Draft SSC Report
October 2020

Balance of SSC Report

Survey loss uncertainty

- The SSC received a presentation on a broad analysis evaluating the loss of survey data in the GOA and BSAI for both groundfish and crab stock assessments.

- The SSC *finds* the approaches taken to be helpful in evaluating the degree of additional uncertainty in biomass and OFL associated with the loss of 2020 surveys.

- The SSC *used* this information during consideration of buffers for crab stocks and will likely do so for groundfish in December.

- The SSC *recommends* consideration of methods to make stock assessments more robust to possible future survey reductions/loss (e.g., evaluation of data conflicts inside assessment models, model-based survey time-series, and exploration of harvest control rules explicitly linked to survey and assessment uncertainty and lags.)

C1/C2 Ecosystem Status Report- Preview

- Presentation highlighted what data were and were not collected in 2020, as well as important highlights

- The lack of field surveys resulted in fewer environmental data

- The ESR team worked hard to supplement the available data with efforts by partners, emphasizing the importance of team work across agencies

- SSC *appreciates* October reports, requests they continue annually

- SSC *recommends* pursuing systematic and consistent incorporation of LK and TK as relevant to ecosystem status updates

C1/C2 Eastern Bering Sea ESR Preview

- New modeling of ocean acidification and aragonite saturations
  - SSC *requested* effort to link aragonite concentrations to time and locations where commercially important crabs are most vulnerable

- Primary production over the middle shelf low, similar to last 5 yrs
  - SSC *suggested* examination of region-wide primary productivity

C-1 BSAI Crab

EBS Snow Crab

- The SSC *appreciates* the author's responsiveness to previous CPT and SSC comments and *looks forward to* resolution of recruitment estimation and continued work on GMACS. In addition to those, the SSC *recommends*:

  - Examination of catchability, natural mortality and selectivity alternatives due to serious concerns about the large positive retrospective pattern.

  - Retrospective analyses of each viable candidate model be included in future assessments.

  - A biological rationale for differing sex ratios of recruitment.

C-1 BSAI Crab

EBS Snow Crab - Continued

- The SSC further *recommends*:
  - Development of an Ecosystem and Socioeconomic Profile (ESP) to explore indicators that directly affect the stock
  - Explore short-term tagging projects to understand implications of possible repeated re-sorting of discarded crabs
  - Development of a prior distribution for M through web-based tool

C-1 BSAI Crab

<u>Bristol Bay Red King Crab</u>

- The SSC *supports* the CPT recommendations and also *recommends*:
  - Including an estimation of the probability that the stock is in an overfished condition
  - Providing information on the prevalence of crab bycatch excluders in pot cod fishery, and whether they influence length composition of bycatch
  - Including raw numbers used for PSC limits in a table as currently done for EBS snow crab, if possible
  - The future use of VAST for this assessment including diagnostics and better-fitting error distributions

C-1 BSAI Crab

<u>Bristol Bay Red King Crab - Continued</u>

- The SSC *appreciates* the Ecosystem and Socioeconomic Profile (ESP) and *recommends*:
    - o Examining the correlation among indicators for potential redundancy
    - o Verifying that out-migrating sockeye salmon actually consume RKC larvae. If so, consider temperature effect on consumption.
    - o Considering whether chlorophyll is the best index for evaluating the match of RKC larval hatch timing with their prey
    - o Including community indices in ESP
    - o Cross-referencing the ESP with results of similar exercise in the 1990s (references provided)

C-1 BSAI Crab

Bristol Bay Red King Crab - Continued

- The SSC *appreciates* the Ecosystem and Socioeconomic Profile (ESP) and *recommends*:

  - For each indicator, specifying mechanism and directional influence of indicator on outcome so the response and causation are clear

  - Considering threshold responses (e.g., pH), non-linear responses (e.g., intermediate optimum temperature), and multiple mechanisms by which some factors may affect RKC in a positive, negative, and/or curvilinear way simultaneously

C-1 BSAI Crab

EBS Tanner Crab

- The SSC *appreciates* the author's responsiveness to previous CPT and SSC comments and *looks forward to* resolution of previous suggestions yet to be fully addressed. In addition to those, the SSC *recommends*:
  - Addressing serious concerns about model convergence. Convergence to a global minimum is required. Strive to reduce the number of parameters and minimize the number of parameters hitting bounds. Posterior correlations should be carefully examined for potential sources of convergence issues.
  - Including retrospective analyses of each viable candidate model in future assessments
  - Including a rationale for using MCMC, if recommended for mgt

C-1 BSAI Crab

EBS Tanner Crab - Continued

- The SSC *further recommends*:
  - Inclusion of raw numbers used for PSC limits in a table in the SAFE as is done with snow crab, if possible
  - Modifications to the assessment be considered to the extent practicable that would bridge disconnects between state-federal management and help facilitate application of the assessment to the state's harvest strategy for fishery management
  - Bridges could include consideration of the two-area management vs. EBS-wide assessment, inclusion of females in state harvest strategy vs. no stock-recruit relationship in assessment, etc.

C-1 BSAI Crab

St. Matthew Island Blue King Crab

o The SSC *appreciates* the inclusion of the ESP.

o In future iterations of this analysis, the SSC *recommends*:

- o Efforts to link corrosivity index to areas overlapping with the stock distribution and thresholds for the onset of shell degradation.

- o Efforts to link physical indices with processes influencing the assessment (e.g., catchability, growth increments, reproductive potential, or molting probabilities).

- o Calibrating Pacific cod indices of predation for spatial overlap between predator and prey consumption.

C-1 BSAI Crab

Norton Sound red king crab modeling

- Authors plan to bring forward results from base model (19.0) and are developing a GMACS version of the same model (20.0).

- Stock currently at low abundance; indications of strong recruitment pulse that will likely increase mature abundance in the near future.

- The SSC had several *recommendations* for model improvements:

  - Consider total catch OFL (including discards) for 2021

  - Provide detailed comparison of base model with GMACS model

  - Continue development of VAST model and consider bringing forward a model that uses VAST estimates of abundance

  - Include information on barren females and, to the extent possible, additional measures of reproductive success in the assessment.

C-1 BSAI Crab - Balance of Crab Plan Team Report

- The SSC *received* a presentation on the CPT report, including:
  - Survey loss uncertainty
  - Stock projections working group
- The SSC *did not receive* presentations on:
  - PSC analysis
  - Pribilof Island BKC NPRB research project
  - Trawl Survey updates (but see agenda item D-1 AFSC report)
- The SSC also revisited BSAI crab ABC buffers

C-1 BSAI Crab - Balance of Crab Plan Team Report

Survey loss uncertainty

- The CPT provided results from
    - 1) retrospective runs with and without the terminal survey year and
    - 2) changes in management quantities with high/low survey proxy values for 2020
    - Provided for EBS snow crab, BBRKC, Tanner crab and SMBKC
- The SSC *finds* results from this analysis to be very helpful to characterize crab stocks' sensitivity to the loss of 2020 survey data
- Results are consistent with Bryan et al., indicating a stock-by-stock approach is necessary with most stocks exhibiting minor sensitivities
- The SSC *reiterates* its strong support for continuing large-scale fishery independent surveys

C-1 BSAI Crab - Balance of Crab Plan Team Report

Stock projections

- A CPT subgroup provided recommendations on standardizing crab stock projections with realistic exploitation levels, as requested by SSC

- Their recommendations include:

  - Projections for five years

  - Average fishing mortality (or linear extrapolation if declining stock)

  - Bootstrapped from historical recruitment or if recent low recruitment, a shorter time series reflective of low recruitment levels

  - Use the MLEs or the MCMC to accommodate ADMB or GMACS models

  - Some flexibility for authors to respond to specific situations

C-1 BSAI Crab - Balance of Crab Plan Team Report

<u>Stock projections cont</u>.

- The SSC generally *agrees* with the CPT subgroup recommendations for stock projections and *requests*:
  - If authors bring forward an alternative projection, provide standard projection as well
  - Consider incorporation of state harvest control rules to provide more realistic projections

C-1 BSAI Crab - Balance of Crab Plan Team Report

BSAI ABC buffers

- Following the SSC discussions for the four crab stocks with full assessments, the SSC revisited the subject of ABC buffers
  - Discussion focused on the rationale for ABC buffers in crab stocks, regarding both the lack of a 2020 survey and in general
  - The SSC *reiterates* its 2015 suggestion for a workshop to clarify the criteria for ABC buffers for BSAI crab
  - The SSC *requests* the CPT come forward with new approaches to specify and clarify additional sources of uncertainty

C-2 Joint Groundfish Plan Team Report

Observer Program

- The SSC *commends* the FMA Division for their responsiveness and efforts to adapt the 2020 deployment plan on short notice, and efforts underway to develop the 2021 ADP.

Longline Survey

- The SSC *commends* the longline survey team for completing the 2020 longline survey in the Aleutian Islands and GOA shelf/slope break.

C-2 Joint Groundfish Plan Team Report

Ecosystem RPA surveys (Recruitment Process Alliance)

- The SSC *appreciated* this report and *supports* the following Joint Plan Team recommendations:
  - For an RPA update next year.
  - That the RPA update focus on highlighting projects and information that are important to management.
  - That the Ecosystem Status Report (ESR) and Ecosystem and Socioeconomic Profile (ESP) committees provide a prioritized list of ecosystem information to be reported to the Teams for the September meeting.

C-2 Joint Groundfish Plan Team Report

<u>Ecosystem and Socioeconomic Profiles (ESP)</u>

- Currently-available and in-development ESPs
    - Currently available full ESPs - sablefish, GOA pollock, SMBKC
    - Currently available partial ESP - BBRKC
    - In-development full ESPs (Nov 2020) - EBS and GOA Pacific cod
- The SSC *endorses* the recommendations and suggestions from the Teams (template format, indicator analysis and scoring methods, development of ESP dashboard with metadata), all of which are consistent with previous SSC recommendations
- We are glad to see that the teams preparing ESPs, ESRs and SAFEs are closely coordinating efforts with each other as well as with staff developing the new annual community engagement and participation overview

C-2 Joint Groundfish Plan Team Report

<u>VAST Modeling</u>

- The SSC received a report on the work of the AFSC survey team to provide stock assessment authors with VAST model-based trawl survey indices

- The SSC *supports* this ongoing work and made several technical suggestions regarding the use of covariates and inclusion of areas not sampled in all years (e.g., the northern Bering Sea, untrawlable areas).

C-2 Joint Groundfish Plan Team Report

Survey loss uncertainty

- The SSC received a report on the implications of the Bryan et al. analysis regarding uncertainty due to the loss of survey data in 2020 and the JPT recommendations for groundfish stock assessments.

- The SSC *notes* that effects were species specific and do not appear to warrant a blanket reduction from the max ABC.

- The SSC *recommends* that groundfish stock assessment authors consider survey loss analyses in their preparation of risk tables for this year.

- The SSC *notes* that if there is further loss of surveys in 2021, it could have an increasingly important effect on uncertainty.

C-2 BSAI Groundfish Plan Team Report

<u>Bogoslof and EBS Pollock</u>

- The SSC received reports on the AI and Bogoslof pollock survey and a saildrone acoustic survey deployed as contingency response to the cancellation of the 2020 EBS summer acoustic trawl survey.

- The SSC *supports* the Plan Team's recommendation to evaluate model results including saildrone acoustic data in 2020 pollock assessment.

- The SSC *encourages* assessment authors and Plan Team to thoroughly discuss assumptions, caveats, issues, and concerns with using the 2020 saildrone data in place of ship-base acoustic-trawl data.

C-2 BSAI Groundfish Plan Team Report

BSAI Octopus

- The SSC received a presentation on the stock structure template report for the BSAI octopus complex, a Tier 6 stock comprised of multiple species with no directed fishery and little information

- The SSC *supports* the Plan Team's and author's conclusion that the BSAI octopus complex be given a rating of "little or no concern"

- The SSC *recommends* that the Plan Teams consider clearly distinguishing stocks in the stock structure template that have insufficient information ('unknown') from those that can be positively confirmed to be of "little or no concern"

- This would not imply a need for action or an imminent need for research, but would motivate future research

C-2 BSAI Groundfish Plan Team Report

Blackspotted/Rougheye

- Data shows fewer older age classes than expected and a large young year class: neither dynamic captured well by model

- Authors' investigated an updated aging error matrix, prior distribution on natural mortality, double-normal dome shaped selectivity, and compared two data weighting methods

- SSC *concurs* with GPT recommendation to include the updated aging error matrix and provide further investigation of natural mortality

- SSC *concurs* with GPT recommendation to bring forward a model with the Francis weighting procedure, in addition to the model with the McAllister-Ianelli method, given improvements in retrospective patterns

C-2 BSAI Groundfish Plan Team Report

Blackspotted/Rougheye

- SSC *reiterates* the following December 2018 recommendations:

  - Bringing forward a model without length composition information to investigate potentially conflicting data signals

  - Include updated maturity information as available

C-2 BSAI Groundfish Plan Team Report

Northern rock sole

- SSC *concurs* with the PT recommendation to use the corrected ABC and OFL values for BSAI northern rock sole in the 2021-2022 harvest specifications

- SSC *encourages* continued work on using environmental conditions to inform recruitment

C-2 BSAI Groundfish Plan Team Report

Yellowfin sole

- The authors brought forward two models: (1) fixed natural mortality (M) for both sexes (base model); (2) fixed M for female and freely estimated male M

- SSC *concurs* with GPT recommendation to bring the new model forward for next assessment

- SSC offers the following model development suggestions:
  - The authors' consider a prior distribution on the freely estimated male M in the two sex model
  - The authors' consider recent work on wave height as it relates to catchability

C-2 BSAI Groundfish Plan Team Report

EBS Pacific Cod

- Numerous models were presented to the SSC, including
  - Models with EBS and NBS surveys separate or combined,
  - Models with single area or areas separate,
  - For models with separate areas, model movement or not,
  - Models with and without time-varying catchability,
  - Models with and without a prior on catchability,
  - A single model with constrained catchability requested by industry,
  - All models use VAST model for surveys.

- SSC concurs with GPT recommendation to bring forward models 19.12a, 19.12, 20.04, and 19.15 (an additional option would be a simpler model previously used for management)

- SSC disagrees with GPT recommendation to bring forward 19.12e or any two-area models at this time, as evidence shows one stock and movement models not sufficiently vetted

C-2 BSAI Groundfish Plan Team Report

EBS Pacific Cod cont.

- SSC *concurs* with GPT recommendation to include only models without priors on catchability

- SSC *agrees* with GPT recommendation that ensemble should be weighted by last year's averaging method

- SSC *concurs* with GPT recommendation to not use CCDA weighting method in December but *recommends* review at upcoming CIE

- SSC *recommends* the new ensemble, spatial and movement models be reviewed at upcoming 2021 CIE review

- The SSC *recommends* collection of fishery size and age composition samples from NBS to verify selectivities for EBS and NBS are similar

- The SSC would *like to see* evidence of spawning occurring in the NBS to support models that have high apportionment of age-0 fish there

C-2 GOA Groundfish Plan Team Report

Survey Optimization

- This tool is timely given constraining budgets

- This tool provides increased flexibility and efficiency and allows surveys to respond quickly and tactically to changing situations

- The SSC *supports* continued development of this tool

- The SSC *encourages* the research team to have conversations with the survey planning team as development continues

- The SSC *suggests* exploring optimizing composition data

- The SSC *suggests* closely considering what species to include and potential weighting of the species

- The SSC *recommends* a comparison between results from design- and model-based estimators

C-2 GOA Groundfish Plan Team Report

<u>Pacific Ocean Perch</u>

- The SSC received a progress report on internal review of the GOA Pacific ocean perch assessment model ahead of CIE review in 2021 and status update of the 2020 stock assessment.

- The SSC is *encouraged* by the progress of the internal review team and efforts to address SSC recommendations.

- The SSC *supports* the authors and Plan Team recommendation to bring forward a model with the updated data and following proposed updates:

  - updates to priors for catchability and natural mortality,

  - estimates of fishery age composition through an age-length key,

  - updated aging error matrix.

C-2 GOA Groundfish Plan Team Report

<u>Dover Sole</u>

- The SSC *supports* further development of multi-area models for this stock.

- The SSC *suggests* authors explore fitting age-at-length relationships outside the model to reduce model complexity and possibly help resolve movement and recruitment.

- The SSC reviewed development of VAST models and comparison with design-based and random-effects model indices.

- The SSC *suggests* that VAST models may help account for biomass in deeper strata that are inconsistently sampled by the GOA bottom trawl survey.

C-2 GOA Groundfish Plan Team Report

<u>Dover Sole</u>

- The SSC *supports* continued evaluation of VAST.

- The SSC *supports* analysts' approach to model validation by comparing the distribution of observed and simulated survey catches.

- The SSC *suggests* exploration of depth and possibly bottom temperature as covariates.

- The SSC *supports* continued exploration of alternative approaches to specifying orientation of spatial correlations in the GOA.

C-2 GOA Groundfish Plan Team Report

Pacific Cod

- The SSC received a presentation on several ongoing research projects including an historical overview of the GOA Pacific cod stock and its management, and developments toward a climate-enhanced stock assessment model.

- The SSC *commends* the analysts on their efforts to publish the unfolding story of GOA Pacific cod in the peer-reviewed literature

- The SSC *finds* it helpful to formalize analyses that support stock assessments and provide the background for future discussions.

C-2 GOA Groundfish Plan Team Report

<u>Pollock</u>

- The SSC reviewed results of Shelikof acoustic-trawl survey, noting the lower-than-expected abundance of the 2018 cohort.

- The SSC *notes* that survey biomass for all length classes was lower in 2020.

- The SSC *supports* continued comparison of LFS and AWT sampling nets and looks forward to reviewing calibration study results.

- The SSC reviewed an application of VAST models to EGOA survey data for use in EGOA pollock assessment under Tier 5.

- The SSC *suggests* that VAST models for pollock across the entire GOA, followed by post-stratification may be appropriate for indexing pollock in the EGOA.

C-4 Cook Inlet Salmon FMP Initial Review

- The SSC *finds* that the EA/RIR clearly describes the Alternatives and options under consideration

- The SSC *finds* that the wealth of information in the document sufficiently summarizes the marine environment, the UCI salmon fishery, other affected fisheries, and the communities that could be impacted by the FMP amendment under consideration.

- While impacts are not fully quantified due to data limitations, the SSC *finds* that they allow the Council and the public to understand the relative impacts of the Alternatives

- The SSC *recommends* the document be advanced to final action after addressing the following SSC concerns

C-4 Cook Inlet Salmon FMP Initial Review

- Under Alt. 3, Opt. 2, the SSC *recommends* clarifying which of the listed conditions must be met to avoid closure of the EEZ and whether prohibition on salmon harvests in the EEZ would be an annual determination.
- The SSC *recommends* clarifications and additions to the Status Determination Criteria (SDC) and Annual Catch Limits (ACL):
  - Clarify that using lower bound of escapement goal range for setting ACL is consistent with producing MSY over the long term
  - Describe relationship between when proposed SDC / ACL indicated a concern in retrospective analyses relative to when State management identified a concern.
  - Consider specifying Optimum Yield (OY) as an OY range
  - Clarify whether ACL calculations account for all catches of a given species in the EEZ (including non-indicator and other stocks)

C-4 Cook Inlet Salmon FMP Initial Review

- The SSC *recommends* enhancements to the Impact Analyses to address the large uncertainties as to how State management might respond to federal measures taken under either Alternative:
  - Describe how State has responded to low escapements in the past
  - Identify and analyze possible 'scenarios' of how State management would respond to federal determinations of overfishing, an overfished condition, or ACL exceedance
- The SSC further *recommends*:
  - Consider additional conservation issues and distributional impacts associated with possible EEZ closures
  - Consider possible conservation benefits of federal management (e.g. bycatch accounting)

C-6 BSAI Halibut ABM DEIS

- *Scope of Review:*
    - An extensive amount of work has been done since October 2019
    - Authors and SSC communicated the week prior to the 2020 meeting
    - Updated documents correcting errors in simulation model <u>inputs</u> were posted the afternoon before SSC review was scheduled
    - The corrections impacted the baseline from which the alternatives and performance metrics are assessed relative to Council objectives
    - Without sufficient time to review the revised model results and their impacts on all aspects of the DEIS, the SSC was ***not able*** to independently evaluate the analyses nor determine if the DEIS is acceptable to move forward at this time
    - The SSC looks forward to the opportunity to review the document and analyses at a future meeting

C-6 BSAI Halibut ABM DEIS

- *Scope of Review cont.*
  - As a result, the SSC agreed to focus its discussion on:
    - Changes that were made in response to simulation modeling recommendations provided to the ABM workgroup in October 2019,
    - The revenue impacts assessment and the DSIA,
    - Provide additional suggestions where possible.

C-6 BSAI Halibut ABM DEIS

- The SSC *commends* the ABM working group for its substantial efforts to improve the analysis in general, and improvements in response to the SSC's October 2019 recommendations in particular.

- The SSC *found* that the ABM working group addressed the four recommendations with six simulation model revisions.

- The SSC *provided* the following comments and recommendations:

  - Due to the narrower scope of this action on A80 sector halibut PSC only, the impact of U26 mortality on annual TCEY calculations may be of much greater importance than in previous iterations.

  - The simulation framework could consider including the calculation of SPR in order to more accurately represent the IPHC's process and eliminate the need to use the approximation of TCEY to spawning biomass as a proxy calculation.

C-6 BSAI Halibut ABM DEIS

- Recommendations cont.

  - There is currently no discussion of the effects of shifting PSC use among IPHC Regulatory Areas within the BSAI – this is where some of the year-to-year effects on the 4CDE directed fishery have come from and may be an important contributor to the variability in annual directed fishery catch limits.

  - The simulation may be overestimating the proportion of the coastwide TCEY in BSAI, because it appears to be using the stock distribution and not correcting for the 0.75 relative harvest rate applied by the IPHC.

  - The SSC *recommends* that the simulation model draw from the abundance-conditional distribution of A80 PSC catches.

C-6 BSAI Halibut ABM DEIS

- Recommendations cont.

  ○ In the newest revision of the analysis the median directed fishery catch ranges from approximately 110% to 200%, which exceeds the 2019 level for the entire duration of the simulation and for all alternatives. The SSC is concerned that this revised projection may not provide for the ability to evaluate differences among the performance of alternatives at relevant fishery levels.

  ○ The corrected directed halibut fishery catch levels in the model means that alternatives are now evaluated within a context of <u>increasing</u> directed halibut fishery catch, not declining. This raises the question of whether the comparison of the alternatives within this context is relevant (e.g. Table 6-5). The SSC believes that careful consideration of the relative impacts within this new context is important, and thus, a thorough review of the revised DEIS is warranted.

C-6 BSAI Halibut ABM DEIS

Revenue Impact Estimation

- While the SSC believes the presentation of results in regard to the impacts of alternatives could be greatly improved, the SSC *finds* the analysis adequate for the DEIS, with the following recommendations:

  - The SSC *recommends* that the "business-as-usual" impacts be calculated for the sake of having a meaningful reference point.

  - The SSC *recommends* that estimates be explicitly mapped onto the alternatives themselves using the predictions from the simulation model.

  - The SSC *recommends* that the analysts consider the variance in the potential impacts, in addition to the average, when the revenue impacts are mapped onto the alternatives more explicitly.

C-6 BSAI Halibut ABM DEIS

<u>Draft Social Impacts Analysis</u>

- The DSIA was an impressive document when the SSC saw it in October 2019, and it's even more impressive today with all the data updates and the new findings.

  - The SSC *recommends* that future versions of the document explore concerns raised in public testimony regarding National Standard 4 and the disproportional impact to tribes

D-1 Survey Planning: SSC Sub-Committee Report

- The SSC reviewed recommendations from SSC sub-committee on trawl survey strategic planning.

- AFSC requested feedback on five specific questions regarding prioritization of trawl survey alternatives.

- Consideration of survey alternatives was in the context of long-term prioritization and planning, rather than specifically in the context of tactical 2021 survey planning in response to COVID-19.

- The SSC *supports* the recommendations put forth by the sub-committee regarding survey prioritization in the case of trawl survey reductions.

- The SSC *highlighted* the importance of continued survey monitoring and that any reduction in survey effort is an undesirable outcome.

D-1 Survey Planning: SSC Sub-Committee Report

- The SSC *supports* continued research to evaluate the impact of changes in survey design, effort and frequency on stock assessments, reference points, and harvest recommendations.

- The SSC *recommends* development and expansion of collaborations with multiple groups, as well as outreach to coastal communities and regional institutions, to facilitate research and to further inform the research prioritization and survey planning process in the Chukchi Sea region.

D-1 AFSC FY20/FY21 Survey Update

- The SSC *appreciates* Dr. Foy's status report on AFSC survey planning and looks forward to future updates.

- The SSC *appreciates* successful efforts of the fishing industry that can help inform best practices for conducting surveys during a pandemic.

- The SSC *strongly encourages* enhanced cooperative research with the fishing industry.

- The SSC *recognizes* the extra importance of LK/TK in data-limited areas (e.g., NBS) and *recommends* development of protocols and guidelines for gathering LK and/or TK, as planned under the Bering Sea FEP LK/TK/subsistence module, to the extent feasible during the ongoing pandemic.

- The SSC *recommends* that LK/TK efforts should involve coastal communities, tribal organizations, and fishing industry participants.