

North Pacific Fishery Management Council

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FINAL REPORT **of the** **SCIENTIFIC AND STATISTICAL COMMITTEE** **to the** **NORTH PACIFIC FISHERY MANAGEMENT COUNCIL** **June 4th –6th, 2018**

The SSC met from June 4th through 6th at the Best Western Hotel, Kodiak, AK.

Members present were:

Gordon Kruse, Co-Chair
University of Alaska Fairbanks

Sherri Dressel, Vice Chair
Alaska Dept. of Fish and Game

Chris Anderson
University of Washington

Amy Bishop
Alaska Sea Life Center

Mike Downs
Northern Economics

Jason Gasper
NOAA Fisheries – Alaska Region

Dana Hanselman
NOAA Fisheries—AFSC

George Hunt
University of Washington

Dayv Lowry
Washington Dept. of Fish and Wildlife

Franz Mueter
University of Alaska Fairbanks

Kate Reedy
Idaho State University Pocatello

Matt Reimer
University of Alaska Anchorage

Heather Renner
U.S. Fish and Wildlife Service

Ian Stewart
Intl. Pacific Halibut Commission

Alison Whitman
Oregon Dept. of Fish and Wildlife

Members absent were:

Robert Clark
Alaska Dept. of Fish and Game

Brad Harris
Alaska Pacific University

Anne Hollowed, Co-Chair
NOAA Fisheries—AFSC

Terry Quinn
University of Alaska Fairbanks

Clarification to Joint Groundfish Plan Teams

The Chairs of the Joint Plan Team sought clarification on two previous SSC requests.

Issue 1: Model fit versus risk of misspecification

The SSC entertained a short discussion regarding a request from the joint Groundfish Plan Teams (GPTs) to clarify comments from the SSC December 2017 minutes:

"The SSC reminds authors of the need to balance the desire to improve model fit with increased risk of model misspecification."

The GPTs were interested in what specific sort of analysis or other procedure the SSC is expecting individual authors to provide in response to this request.

The tradeoff between model complexity and parsimony, and therefore between bias and precision of estimates, represents a basic and fundamental ecological modelling challenge. In the context of fisheries stock assessment, we are frequently faced with the choice of assigning lack of fit to process error (actual changes in the mechanisms generating the data) and observation error (our imprecise ability to measure the underlying processes). In the former case, it is often appropriate to add model complexity to reduce bias; in the latter, adding parameters will decrease model precision and could add bias. There are no completely objective criteria that can be employed in the search for a model that is complex enough, without being overly parameterized, making final model formulation the result of a subjective analysis informed by the author's training and professional experience..

The SSC would prefer that new assessments start as simple as is practicable, and additional model complexity be evaluated using all diagnostic tools available to authors. Even existing assessments should be periodically evaluated for "complexity creep" and consistency with similar assessments. Diagnostic tools can include evaluation of: residual patterns, consistency with biological hypotheses, plausibility of estimated values, model stability, retrospective patterns, consistency with modelling of similar species (or the same species in other areas), model predictive skill, and even expert judgment. It is essential that analysts use a comprehensive evaluation and not rely on a single model selection criterion. The SSC notes that simple parameter counts may not always be appropriate when parameter values are constrained via informative prior probabilities or distributional assumptions (recruitment and other constrained deviations). Further, likelihood-based model complexity criteria (e.g., AIC, likelihood ratios, DIC) can be very sensitive to data-weighting and penalized likelihoods, and are therefore not sufficient to justify or discourage additional model complexity.

In the absence of strict objective guidelines, the SSC recommends that thorough documentation of model evaluation and the logical basis for changes in model complexity be provided in all cases.

Issue 2: Criteria to determine the ecosystem and stock assessment status

When discussing early signs of the GOA Pacific cod decline in the SSC's October 2017 report (bottom of p. 13, top of p. 14), the SSC stated:

"the SSC also recommends explicit consideration and documentation of ecosystem and stock assessment status for each stock ... during the December Council meeting to aid in identifying stocks of concern."

In making this statement, the SSC borrowed terminology from a figure from Zador and Harvey (in preparation). The GPTs sought clarifications about what the SSC meant. The SSC responded in the December 2017 report (p. 4), but the explanation was not clear.

Since then, Stephanie Zador has replaced the misleading term "status" with "information" so that the sides of the contingency table are now labelled "Stock Assessment Information" and "Ecosystem Status Report Information," and the thumbs up/thumbs down icons were replaced with "Okay" and "Not Okay".

To help clarify the SSC's intention, the SSC offers the following:

- The SSC clarifies that "stock assessment status" is a fundamental requirement of the SAFEs and is not really useful to this exercise, because virtually all stocks are not overfished, nor is overfishing occurring.
- Rather, the SSC suggests that recent trends in recruitment and stock abundance could indicate warning signs well before an official critical status determination is reached. It may also be useful to consider some sort of ratio of how close a stock is to a limit or target reference point (e.g., B/B35). Thus, additional results for the stock assessments will need to be considered to make the "Okay" or "Not Okay" determinations.
- The SSC retracts its previous request for development of an ecosystem status for each stock/complex. Instead, while considering ecosystem status report information, it may be useful to attempt to develop thresholds for action concerning broad-scale ecosystem changes that are likely to impact multiple stocks/complexes.
- Implementation of these stock and ecosystem determinations will be an iterative process and will require a dialogue between the stock assessment authors, Plan Teams, ecosystem modelers, ESR editors, and the SSC.
- In consideration of this request to examine stock status and ecosystem status report information, the leadership of the joint Teams recommended that a group be formed to work with the editors of the ecosystem status report to develop these ecosystem thresholds for action. Moreover, they asked the SSC to assign members to participate in this effort. If the workgroup is formed, the SSC nominates the following SSC members to participate in this workgroup: Franz Mueter and George Hunt.
- Finally, one SSC member indicated that there were multiple groups doing this or a very similar exercise (i.e., trying to explicitly use ecosystem data to anticipate changes in stock status) at present, with several products in the pipeline. The SSC requests that the Alaska Fisheries Science Center coordinate these efforts so as to avoid duplication of efforts, and determine whether a new group is necessary.

B-1 Plan Team Nominations

The SSC reviewed the Plan Team nominations of Dr. Steven Barbeaux to the BSAI Groundfish Plan Team, Ms. Lisa Hiller to both the BSAI and GOA Groundfish Plan Teams, Dr. Pete Hulson to the GOA Groundfish Plan Team, Dr. Kalei Shotwell to the BSAI Groundfish Plan Team, Ms. Jane Sullivan to the BSAI Groundfish Plan Team, and Dr. Cody Szuwalski to the BSAI Crab Plan Team. The SSC finds all six nominees to be highly qualified to serve as Plan Team members. The SSC recommends the Council approve all of these nominations.

B-1 Ecosystem Workshop Report

The SSC received a presentation by Catherine (Katie) Latanich (co-director of the Fisheries Leadership & Sustainability Forum at Duke University's Nicholas Institute for Environmental Policy Solutions), introduced by Diana Evans (NPFMC). Although there was no public testimony, public comments were submitted in writing at the meeting by Kawerak, Inc. and the Bering Sea Elders Group. The SSC wishes

to commend Katie on not only her excellent report, but also for her work organizing a valuable workshop highlighting the progress being made in integrating ecosystem considerations into the management of North Pacific fisheries.

The workshop was well attended by a wide variety of stakeholders, from scientists to managers, individuals from industry, communities and NGOs. Presentations provided reviews of the state of the art in integrating ecosystem considerations into management, and also highlighted the challenges of incorporating this information into the assessment process. The discussion breakouts provided the opportunity for many voices to be heard, and the Workshop Report summarized these discussions so that all attendees could be more aware of the issues raised. There was interest in seeing the workshop repeated, and **the SSC recommends that the Council consider having similar workshops on a regular basis, perhaps annually or biennially.** The workshop provided the opportunity for Plan Teams, SSC, Council members, and the broader community to interact, discuss, and brainstorm. As such, this was beneficial and a productive starting point for ecosystem conversations. Such workshops can be a good mechanism for encouraging trust, transparency and, eventually, solutions to difficult problems.

The presentations and discussions of ecosystem indicators, as well as the summary in the report, were most valuable. It was clear that we have made considerable progress. The GOA Pacific cod collapse provided an excellent case study of how ecosystem indicators might have been used to provide advanced warning that Pacific cod might be in trouble. There was a large suite of data from many different, but overlapping, studies that all indicated poor prey availability for, and body condition of, higher trophic level species. These data were reliable, but their interpretation regarding the fisheries of the GOA was uncertain. Developing the means to interpret warning signs correctly and then act on them was a major theme. Leveraging information from non-traditional sources may become increasingly important as the ecosystems managed by the Council change in response to climate warming and ocean acidification.

The SSC was pleased to see attention paid to traditional and local knowledge. Humans have knowledge of the environment, but humans are part of the environment (predators and competitors), as well. The Ecosystem and Socioeconomic Profiles (ESP) discussion (page 19) does not contain socioeconomic information but provides a footnote that reads: “The first prototype ESP produced by AFSC is included with the 2017 BSAI sablefish stock assessment and includes three information products: a species profile, a conceptual model, and a report card.” While the referenced ESP prototype was reviewed by the SSC during its December 2017 meeting, some concern was expressed by an SSC member during the current (June 2018) SSC meeting that the socioeconomic information would need to be expanded and better integrated if future ESPs are intended to track engagement in the fisheries. Comments specific to this concern are being provided to Council staff for further distribution as appropriate.

The SSC suggests that future workshops be more focused. For example, in Australia frequent workshops are held on programmatic issues as a means of getting a wide-ranging set of inputs from experts and stakeholders. For the North Pacific, one such focus could be on ecosystem indicators and their use as early warning signs. We need to develop means of formalizing the process for using the available indicators and identify the multi-disciplinary studies that will provide managers with confidence in the warning signals generated. Another useful topic to explore in a workshop could be an examination of the

impacts of shifting stock distributions on commercial fisheries and communities, and the resilience of the current management system. This is an important topic in general and applies in all systems, not just the Bering Sea. However, the Bering Sea could offer a useful case study for such a workshop as shifting distributions there relate to most of the “Opportunities for further discussion and dialogue” identified in the report. Distributional shifts on the Bering Sea shelf may be happening faster than previously assumed, and such shifts have important consequences for both commercial fisheries and communities in the Bering Strait region. Potential conflicts between fleets based in more southern ports and local communities require explorations of new management options and scenarios, and the development and evaluation of strategies to deal with the associated trade-offs. Such a workshop could provide a test case for the resilience of the current management system to challenges arising from anticipated ecosystem changes. The SSC suggests that future workshops focus on providing the Council guidance on how to handle an issue or what research is required to address an issue. **Subsequent workshops could focus on identifying the data gaps that are impeding progress, and put them forth as research priorities to be evaluated in the June meeting.**

The SSC recommends not using the term “squishy data” in the report. We appreciate that the report authors clarified the description of ecosystem information that lacks a defined entry point and is used in a qualitative manner in decision making. This does not necessarily mean that the data are qualitative. There are many data streams, some quantitative and some qualitative, that can broaden our understanding of the ecosystem and directly benefit stock assessments. We need to determine a more defined entry point into management. We need people better trained in ways of using qualitative data, including tools for evaluating the practical informational value of such information and discriminating “qualitative” from “anecdotal.” **This is a discussion area worth developing.**

The SSC discussed formalizing the review of indicators, possibly reviewing them earlier in the yearly cycle. Unfortunately, many of the indicator reports are not available earlier because the Ecosystem Considerations report relies heavily on voluntary submissions by various authors that have challenges due to timing of the field season. One suggestion would be to spread out the review of indicators across meetings – depending on when they are available. The timely delivery of ecosystem information could also be facilitated by automating data processing and analysis in reproducible ways to develop indices that are derived from publicly available datasets as soon as these datasets become available. Some efforts along these lines are already underway and should be expanded, but may require additional resources in the short term. **The SSC agrees that, when possible, we need to be integrating ecosystem data throughout the cycle rather than only once per year.**

B-2 NMFS Surveys

A letter was provided by Dr. Doug DeMaster (NMFS-AFSC, Science and Research Director) and a presentation was given by Mr. Jeremy Rusin (NMFS-AFSC, Deputy Director) regarding NMFS surveys. Dr. Jeff Napp (NMFS-AFSC, RACE Division Director) also contributed some details to the presentation. There was no public comment.

After multiple attempts, the Alaska Fisheries Science Center (AFSC) was unable to procure a charter fishing vessel for the Bering Sea slope survey for FY 18 owing to too few bids from qualified vessels.

Additionally, it was reported that the one qualified bid they received was determined to have a cost that was deemed not “fair and equitable” to the agency. This is most unfortunate, as data from these surveys are critical to the stock assessments for Pacific ocean perch, Kamchatka flounder, Greenland turbot, and other species. The AFSC will continue to work with the NOAA Acquisition and Grants Office to reduce hurdles to competition so that more qualified bids can be received next year.

Mr. Rusin also indicated that, in a typical odd year, five groundfish survey charters would be contracted, with three vessels surveying the Gulf of Alaska and two vessels surveying the eastern Bering Sea shelf. It appears most likely that the AFSC will have adequate funds to procure only four vessels for FY 19. As with FY 17, this may result in the standard two vessels deployed in the eastern Bering Sea, but only two vessels for the Gulf of Alaska.

The AFSC is also planning for the possibility that only three vessels may be available for these surveys in FY 19. If only three vessels are available, then three alternative survey scenarios have been identified thus far: (1) two vessels for the eastern Bering Sea (including the northern Bering Sea) and one for the Bering Sea slope; (2) two Gulf of Alaska vessels and one Bering Sea slope vessel, with no survey of the eastern Bering Sea; or (3) three vessels for the Gulf of Alaska only, with no surveys of any portion of the Bering Sea. The number of vessels available for surveys depends on uncertainties in the AFSC budget, including uncertain obligations for costs to maintain AFSC facilities at Sand Point, WA. Other surveys, such as recruitment and hydroacoustic surveys, are expected to proceed as planned at this time.

Mr. Rusin has requested the assistance of the SSC to help the AFSC explore and prioritize alternatives for survey deployment based on NPFMC needs. The SSC has nominated the following members to assist the AFSC in this effort: Dana Hanselman, Dayv Lowry, Alison Whitman, George Hunt, and Gordon Kruse. This SSC subgroup will work with the AFSC to schedule an in-person workshop, webinar, or teleconference to provide the requested input in a timely manner. Recommendations will be drafted by this SSC subgroup for review by the full SSC prior to distribution to the AFSC.

C-1 Observer Program Annual Report

Presentations were given by Elizabeth Figus (NPFMC), Craig Faunce (NMFS-AFSC), Phil Ganz (PSMFC), Jennifer Mondragon (NMFS-AKRO), and Jennifer Ferdinand (NMFS-AFSC) on the North Pacific Observer Program 2017 Annual Report (Annual Report). Public testimony was provided in person by Molly Zaleski (Oceana), Robert Alverson (Fishing Vessel Owners’ Association, and OAC member), and Julie Bonney (Alaska Groundfish Databank, and OAC and EM Trawl Workgroup member). Additional written public testimony was provided by Jon Warrenchuk (Oceana), Nikita Kuzmin (fisherman), Abigail Turner-Franke and Dan Falvey (North Pacific Fisheries Association and Alaska Longline Fishermen’s Association), and Robert Alverson and James Johnson (Fishing Vessel Owners’ Association and Deep Sea Fishermen’s Union).

The SSC received the fifth Annual Report of the restructured observer program, which pertains to sampling of trips during 2017. The SSC appreciates the dedication and tireless work of observer program staff to provide this information. The North Pacific Fisheries Observer program is not only the largest of its kind in the world, but also the best documented and vetted program, which includes elaborate in-

season QA/QC and an annual analytical review. Observer-collected data provide essential biological samples and fishery-dependent catch and effort information for management of sustainable fisheries in waters off Alaska. Additionally, the current EM program is among the first to use video to collect data for catch estimation, compared to compliance-based logbook programs that provide catch only for a focused subset of species.

The Annual Report provides comprehensive information on implementation of the observer program in 2017, including detailed information on coverage categories and levels, fees and the budget for the partial coverage category, metrics and evaluation of performance of the deployment plan, fishery information summaries, summaries of EM video review (as an appendix), compliance and enforcement statistics, outreach activities, and NMFS recommendations for the program. It also discusses significant changes to the program in 2018. Analysts have been responsive to SSC comments about the program provided during June and October meetings, and the SSC appreciates inclusion of the report section that provides targeted responses to direct questions and concerns raised in the prior year. The SSC found the report to be well written and to be rigorous in its evaluation of how well the program is conforming to the current deployment plan.

The SSC focused primarily on the performance of the partially observed coverage category and notes the following successes:

- The observer program in 2017 can be deemed successful based on effective use of fees collected, as well as largely effective deployment and performance based on the reported metrics.
- Stratification by gear and presence/absence of tendering for the partially observed trip selection strata is straightforward to interpret and allows ready identification of strata for which catch and bycatch metrics affect management, versus those for which effort and catch are too low to have much impact.
- The ODDS system largely works as intended for trip planning and logging of trips. However, plans to link ODDS with eLandings are still progressing very slowly. Addition of a voluntary field to eLandings constitutes a minor improvement (but substantial reprogramming is expected to be operationalized in 2019).
- The EM selection pool continues to evolve and expand.

While the SSC acknowledges the achievements of the analysts in rapidly improving the program to its current state, we also note that the program is not fully achieving an unbiased or representative sample of trips from the partially observed category, due in large part to the following:

- There are statistically significant differences between observed and unobserved trips for several characterization metrics, including fundamental attributes like catch weight and trip duration. There also continue to be problems with sampling of tendered trips, though for some gear types very few tendered trips occur.
- Through 2017, there were indications that funds to observe trips adequately in the current gear and tender-status strata were decreasing, with concomitant impacts on sampling rate.

However, in 2017 the SSC supported a minimum sampling rate of 15% across all strata and encouraged sampling rates higher than the minimum should additional funds be available. The 2017 report indicates that funding for observer coverage in 2018 was adequate to meet this hurdle for all strata and the SSC looks forward to seeing those results in 2019. **Adequate funding of the observer program is critical to the ongoing success of in-season management, stock assessment, and specifications setting processes that depend on these data.**

- The behavior of the ODDS system with respect to inheritance of trip selection after a trip is cancelled leads to temporally biased sampling of some strata, with many, or most, observed trips coming very late in the season. **The SSC concurs with the NMFS recommendation that a sub-group be created to evaluate system behavior and identify ways to obtain broader, more representative observer coverage throughout the season.**

The SSC predominantly agrees with the recommendations made by the OSC and NMFS for the 2019 deployment year. However, based on the aforementioned successes and continuing challenges of the program, the SSC has the following recommendations with respect to the partially observed category:

- We support continued development and utilization of the optimized hurdle model and look forward to seeing results from its initial use during 2018 at our June meeting in 2019.
- We reiterate that, while the SSC recognizes that development of variances for use in planning of deployments and stock assessment is ongoing, **we urge the analysts to initiate a comparison of the likely magnitude of bias that has been detected between observed and unobserved trips with the overall magnitude and precision of discard or PSC that is being monitored for compliance by management.** The analysts note in the report that further clarification and conversation with the SSC is needed and we look forward to this exchange.
- Given the potential for future funding constraints, the SSC looks forward to the Council's review of the current fee structure of the observer program. We again note from our June 2010 report on this issue that the initial analysis of the revised observer program was based on the assumptions of a maximum 2% fee and a daily observer cost of \$450, and neither of these assumptions have been met in the current system (i.e., the fee is 1.25% and the daily observer cost is often >\$1000 annually). Additionally, as noted by Mr. Alverson during public testimony, funding the observer program largely through fees that are based on often volatile landed value of fish introduces uncertainty into the funding stream. Stabilization of this funding stream may require novel approaches to fundraising.
- While the SSC recognizes the Council's new priority for EM research on trawl vessels, to the extent possible, the SSC also encourages consideration of coverage for the under-40'-no-coverage fleet for 2019 as this represents a large segment of the targeted halibut trips and, in fact, some vessels have significant landings. Deployment options should be brought forward for discussion during the ADP review in October, if practicable.
- Compliance and enforcement issues remain a problem within the observer program that are

contributing to bias, fluctuate substantially among years, and may be substantially underreported for a variety of social and safety reasons. **The SSC encourages the training of crew fleet-wide on the necessity of the observing program to proper fishery management and how crew can contribute to the success of the program by interacting appropriately with observers.** It is critical that these issues be addressed immediately.

The SSC offers the following additional recommendations to the analysts:

- While the SSC supports the NMFS recommendation to use the same observer trip selection strata in 2019 as in 2018, in cases where there are multiple gear types in a stratum (e.g., pelagic and non-pelagic trawls) the SSC recommends analysis of the results by gear type separately in addition to analysis aggregated to the stratum level. Such disaggregation will avoid masking of gear-specific differences in catch composition and other factors that could provide justification for possible further subdivision of strata.
- The SSC remains concerned that performance metrics from EM pre-implementation have not been fully evaluated prior to full implementation of EM in the observer program. We look forward to seeing a full evaluation of this program as soon as is practical, as well as an evaluation of the tradeoffs between use of EM and the existing partially observed coverage category. As the Council considers continued growth of the EM program, it will be important to conduct appropriate cost comparisons, specifically including video review costs, as well as an evaluation of the ability of EM versus onboard observer data to meet program needs.
- As detailed in our June 2016 report, and IPHC public comments made at that meeting, the SSC encourages additional progress toward resolving the calculation of mean weight of halibut discarded by the IFQ halibut fleet.

C-3 Aleutian Islands Golden King Crab OFL/ABC Specifications and Crab Plan Team Report

Diana Stram (NPFMC) and Ben Daly (ADF&G) presented a summary of Crab Plan Team discussions and recommendations, including a summary of the AIGKC assessment presented by Ben Daly and summaries of the Bristol Bay red king crab, snow crab, and Tanner crab preliminary assessments presented by Buck Stockhausen (NMFS-AFSC). Public testimony, focusing on the Aleutian Island Golden King Crab, was provided by Clem Tillion (Aleut Enterprise).

General comments to stock assessment authors

The SSC reminds all stock assessment authors to implement the guidelines for model numbering for consistency and easier version tracking over time. The authors should use their best estimate of catch for current and future years to get the best estimate of projected ABC/OFLs. The groundfish stock assessment authors have adopted methods to do this, such as using the 3-year average ratio of catch/TAC.

Aleutian Islands Golden King Crab (AIGKC)

This stock was managed under Tier 5 through the 2016/17 fishing year. A length-based stock assessment modeling framework was recommended by the CPT and was first approved by the SSC as a Tier 3 assessment for use in the 2017/18 specifications cycle. The model establishes a single OFL and ABC for the stock, although separate models are fit for the eastern (EAG) and western (WAG) stock components.

The male-only model is fit to data on catches and discards in the directed fishery, discards in the groundfish fishery, standardized indices of abundance based on observer data, fish ticket CPUE data, length-frequency data for the directed fishery (landings and total catch), and mark-recapture data through the 2016/17 season.

Model scenarios explored in this assessment cycle focused on different approaches to obtaining abundance indices from CPUE data (CPUE standardization), as well as a scenario that used a different method to tune length composition data (McAllister and Ianelli vs. Francis method), a scenario that used a separate catchability/selectivity period for 2013-16, and a scenario that included an abundance index from a cooperative pot survey.

The CPT reviewed each of the model variants and recommended using last year's model for specification because of concerns with each of the alternative models. **The SSC agrees with the Plan Team to use last year's approved model for the 2018/19 fishing year, as well as with the use of a 25% buffer for the reasons outlined by the SSC last year. The resulting OFL for 2018/19 is 5,514 t (12.16 million lb) and the ABC is 4,136 t (9.12 million lb).** Overfishing for the 2017/18 season will be assessed in September 2018.

The SSC had the following suggestions and recommendations for further improvements to the model:

- There is continued high uncertainty about maturity. Using knife-edge maturity, as currently implemented, was an interim fix due to problems with estimating maturity at size. We support and encourage efforts to obtain additional chela measurements to improve the parameterization of maturity in the model as a probabilistic function of size (e.g., logistic).
- Three years of cooperative survey data have been collected and a model that incorporates these data was presented for the first time. The SSC appreciates and strongly encourages efforts to include these data in the model. However, the CPT suggested that the time series is presently too short to meaningfully inform the model and identified issues with the way the data were incorporated into the model. We encourage this survey to be continued and endorse further work to include this independent survey into the model. The SSC specifically endorses the CPT recommendation to use nested random effects for strings within vessels and for pots within strings in a mixed-effects model. The SSC also requests the authors to include a brief description of the cooperative survey in the document, including the area sampled, size composition, and a summary of trends in CPUE.
- The use of the VAST model as a geostatistical modeling approach for smoothing CPUE data is still relatively new and is particularly challenging in the Aleutians because of the many islands and associated edge effects. We agree with the CPT that the VAST model will require more analyses, which are ongoing, before it can be adopted for AIGKC. One specific suggestion to consider is using a smoother in the analysis that is designed to better deal with edge effects such as a "soap film" smoother. The VAST model is relatively untested for dealing with fishery-dependent data, and the areas used to extrapolate spatial temporal effects need to be chosen carefully.

- The CPT noted that the year effect is not appropriate as an abundance index in the presence of interactions and recommended use of the “fishing footprint” as a measure of area, then use of area weights to compute the annual abundance index. The SSC supports this recommendation but notes that, like the VAST analyses, the ‘fishing footprint’ needs to be clearly defined and a rationale for how it is quantified needs to be developed before further pursuing year-area interactions in the model.
- In terms of model selection, all models except one use a somewhat arbitrary R2 criterion for model selection. The SSC is unclear on the rationale for this choice of model selection criterion and why it was considered better than the AIC. The SSC encourages the authors to consider AIC or other information-theoretic approaches (e.g., BIC) if any non-independence in the fishery CPUE data can be addressed appropriately through a geostatistical approach and/or the use of random effects.
- The SSC noted that the model used the mean of the discard mortalities from the groundfish pot (0.5) and groundfish trawl fishery (0.8). The SSC suggests that the authors use a weighted average of the respective bycatch amounts by year.

Bristol Bay Red King Crab (BBRKC)

Five model scenarios were investigated and presented during the CPT meeting, the results of which suggested relatively small differences with regard to management quantities. The SSC supports the CPT’s recommendations to bring forward two model scenarios (2bn1 and 2bn2) in addition to the base model. In the draft document, scenario 2bn1 uses a “subtraction” method to estimate male annual bycatch biomass since rationalization (2005-present) and total observer male length composition data to compute log negative likelihoods in the directed pot fishery. Scenario 2bn2 is the same as scenario 2bn1 except that only one logistic curve is estimated for all years for retained proportions and adjusted annual retention factors are estimated to modify retained proportions for years after 2004.

The SSC highlights the CPT’s recommended changes for scenario 2bn1 and 2bn2, which use a “subtraction method” to calculate legal male discards. This method combines an estimated value (observer data) with an assumed known value (fish tickets) to calculate total catch or discards. As noted in the CPT minutes, this complicates evaluation of the length composition data. The SSC concurs with the CPT’s suggestion to fit total catch and total retained catch separately, and to not use the subtraction method moving forward.

The SSC also requests that the authors investigate whether groundfish discard information is available for fixed gear prior to 2010. In addition, the document uses inconsistent terminology for pot gear and fixed gear (particularly on figure and table headings), as well as groundfish gear versus crab gear, and the associated mortality rates. The SSC requests that the authors check the document for consistent use of these terms.

There is an ongoing effort to adopt the GMACS modeling framework for this stock, but there are a number of discrepancies between results from the current and GMACS model that need to be resolved so that the CPT and SSC can understand the differences.

EBS snow crab

This assessment had an issue with bimodality in the likelihood surface that was solved by the addition of growth data and fitting female mortality. The author also compared results from a Bayesian approach and a Maximum Likelihood Approach and found that they were similar. The SSC concurs with Plan Team recommendations to use the MLE approach with jittering for now because of the computational costs of the Bayesian approach. The SSC also concurs with other suggestions by the CPT, particularly to estimate separate catchabilities for males and females, incorporate the BSFRF side-by-side data into the model, and to explore the use of different recruitment deviations for males and females. The SSC concurs with the CPT recommendation for models to bring forward in September 2018.

EBS Tanner Crab

The method of fitting maturity ogives within the model to aid in propagating uncertainty in model results seemed promising. However, there was some sensitivity in fitting the maturity for length groups that are unlikely to be mature. The SSC recommends that the maturity data be pooled over time, or that the logistic curve be penalized to equal zero at short lengths. In addition, the SSC was concerned that fitting the maturity curve inside the model caused estimated selectivity to change, which is an unusual result.

The SSC thought that the approach of examining the retrospective pattern of recruitment estimation was a useful approach for determining the terminal year used in the calculation of reference points, but also would like to see a comparison with the method developed by the Groundfish Plan Team that uses life history characteristics to make this determination. The presentation of the author's method also showed a substantial retrospective pattern in recruitment estimation, which should be addressed.

There was a presentation of 42 models for consideration. The SSC appreciated these evaluations but would appreciate these model options being accompanied by rationale for the model changes to help evaluate the potential revisions.

Norton Sound Red King Crab

The SSC noted that new maturity studies are needed to consider this stock for an increase in tier status.

Crab Economic SAFE

The upcoming crab SAFE analysis of the extent of quota leasing, the degree to which quota is being fished by leaseholders rather than quota owners, and how ownership patterns have changed over time should include a disaggregation to the community level where possible. This would allow time series tracking of the flow of ownership among communities and analysis of trends (e.g., quota moving from smaller to larger communities over time). Vessel ownership by community should be similarly tracked on an annual basis in the SAFE document to allow the identification of trends, as should the number of reductions in the amount of employment throughout the fisheries noted (e.g., the number of crew positions decreasing by 10%).

The document notes that the total volume of ex-vessel landings sold to processors during 2016 was down 30% across all stocks due to decreases in TACs, "although the decline was mitigated by an increase in ex-

vessel and wholesale prices.” It should be clarified that an increase in price does not mitigate all community impacts of the decrease in vessel and processing activity that would accompany such a large decrease in TAC (e.g., declines in vessel-related support services sector spending or port infrastructure usage fees).

Further, the statement that for “Bristol Bay red king crab, crew daily wages have increased due to a decrease in the TACs meaning that crews are spending less time fishing and have less expenditure” should be clarified. The SSC suggests that information on average daily and total seasonal wages be provided by community and tracked over time. Similarly, clarification is needed on the relationship between the attribution of a decrease of 33% in processing hours in 2016 compared to the previous year to “the decrease in TACs across all stocks” and the decrease in median processing wages seen that was stated “as most likely due to increased efficiencies in processing procedures and a resultant decrease in overtime pay.” These processing compensation indicators should also be disaggregated to the community level to the extent possible and tracked annually. Finally, if possible, the effect of the noted transfer of profit between vessel and quota owners on crew compensation patterns should be similarly tracked.

C-4 Fixed Gear CV Rockfish Full Retention Initial Review

The SSC received a report from Jon McCracken (Council Staff) and Josh Keaton (NMFS-AKRO). Public comment was provided by Jon Warrenchuk (Oceana).

The SSC commends the analysts for a very thorough exploration of the various costs and benefits of requiring the retention of rockfish caught with fixed gear, predominantly longline. The exploration of home pack and donation practices for non-salable rockfish catch in rural communities provided new information and insight. The proposed modification of Maximum Retainable Amounts (MRAs) to Maximum Commerce Amounts (MCAs) is a reasonable way to manage the incentives to target rockfish species, while avoiding waste. **The SSC finds the discussion paper provides a complete analysis and recommends release for public review.**

The SSC suggests that the analysts reorganize some sections of the analysis, relative to benefits and costs, to clarify the likely effects of requiring retention. There are three major categories of benefits. First, full retention would simplify currently complicated retention regulations (including combinations of MRAs and PSC), which apply on the water. Second, utilization of rockfish is likely to increase, in the sense that landing more fish provides opportunities for harvesters to sell to processors and processors to sell at wholesale, provide home packs for workers, or donate to food banks; even non-salable distribution can enhance local food security and nutrition. Third, the retained catch could be counted and studied/sampled, thereby reducing uncertainties in stock assessments. Although population estimates could be improved by analyzing or sampling fish that are discarded or landed, the SSC notes that reducing uncertainty per se is not a national standard, so for this to be considered a benefit it is necessary that reduced uncertainty materially reduces the chance of overfishing, leads to better attainment of optimum yield, or provides for sustained participation. Since the affected stocks are bycatch stocks assessed at Tier 5, the SSC finds this reduction in uncertainty is unlikely to lead to changes in policies that lead to benefits.

The analysis considers a wide range of costs, including those associated with target catch displaced by retained rockfish on trips with full holds, and loss of quality associated with delicate target fish rubbing against rockfish spines. In this context, it would be helpful to clarify what is meant by “waste” of currently discarded rockfish: since it would be landed if it were profitable for operations to do so, mandating landings will result in losses on some fish. This may be particularly important on longer trips more typical of the Western Gulf. The SSC recommends that the analysts include a representation of the 27% of fish that are currently being discarded, decomposed by fishery, region, and species, along with the presumptive reason for the discard. This will clarify which potential cost components are likely to be realized.

To the extent that a differential distribution of beneficial and adverse impacts of the proposed amendment can be attributed to varying vessel characteristics (e.g., vessel length, hold capacity) or operational characteristics (e.g., area fished, average trip length), an analysis of community fleets (locally owned vessels) and associated operational characteristics should be undertaken to determine the pattern of beneficial and adverse impacts across communities. Similarly, if there are general community or processor characteristics identified that would influence whether a community or set of communities would experience different types of impacts (e.g., community size, location with respect to the road system), this should be described in the Effects on Communities section of the document, including counts of relevant locally operating processors.

D-1 Social Science Planning Team Report

The SSC received a presentation on the Social Science Planning Team minutes from Sarah Marrinan (NPFMC). Public testimony was provided by Brenden Raymond-Yakoubian (Kawerak, Inc.) and Lauren Divine (Aleut community of Saint Paul Island).

The Social Science Planning Team (SSPT) was formed at the request of the SSC to improve the collection and use of social science data throughout the Council process to better inform decisions and evaluation of policies and programs. The SSC appreciates the in-depth discussions on a broad range of social science topics and methods, as well as data availability and data quality issues. As this was the inaugural meeting, an evolution of the focus and structure is expected over time. A tension between the SSPT’s role in commenting on longer-term scholarly research and its role in addressing issues that fit into the analytical time-frame and approach of a typical Council analysis is apparent throughout the minutes. The SSC cautions that its intent is not another review body for specific Council actions, although formal staff tasking may take place. **The SSPT should remain focused on improving recurrent and episodic data collection and identifying key gaps in data and process understanding.** The SSC discussion and public comment expressed concerns that the first meeting may have strayed from this mission.

The meeting started with a debate about whether the SSPT should review AFSC research project proposals. The SSC agrees that this could be a productive function of the SSPT, since the AFSC reports low quality of proposal review that could benefit from social science review. However, providing this “service” might depend upon the workload it demands and the timing of the meetings. The SSC recommends addressing the SSPT’s reported concern about setting a precedent of reviewing technical aspects of relatively small projects by focusing any future reviews on alignment with long-term research

programs.

The SSPT received presentations from the ADF&G Subsistence Division to understand their existing data sources and their limitations. This was an important step to strengthen working relationships between the Division and the Council process so that these data can be meaningfully included in analyses when subsistence use is a consideration. In addition to the Division, the SSC suggests the SSPT build working relationships with the anthropologists, human geographers, sociologists, and others who have long-standing research relationships within North Pacific rural communities. In the absence of Council capacity to establish long-term research relationships with communities affected by Council decisions, the existing social science community has a great deal to offer both scientifically and in incorporating research findings into Council analyses. For example, in the Ecosystems Considerations chapters of the SAFEs, researchers developing the Human Dimensions indicators on the “health” of fishing communities could benefit from working with the State of Alaska’s Salmon and People (SASAP) project of the National Center for Ecological Analysis and Synthesis (NCEAS) that is creating well-being indicators and working towards integrating well-being concepts into salmon fishery management (see: <https://www.nceas.ucsb.edu/projects/12737#>).

A discussion on co-production of knowledge, local and traditional knowledge, and expanding stakeholder engagement elucidated a number of challenges in incorporating qualitative data into the Council process. **The SSC recommends that the SSPT work to identify pathways for overcoming these challenges, both helping the Council recognize where such research can provide value to the Council process, and supporting practitioners and participants in understanding the needs of the Council.** Without a clear needs-driven focus to social science efforts, such research will continue to be marginalized and Council support for the SSPT will be undermined. Council needs can be addressed through providing information that better addresses policy impact questions that have been articulated by the Council; helping the Council relate the effects of policy decisions to certain constituencies; or through identifying for the Council consequential new aspects of policy effects that have not been analyzed within the existing framework. **The SSC suggests that this process may be advanced by developing a “Best Practices” document that addresses methodologies, assessing scientific information for human impacts and interest, information sharing, and how to incorporate social science data into the Council process.** For field and engagement practices, the National Science Foundation’s *Principles of Conduct for Research in the Arctic* could serve as a starting guiding document among other indigenous, federal, state, and professional sources.

The SSC is also concerned that the SSPT be able to remain focused on developing and testing hypotheses related to social processes; behavioral responses and adaptation; and human and community resilience. The SSPT should not focus on science communication, and it may not be the best venue for managing the gathering of traditional or local knowledge data about ecological status or processes; the FEP is leading that process. Similarly, qualitative data is not unique to social science, as qualitative information from natural history, for example, is frequently integrated into biological models.

Among presentations about existing data, it is apparent that Economic Data Report (EDR) data are underutilized and perceived by industry as burdensome, leading to industry requests to repeal the

requirements. A forthcoming discussion paper will synthesize the EDR requirements for the different programs and show the costs and benefits. **The SSC recommends the SSPT make recommendations regarding uses of these data and methods for exploring a framework for collecting usable data in a consistent way across management plans.**

Textual analysis of SSC minutes identified possible misinterpretations of non-economic social science terms, especially a lack of precision in the use of technical terms. This insight is useful for identifying barriers to enhancing the use of non-economic social science in the Council process, but more comprehensive analysis is required before firm conclusions can be derived.

The data gap analysis is a good start at developing a foundation for planning social science research programs, though there was not enough time at the meeting to elaborate or clearly prioritize or discuss approaches to addressing the gaps. The SSC expects the data gap analysis to be an iterative document of both gaps for meeting statutory requirements and medium and long term improvements to social science data collection. **Developing strategies to address the data gaps should be a focus of the SSPT.**

In asking the SSPT to help specify research programs to support allocation review, the SSC is concerned that the scope of the halibut allocation review may be narrower than is required. In addition to charter and directed IFQ fleets, allocation review may require including the unguided recreational sector, PSC allocations, and subsistence users.

For the next meetings, the SSC recommends the SSPT consider the following procedural modifications:

- To ensure alignment with the group's mission, **the SSC recommends that the SSPT prioritize a refinement of its purpose and meeting goals.**
- The functioning of the SSPT would be helped by developing an agreed upon meeting structure, for example, is this a voting or consensus based committee?
- For the Best Practices document, and similar future efforts, the SSPT may wish to **consider work assignments for its members between meetings** so that working drafts can be finalized at the in-person meetings.
- The SSPT is an avenue for interested members of the public, including rural and Alaska Native community residents, to engage in discussions about social science, and a record of their contributions can potentially improve the use of social science data in management. **The SSC recommends that the SSPT characterize the public testimony before them in their minutes, perhaps by appending written comments from the public to the SSPT minutes.**
- Public comment addressed SSPT membership and requested inclusion of traditional knowledge holders and social scientists who work directly with rural and Alaska Native coastal villages in the fields of anthropology, human geography, and sociology, as members of the committee, not just members of the public. **The SSC agrees that committee membership should be balanced to reflect the range of expertise and experiences that can provide the best available science to address Council needs.**

D-2 Community Engagement Draft Committee Scope and Ideas for RFP

Steve MacLean (NPFMC) presented a short discussion paper on community engagement and outreach that explores the creation of a new committee, asks questions and clarifications of the Council for the committee's objectives and function, and proposes an initial charter and membership. Public testimony was received by Brenden Raymond-Yakoubian (Kawerak, Inc.), Lauren Divine (Aleut community of St. Paul Island and City of St. George), and Gerry Merrigan (self).

The SSC appreciates the response by the Council to public requests for improving two-way engagement. The discussion paper reviews current institutionalized ways for the public, and rural and Alaska Native people in particular, to participate in the Council process but recognizes that these opportunities still may not fully satisfy public desire for their voices to be heard. The SSC cautions that the public engagement opportunities provided by the newly formed SSPT are overstated in the document. Although public participation is an important part of the SSPT, particularly with respect to facilitating co-production of knowledge and working toward incorporation of local and traditional knowledge into ongoing management decision-making and program evaluation, their annual meetings would not foster ongoing engagement with communities, nor is maintaining a community outreach program central to the SSPT mission.

The SSC endorses the staff recommendation for a moderated workshop to review and develop community engagement strategies and identify objectives for the committee. The workshop should explore the tradeoffs between reactivating the Rural Outreach Committee (ROC) and refocusing its purpose, or creating a new committee. This reformulated or new committee is not intended to replace current rural outreach work. The SSC recommends that the term "rural" remain in the title of the committee so that the intent is not lost, since the term "community" has been broadly interpreted to include communities of interest. The Federal fisheries focus of the Council will help define those communities and regions that should be invited to participate. The SSC suggests that the Federal Subsistence Regional Advisory Committees are starting places for soliciting recommendations for membership. The SSC also recommends that representation at this workshop include potential permanent members of the formalized committee and suggests considering including expertise in rural communication.

In addition to exploring the Request for Proposals concept to solicit engagement ideas and priorities from the rural public, the SSC also recommends that the workshop review the reports from the ROC for their utility in developing community engagement strategies. A cursory SSC review of ROC documents identified a number of strategies from those meetings, for example, employing technology and social media to reach rural people, forming regional partnerships with those already familiar with the Council process (such as CDQs), working more directly with the Federal Regional Advisory Councils (RACs), partnering with Alaska Sea Grant using workshops, attending the Alaska Federation of Natives and other Alaska Native meetings, creating rural community outreach liaisons, among many suggestions. The timing of community engagement around actions that affect communities should be considered as well. The workshop should also begin to consider what constitutes successful outreach and engagement from the perspective of rural and Alaska Native communities, recognizing Council needs and institutional

constraints.

The workshop report should highlight how a robust rural and Alaska Native community engagement and outreach program could benefit the Council. First, it could provide insight into processes about which the Council has framed questions for analysis, facilitating more fully informed decisions by broadening the content of best available information in a timely manner and increasing understanding of the potential consequences of Council decisions with respect to the sustained participation of fishing communities and/or minimizing adverse economic impacts to those communities. Second, it could help the Council relate the scientific basis for their policy decisions to key constituencies. A third benefit, not reflected in the discussion paper, is to articulate for the Council categories of policy outcomes or types of processes that have not been identified within the Council's current analytical frameworks. Throughout, it may be helpful to identify specific examples of these categories of benefits that better address needs of the Council within the scope of its regulatory authority.

Council committees are typically no-host meetings of volunteers, but past experience and current public testimony suggest that alternatives to that model should be explored in this case. In the ROC minutes, costs for one rural person to attend all five Council meetings in a year were calculated at between \$13k and \$31k depending upon from where that person was traveling. Public comment also reiterated that capacity and means are the largest barriers to participation in the Council process. Capacity and means will need to be addressed so the effort can be successful.

D-3 Kuskokwim River Model Review for Three-River Index

The SSC received presentations from Diana Stram (NPFMC), who provided background for this item, from Zach Liller and Hamachan Hamazaki (ADF&G) on the current and revised Kuskokwim River run reconstruction models, and from Katie Howard (ADF&G) on the "three-river index." Public testimony was provided by Steve Martell (Sea State, Inc.), Stephanie Madsen and Austin Estabrooks (At-Sea Processors Association), and Karl Haflinger (Sea State, Inc.).

The July 2016 Amendment 110 to modify the Chinook and chum salmon bycatch avoidance program included a provision to lower Chinook salmon PSC limits in the Bering Sea pollock fishery when a three-river index for Chinook salmon abundance in western Alaska falls below a threshold of 250,000 fish. Abundance estimates for the three-river index are provided by ADF&G and include abundance estimates for the Kuskokwim River from a run reconstruction model. ADF&G is changing the methodology that was approved under the Amendment and the SSC was asked to review a revised model for the Kuskokwim River Chinook salmon run. We note that the SSC did not previously review the model that has been used to date (referred to as the 'current model'). The SSC also expressed concerns that the current review process does not permit timely and iterative review of important changes to the model and underlying data.

The SSC commends the ADF&G analysts on an excellent presentation and appreciates the work that has gone into improving the model in response to several issues that had been noted with the current model. Based on internal reviews and recommendations by the outside review panel (AYK SSI Expert Panel), changes were implemented in the revised model to address a number of issues. First, changes and updates

were made to the data; in particular recent independent estimates of total run size from mark-recapture studies conducted during a period of low abundance in 2014-2017 were incorporated. Second, adjustments were made to total run size estimates that combine mark-recapture estimates for a period of high abundances in 2003-2007 with weir and aerial survey information. In addition, the model structure was simplified to address issues with model stability that may have resulted from over-parameterization of the current model. The model is fit to commercial fishery CPUE, and weir counts and aerial survey data from a number of tributaries to estimate interannual trends. These trends are scaled by fitting in-river abundances to external estimates of total run size, which are obtained by combining mark-recapture estimates of abundance for the upper river with harvest and survey data from the lower river.

The SSC notes that the change from the current model to the revised model has a small impact on the abundance estimates when both the 2003-2007 and 2014-2017 independent estimates of total run are included. Therefore the more important and influential choice is whether or not to include the new mark-recapture data.

Based on the description of the revised model that the SSC received and a memo from the Expert Panel with preliminary results and recommendations, the revised model appears to represent an improvement over the current model in several respects. In particular, the revised model demonstrates:

- improved stability,
- less sensitivity to the inclusion of recent mark-recapture estimates than the current model, and
- somewhat better performance in simulations.

The revised model has been reviewed internally and adopted by ADF&G for managing Kuskokwim River Chinook salmon. **The SSC recommends that the revised model be used for estimating in-river abundances of Kuskokwim River Chinook salmon for inclusion in the three-river index.**

As noted, the differences between previous and new abundance estimates are almost entirely a result of including the new independent estimates of run size based on recent mark-recapture studies. The mark-recapture study was redesigned in 2015 to tag salmon lower in the river such that the estimate reflects a much larger proportion of the total drainage. **While the SSC did not review details of the mark-recapture study, we recommend that the new mark-recapture estimates be included for estimating in-river abundances.** While there is always a potential for bias, we note that (1) ADF&G has extensive experience conducting tagging studies, (2) the analysts indicated that this study meets the main mark-recapture assumptions, and (3) the recent mark-recapture study reflects abundances in much of the Kuskokwim River drainage, thereby avoiding the need to combine mark-recapture estimates with highly uncertain aerial survey data and weir data for multiple lower river tributaries to obtain an index of total run size. The analysts also noted that the mark-recapture studies were reviewed by members of the Expert Panel, who did not note any problems with the study design in their initial report. **Therefore, the SSC considers the use of the new mark-recapture results to be consistent with the use of the best available scientific information.**

Although we recommend the use of the revised model with all independent estimates of run size that are

available, our review and public testimony suggest a number of remaining issues with the model and provided the following recommendations for the analysts to consider in future updates:

- A major concern is the underestimation of uncertainty in the mark-recapture estimates. The AYKSSI panel recommended the use of closed-form solutions for the variances of the mark-recapture estimates, rather than bootstrap variances. Both are likely to underestimate the true uncertainty in the independent run size estimates. This is true for the earlier years (2003-2007, 2014), when mark-recapture estimates are combined with highly uncertain weir counts and aerial survey counts, as well as for the later years, which appear to have very small standard errors that the SSC considers to be unrealistic.
- The analysts indicated that the proportion of the run returning to different parts of the river may not be constant over time. In particular, a larger portion of the run is expected to have escaped upriver in recent years since fishing in the mainstem has been closed during the early part of the run. In addition, the analysts acknowledged interannual variability in the spatial distribution of spawners. However, the model assumes that the proportions returning to each tributary remain constant over time. The impact of this model assumption should be evaluated. One suggestion is to account for the change in distribution resulting from closing the early portion of the run to fishing by using two time blocks for the fractions returning to each drainage (k parameters). Other time-varying behavior such as random walks could be considered for these parameters.
- The sensitivity of the model fit to the inclusion of different data sources and appropriate weights should be further evaluated and could employ a number of approaches:
 - Both the current and revised model were sensitive to the inclusion of the recent mark-recapture data. The current model estimated high run sizes when these data were excluded, while the revised model estimated lower abundances when these data were excluded. This issue should be explored to improve understanding of the reasons for this behavior.
 - What is the impact of changing the mark-recapture methodology in 2015, and hence the calculation of the total in-river run size? The best approach to disentangle this may be using the mark-recapture data directly in the model (see below).
 - With the low CVs on the scalars, and the free estimation of CVs for aerial and weir counts and CPUE data, the model generally discounts any fitting to the latter data. This may result in bad model performance in years when mark-recapture data are not available. Alternative variances for the other data could be considered. For example, CVs for weir counts could be fixed at low values, given that confidence in weir counts is typically high. Alternatively, year-specific CVs accounting for weir operations could be used as a basis for subsequent variance estimation for the entire data type.
 - Similarly, uncertainties for the aerial survey data are likely to vary among tributaries and relative differences in CVs could be fixed while scaling the

absolute CVs across tributaries.

- The influence of individual data series and data points should be evaluated. For example, the Expert Panel noted that results from sensitivity analyses appeared to be sensitive to high counts at some weir sites in 2014. Additional discussions of trends in the non-scalar data would be helpful.
- In the long run, it would be preferable if the mark-recapture data could be directly integrated into the model to improve the weighting of different data sources, and more appropriately characterize the uncertainty.

Given the importance of the Kuskokwim River abundance estimates to the three river index, the SSC highlighted the need for continued comprehensive aerial and weir sampling moving forward, as well as continued mark-recapture studies, especially if run sizes change appreciably from the *status quo*.

The SSC also reviewed the influence of revised Kuskokwim River abundance estimates, as well as updated AEQ estimates, on the relationship between total western Alaska AEQ and the three-river index. These relationships were evaluated both for the original time period (1994-2012) and for the updated period through 2017. Changes to the AEQ analyses represent a straightforward update and differ from the estimates in the Amendment 110 analyses because only recent, systematically collected genetic data are used in the updated analyses. These changes resulted in somewhat lower AEQ estimates but do not affect the determination of a Chinook salmon threshold.

The revised run-size estimates do have some impact on the relationship and, more importantly, shift the three-river abundance index relative to the static 250,000 fish threshold. The threshold was adopted by the Council based on best-available information during a baseline period and was a policy decision that was perceived to provide a safe threshold for reducing PSC limits. In establishing the threshold, the Council did not anticipate adjustments to the scale of the abundance index. However, the updated model changed our understanding of the number of fish during the baseline period, whereas the threshold remained constant. If the Council chooses to adjust the threshold, a dynamic reference point that is scaled in proportion to changes in the abundance index would be more consistent with standard practice for establishing reference points in this or similar situations. This could prove useful since the ADF&G methodology is likely to be revised and updated in the future, with potential impacts on the scale of the abundance index.

D-4 BSAI Halibut Abundance-Based Management Evaluation Methodology

A discussion paper on possible methods for evaluating halibut prohibited species catch (PSC) abundance-based management (ABM) alternatives was presented by Diana Stram (NPFMC). Public testimony was given by Mark Fina (U.S. Seafoods), Steve Martell (Sea State, Inc.), and Heather McCarty (Central Bering Sea Fishermen's Association).

The discussion paper provides an overview of three possible approaches for evaluating ABM alternatives. The approaches differ in their comprehensiveness and technical complexity, in addition to the time that they require for development. The models also differ in the information that they will provide, and none

of the suggested models will provide information with respect to all the Council's objectives. The SSC notes that selecting an approach for evaluating ABM alternatives requires finding the right balance between complexity and clarity: while it may be desirable for a model to be as realistic as possible, models that are too complex tend to lack transparency, are difficult to understand, and are often driven by hidden underlying assumptions. The SSC therefore recommends that the working group start with a simpler approach that is capable of identifying the key underlying assumptions of the model, conduct sensitivity tests with respect to these assumptions, and investigate a range of scenarios that consider possible future states of: halibut and groundfish abundance, spatial overlap, halibut size/age structure, halibut size at age and recruitment, and linkages between the Bering Sea and the rest of the coast in both halibut biomass and recruitment.

Based on these criteria, the SSC recommends that the working group move forward with their proposed plan for the October 2018 meeting using Approach 2 (i.e., the “two-area” halibut simulation model) to conduct a preliminary analysis of a subset of ABM alternatives. Approach 2 is the simplest and the closest to being developed of the three suggested approaches and will be capable of providing a preliminary analysis of ABM alternatives for the October 2018 meeting. Further, this approach is the most transparent and can explore some of the key assumptions that underlie halibut population dynamics. However, in its current form, Approach 2 still requires additional work before it can be used to evaluate ABM alternatives. Specifically:

- A management model for setting the Total Constant Exploitation Yield (TCEY) must be developed. The SSC agrees with the working group's suggested approach of using historical observations to relate available halibut biomass and TCEY.
- Halibut PSC limits must be tied to impacts in the groundfish and directed halibut fisheries. The SSC was unsure of whether the suggested empirical approach of relating historical PSC limits to PSC use and groundfish harvest is appropriate since there is very little historical variation in PSC limits. A different approach for measuring impacts to the groundfish fisheries may be needed.
- Additional thought must be given to how uncertainty will be incorporated into the model. The working paper suggests that a halibut simulation framework with “perfect information” could be ready for the October 2018 meeting, but the SSC notes the importance of evaluating the performance of ABM alternatives under various sources of uncertainty (e.g., estimation, process, or implementation error).

The other components of the proposed plan for the October 2018 meeting should proceed as outlined in the discussion paper; moving forward with the initial components of an environmental impact statement and social impact assessment will likely result in additional ideas of what may be needed in the refinement of the outputs of the modeling effort. The SSC notes that the recommended approach is more appropriate for hypothesis testing and making relative comparisons of different alternatives/options and not for making long-term projections. **It is therefore important to limit expectations regarding how realistic the modelling exercise will be.** The SSC also notes that we did not receive a detailed review of the methods for the recommended approach, and we will likely have more detailed comments on model formulations after we see more documentation and preliminary results. **The SSC also has the following**

recommendations for the working group:

- It is critical that potential impacts to the groundfish and directed halibut fisheries be sufficiently quantified so that economic impacts to the fishing communities that are engaged in and/or dependent on the halibut or groundfish fisheries (or both) can be evaluated, as required under National Standard 8. Depending on how Approach 2 addresses this issue, it may be necessary to add the complexity of Approach 3 (the Two Species Framework) in a stepwise fashion after sufficient development of Approach 2, perhaps using an aggregate flatfish species group to represent the species targeted by groundfish fisheries.
- Multiple PSC limit starting points should be evaluated as part of the preliminary analysis. The working group currently proposes to evaluate alternatives using only one starting point (Element 2, Option 4). However, since the starting point is likely to be one of the most influential choices on model outcomes, additional starting points should also be evaluated to “bookend” the range of ABM alternatives.
- More focus should be placed on identifying outcomes that can inform whether Council objectives are being met, rather than identifying thresholds and performance metrics. It is unlikely that the Council will be able to reach consensus on what these thresholds should be, and performance metrics based on these thresholds will likely cause confusion and dissension within the Council. Model outcomes can still provide information on the performance of an alternative without having to make judgement on “acceptable” thresholds. The SSC notes that several of the measurable objectives and performance metrics presented in Table 1 do not provide information on whether Council objectives are being met. For example, it’s not clear how the average PSC limit speaks to how well an alternative meets the Council’s Objective 3.
- While the working group acknowledges that the model in Approach 2 is not trying to replicate specific halibut information, the SSC notes that:
 - A scenario with no downstream effects is unrealistic: thousands of tag recoveries suggest that this is not a reasonable bookend -- small halibut clearly move from the Bering Sea to the GOA and further south.
 - The proposed method to use the correlation between BSAI recruitment and coast-wide abundance to inform the upper end of downstream effects will likely underestimate the contribution of the BS if there is any recruitment outside of the BS that does not vary in strict proportion.

D-5 Review of O26 Sampling Data for BSAI Halibut O26 Performance Standard

Diana Stram (NPFMC) presented a discussion paper about data considerations for developing an O26 performance standard for halibut in the BSAI. The paper provided an overview of halibut length and weight sampling methodology aboard vessels fishing in the BSAI, and the resulting data potentially available for assessing these same characteristics in PSC. Specific attention was given to data issues associated with deck sorting under an Exempted Fishing Permit (EFP). The document also provided halibut length and weight data from the IPHC setline survey, which has been proposed as a data source for evaluating O26 PSC aboard longline boats in the BSAI, as well as an overview of additional considerations associated with evaluating and implementing a performance standard. Public testimony

was provided by John Gauvin (Alaska Seafood Cooperative), Heather McCarty (Central Bering Sea Fishermen's Association), and Gerry Merrigan (Freezer Longline Coalition). Written comments were provided by John Gauvin.

The SSC thanks staff for providing a concise and informative document. The sampling methods, data availability, and major issues related to both were well described. In addition, the overview of considerations relative to creating a performance standard provided important context with regard to implementation issues under a regulated performance standard. In this section, MSA national standards 1 (optimum yield) and 9 (minimize bycatch to the extent practicable) are referenced. The SSC recommends future versions of the analysis include reference to MSA national standard 8 (provide for the sustained participation of fishing communities and, to the extent practicable, minimize adverse economic impacts on such communities).

The SSC focused most of its discussion on issues associated with the length composition data and sampling issues on EFP vessels, and the interaction of a performance standard with the halibut ABM evaluation currently underway.

Data and sampling issues

The SSC discussed differences in sampling methodology depending on whether a vessel was fishing under the authority of an EFP:

Non-EFP vessels: For all vessels not fishing under the authority of the EFP (including Amendment 80 vessels), length data provided by fishery observers is likely adequate to grossly evaluate the length composition of halibut within a sector. The SSC notes that the methods used to collect length composition changed in both 2010 and 2016. Prior to 2010, lengths were collected based on a nonrandom 20 halibut per day sampling protocol (sampled across hauls). After this time, length data were randomly collected using systematic sampling of halibut within each haul. The 20 samples per day method resulted in sparse data within certain groupings, and haul-specific composition data is unavailable. This may be a consideration in future analysis for this or other uses of the halibut information.

The SSC also notes that in order to balance the need for careful release of halibut with data collection, the collection of weight data on groundfish longline vessels is imprecise. Observers collect weight data from halibut released at the rail. This requires observers to visually estimate the total length of a halibut and assign that length to a 10 cm bin that has an associated weight that is calculated using the IPHC length-weight conversion.

EFP Vessels: This category is defined as those Amendment 80 vessels that fish under the authority of the EFP. Under the first year of the EFP in 2015, halibut were sorted on deck and observers received only counts and total halibut PSC weight from the crew. Though this changed in 2016, complete length data are unavailable for the factory portion of halibut caught on EFP vessels fishing in 2016 and 2017. Bias in the overall length composition arises because the distribution of fish making it into the factory tend to be smaller than those deck sorted. Table 5

compared with Table 4 in the discussion paper illustrated this difference. Possibly, some of the differences could be caused by EFP vessels fishing in different locations than non-EFP vessels. However, length compositions presented by the Alaska Seafood Cooperative during public testimony also show substantial compositional differences between the factory and deck-sorted halibut. The SSC notes that representative length compositions will be available from the factory starting in 2018.

The SSC also expressed concerns about the sampling method used to collect halibut weights, which may be used to derive aggregate length-frequency data. The current protocol for sampling aboard trawl vessels involves collection of weights from the first 15 fish, then from every 5th fish. Since the first 15 halibut are a nonrandom sample from a trawl haul, and there is additional manual sorting, this sampling design may lead to a bias in the size of fish included (particularly when sampling fractions are small). The SSC noted that this did not appear to be standard practice for the sampling of trawl catches. Although this issue was not presented in detail in the discussion paper, the SSC suggested that the protocol or analysis be revised in the future to create a statistically unbiased result.

Based on these concerns, the SSC concluded that these data were not directly comparable across recent years and does not recommend that recent length compositions collected on EFP vessels be used for the creation of an O26 performance standard.

Performance Standard and ABM measures

The SSC had a lengthy discussion about the implementation of a performance standard and defining associated objectives, and whether there is a relationship between the performance standard and the ABM measures being considered. The overarching issue is the lack of a defined objective - i.e., what is the problem/issue that the performance standard is intended to address? Without this direction, a discussion concerning the type of analysis required was not possible.

However, incorporating a performance standard will require a regulatory analysis that also considers analyses associated with the ABM measures. The SSC was concerned that many of the issues that would need to be discussed in a regulatory analysis for the performance standard would be the same issues as those in the ABM, but without the benefit of the ABM tools and an understanding of how the O26 interacts with the ABM elements. **For this reason, the SSC recommends that any O26 measures be considered along with the ABM measures, not as a stand-alone analysis.**

In addition, during its June 2017 meeting, the SSC recommended that an O26 measure could be considered as a performance metric in the ABM process. As a performance metric, a well-defined O26 objective could be used to evaluate the behavior of O26 PSC catch in the context of the ABM modeling efforts. Because the performance standard currently has no defined objectives, the SSC could not comment on what would be a reasonable performance metric, but suggested that reporting of O26 relative to total PSC could provide additional information for future evaluation. The SSC found the considerations section in the discussion paper to be particularly helpful and relevant in defining a potential standard or metric. Two important questions followed from this section: 1) whether the performance standard

improves bycatch performance relative to objectives; and 2) whether industry can control factors that improve performance. These questions must be considered in defining what is meant by “performance” under an O26 standard or metric.

D-6 Research Priorities for 2018

The SSC undertook its annual review of the Council’s research priorities. Jim Armstrong (NPFMC) presented changes to the research priority review process and changes to the priority list from the Plan Teams and Sarah Marrinan (NPFMC) presented on the halibut catch share plan allocation review. Finally, Matt Baker from the North Pacific Research Board (NPRB) presented on the NPRB’s research priorities, funding, and the progress made to improve linkages between NPRB and NPFMC priorities. There was no public testimony, though there were written comments provided by the Aleut Community of St. Paul and the Halibut Coalition, which were considered in the SSC discussions.

First and foremost, the SSC would like to express appreciation for the work done by the Plan Teams and NPFMC staff both to review the database as normal and to also develop their top priority lists. The input provided by the Plan Teams was given strong consideration. In 2018, a new process for review of the research priorities was executed. This change stems from a proposal from a working group of SSC and Council members that was reviewed by the SSC in April 2018. In this proposal, the annual curation of the database would be conducted as normal, with consideration given to the Plan Team’s suggested changes. In addition, the subgroup requested that the SSC develop a top ten list of research priorities for 2018 from the priorities identified as Urgent or Important. This top priority list would be developed from a combination of sources. First, the Plan Teams would identify three to five top priorities relevant to their particular team that would be candidates for the top priority list. Second, the SSC would additionally consider any priorities not reviewed by any Plan Team, including those relevant to halibut, marine mammals, seabirds, and social science topics. The intent of this top priority list was to both reduce the review burden on the Council and to improve communication of these highly relevant priorities to external funding sources and the general public. At their April 2018 meeting, the SSC agreed to test this process, with the caveat that they not be limited to exactly ten priorities. General criteria for inclusion on the top priority list included considerations of priority level, research status, recent management events or actions, and the specificity of a particular research priority. The SSC’s top priority list is presented in Table 1, and the SSC notes that they are in no particular order. Specific discussion of the process for the development of this list follows in a later section of this agenda item.

Though not considered candidates for the top priority list, the SSC recognizes the continued importance of priorities identified as Critical Ongoing Monitoring, and has developed a preamble to convey this, as requested by the Council/SSC subgroup. This preamble is as follows:

Research priorities designated as Critical Ongoing Monitoring are of the highest priority level for the North Pacific Fishery Management Council. These priorities create and maintain indispensable data that substantially contribute to our understanding and management of fish populations, fisheries, and the communities dependent upon those fisheries. Discontinuation or diminishment of the research that provides these datasets would leave a significant gap in the science needed to support sustainable and

successful fisheries management in the North Pacific. The North Pacific Fishery Management Council and its Scientific and Statistical Committee continue to provide the utmost support for these priorities.

The SSC would request that this paragraph also be posted on the NPFMC website describing the research priorities. The SSC was also tasked with making a recommendation on the review frequency for Strategic priorities, which will be discussed in a subsequent section discussing the process.

Curation of research priorities database

Again, the SSC appreciated the effort by the Plan Teams to review and update the database, both in terms of the priority level and whether there had been progress made on each research priority. The SSC review focused primarily on those priorities where the Plan Teams had made suggested changes, with the addition of reviewing in detail the priorities not reviewed by any Plan Team. In some cases, the SSC agreed with the change to the priority level suggested by the Plan Teams, and in some, the SSC maintained their existing priority level regardless. Additionally, the SSC modified the text of some priorities to combine similar priorities or create further delineations among the priorities. All new priorities lacking a priority level designation were reviewed by the SSC and a priority level was subsequently assigned, with the exception of a new research priority suggested by the Crab Plan Team regarding benthic production in a changing climate. While provisionally accepting this suggested priority, the SSC requests a rationale be developed by the Plan Team prior to assigning a SSC priority level. A spreadsheet will be provided to Council staff of these changes in order to update the online database.

The SSC noted some inconsistencies in the SSC priority level for some priorities distributed to more than one Plan Team, which was discovered when comparing across Plan Team spreadsheets. These included priority numbers 240, 242, 251, 611, 612, and 613. This is regrettable given that the SSC priority level could influence the Plan Team's subsequent recommendation for its priority level. Four of the six priorities were reviewed during the database curation and the priority level clarified. The priority level of the final two (#240 and 242) were confirmed to be Important from the master database.

The lead for the SSC research priority review conducted a keyword search to identify research priorities brought forward in SSC minutes from the past year (June 2017 – April 2018) that may not yet have been captured in the database. The two potential priorities identified included a suggestion to examine scallop survey catchability, which is already an existing priority (551), and to use thermally marked otoliths to explore hatchery contributions to salmon PSC in the Gulf of Alaska (# 651), which was identified as a new priority and assigned a ranking of Important.

Sources of new potential research priorities

The SSC discussed several new potential sources for additional research priorities from recent Council activities, including the April presentation from the seabird working group, the social science planning team (SSPT) and the request from the Council regarding socio-economic data for the upcoming halibut catch share plan allocation review. While the seabird working group presented its internal priorities for research and examination at the April 2018 meeting, the SSC did not feel that any of these priorities were sufficiently developed to add to the research priority list, and suggests further discussion at the next working group meeting to clarify any suggested research priorities for consideration next year.

There was some discussion of whether it was the role of the SSPT to participate in the annual review, and the SSC noted that it would be logistically difficult, given the large burden of this review and that the team is currently meeting annually. Also, the SSC did not want to suggest that the scallop, crab, and groundfish Plan Teams stop reviewing socio-economic priorities relevant to their respective fisheries by relegating these to the SSPT, due to their expert knowledge of the species and the possible impacts to communities that harvest them. As a middle ground, the SSC would request that the SSPT develop a list of suggested research priorities, potentially based on the results of the gap analysis discussed in their minutes, to be brought forward next year.

Finally, Council staff developed a short explanation of the request for SSC review of data needs for the upcoming allocation review for the halibut catch share plan, including two suggested draft research priorities. Staff requested feedback on these priorities and input on this process for submission of research priorities. The SSC had limited time to review the specific draft priorities, but suggested that they were sufficiently covered by existing priorities and did not feel strongly that these should be added. Regarding the process, the SSC was open to additional Council bodies acting as sources of potential research priorities, in addition to the Plan Teams, provided the draft priorities were sufficiently developed for adequate review.

Process for research priority review

It is difficult to overstate the SSC's frustration with the annual review process in general, as it relates to the curation of the database and the review of priority levels. There is concern regarding the value of this process, given the amount of time and level of attention required for a thorough and thoughtful review, and the recognition that, despite the large amount of time the SSC spends on annual reviews, much of this time must be dedicated to administrative process rather than rigorous scientific review of each identified priority. The SSC questioned whether this annual review was the best use of limited meeting time, and considered options for increasing the interval between such reviews. While the SSC was pleased with the progress made in 2018, members also noted that the complete list of research priorities changes relatively little from year to year, supporting an increased review interval.

The SSC had a lengthy discussion regarding how to maximize the utility of the research priority review process. The frequency of review could be changed, potentially to once every three to five years. The SSC suggests that this may be appropriate specifically for Strategic research priorities. The SSC notes that the Magnuson-Stevens Act only mandates a review of a council's priorities once in five years, other councils review priorities at a reduced frequency, and that assigning more meeting time every few years may allow for a more in-depth review. Another suggestion would be to annually review only a subset of priorities, and a variety of suggestions for the method by which to identify this subset were discussed, including filtering by priority level (i.e., not review Critical Ongoing Monitoring), research status (reviewing only those not underway or partially underway), and funding status, if such a connection can be developed. The SSC will consider these changes for next year's review but requests feedback from the Council/SSC subgroup as well.

The SSC did find value in the development of a top priority list and is amenable to continuing to develop these lists in the future, as the Council requests. The internal SSC process for the development of the list was relatively unstructured in a deliberate attempt to test the process, but generally created a master top priority list that combined multiple members' suggestions for top priorities and then evaluated that list as a whole to cull any that seemed inappropriate. More by happenstance than by design, this resulted in ten top priorities. The SSC also suggests that a "year-added" field be added to the top ten list, similar to the general database, so that it is known how long a priority has remained on the list if there is rollover from year to year.

Miscellaneous comments

The SSC commends NPFMC staff and the hosting body at AKFIN for their responsiveness in requested improvements to the online database, and notes the extensive progress made on this front over the last several years. The online database provides a mechanism to export lists of research priorities in a spreadsheet format, and the SSC suggests that metadata, specifically field definitions, be made available when exported from the database. The SSC further notes that there are some fields in the exported file that are now defunct and that could be removed.

The SSC was appreciative of the information presented by Dr. Baker and is extremely encouraged by the mechanisms that are being developed to track funding of specific research priorities in cooperation with the NPRB. These types of NPFMC-NPRB linkages are key to documenting measurable progress on research priorities and, ultimately, the removal of a priority from the list. Dr. Baker noted that a Sea Grant fellow will be starting soon who will focus their time on this ongoing project, and the SSC looks forward to continued progress and momentum on this front. Documentation of funding of the Council's research priorities by other funding agencies (e.g., Pollock Conservation Cooperative Research Center, Alaska Sea Grant) would also be useful in this regard.

Table 1: The SSC's top priorities for 2018 in order by Research ID. The priorities are not ranked by the SSC; however, the ranking provided by the Plan Teams was provided for reference. Red font indicates changes from 2017.

Research ID	Title	Rationale	PT	Council Priority	2017 SSC Priority	2018 SSC Priority	2018 PT Priority	PT Rank
148	Spatial distribution and movement of crabs relative to environmental variability, life history events, and fishing	Environmental conditions are changing rapidly in the eastern Bering Sea, driving related changes in the distribution of commercially exploited crab stocks. Fishing behavior and life history timing (e.g., reproduction, growth) may subsequently be influenced by changes in crab distribution. The CPT identified collection of data on distribution and movement relative to oceanographic conditions as critical for development of the complex models needed to predict future stock abundance, stock boundaries, stock production, and management strategies.	Crab	Urgent	Important	Urgent	Urgent	1
163	Conduct routine fish, crab, and oceanographic surveys in the Arctic Ocean	Although fishing is currently prohibited in Alaska's Arctic waters, the region is changing rapidly and fish or crab populations may expand into or increase locally in the Arctic. Therefore, it is important to conduct routine surveys to monitor changes in populations of these species in Arctic waters.	JGF	Urgent	Critical Ongoing Monitoring	Important	Important	n/a ¹
179	Conduct pre- and post-implementation studies of the benefits and costs, and their distribution, associated with dedicated access privileges	Data on the economic and social dimensions of changing benefits, costs, and their distribution associated with changes in management regimes are needed for recurring program reviews and ongoing management of the halibut/sablefish, AFA pollock, and BSAI crab fisheries. Such data could be used to improve analysis of changes in product markets, quota share markets, distribution of ownership of vessels and quota, crew compensation, fishing community engagement and dependency, and the efficacy of program community protection measures, among other needs.	Crab/JGF	Urgent	Urgent	Urgent	Urgent	n/a
182	Evaluate current and alternative Council PSC/bycatch reduction initiatives	Evaluation of bycatch reduction initiatives are particularly relevant with the ongoing development of halibut PSC abundance based management, but is also more broadly applicable to salmon and crab stocks.	Halibut	Important	Important	Urgent	n/a	n/a

¹ Note that the SSC removed the language referring to the Northern Bering Sea in #163. The original #163 was ranked at #1 by the JGFPT.
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Research ID	Title	Rationale	PT	Council Priority	2017 SSC Priority	2018 SSC Priority	2018 PT Priority	PT Rank
189	Develop stock-specific ecosystem indicators and incorporate into stock assessments	To support an ecosystem approach to management in the context of single-(or multi-) species assessments, there is a continued need to develop indicators that link ecosystem variability and changes to variability in growth, survival, and recruitment of fish stocks, as illustrated by the recent dramatic downturn in Pacific cod. This provides an important avenue for linking ecosystem changes directly to management-relevant reference points such as OFL and ABC.	JGF	Important	Important	Important	Urgent	1
246	Cooperative research efforts to supplement existing at-sea surveys that provide seasonal, species-specific information on upper trophic levels	The pelagic distributions and abundances of top predators (seabirds and marine mammals) provide indicators of the availability of prey species, many of which are commercially important, such as pollock and Pacific cod. Thus, knowledge of their distributions and abundances can be useful as indicators of ecosystem "health." Also, in some instances, these top predators are inadvertently impacted by fisheries, making knowledge of their distributions important for fisheries where impacts may occur.	JGF	Important	Important	Important	Important	2
365	Retrospective analysis of the impact of Chinook PSC avoidance measures on communities of western Alaska	Considering the reduced salmon runs in western Alaska, it is critical to understand impacts to local communities as management has changed. This is also timely due to recent availability of genetic information linking Chinook caught as PSC to specific areas or river systems of origin, newly allowing analysis of differential distribution of impacts of PSC catches among fishing communities.	non-PT	Urgent	Urgent	Urgent	n/a	n/a
431	Develop tools for analyzing coastal community vulnerability to fisheries management changes	Predictive accuracy of pre-implementation economic and social impact assessments of proposed fishery management changes would be improved through better understanding of how various dimensions of community vulnerability and resilience can be effectively analyzed and, ultimately, how identified and measured vulnerabilities are likely to variously interact with the nature, direction, and magnitude of proposed changes to the fishery.	Crab/JGF	Important	Important	Important	Important	n/a

Research ID	Title	Rationale	PT	Council Priority	2017 SSC Priority	2018 SSC Priority	2018 PT Priority	PT Rank
491	Assess dependence and impacts of halibut management actions on communities	A complete evaluation of the impacts of alternatives of the halibut PSC abundance-based management action will require knowledge of community engagement in, and dependence on, the halibut and groundfish fisheries.	Halibut	Urgent	Urgent	Urgent	n/a	n/a
592	Maturity estimates for Bering Sea and Aleutian Island crab stocks	Maturity data from male and female crab are needed for use in stock assessment models. Key parameters defining size at maturity, proportion mature at size, and the potential for biennial reproductive cycles are currently uncertain for many stocks. Methods for determining spatial and temporal variability of these quantities are needed to adequately characterize mature biomass.	Crab	Urgent	Urgent	Urgent	Urgent	3