the crab FMP guidance.

Tier 4 fallback for snow crab. The author suggested an alternative for snow crab to the basic Tier 4 calculation that is being brought forward for other stocks. Specifically, a fallback Tier 4 option would be calculated as the vulnerable biomass in this year's survey (not smoothed, and vulnerable defined by a cutoff of 95 mm CW), decremented by the proportion of natural mortality that occurs between the time of the survey and the fishery, and M applied as the proxy for F_{MSY} to calculate the Tier 4 OFL. The motivations identified for using the annual survey design-based estimate of vulnerable biomass rather than a REMA smooth through the survey time series were: 1) that the high number of positive stations for snow crab on survey (238 stations in 2023) make the design-based estimate a robust measure of annual biomass; and 2) that the large interannual fluctuations in biomass observed in some recent years would be poorly captured by a smooth. The motivation for decrementing the biomass estimate by the proportion of natural mortality occurring between the survey and the fishery is that failing to account for this mortality could lead to unintentionally high values of *F* if the Tier 4 fallback was used. The CPT supports both of these decisions.

Cody also presented recent work on snow crab population projections under prevailing environmental conditions and continued loss of Bering Sea ice. These projections suggest a long-term pessimistic view of the snow crab population as ice retreats and the ocean warms. His findings were also supported in two recent publications.

BBRKC proposed model runs

Katie Palof (ADFG) presented models for Bristol Bay red king crab around several themes, including: incorporating updates to GMACS with a change of season for MMB, estimating survey selectivity as a non-parametric curve using the BSFRF selectivity experiments as a prior, estimating M with an informative prior rather than fixing it (which was accepted in the 2023 final assessment as model 23.0a), and removing time blocks in molting probability. The updates to GMACS resulted in very small differences to likelihoods and the change in season altered the estimated MMB slightly. The change in season was implemented after a better understanding of the timing of calculations in GMACS and both the change of season and the other GMACS changes were seen as improvements and recommended for adoption by the CPT.

Estimating M changed model output slightly, but improved retrospective patterns markedly. Incorporating the BSFRF data as priors produced very similar selectivity curves (and other output like MMB) compared to incorporating the BSFRF data as additional surveys. Removing a block for molting probability during 1975-1980 produced nearly identical output to models without molting time blocks, but did so with 2 fewer parameters. Given these observations, the CPT agreed with the author's recommendations to bring forward the updated base model (23.0a.p7) and model 24.0c (i.e. the updated base model with the addition of removing the time block for molting in the late 1970s). The author will also bring forward the Tier 4 option from 2023 and the CPT recommended keeping the Tier 4 calculations as an appendix to the SAFE

report. The CPT also recommended bringing forward "Buck's buffer", in which the ABC buffer is the CV of the final year of the REMA output, rounded to the nearest 5%.

The CPT had several suggestions for future model exploration or documentation, including:

- Including BSFRF as a 'ghost fleet' as a check on model behavior. This would involve producing the index within the model based on the estimated numbers at length and empirical availability of the BSFRF experiments to see if the trends in the index of abundance from BSFRF are mirrored by the model predictions.
- Split the selectivity into eras to reflect the change in survey gear, but still use the same priors (perhaps with larger CVs in the early era)
- Include larger size bins in the model. One of the interesting outcomes of the 'BSFRF as priors' model exploration was the possibility of dome-shaped survey selectivity. This could be particularly important if the dome-shape continued down for larger size classes, which are currently included as a plus-group. This would imply cryptic biomass of large individuals, which can have large management implications.
- Remove shell condition from the model. There are no data on shell condition, but the model is parameterized to track shell condition. This slows the model down.
- Explore the parameter that allows for the retention curve to asymptote below one.
- Explore splines for selectivity.
- Perform sensitivities to using time-varying selectivity in the fishery to better understand the relative information content of the fishery data vs. the survey data. Philosophically the survey should drive model dynamics, so looking at the differences between the data sources could illuminate further paths for model exploration.
- Include the units of residuals on the plots.

Bering Sea Fisheries Research Foundation update

Scott Goodman (Bering Sea Fisheries Research Foundation, BSFRF) provided a research update on collaborative BBRKC pot/trawl sampling survey number two (CPS2) preliminary summaries, continued BBRKC research, planned snow crab research, and fishery disaster relief funds. A brief overview of the CPS2 survey area extent in relation to existing Bristol Bay shellfish management boundaries was given, and the successful work of three survey charter vessels (F/Vs *Arctic Lady*, *Seabrooke*, and *Vesteraalen*), crew, and science party were recognized. Preliminary density plots for crab (red king and Tanner) by size and sex, fish bycatch (Pacific cod, pollock, yellowfin sole, and rock sole), and observed bottom temperature from CPS2 were presented in a series of summary maps.

CPS2 comprised approximately 650 pot survey stations which were surveyed by two pot vessels and 135 Nephrops trawl stations (128 completed) which were surveyed by one trawl vessel. The target soak time for pots was 30 hours and trawl stations were towed for five minutes. Snow crab pots from F/V *Arctic Lady* were used for the survey, and pot configuration was standardized with all escape rings closed. The primary bait used for sample pots in both

CPS1 and CPS2 was frozen Kodiak herring. Trawl stations were added to CPS2 to address the disparity in the RKC sex ratio observed in CPS1 pot gear (77% male). Trawl stations were located approximately seven miles away from pot transects to minimize any trawling impact on the fixed gear sampling. Trawl sampling and pot sampling along the transects was not coordinated between vessels and occurred at different times within the survey given the way in which survey stations were divided among the three vessels and logistical challenges with sea ice; sea ice covered 35-40% of the northern edge of the survey area at the beginning of the survey.

A generally higher density of total RKC was observed in eastern Bristol Bay and along the Alaska Peninsula, relative to lower densities observed in the western portion of the survey area; very few if any RKC were caught in the southwestern area. Mature male (≥ 120mm) RKC were observed in several hotspots of survey catch generally in alignment with the Alaska Peninsula. There was a large catch of mature female RKC s (147 crab) in a single trawl station along the Alaska Peninsula, and it was noted that this is in the same area that the NMFS bottom trawl survey caught a large number of mature female RKC during summer 2023. Densities of immature male (< 120mm) RKC were highests in survey pots around the southeastern corner of the Red King Crab Savings Area (RKCSA) and there was one high density trawl tow (59 crab) in the northeastern edge of the survey area. Immature females were generally lacking and were seen in only small numbers, primarily in trawl stations in the northeastern portion of the survey area.

Although not the species of focus for CPS2, survey results for Tanner crab and fish bycatch were presented. Both male and female Tanner crab were concentrated in the southwestern portion of the survey area and along the western edge, with higher catches in trawl gear compared to pots. Pacific cod were well distributed throughout the survey area in both pot and trawl stations. Pollock were caught in pot and trawl stations with differential hotspots between the two sampling gears. Yellowfin and rock sole were caught in both pot and trawl gear and were well distributed throughout the survey area. Several of the trawl catches of flatfish were problematically large as they contained 5 to 6 thousand pounds of fish from a 5-minute tow.

Preliminary bottom temperature data collected during CPS2 were presented and showed relatively colder water temperatures compared to CPS1. This was associated with the larger extent of sea ice coverage in Bristol Bay during CPS2. Summary maps of survey catches overlaid with interpolation of temperature data showed RKC, Tanner crab, and Pacific cod generally avoiding the coldest water temperatures in the survey area. Relative to CPS1, mature female RKC were distributed more to the northeast of the survey area in CPS2 with the colder water in 2024.

A summary table of survey catch/effort and crab sex ratios between CPS1 and CPS2 surveys was presented. Total survey effort in CPS2 was 646 pots and 128 trawl tows, compared to 637 pots and 0 trawl tows in CPS1. Total CPS2 RKC catch was 6,911 crab (6,415 in pots, 496 in trawl) compared to 10,191 RKC caught in CPS1 (pot gear only). This difference in total catch between survey years was attributed more to annual survey variability and differences in water temperature rather than decreased abundance. RKC sex ratio in CPS2 was 76% male in pot

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gear (very similar to CPS1) and 44% male in trawl gear. Total CPS2 Tanner crab catch was 1,937 crab (1,009 in pots, 928 in trawl) compared to 670 Tanner crab caught in CPS1 (pot gear only). Tanner crab sex ratio in CPS2 was skewed, with 99% of pot catches being male and 68% of trawl catches being male, compared to 83% male in CPS1. It was discussed that the particularly skewed Tanner crab sex ratio in pot gear is likely a result of female Tanner crab being able to easily walk out of the pot mesh given their smaller size. Also discussed was the overall utility of pot sampling versus trawl sampling. Important benefits of pot sampling are the higher spatial resolution of the data and the ability of individual pots to contour to the subtle bathymetric features of Bristol Bay that influence RKC distribution. Additionally, Scott noted the importance of involving crab fishers in BBRKC research and the employment opportunity that these survey charters provide for vessels and crew given the ongoing financial challenges that the crab industry faces.

Several special projects were conducted during CPS2, including stomach content analysis of fish, primarily from trawl stations. It was noted that Pacific cod in pot gear often had empty stomachs perhaps due to the timing of the survey which occurred during spawning when Pacific cod don't eat as much or because Pacific cod may be entering the pot specifically because they are hungry. Cameras were installed in some of the pots to observe interactions between crab and fish inside pots. It was noted that yellowfin sole, Pacific cod, and sculpin enter the pots first with crab being the last to enter; the presence of fish in pots does not appear to deter crab from entering. It was noted that past camera observations in opilio pots and RKC survey work in Southeast Alaska showed that halibut in particular are disruptive to crab entering pots. Future analysis of the CPS2 survey data will include analyzing the relationships between fish and crab, spatial/temporal trends between the two sampling gears, and the differences in the ecosystem variables.

A video was shown of one single trawl tow that had 320 RKC shed carapace. The assumption is that the trawl passed over a very recent molting event. Scott noted that he saw more soft shell RKC in CPS2 trawls than he had seen in previous trawl survey work. The trawl seems to do a better job catching soft, recently molted crab that otherwise would not be entering pots.

Scott concluded his presentation by sharing that the results of the CPS1 survey were published as a NOAA Tech Memo (NMFS-AFSC-483) and highlighted that this was a shared effort between BSFRF, NOAA, and ADF&G. He gave a brief update on upcoming RKC tagging work that will be conducted by Dr. Leah Zacher on survey leg one of the 2024 NMFS trawl survey in collaboration with BSFRF, (primarily focusing on female RKC) and provided an update on the ADF&G camera sled work to evaluate habitat suitability for juvenile RKC in Bristol Bay that is currently underway on the F/V *Early Dawn*. Scott also updated the CPT on the recent Opilio Workshop that took place in St. John's, Newfoundland as well as BSFRF research plans for snow and RKC using anticipated fishery disaster relief funds. This includes the Opilio Pilot Project that will use one trawl vessel and one pot vessel, similar in design to CPS2.

Economic impacts of snow crab closure

Although the economic impact analysis was postponed, Brian Garber-Yonts (AFSC) requested CPT feedback on socioeconomic indicators for inclusion in September ESP report cards. Brian reviewed the October 2023 Council motion that formalized the recommendation for socioeconomic indicator development to support OFL/ABC and TAC decision making. He reported that under Council direction, a working group has been formed, and includes staff from the AFSC ESSR group, AKRO economists, and Council staff economists. The immediate goal of the working group is to develop a standard set of socioeconomic indicators to inform 2024/25 groundfish TAC setting.

Brian specifically requested clarification from the CPT on which socioeconomic indicators to include in 2024 crab ESP report cards to inform the OFL/ABC, and ADF&G TAC setting. The CPT requested that all fishery performance, economic and community indicators previously reported in the BBRKC and snow crab ESPs be retained. Because economic indicators are lagged, the CPT expressed interest in seeing price nowcasts in September as part of the ESP report cards, if possible.

The CPT agreed that the initiation of a general ESP (proposed framework in "ESP Updates" agenda item) should be limited to fishery performance indicators, as the primary intent of the general ESP is to inform risk tables. Brian emphasized that the current suite of socioeconomic indicators included in crab ESPs does not encompass the full scope of what the Council is requesting, so the working group will aim to develop additional community-based indicators, and differentiate between indicators intended to inform the OFL/ABC (fishery performance/health of the stock) and the TAC (economic and community indicators). The CPT inquired about developing forecasts for upcoming year market conditions to inform TAC decisions, and Brian noted that while capacity currently doesn't exist to do so, market forecasts may be developed in the future.

New Business

September 9th - 13th, Seattle, WA (AFSC)

Nov 5th, virtual meeting to approve NSRKC final specs (morning)

Jan 14th - 16th (modeling workshop, no CPT meeting), Anchorage, AK (NPFMC office)

May 12th - 16th, Anchorage/Kodiak (T)

September agenda topics:

- Final SAFE - snow, Tanner, BBRKC, SMBKC
- Proposed model runs - NSRKC, AIGKC
- Risk tables - snow, Tanner, BSRKC
- ESPs (snow, BBRKC)
- Fishery updates (Ben / Krista)
- Survey updates (Mike)
- Overfishing updates - AIGKC (total catch update), PIBKC, PIRKC, PIGKC, WAIRKC
- BSFRF update
  - CPS 2 update
- GMACS update (T)
- Project update - 1 or 2 slides
  - BBRKC juvenile (Jared)
- Research update ideas
  - Louise Copeman (T)
  - Sean Hardison (T)
  - Noelle Yochum (T)

Others in attendance:
*denotes a presenter

Abigail Harley	Jamie Goen	Nat Nichols
Andy Nault	Jeff Steele	Nicole Kimball
Bo Whiteside	John Hilsinger	Noelle Yochum
Caitlin Stern*	Kalei Shotwell*	Paul Wilkins
Connie Melovidov	Katie Latanich*	Sam Comeau
Cory Lescher	Kendall Henry	Sarah Webster
Danielle Lampe	Kirsten Dobroth	Scott Goodman*
Edward Poulsen	Lance Farr	Sean Harding
Emily Ryznar	Linda Kozak	Shannon Hennessey
Frank Kelty	Madison Heller-Shipley	Tim Loher
Franz Mueter	Mark Stichert	Wes Jones
Heather Mann	Mateo Paz-Soldon	
Henry Tashjian	Mellisa Haltuch	