DRAFT REPORT
of the
SCIENTIFIC AND STATISTICAL COMMITTEE
to the
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
February 2nd – 4th, 2015

The SSC met from February 2nd through 4th at the Renaissance Hotel, Seattle, WA.

Members present were:

Farron Wallace, Chair *NOAA Fisheries—AFSC*	Robert Clark, Vice Chair *Alaska Department of Fish and Game*	Milo Adkison *University of Alaska Fairbanks*
Chris Anderson *University of Washington*	Sherri Dressel *Alaska Department of Fish and Game*	Brad Harris *Alaska Pacific University*
Anne Hollowed *NOAA Fisheries—AFSC*	George Hunt *University of Washington*	Seth Macinko *University of Rhode Island*
Steve Martell *Intl. Pacific Halibut Commission*	Lew Queirolo *NOAA Fisheries—Alaska Region*	Kate Reedy *Idaho State University Pocatello*
Matt Reimer *University of Alaska Anchorage*		

Members absent were:

Jennifer Burns *University of Alaska Anchorage*	Alison Dauble *Oregon Dept. of Fish and Wildlife*	Terry Quinn *University of Alaska Fairbanks*

SSC Election of Officers
The SSC appointed Farron Wallace as chair and reappointed Robert Clark as vice chair.

C-2 EM Cooperative Research Plan
EM Field Projects
Diana Evans (NPFMC) presented the Cooperative Research Plan (CRP) for deploying Electronic Monitoring (EM) systems on 13 vessels in the Gulf of Alaska for the 2015 season. The SSC was tasked with reviewing the CRP and providing comments. Public testimony was provided by Dan Falvey (self).

The overarching goal of the project is to evaluate the efficacy of EM in combination with other tools for an accounting of retained and discarded catch. An additional goal is to identify decision points for operationalizing EM systems into the Observer Program for fixed gear fleets that are currently subject to partial (vessels 40 to 57.5 feet) or no observer coverage (vessels less than 40 feet). Current research projects being conducted in 2015 are intended to identify procedures for operationalizing EM and test the efficiency of EM to provide data to estimate discard. The field work outlined in the CRP is intended to address four elements:

1. Deployment of EM systems.
2. Research and Development of EM technologies.
3. Infrastructure to support EM implementation.
4. Analysis to support EM implementation and decision points.

The Council adopted a Strategic plan for EM and reporting in the North Pacific, including Goal III, Objective 1: "Implement EM/ER technology where appropriate and cost effective to improve catch estimation and better inform stock assessments." Estimation of at-sea catch and prohibited species catch (PSC) is of high priority for stock assessment and estimation of ABCs and OFLs. The SSC acknowledged the breadth of work that has been done to date in the development and appreciated the presentations in the EM workshop.

The SSC recognizes the importance of the Council's program goals of providing accurate catch accounting for improved information from the small boat fleet and for preventing displacement of family members and deckhands by observers on small vessels. The SSC appreciates the ongoing research in EM technology being done by NMFS staff. Although the technology appears to be sufficient to enumerate catches directly, it is not clear how quickly a fully automated EM catch accounting system can come online. Simpler systems have been developed in the BC fixed gear fisheries. These systems have been in use for over a decade now, and are providing detailed catch accounting through a combination of logbooks, dockside monitoring, and partial audits of the EM data to provide for compliance with logbook reporting on discard and retention. Expanding the BC program to Alaska may pose many logistical problems in terms of gear maintenance, recovering hard drives from the numerous ports, and providing dockside monitoring where there is none. Presumably these logistical issues are just as problematic for a fully automated EM system. The SSC encourages the EM workgroup to continue to consider the development and use of a combined logbook and partial audit method.

Howard McElderry of Archipelago Marine Research (AMR) summarized the operational testing plan for deployment of standard EM systems within the Alaska fixed gear fleet. In his presentation, he also discussed key program design considerations from the perspective of *Management Goals, Operational Goals,* and *Operational Objectives*. The SSC noted that the Council's objectives may need to be further articulated with respect to the Operational Objectives of the EM program. Specifically, there is no clear statement in the Council's vision about the importance of detecting a rare event (e.g., capture of a short-tailed albatross) with a given probability. In addition, the objectives for the EM program should contain quantifiable goals such as estimating the uncertainty in PSC estimates and bycatch mortality. Public testimony also cautioned that EM should not be intended to replace observers on vessels. **The SSC recommends that prior to implementation of EM, the Council clearly articulate quantifiable program goals for implementation such that EM coverage rates can be determined.** Once quantifiable program goals are developed, the SSC recommends a time and motion study to assess efficiencies and dis-efficiencies of the program (e.g., estimate the time required to analyze the video and produce an estimate of catch and the associated uncertainty).

Farron Wallace (NMFS-FMA) presented operational plans for enhanced EM system testing on one pot fishing vessel and several long line vessels to determine the accuracy of this system for direct accounting of catch by species. In these experiments, EM will be paired with onboard sea samplers to assess directly the species identification and counting capabilities of: a single camera, stereo camera and a camera chute system on a pot vessel; standard camera and stereo rail on the IPHC long line survey; and standard camera, stereo rail, and camera chute system on a long line vessel. The SSC appreciates the technology development aspect of these projects that serves as a parallel development track to the more established project fielded by AMR. Statistical analyses described in the literature allow comprehensive comparisons

across species and across reviewers, and allow inclusion of descriptive variables such as length that may help describe why potential differences between observers and/or EM reviewers occur.

Considerations for Cost Data Collection

The SSC received a presentation from Sam Cunningham (NPFMC) on plans to establish a cost accounting study of the implementation and operating costs of EM on fishing vessels. The report identified major cost categories about which data needs to be collected: field services, data services, operational impacts, and administrative costs. The first two categories are primarily accounting of costs paid during the pilot study. Operational impacts are more difficult to quantify because the costs involved are foregone benefits of actions that are no longer possible due to EM implementation, for example reduced catch due to harvesting only in certain light conditions, or with fewer crew to make deck, bunk or life raft space for an observer. The SSC agreed this is the sensible set of costs to track.

The SSC is supportive of the proposed emphasis on the operational impacts of EM, which is not common in studies of similar electronic or human monitoring programs. These costs are particularly salient in this small boat fishery because high operational impacts have been previously used to justify exempting this fleet from trip selection, and therefore demonstrating reduced monitoring costs and other impacts relative to human observers is a significant enticement to EM adoption by individual vessels. However, precisely quantifying operational impacts—as relative to the operational impacts of some baseline monitoring policy—is a complex and demanding data collection and analysis task. The SSC did not have sufficient information about how the cost analysis would affect the outcome of the policy process to determine whether this warrants the required resources.

The SSC strongly encourages identifying a particular baseline monitoring policy (e.g., trip selection by human observers), for which a comparable set of costs is assessed. One proposed strategy is for study vessels to report their operational impacts on an industry-developed questionnaire. This is practical, but needs to use objectively quantifiable metrics to the extent possible to prevent misrepresentation of costs. Anecdotal experiential information should be used to help guide the interpretation of these metrics. The SSC also encourages including 'control' vessels (perhaps those applicants who are not installing EM systems) in the survey, which would capture important effects of the status quo program, including the rate of displacing crew and rerouting vessels to different ports.

C-4 Halibut Total Mortality

A presentation on halibut total mortality was given by Ian Stewart (IPHC). Public testimony was provided by Gerry Merrigan (Freezer Longline Association) and Simeon Swetzof, Jr. (City of St. Paul and Tribal Government of St. Paul).

The IPHC document describes the transition from the current exploitable biomass-based approach to a total mortality approach where all sources of removals of halibut of all sizes are explicitly quantified and accounted for as components of fishing mortality. Spawning Potential Ratio (SPR) is introduced in the document as the method for integrating over all sources and sizes of mortality of halibut to determine the level of fishing intensity. This allows for immediate and explicit accounting of small under-26 inch halibut (U26) in the calculations of harvest projections for directed fisheries across all halibut regulatory areas. This is not achievable under the current accounting system.

The SSC greatly appreciates the opportunity to review the document. The SSC notes that it is readily apparent from the document that this method of accounting for all mortalities and assessing of fishing intensity promotes:

- transparency in accounting for, and listing of, each source of mortality that contributes to the overall fishing intensity,
- clear and consistent assessments of tradeoffs between sources of mortality,
- accountability for each fishery in sustaining yields into the future, and
- improved management of the directed fishery against the backdrop of mortality that occurs in other fisheries.

The SSC support the IPHC using the total mortality approach. This approach is essentially the same approach used by the NPFMC to assess and manage fisheries under its jurisdiction. However, the SSC also notes that there will be challenges to implementing this approach, specifically with questions that will arise with:

- how the stock assessment and biological sampling is conducted
- how the stock is modeled to assess status and project fishery yields
- how, and with what lag, changes in mortality of very young fish will affect harvest rates of older fish subject to the directed fishery
- how management advice is provided to all stakeholders and fisheries that impact the halibut stock

The SSC notes, with greater transparency comes greater scrutiny of data sources and inputs to stock assessment models, as well as the assumptions made in constructing these models. Moreover, the relative uncertainty of data inputs will likely become much more important in these stock assessment models.

The SSC also had the following comments and suggestions on specific aspects of the IPHC document:

- The document spoke to specific discrepancies between discard and mortality accounting of the two agencies (IPHC and NMFS). These discrepancies should be resolved so that all stakeholders have trust in the discard mortality information that is used to inform the stock assessment for Pacific halibut.
- Although SPR is an oft used concept in the management of fisheries in the North Pacific. We suggest that future versions of the document include a worked example of the method of calculating SPR that includes all the sources of information that are utilized in the calculations for the public.
- During questioning of Dr. Stewart, several additional slides were provided that showed the effect on prescribed fishing intensity of implementing a total mortality approach in past years in comparison with the current approach. These graphics were very helpful in illustrating the potential changes that a total mortality approach might portend, and should continue to be included in any future versions of the document.
- The explanation in the document of current uncertainties in data inputs, especially for the accounting of U26 mortalities, was excellent. The SSC hopes that research to resolve some of these uncertainties will be forthcoming and that relative uncertainties can be assessed to guide future research.
- A graph of the long-term time series of biomass, O26 mortality, and total mortality would have been helpful for providing context to the current situation for the halibut fishery.

- A presentation of selectivity curves by area and a time trajectory of historical weight at age for smaller halibut also would have been helpful.
- We note that potential U26 savings due to decreases in halibut PSC would benefit directed halibut fisheries over a broad area, and that the benefits are much less than 1-to-1 in the area where PSC would be reduced.
- Although IPHC can implement this approach without approval from the Council, use of SPR and total mortality accounting implicitly accommodates decision-making that will likely occur between management entities (NPFMC and IPHC).

C-5 Bering Sea Halibut PSC

Review of Deck Sorting EFP

John Gauvin (Alaska Seafood Cooperative, AKSC) gave a presentation supporting an application for an exempted fishing permit (EFP). The goal of this EFP is to evaluate the effectiveness and feasibility of reducing mortality of halibut bycatch in the Amendment 80 sector in 2015. The proposed study builds on several previous projects undertaken in 2009 and 2012. This EFP would allow operators of non-pelagic trawl catcher/processor vessels to sort halibut on deck rather than routing halibut over the flow scale and below deck. No public testimony was given on this topic.

The objectives stated in the EFP include:

1) Assess the benefits of deck sorting in terms of savings of halibut mortality under an arrangement that deck sorting is available as an optional catch handling procedure provided EFP participants meet all the requirements to use deck sorting.

2) Evaluate the usage of deck sorting in terms of frequency of tows where deck sorting is used relative to the existing catch handling procedures and the percentage of participants' total halibut catch that is sorted on deck.

3) Evaluate the utility of deck sorting as an option in the context of the rules and constraints of the EFP.

4) Provide a final report from the EFP that evaluates the outcomes in terms of performance indices for how often participants sorted halibut on deck, what portion of the overall halibut catch was sorted on deck, average mortality rates of halibut sorted on deck, and other indicators of performance of interest to NMFS, NPFMC, and the IPHC.

To accomplish the study objectives, specific regulatory exemptions from current Amendment 80 catch handling procedures were requested. These include:

1) Catch handing regulations currently prohibit catch sorting or removal on deck, prior to observer sampling (50 CFR 679.93(c)(1)). Additionally, these regulations require all catch to be weighed on a NMFS-approved scale. During the EFP, catch estimates and viability assessments of halibut will occur principally on deck (and in the processing area for any halibut missed on deck)

according to the methodology described below. These activities would normally occur at the observer work station below deck.

2) Regulations at 50 CFR 679.93(c)(5) prohibit catch from remaining on deck without an observer present. Because halibut will be handled on deck, exemption from this regulation is necessary.

3) Regulations at 50 CFR 679.7(g)(2) prohibit sorting catch prior to observer sampling. Because sampling will occur on deck, a regulatory exemption will be needed.

To accomplish the study objectives, no additional halibut quota is requested as part of this EFP application, and all groundfish catch will accrue against Amendment 80 target species and non-allocated catch allowances.

The deck sorting methods used in this EFP are identical to those used in the 2012 EFP. The SSC (Dec 2011) determined the previous EFP to be a "very well designed project with the potential for important results regarding methods to reduce halibut bycatch on Amendment 80 vessels." The substantive change in the proposed EFP is the expansion of deck sorting to "any vessel under the authority of an Amendment 80 permit owned by a member company of the AKSC." Further, deck sorting on these vessels will be optional.

The SSC recommends approval of the EFP and commends Mr. Gauvin and the AKSC for the continued work to establish methods to reduce halibut discard mortality.

Initial draft analysis to reduce halibut PSC limits

The SSC received a presentation on the Pacific halibut PSC Mortality Limit Draft EA/RIR/IRFA by Diana Evans (NPFMC) and Marcus Hartley (Northern Economic Inc.). Public comment was provided by Gerry Merrigan (Freezer Longline Coalition), Jon Warrenchuk (Oceana), Heather McCarty (CBSFA) and Mateo Pez (City of St. Paul), Simian Swetzof, Jr. (Tribal Council of St. Paul), Linda Benhken (ALFA), and Mark Fina (US Seafoods).

The SSC acknowledges and commends the efforts of the analytical team, tasked with preparation of this EA/RIR/IRFA package. The initial draft represents an impressive compilation (and an elaborate presentation) of recent empirical information, documenting the commercial activity of a highly varied and diverse suite of participants in the BSAI groundfish and halibut fisheries.

The proposed Council action would reduce the Pacific halibut Prohibited Species Catch Mortality Limits, as they apply to each of the major gear/target/operational-modes, incrementally over a 10 percent to 35 percent reduction range. The draft presents a thorough descriptive characterization of the development and evolution of the BSAI halibut PSC management process, providing context to compare and contrast these alternative reduction limits.

The predicted economic implications of each competing PSC reduction threshold, for each gear/target/operational-mode, were computed using an "Iterative Multi-year Simulation Model" (IMS Model) developed by the analysts. The net impacts of PSC limit reductions over a 10-year period are

modeled as: 1) the forgone gross revenues from reduced groundfish harvests due to binding PSC limits in the BSAI commercial groundfish fisheries; and 2) the increased gross revenues from a higher Fishery Constant Exploitation Yield (FCEY) in the IPHC Management Area 4 commercial halibut fishery due to decreased PSC mortality in the commercial groundfish fisheries. To account for unknown fishery conditions in future years, the analysts randomly draw from a pool of historical (2008-2013) month-, area- and target-specific PSC mortality and groundfish harvest data, and calculate what groundfish revenues, PSC mortality, and directed halibut fishery revenues would have been over a 10-year period under the status quo and all alternatives under consideration by the Council. This process is repeated 10,000 times using new draws from the pool of data, generating a distribution of 10-year impacts to both the groundfish fisheries and the directed halibut fishery.

The IMS model is an improvement over previous Council analyses of PSC mortality, which use the highly simplified "revenues-at-risk" approach. However, **the SSC identified four critical deficiencies in the initial review (below) that severely limit the use of the model for application within the context of the proposed action. The predicted outcomes from the model are therefore difficult to interpret and could be seriously misleading. The SSC recommends that the document not be released for public review.**

- *No consideration of U26 halibut mortality*: While the IMS model considers the impacts of PSC limit reductions over a 10-year period, it is not truly a dynamic model in the sense that the savings in U26 halibut from reduced PSC mortality are not accounted for in future years. In general, there is uncertainty and confusion surrounding the way in which U26 halibut PSC mortality impacts are accounted (or unaccounted) for in the annual TCEY and FCEY process in the IPHC. Current savings in U26 halibut mortality are likely to have important implications for the exploitable halibut biomass in future years, thereby influencing the future benefits accruing to commercial halibut fisheries and the future difficulties of avoiding halibut PSC in the groundfish fisheries under fixed PSC limits. The impact of U26 halibut mortality savings is therefore an important aspect that is not considered in the analysis.
- *Inadequate consideration of behavioral changes*: The IMS model assumes that PSC halibut mortality reductions in the groundfish fishery can only be achieved by reducing groundfish harvests and gross revenues. By using groundfish harvest and halibut mortality data from 2008-2013, the analysis assumes that the PSC mortality rates will be the same after PSC limit reductions are implemented. The industry has made significant operational adjustments to reduce PSC mortality rates in recent years, and are likely to continue to do so, especially if PSC limits are reduced. If industry can change its behavior to reduce PSC mortality without a reduction in groundfish harvests (although perhaps at a higher cost), the model conclusions overestimate the potential costs of PSC mortality reduction accruing to the groundfish fishery. This aspect of behavioral change must be considered in the analysis.
- *Inadequate consideration of socioeconomic impacts*: The analysis only considers the direct effect of PSC limit reductions on the gross revenues of the groundfish and commercial halibut fisheries. It does not adequately consider the indirect effects of reducing halibut PSC limits on the people, industries, and communities that depend on the impacted fisheries. It largely neglects non-commercial values in Area 4, such as subsistence and cultural contributions. The inadequate treatment of socioeconomic and cultural issues was made even more apparent during public

testimony and submitted public comments in which dependencies on the directed fishery and a projected set of threats to communities were presented. Analyses of these human dimensions and community impacts are essential to meet National Standard 8. This is symptomatic of a more general lack of integrated frameworks and analyses that jointly consider biological, economic, and social dimensions of fisheries management.

- *Lack of clarity in model assumptions*: It is necessary to make assumptions to predict the impacts of a policy measure in a complicated setting; however, it is important that the assumptions are clearly and explicitly laid out in a way that facilitates the understanding of how the model works and the implications of the assumptions. The present draft is seriously deficient in this respect. While some assumptions may have little influence on the outcome of the model, other assumptions may be very influential. Sensitivity tests should therefore be conducted to explore the range of possible outcomes under different assumptions. Evaluating the IMS model under Scenarios A and B is an example of a specification test in the analysis, and demonstrates that the IMS model outcomes can change significantly when assumptions are altered. When quantitative sensitivity tests are not feasible, the analyst should provide a qualitative assessment of how the model outcomes might change under different assumptions.

Other considerations influencing the SSC recommendation are summarized below:

- The document acknowledges that the halibut population has exhibited large changes in spatial distribution, growth, and abundance. All three of these factors may influence the PSC mortality rate in groundfish fisheries and the probability that PSC limits would constrain groundfish fisheries. This review of past conditions indicates that the current model doesn't address a realistic range of possible stock conditions that could occur in the future.
- The analysis provided by Leaman et al. provides useful information on the relationship between PSC halibut mortality and halibut abundance; however, it does not formalize the various factors influencing the probability of halibut PSC in the BSAI groundfish fisheries. The SSC requests an attempt to measure the probability of PSC, as a function of the expected spatial distribution of the halibut resource, the abundance and size distribution of the halibut and groundfish resources, the spatial overlap of the groundfish fisheries and halibut, realized catch and effort levels for the groundfish sectors, and fleet-specific DMR. The paper by Leaman et al. does indicate that halibut abundance may explain some of the variation in halibut PSC in the groundfish fishery, which suggests that accounting for future impacts on the exploitable halibut biomass in the analysis is important.
- If time permits, a much more ambitious modeling effort could be conducted. This effort could expand the AFSC's multi-species technical interaction modeling platform to include halibut population dynamics, and the dynamic factors influencing the probability of PSC noted immediately above. This modeling framework could allow the Council to evaluate the implications of PSC limits under plausible scenarios for past and future status of groundfish and halibut. The dynamic modeling approach would address the U26 issue noted earlier in the SSCs recommendation.

In many areas the draft pertains to the "unspecified" units associated with reported economic value and revenue estimates. It appears that all reported economic value, revenue, and receipts estimates are "gross" measure since there is no consideration of costs in the analysis. The document fails to correctly

attribute these economic estimates, inviting erroneous interpretations about potential net economic effects of the action alternatives.

When the RIR treats "regional economic impacts" (e.g., Sec.5.5.3.3), care must be exercised to clearly distinguish between estimated changes in economic activity (within a given location, region, etc.), and economic benefits and costs. The distinction is critical, but inadequately made in the draft.

Estimates of present value (PV) allow direct comparisons of monetized values accruing at differing points in time. PV estimates are not comprehensive or exhaustive in content. Specifically, non-market benefits and costs, for example, are not readily amenable to PV comparison. Further, explicit policy objectives, distributional preferences, and social welfare weightings, which often influence policy interpretation of impact assessments, are not captured in PV measures. These limitations on PV estimate interpretation must to be articulated in this presentation.

D-3 Norton Sound Red King Crab OFL/ABC

The SSC received a presentation by Diana Stram (NPFMC) on the stock assessment and Plan Team recommendations for Norton Sound red king crab. There was no public testimony.

The 2015 Norton Sound red king crab stock assessment model was updated to include 2014 summer commercial fishery, the 2014 summer trawl survey, and the 2013/2014 winter commercial and subsistence fishery data. The assessment model had several substantial changes. The first major change shifted the model year to run from Feb 1 – Jan 30 to accommodate the unique fishery schedule, and consequently the OFL determination was based on Feb 1 mature male biomass. Another set of changes involved the structure of the stock assessment: the weight assigned to tag-recovery data was reduced, the winter pot survey selectivity was changed, and the NMFS and ADF&G surveys were assumed to have identical selectivities. Finally, the buffer applied to the retained OFL to calculate ABC was increased to 20%, because of several known sources of uncertainty in the assessment and to be consistent with other Tier 4 stocks.

The SSC appreciated the improvement in the clarity of the assessment document, particularly the clear and organized set of materials provided in the Appendices. The SSC appreciates the contributions of the author and the CPT derived from the crab modeling workshops which resulted in improvements to the assessment. The SSC agreed with the CPT that the next assessment should document the methods used to standardize survey data and clarify the terminology used in Figure C4-1 regarding "effective" sample size and "implied" sample size.

The SSC emphasizes the importance of the fishery independent trawl survey for this stock. Due to poor weather conditions, only 47 stations were successfully sampled in 2014 and these stations showed marked variability in CPUE. Thus, while the 2014 survey results showed that the total male crab (> 73mm) abundance of 5.4816 million crab was up from previous years, this estimate was uncertain.

The SSC identified the fate of large males as the major uncertainty and hopes that this can be resolved through further research. The competing hypotheses of localized depletion, high natural mortality, or migration to a refuge from fishing have very different implications for OFL and ABC. Until this is

resolved, the SSC felt that moving this stock to Tier 3 status would be problematic. The SSC prefers that OFL and ABC be consistently presented in units of tons. **The SSC endorsed the author and CPT's choice of assessment model, the Tier 4a categorization of this stock, and the use of a 20% buffer for calculating ABC (*max*ABC = 328 tons). The SSC recommends a retained catch OFL of 330 tons and an ABC of 262 tons.**

D-4 Crab Modeling

Diana Stram (NPFMC) presented an overview of the Crab Modeling Workshop which was held in Seattle, in January. The purpose of the workshop was to provide an opportunity for the model developers (Steve Martell, Andre Punt, Athol Whitten and Jim Ianelli) to train the crab stock assessment modelers (developers/users) how to use the model and evaluate performance of the model. In all aspects the workshop was a success. The GMACs open source program is accessed using Github, an innovative online environment designed to track model modifications, store versions and document changes. Workshop participants were trained using a demonstration application developed for the Bristol Bay Red King Crab assessment. The workshop provided an excellent opportunity for stock assessment experts to review the code and recommend improvements. The end product of the model showed great promise with outputs generally tracking those of the current BBRKC assessment. In addition, the model developers have provided an R package for rapid review of the stock assessment results. The SSC congratulates the model developers for their vision and leadership in bringing the GMACs model to its current state of development.

The workshop report described an ambitious timeline for future model improvements. Buck Stockhausen will develop a simulated data set that can be used to evaluate the performance of the GMACs length based assessment modeling environment. Stock assessment analysts plan to develop GMACs implementations for BBRKC, PIRKC, Tanner crab and NSRKC. The BBRKC GMACs assessment and preliminary assessments of NSRKC and PIRKC developed using GMACs will be reviewed at the May CPT meeting and the SSC will review this assessment in June 2015. BBRKC implementation of the GMACs assessment model will be reviewed in parallel with the current BBRKC assessment during a CIE review in July 2015. The Tanner crab GMACs assessment will be reviewed at the January 2016 crab modeling workshop.

The SSC strongly endorses the continued work on the GMACs model and commends the hard work by model developers and assessment analysts.

D-5 Research Priorities

The SSC heard a report by Jim Armstrong and Dianna Stram (NPFMC) on the response of the Groundfish Plan Team (GPT) to the small group (comprised of SSC and Council members) proposed categories, descriptions, and examples for evaluating and prioritizing proposed research needs. There was no public comment.

The GPT continues to be concerned about the name of the lowest research priority category ("useful") and suggested an alternative set of names for the three categories of "Temporary Research Needs"' which are in essence high, medium and low. There was considerable discussion of possible alternate names for the "useful" category, with the term "beneficial" being suggested. The Plan Team also requested that the

SSC flesh out the description of the priority categories, and provided a series of shifts in the examples provided for each category.

During the discussion of the GPT recommendations, members of the SSC suggested that we incorporate the idea that some projects may be "strategic." That is, these research projects are unlikely to influence short-term decisions pertaining to the assessment program, but they may be very important in developing long-term ecosystem-based management of the fishery.

The SSC recommends that the issue of terminology and the addition of the category of Strategic Research be remanded to a sub-committee including members of the Council, SSC, and Plan Team to resolve the outstanding issues and report back by the April 2015 Council meeting. The SSC also recognizes that scoring of the backlog of 200+ proposals will be a very demanding task, that should best be done between meetings, with the results to be discussed at a regular SSC meeting.

D-6 EFH 5-year Review

An Essential Fish Habitat (EFH) 5-yr review presentation was given by John Olson (NMFS-AFSC), Chris Rooper (NMFS-AFSC), and Brad Harris (Alaska Pacific University). Public testimony was provided by John Warrenchuk (Oceana).

The SSC reviewed the document, "Defining EFH for Alaska Groundfish Species using Species Distribution Modeling", that demonstrated the use of distribution models and proposes to use the distribution modeling framework to refine descriptions of essential fish habitat on a regional level for three Alaska regions (eastern Bering Sea, Aleutian Islands and Gulf of Alaska). Where possible, authors propose utilizing available life history information to provide descriptions of essential fish habitat for the different life stages of each species or species group.

The authors described four levels of species descriptions included in the EFH mandate. In the previous EFH assessment, species were described at Level 1 where the 95% of each species distribution range was determined using cumulative survey data and observed catch per unit effort. The species distribution modeling framework, as proposed by the authors, will provide data driven predictions of the 95% species distribution range, moving the species descriptions to Level 2, and will promote the possibility of habitat-based modeling in stock assessments. The authors propose using habitat measurements widely available from remote sensing, long-term monitoring programs at the AFSC such as survey catches (bottom trawl, but also pelagic surveys and ichthyoplankton surveys) since 1991 to provide a summer snapshot of each species', and/or species' life stage, distribution. Authors will use the best available data (presence/absence, or abundance data) for each species or species life stage. Expected products from the study include:

- a NOAA Technical Memorandum that describes the individual species modeling results, with maps of the distribution of each species in each region for all life history stages where modeling can be accomplished,
- ArcGIS coverages for each species, region and life history stage that can be incorporated into SAFE documents and used for further analyses, and
- a manuscript describing the general methodology and results for publication in a peer-reviewed journal.

The SSC supports the use of species distribution modeling for predicting species distribution and we have the following suggestions and comments:

- Any limitations to the data used in the modeling should be explicitly described and confidence bounds on predictions included when possible. In cases where estimates of variability are not possible, including an author's recommendation as to what uses the model results can support (in terms of scale and data limitations) may be helpful since very few data are available to estimate most parameters.
- Due to changes in species' distributions over time, the SSC believes it is necessary to include survey data collected prior to 1991 when describing EFH, even if that means incorporating the data as presence/absence or describing them as of a different quality.
- The SSC believes that acoustic data should also be included when describing species distributions.
- The SSC believes it is important to include seasonal distributions when there are data available (including fishery data) to do so. Even though survey data are often not available in winter and fishery data may provide incomplete distributions, using fishery data may be useful to describe distributions in seasons other than summer would be extremely valuable, but may need to be acknowledged as minimum distributions.
- Because 95% of the species distribution is being used for defining EFH, the SSC encourages authors to check annual distributions to make sure that anomalous environmental conditions in a particular year do not result in a large amount of that year's data being excluded in the 5%.
- The survey data could be compared to the fishery data as an evaluation of the two data sets within the same season.
- For model predictions based on abundance data, contours or percentiles on the resulting maps would be useful for identifying species "hot spots".
- Model predictions that are based on presence/absence data from opportunistic surveys, or results from the literature may provide an incomplete description of a species distribution. In these cases, in may be necessary to use habitat association data (more than one variable may be necessary) to extrapolate the data to predict a more complete distribution. If this is done, delineating species distributions with and without extrapolation on the same map would be helpful.
- The SSC encourages authors to include information from the literature, in addition to data from AFSC surveys, to help describe EFH. The SSC acknowledges that literature information may be on a different scale that is not comparable in time and space to current data included in model, so encourages the authors to include literature information in whatever way they feel is possible.
- The SSC encourages authors to include organics in the sediment as a habitat characteristic in modeling. Because sediment organics relate to the presence of benthic animals that serve as prey for fish species, they may be a useful data source for EFH. Data on the distribution of sediment organics might be found in the literature and may require extrapolation to be used as a large scale predictor. Authors should consider how to incorporate sediment organics data, given that their distribution may change over time
- Defining EFH for pelagic species will continue to be challenging, but exploration of this issue may lead to better understanding.

- Producing a distribution map of all species combined would be a helpful addition to that of individual species. This could reveal which habitats and places are important for numerous species.
- Peer reviewed publications by Matt Baker and Dan Kotwicki have both examined overlapping distributions of species and ocean variables and might be helpful for reference.

Another document provided to the SSC, "Examination of the Fujioka fishing effects model: model formulation, implementation, and interpretation", provides an explanation of the Fujioka (2006) model and its implementation during the previous 2005 assessment of fishing impacts on essential fish habitat in Alaska. The model is a generic ocean-impacts analysis framework, compares the model and its implementation to the Swept Area Seabed Impact model (SASI) implemented by the New England Fishery Management Council. The document discusses how it can be used to evaluate alternative management options (e.g. area closures, gear modifications) to minimize adverse impacts of fishing on essential fish habitat. Finally, the document provides recommendations for updating the implementation of the Fujioka model to assess potential adverse impacts on essential fish habitat from commercial fishing gear.

The SSC supports the authors' recommendation to examine fishing effects on habitat under a schedule of time-varying fishing effort and urges the authors to carefully consider the appropriate time step (e.g. monthly, seasonally, annually, multi-year) with consideration of the data and habitat recovery rates. The SSC believes that moving to a time-discrete model would be a valuable advancement because, not only could fishing effort vary among time steps, but the productivity of the living substrate could also vary over time. In addition, using a time-discrete model would provide analysts with a covariate related to a fish life history that could allow them to evaluate the impact of habitat on fish species before populations decrease to a critical level, such as the minimum stock size threshold.

The SSC commends the authors on the work that has been done and attainment of funding grants to carry out the proposed work. Due to the extensive work required to complete these projects, SSC acknowledges that recommended analyses may not be completed within the timeframe originally predicted in the documents.

D-7 Economic SAFEs for groundfish and crab

The SSC received a presentation of the 2015 iteration of the Groundfish Economic SAFE, from Ben Fissel and Ron Felthoven (NMFS-AFSC), and the Crab Economic SAFE, from Brian Garber-Yonts (NMFS-AFSC). The reports are part of the annual Groundfish and Crab SAFE reports, and are provided as an appendix to the stock assessment. The Economic SAFEs provide information on status and trends in social and economic dimensions of the groundfish and crab fisheries, to support evaluation of management and regulatory decision making. The SSC requested an annual presentation by the authors/analysts of the Economic SAFE and appreciates this opportunity to review the drafts with the analysts.

The Groundfish Economic SAFE report continues the trend the SSC highlighted in our review of the 2014 document, reflecting continued improvement in accessibility, coverage, format, and presentation. Our previous recommendations pertaining to enhancements to the 2014 Groundfish Economic SAFE

have been given serious consideration in this draft, resulting in an even more useful reference tool for application in the Council process. The SSC encourages extension and elaboration of the modeling effort. The reported model output estimates are informative. That said, a more nuanced and inclusive explanation of factors that may influence interpretation of model projections should be included. Exogenous economic factors may have disproportionate effects on the projections and the surrounding confidence bounds. Explicit acknowledgement of these influences should be provided, if only qualitatively (e.g., trends in currency exchange rates – especially strength in the U.S. dollar; uneven economic recovery in important market regions – EU, Japan, China, Russia; energy source, supply, and price).

The Crab Economic SAFE report contains many good indicators of economic activity and performance in the crab fisheries, and seems particularly useful for monitoring the status and evolution of these fisheries over recent years. The report continues to improve over time as relevant metrics for monitoring the status of the crab fisheries are added. The SSC recommends that the analysts consider the possibility of providing measures of net revenues in the rationalized crab fisheries by using the cost data collected by the Economic Data Reports. Since many vessels participate in multiple crab fisheries, the SSC also recommends the analysts explore ways to report measures at the individual vessel level, to capture trends and variation at the business-entity level, independent of each crab fishery. The SSC appreciates the analysts' response to our request to provide an "Economic Report Card" that summarizes important trends in the crab fisheries. The executive summary provides an overview of new information and important trends in the crab fisheries, supported by a few figures and tables. While this summary is not a "report card" per se, it nicely summarizes the most frequently referenced economic statistics pertaining to the crab fisheries, highlights measures that have been the emphasis of recent policy actions, and points users to more detailed information available in the full report.

Fisheries rationalization has induced economic and operational efficiencies, reflected, in part, through tradable (i.e., marketable) units of harvestable quota amounts. The Economic SAFEs' documentation and analysis of quota sales and leasing patterns provides key empirical evidence of how these management programs are achieving their objectives, over time. The SSC regards this analysis as an important element with the annual SAFE report and recommends continued efforts to improve collection and analysis of these "Quota Share market performance" data. The SSC encourages the analysts to report quota leases and shares in a context that reflects the proportion of quota tha is traded or leased, rather than quota units.

The SSC noted in our last review of the Economic SAFEs that the inclusion of retrospective information on where, and to whom, attributable fisheries benefits accrue should be an integral part of an economic performance profile. We are gratified to see this addition reflected in the 2015 drafts, and encourage continued refinement of presentation and interpretation of these distributional data. The SSC notes the importance of information pertaining to socio-economic dimensions of the fisheries, such as employment statistics, labor compensation, source of labor, and shares accruing to labor inputs within the several sectors of the industry. The present drafts make a reasonable effort to address the SSC's interest in providing these statistics, building upon last-year's presentations. The SSC is also encouraged to learn that AFSC is constructing "Community Snapshots" which will provide additional fishery-specific data and information on fishing communities to complement the AFSC's Community Profiles.

The SSC had a lengthy discussion regarding the purpose and objectives of the Economic SAFE reports, particularly about the depth of explanation SAFEs should offer for notable trends that emerge from the reported fishery performance metrics: should analysts conduct quantitative analyses to explain them, offer short narrative explanations summarizing extant research, or should the Economic SAFEs simply report data that support the preparation and use of economic information in more targeted analyses of fishery management measure?. Human dimensions data are absolutely critical to meeting the obligations imposed by MSA National Standard 8. Confronted with this need, and the perceived chronic deficiency of human dimensions in the Economic SAFE treatment, the SSC suggests exploring the feasibility of developing a Human-Dimensions SAFE, with specific focus on the social, cultural, and community facets of fishery management impacts.

Finally, there are numerous minor editorial issues that were identified in our review. The SSC will provide these editorial comments to the Economic SAFE analysts following the meeting.