North Pacific Fishery Management Council

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FINAL REPORT
of the
SCIENTIFIC AND STATISTICAL COMMITTEE
to the
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
March 28th – March 30th, 2011

The SSC met from March 28th through March 30th, 2011 at the Hilton Hotel, Anchorage Alaska.

Members present were:

Pat Livingston, Chair *NOAA Fisheries—AFSC*	Farron Wallace, Vice Chair *Wash. Dept. of Fish and Wildlife*	Robert Clark *Alaska Department of Fish and Game*
Susan Hilber *Oregon Dept. of Fish and Wildlife*	Anne Hollowed *NOAA Fisheries—AFSC*	George Hunt *University of Washington*
Gordon Kruse *University of Alaska Fairbanks*	Kathy Kuletz *US Fish and Wildlife Service*	Franz Mueter *University of Alaska Fairbanks*
Jim Murphy *University of Alaska Anchorage*	Lew Queirolo *NOAA Fisheries—Alaska Region*	Terry Quinn *University of Alaska Fairbanks*
Kate Reedy-Maschner *University of Idaho Pocatello*	Ray Webster *International Halibut Commisson*	Doug Woodby *Alaska Department of Fish and Game*

Members absent were:

Jennifer Burns *University of Alaska Anchorage*	Seth Macinko *University of Rhode Island*

B-1 Plan Team Nomination

The SSC reviewed the nomination and resume for Heather Fitch to serve on the Council's Crab Plan Team, filling the vacancy left by Forrest Bowers. The SSC finds that Ms. Fitch has management experience with BSAI crab fisheries that will be a valuable asset to the CPT and recommends that the Council approve her appointment. The SSC also discussed the scarcity of CPT members with quantitative stock assessment experience and recommends that the Council consider adding an additional member to the Plan Team to fill this void.

C-3 (b) Initial review of GOA Chinook salmon PSC

The SSC received presentations from Diana Evans (NPFMC), Darrell Brannan (Consultant), and Mark Fina (NPFMC). Public testimony was received from Don Rivard (USFWS Office of Subsistence Management), Bob Krueger (Alaska Whitefish Trawlers Association), Jon Warrenchuk (Oceana), and Julie Bonney (Alaska Groundfish Data Bank).

The RIR/IRFA presents a comprehensive treatment of the historical context of the proposed action. It methodically steps through each of the elements contained in the suite of alternatives and options, identifying data needs, and contrasting those needs with available sources. It is apparent from the outset that analysis of this action will confront the accustomed voids and shortcomings in our understanding of

impacts and outcomes, directly attributable to inadequate economic, socioeconomic, and operational data (e.g., operational costs – variable and fixed; relative dependency; affiliation and ownership patterns; net performance indicators). These deficiencies result in a diminished ability to narrow the confidence bounds on analytical projections made for many of the key outcomes of the action alternatives. This is of particular significance for the GOA pollock fisheries, because many of the potentially impacted operations are of substantially smaller scale and are operating nearer economic margins than their counterparts in the Bering Sea AFA fisheries. These deficiencies also impair the ability of analysts to assess impacts on protected resources and endangered species.

The document does an effective job of identifying the expected sources, characteristics, and recipients of impacts attributable to the alternatives. Much of the subject impact analysis is qualitative, due to a lack of usable empirical data, but the report does a reasonable job of quantifying those aspects for which such estimates can be usefully derived. **A large obstacle to fully describing and measuring the ramifications of these Chinook PSC avoidance measures is the incomplete scientific knowledge as to "source-of-origin" of the Chinook salmon PSC removals in the GOA pollock fisheries. Because the source-of-origin data are critical for any comprehensive economic analysis, the SSC recommends that a high priority be placed on efforts to identify and apportion Chinook PSC in the GOA to their natal source.**

Substantially more work remains as the draft evolves through the next iteration. Both the initial RIR and IRFA contain some unnecessary elements. The SSC recommends adherence to technical requirements and use of consistent terminology. Care should be exercised when expressing the relationships between PSC allowance numbers and NMFS management and enforcement protocols, as related to allowance limits. Because PSC is required by law to be avoided, it should be assumed for analytical purposes that an overage will be an extraordinary event. Otherwise the PSC removal, in excess of the maximum limit, becomes a *de facto* allocation of an additional amount of Chinook removal, explicitly made available to GOA pollock operations every third year, instead of a safety-valve for *extraordinary* events. Many of the same uncertainties about the relationship between pollock catch and Chinook PSC frequencies that were encountered in the BSAI Amendment 91 analyses are of equal concern for the GOA action. The BSAI Amendment 91 experience should inform the analysts in this action.

The SSC identified a substantial number of questions and concerns about Chinook salmon PSC cooperative provisions contain in this action. Before these could be explored, the SSC was advised by the analyst that NOAA General Counsel has expressed significant legal concerns about approvability of an amendment containing such cooperative provisions. Therefore, the SSC did not directly address this topic in our review.

The SSC believes the report should be explicit that the retrospective analysis of the impacts of proposed PSC limits assumes no behavioral changes in operators' response to the limits. If the proposed limits are effective in encouraging pollock harvesters to increase avoidance efforts, then the revenue impacts in the report are likely overstated and the dates on which the fishery would shut down are earlier than what may have occurred. Further, the years over which the retrospective analysis was conducted coincides with a low period of pollock biomass in the GOA. It is possible that when the pollock biomass increases greater total pollock catch amounts may be placed at-risk.

The report provides no rationale for the set of proposed PSC limits. Similarly, with respect to the 125% buffer provision, there is no rationale for its inclusion or for the choice of buffer level (25%) or the choice of every-third-year. The document should include additional information to indicate the basis for these choices.

Because the smaller vessels (<60') are typically owned by Western GOA residents, an analysis of the economic and social costs of requiring observers would be useful. If the modified observer program is approved, it may lessen incentives to fish with <60' vessels. However, there are other factors that also play a role in determining vessel size. The analyses could be improved by considering the likely magnitude of the impact that the 60' threshold provides. For those who own a single vessel, other factors, such as vessel length limits in other fisheries imposed by the State of Alaska salmon regulations, may be a more important determinant of vessel length.

The SSC would like to see an inclusion of information on the processor landing taxes levied by boroughs and communities in Section 3.6.6. These data could also contribute to an understanding of potential economic impacts on coastal communities, a requirement of National Standard 8. NS8 further requires a description of community dependency (p. 195). RIR Section 3.6.5 only addresses fishery engagement; this needs to be revised to address dependency in the communities. There is insufficient information in the RIR upon which to make statements such as "economic impacts to participating communities would not likely be noticeable at the community level" (p. 195) . For all practical purposes, community economic data are absent from this analysis. If time and resources are available, development of a formal Social Impact Assessment (SIA) should be considered.

The SSC's review has identified a number of lesser concerns that will require treatment by the analysts (e.g., revenues should consistently be identified as 'gross' measures, correction of erroneous catch values must be made, several circular assertions need disentangling). These will be communicated directly to the analysts.

The RIR/IRFA suggests that, whether or not the GOA pollock operators perceive value from Chinook PSC avoidance, beyond the direct effect it may have on attainment of the pollock TAC, society has a substantial interest in 'optimizing' the implicit trade-off between total pollock catches and total Chinook PSC removals. It is, therefore, important that the externalities imposed by GOA pollock harvesters through Chinook PSC mortality, be appropriately accounted for, and those incurring these externalized costs identified.

The SSC finds that the EA adequately covered protected species, their prey, and their habitat requirements with respect to the proposed amendment.

In addition to those issues identified above, the SSC has identified several issues that we would like to see clarified or expanded on in the EA/RIR/IRFA report to be released for public review:

Additional discussion is needed regarding the precision of the estimates of Chinook salmon PSC for both observed and unobserved catches. This discussion should include the potential impacts on the ability to manage the fishery to stay within the proposed cap limits, taking into account the lag between occurrence of the Chinook interception and the time that the PSC is reported.

In several places, the report states that one of the advantages of mandatory cooperatives would be to identify hotspots of Chinook salmon encounters and limit fishing in those areas. However, the report also states (p.12) that the Council has determined that area closures based on monitoring of hotspots was not an effective tool to reduce salmon PSC. The analysis should clarify whether monitoring Chinook salmon PSC hotspots might be useful in the GOA.

The caveats on use of the coded wire tag (CWT) data on page 110 should also be reflected in the last sentence of the first paragraph on page 111 to clarify the percentages attributable to Southeast Alaska and Cook Inlet. Also, Figures 11-17 should clearly indicate that the points do not reflect abundance.

It would be helpful to have a graphic that permits a better understanding of how well the observed PSC catch locations represent the locations of unobserved Chinook removals.

The correct annual average sport fish catch of Chinook salmon (1989-2006) is the figure on page 33 (176,000 fish), and not as given on page 30.

Figure 4 (p. 47) would be more informative if the seasons (A, B, C, and D) are shown on the x axis.
The surveys from which Chinook salmon PSC data are derived (Table 65 p. 128) should be listed. Provide a brief discussion to explain why the survey interceptions of ESA-listed CWT salmon are fairly large (especially from the upper Willamette River) relative to the commercial trawl PSC, which would be expected to be several orders of magnitude larger.

The definition of Sustainable Escapement Goal (SEG) on page 119 should be updated by the definition available at the regulation citation given on that page.

For the longer term amendment analysis (not the present document) the SSC has the following comments:

The SSC recommends that NMFS develop sampling goals for genetic data collection for the purpose of providing stock composition of the prohibited species removals on a geographic basis that would be meaningful from a PSC avoidance management standpoint.

The SSC recommends that observer sampling include age and length data, which in combination with the genetic stock composition data, can be used to develop adult equivalency estimates for stock specific removals, similar to the method being developed for the BSAI Chinook PSC avoidance amendment.
Once estimates of stock composition are available, the SSC suggests that it would then be possible to reconsider the hard cap alternatives in terms of impacts on Alaska salmon stocks, whereas the current caps are substantially motivated by the incidental take statement for threshold catches of ESA listed Chinook stocks.

The SSC recommends release of the draft analysis for public review, after the identified substantive edits have been incorporated, to the extent practicable.

C-4(b) BSAI Crab – Review alternatives for Crab Economic Data Collection

The SSC received an overview of the discussion paper from Mark Fina (NPFMC). Public testimony was given by Edward Poulsen (Alaska Bering Sea Crabber Association) and Shawn Dochtermann (Crab Crewmen's Association).

The SSC has spoken to this issue on numerous occasions over the past five years. In October of 2007, the SSC identified the critical need for a systematic collection of coherent, comprehensive social and economic data from Crab Rationalization Program fisheries. The SSC continues to emphasize this data need. Since that time, as development of the BSAI crab comprehensive economic data collection program (EDR) progressed, the SSC has also commented on data quality concerns. The completion of a formal audit of the EDR submissions, reported to the SSC in February 2008, was not encouraging in this regard, and the SSC made recommendations for improvement. In October 2010, the SSC reiterated the importance of high quality economic and socioeconomic data.

The Council has expressed a purpose and need statement that considers balancing of data collection costs with the contribution those data provide to the fisheries management process. The discussion paper provides a good range of alternatives to consider for revising the Crab EDR in the context of this purpose and need statement. The paper is responsive to the Council's expressed purpose and need, which

indicates a desire to identify alternatives that are more streamlined in the selection of data elements in a revised EDR. The SSC is optimistic that a more focused approach with incremental additions is a viable one.

The paper examines problems associated with appropriately apportioning economic data (e.g., variable costs, payments to labor, deductions and charges), which have been identified as a primary source of the reporting burden on industry and weakness in the resulting datasets. The SSC also notes that the categorization of data quality and cost of collection may depend upon the desired level of analysis. For example, fuel costs at the "all fisheries" level may be reasonably accurate with a low reporting burden, but allocating these costs to individual fisheries may be more challenging and less reliable.

The SSC emphasizes that although some data elements may be difficult to collect or that these elements have reliability concerns, they are still essential to completing the legally mandated benefit/cost, net benefit to the Nation, and distributional impact analyses, in support of proposed Council actions. The SSC recommends that a framework be developed to apportion data elements in a reasonable and credible manner in order to be useful in informing Council decisions.

No data elements address the economics of coastal communities, which is a problem expressly identified in the Council's rationale. Although it was indicated that these data are being gathered elsewhere, it was also mentioned that these data are difficult and time consuming to collect. The SSC reiterates that level of difficulty should not be a barrier to collecting the data. Ongoing efforts to collect and integrate coastal community data into other economic analyses are essential to addressing the Council's identified problems and evaluating the success of the Crab Rationalization Program.

The paper contributes several useful observations that pertain to opportunities to reduce the reporting burden, without significant loss of data, through cross-referencing other sources (e.g., COAR) or by more precisely identifying information with and without actual relevance to management of the crab fisheries (e.g., self-identified product 'grades') – see p.10. Identification of other equivalent opportunities and insights may only emerge with the cooperation and advice of industry. Industry assistance continues to be critical to accomplishing this task.

The SSC also encourages exploration of alternative methods for acquiring economic and operational characteristics and parameters of sector elements. While not a perfect substitute for primary data collection and analysis, these alternative approaches have the potential to contribute useful insights into, for example, effects of an action alternative on the key components of the industry, based upon agreed characteristic attributes/elements/operational strategies.

C-4(d) Alternatives for the Tanner Crab Rebuilding Plan

Diana Stram (NPFMC) gave a presentation on the status of the Tanner crab rebuilding plan analysis. Public testimony was provided by Edward Poulsen (Alaska Bering Sea Crabbers). The report included some tables and figures on historical status determinations, catch, and bycatch of Tanner crabs from crab, groundfish and scallop fisheries in the EBS.

At the present time, the stock assessment model is still under development and not currently acceptable for use in rebuilding analyses. Also, alternatives have not been articulated. Text describing the alternatives for snow crab rebuilding were included into the document for reference.

The SSC notes that the current discussion paper is preliminary and it was difficult to provide detailed comments on the alternatives for Tanner crab rebuilding. One major concern is that the Tanner crab model is not ready for use in a rebuilding analysis. Given that the Council may need to take final action in

February 2012 in order to have new regulations in place by the October 2012 deadline, it is possible that an approved model may not be available to conduct the rebuilding analysis. The model continues to undergo further development. A revised version will be reviewed by the Crab Plan Team in May and the SSC in June. So, the availability of an approved model for rebuilding analysis should become clearer at the June Council meeting.

The SSC offers the following additional comments:

If an approved Tanner crab model becomes available in time, then the framework used for snow crab rebuilding could serve as a point of departure for the Tanner crab analysis. The SSC had some discussion that the snow crab approach may be more complicated than is needed for Tanner crab.

Unlike snow crabs, data presented in the discussion paper indicate that rebuilding alternatives must consider groundfish and crab fisheries, based on the magnitude of crab bycatch relative to target catch. Tanner crab bycatch in the scallop fishery is an order of magnitude lower than crab catches in the crab and groundfish fisheries.

A major issue for consideration is the time period used for estimation of B_{msy}. Currently, B_{msy} is based on the average mature male biomass (MMB) for 1969-1980. The document justifies this choice with the following statement: *"The time period is thought to represent the reproductive potential of the stock because it encompasses periods of both high and low stock status equivalently."* On the surface, this justification does not appear correct – the value of MMB for 1980 is a moderately high value; MMB continued to decline through 1985/1986. More importantly, these years represent pre-regime shift conditions. The buildup of groundfish from strong recruitments in the late 1970s resulted in a large biomass of predators (e.g., cod, flathead sole) and competitors (yellowfish sole, rock sole) that in 1980 undoubtedly influenced the ability of the system to support Tanner crabs. Finally, indications are that the Tanner crab model performs much better when early survey data (1969-1973) are dropped, but estimates of mature male biomass before 1974 become highly uncertain. That leaves just the average of 1974-1980 mature male biomass estimates to determine B_{msy}, which is probably too short of a time period. The SSC has commented on this issue previously in the SSC reports from the June and October 2010 meetings. The assessment authors and Crab Plan Team should undertake a thoughtful discussion on the use of time periods to estimate B_{msy} in general, with a priority for Tanner crab.

The time period to be used for determination of rebuilt status will need to be revisited in the future. Currently, stock status must be above B_{msy} for two years before the stock can be declared as rebuilt. One criterion that may factor into the decision is the availability of a stock assessment model to reduce uncertainty about stock status.

There is a need for greater clarity about the data (units) being presented in tables in the document. Headings for tables of bycatch statistics should be clarified to indicate whether bycatch represents the weight of Tanner crab bycatch with or without application of discard mortality. Tables should report bycatch in the same units as catch to allow for comparisons. When bycatch mortality is estimated, it would be helpful to compare the various sources of mortality with respect to OFL levels. Also, tables that present data on Tanner crab bycatch should clearly indicate whether they represent males only or both sexes combined.

The document should describe observer sampling procedures for Tanner crabs with respect to size and sex. Methods used to estimate male-only bycatch estimates should be described in the text.

During NMFS surveys, hybrid crabs (resulting from snow-Tanner crab mating) are estimated separately, whereas ADF&G counts hybrids with Tanner-like characteristics as Tanner crab. To the extent

practicable, catches of hybrid crabs should be deducted from Tanner crab catch statistics. If this is not possible, the document should describe the relative contribution of hybrids to the total reported catches.

C-4(e) Crab modeling workshop

Diana Stram (NPFMC) introduced the Bering Sea crab modeling workshop held on February 16-18, 2011 at the Alaska Fisheries Science Center in Seattle. The purpose of the workshop was to bring together researchers on crab assessment, modeling, and biology to make recommendations for improvements to stock assessment models of snow crab, Tanner crab, and Pribilof red and blue king crab. A response to the CIE review of Bristol Bay red king crab was also given. Steve Martell (Univ. British Columbia) chaired the workshop and presented to the SSC a summary report of the workshop discussions and recommendations. For each species group, separate sections of the report gave background and objectives, technical issues, short-term recommendations, and long-term recommendations. Public testimony was provided by Edward Poulsen (Alaska Bering Sea Crabbers) and Ed Richardson (Pollock Conservation Cooperative).

Eastern Bering Sea Tanner Crab

A considerable portion of the crab modeling workshop was devoted to a review of the stock assessment model for the Tanner crab stock in the eastern Bering Sea. The objective of the modeling is to improve the stock assessment for Tanner crab such that this stock can be moved from Tier 4 to Tier 3 for purposes of setting OFLs and ACLs. Progress in the development of a stock assessment model for Tanner crab since the modeling workshop was presented by Lou Rugulo and Jack Turnock (NMFS-AFSC). According to the current schedule, the SSC would review the full model in June following review by the Crab Plan Team in May 2011.

The SSC commends the stock assessment scientists on their recent progress on Tanner crab. Considerable work has been completed since the February workshop. Pursuant to workshop recommendations, recent changes include: (1) removal of 1969-1973 survey data from the analysis owing to concerns about spatial coverage and other technical issues, (2) changes in the coding of the growth transition matrix, including the number of size bins, (3) changes in how the likelihood is estimated, (4) changes in how recruitment is handled in the model, (5) creation of two selectivity periods based on gear change (1974-1981, estimated with a 3-parameter logistic, and 1982 onwards, informed by catchability based on the underbag study of Somerton and Otto), and including estimates of growth obtained by fitting models to Tanner crab growth data from Kodiak. **Collectively, these changes have resulted in noted improvements in model fits, however much work remains to be done and the current model is not yet ready for use in stock assessment or stock rebuilding analysis.**

The SSC supports the short- and long-term recommendations from the modeling workshop with just a few changes. First, the recommendation to develop a spatial model should be a long-term recommendation. Likewise, changes in management (e.g., rationalization) or fleet behavior that may help explain residuals should be considered, but any resulting structural model changes may need to be deferred to later. Finally, if time is available, the SSC supports a modified non-consensus recommendation to conduct a prospective analysis by successively dropping starting years up to 1981 so that the final model comparison would consider survey data from 1982 onwards; 1982 was chosen as the current survey gear has been used since that time. The goal of this analysis would be to assess the sensitivity of model fits to inclusion of the early data. Regardless of whether this analysis can be conducted by May, this prospective analysis will become important for subsequent considerations of biological reference points and their sensitivity to the early data.

In addition to recommendations resulting from the workshop, the SSC offers the following additional recommendations:

To better judge the integrity of data from the early years of the fishery, the SSC encourages a more thorough examination of information about these early years. Many old reports talk about "Tanner crab" but actually address *Chionoecetes* spp. It is important to carefully scrutinize these early reports to assure that the data associated with Tanner crab *(Chionoecetes bairdi)* are correctly assigned. In addition to species identification, there are some concerns about the accuracy of catch records attributed to Tanner crab landings, especially from the foreign crab fisheries in the EBS during the early years of the fishery.

As raised by the SSC in the October 2010 report, the assessment should consider the degree to which hybrid crabs (resulting from Tanner-snow crab mating) may affect the assessment. The SSC understands that hybrids are counted as "hybrids" during NMFS trawl surveys, but that ADF&G counts hybrids with certain morphological features (Tanner crab-like features) towards the annual catch quota for Tanner crabs. To the extent possible, only true Tanner crabs should count toward the Tanner crab quota.

Analyses of size at maturity were presented that indicate some cycles, but no trends, in size at maturity of Tanner crabs in the eastern Bering Sea. Several previous analyses (i.e., Somerton 1981, Otto and Pengilly 2001, Zheng 2008) found spatial and temporal patterns in size at maturity. As a long-term priority, the SSC recommends further analysis of maturity to determine whether difference in current versus previous findings are attributable to spatial aggregation in the current analysis or differences in methodology among studies.

As noted by the assessment authors, current model fits have some very undesirable residual patterns indicating lack of correct model specification. The SSC recommends detailed examination of residuals for insights about their causes. For instance, the SSC recommends comparing cycles in size at maturity for males and females with each other and with cyclical residuals in model fits to survey area-swept estimates. Model and survey estimates of abundance for both males and females cycle among over- and under-estimation. Also, examination of residuals in size frequencies may provide better insights about how the model is handling data conflicts among size, abundance, and other data.

The SSC appreciates current efforts to address questions raised about natural mortality in the model. Primary concerns addressed whether immature crabs experience higher natural mortality (e.g., see Somerton 1981) and whether females have higher mortality rates than males. Assumptions about Tanner crab mortality are largely derived from snow crab. Recent analyses by Ernst, Armstrong, Orensanz and Burgos indicate a maximum life span of 11.5-14.5 years for female snow crab in the EBS. Males likely live a few years longer; the maximum age of any male sampled from Bonne Bay, Newfoundland, by Comeau et al. (1998) was 19 years. A workshop recommendation was to estimate *M* internally in the model. Also, assessment authors indicated a desire to explore incorporation of crab predation estimates into natural mortality estimates to recognize large changes in the crab predator field since the late 1970s. The SSC also looks forward to this longer term analysis.

The SSC understands that the Alaska Board of Fisheries approved changes in size limits for Tanner crabs east and west of 166 °W. The size limit was dropped to 4.8" (122 mm CW) east of 166 W and 4.4" west of 166 W. However, the industry will retain crabs above 5.5" east of 166 and 5" west of 166. In the absence of data on the implications of these changes in the selectivity curve, Assessment authors proposed to shift the current fishery selectivity curve to smaller sizes to approximate the implications of this management change on catches after consultation with ADF&G on their intended implementation of the Board's decision. The SSC supports this practical approach until new data are collected after implementation of the new size limits, allowing new selectivity curves to be estimated.

Finally, the SSC recommends examining the cooperative survey data collected in 2010 to determine whether it provides useful information on selectivity for comparison with the previous underbag experiment.

Pribilof Islands Red and Blue King Crab (and Implications for St. Matthew Island Blue King Crab):
A preliminary 4-stage assessment models for Pribilof Island red and blue king crab were reviewed during the workshop. The workshop report highlighted issues with these models that relate to model initialization using survey data, code documentation and discontinuous objective function.

Workshop participants recommended that the existing model should not be used until it is fully documented and the code itself is peer reviewed by an independent expert who is familiar with ADMB and non-linear parameter estimation. The SSC concurs with this conclusion.

Workshop participants made four short-term recommendations relating to treatment of post-recruits and recruits, simplification of models growth increment matrix, model documentation and consistency between stocks. The SSC agrees with these recommendations and encourages the stock assessment authors to move forward to address these issues. However, the SSC expresses some concern about the workshop recommendation to collapse post-recruits and recruits into one category so that the CSA model would become 3-stage instead of 4-stage. Estimates of recruits and post-recruits result from direct measurements of size and shell condition and include the highest quality data available from the survey and the only data available from commercial fishery. On the other hand, the two pre-recruit stages must be estimated based on size measurements, as well as estimates of molting probabilities and growth increments, both of which are estimated with error. The SSC would like to see results from both 3- and 4-stage CSA models prior to any change in assessment methodology.

The highest priority should be placed on the workshop recommendations that encourage authors to carefully examine the assessment model equations, ensure constants are correct and documented and that the objective function is appropriate. **Since directed fisheries for Pribilof red and blue king crab are closed, the most urgent issue is to document the model parameterization for St. Matthew blue king crab. This will ensure that the model provides an appropriate basis for OFL and ACL/ABC specifications. As a precaution against the possibility that the CPT does not approve use of the CSA model for St. Matthews blue king crab, the SSC requests that the authors also estimate biological reference points based on survey biomass or some other index of abundance.**

Bristol Bay Red King Crab
This was a brief report at the workshop on the stock assessment authors' response to a CIE review of the stock assessment model for Bristol Bay red king crabs. The authors have been making progress to address the CIE comments.

Snow Crab
The main issue for the current snow crab assessment concerns incorporation of information into the model from a cooperative field study of gear selectivity between BSFRF and AFSC in 2009 and 2010 (see SSC report, February 2011). Workshop participants examined the study results in depth and provided suggestions on alternative analyses, including averaging 2009 and 2010 results and fitting a mixed effects linear model. Snow crab assessment scientist Jack Turnock (AFSC) presented preliminary results of an analysis which incorporated the experimental results directly into the stock assessment model. Workshop participants were not satisfied with the preliminary results because, counterintuitively, the 2010 selectivity curve increased dramatically at larger crab sizes, which were poorly represented in the data (also noted by the SSC in their report). Suggestions were made for alternate selectivity curves and inclusion of an availability parameter.

Since the workshop, the stock assessment analyst has continued to develop the model and presented new results at this SSC meeting. He examined 3- and 6-parameter logistic curves and a 23-parameter smooth-penalty function, and included an additional parameter for availability. The resulting selectivity curves were promising, except there was still a hump in male selectivity at small crab sizes using the smoothing approach. Because natural mortality and selectivity are often confounded, assessment author explored the use of higher natural mortality on immature crabs. The likelihood was maximized for values of immature male natural mortality between 0.35 and 0.40, compared to the standard male mortality of 0.23. This also smoothed out the hump and made the curve look more like a logistic curve. The SSC is pleased with the progress that has been made but suggests that immature mortality should be estimated internally in the model. The SSC also notes that the assessment author has followed the spirit of SSC recommendations from February. **For the May-June crab meetings, the SSC is supportive of the approach of incorporating the experimental data directly into the assessment model, instead of outside the model as the SSC suggested in February.**

The SSC notes that there are other suggestions contained in our June 2010 and October 2010 reports that still might be useful. These suggestions include estimation of natural mortality for females and mature males, bivariate distributions of catchability and natural mortality, and sensitivity studies of population parameters and reference points to various model components.

In the long term, the SSC recommends that crab researchers pursue further analysis of the experimental data. This leads to two recommendations that are concisely stated in the workshop report as short-term recommendation 2 (developing a logical scheme to combine the 2009 and 2010 data) and long-term recommendation 1 (developing a negative binomial mixed effects model). This work could help validate the selectivity estimates from the stock assessment model and provide further understanding of the factors affecting selectivity.

C-5(b) Fishing effects on crab essential fish habitat

The SSC received a presentation by Diana Evans (NPFMC) and Bob Foy (NMFS-AFSC) on a discussion paper entitled "The evaluation of adverse impacts from fishing on crab essential fish habitat." Public testimony was provided by Jon Warrenchuk (Oceana). The SSC appreciates the concise summary of available information for assessing habitat effects on red king crab (RKC) in Bristol Bay. The detailed information provided in the oral presentation should be incorporated into any future updates of the discussion paper.

The main concerns identified in the presentation relate to the potential importance of larval release points as inferred from the distribution of spawning and breeding females, the distribution of these females in heavily trawled nearshore areas on the north side of the Alaska Peninsula, and the distribution of early juvenile stages (post-settlement). Larval release points are important because they affect drift trajectories and settlement into suitable nursery areas. The distribution of spawning and breeding females occurs in nearshore areas that are poorly sampled by the annual bottom trawl survey, in particular to the SW and W of Amak Island. Some of these areas have experienced increased trawling intensity in recent years, in spite of an overall decrease in trawling intensity in the SE Bering Sea. Finally, the distribution of juvenile red king crab is of concern because it extends well beyond the current no-trawl areas that were put in place to protect this life stage (Bristol Bay Trawl Closure Area and RKC Savings Area).

Population-level effects related to these concerns are poorly understood, but it has been hypothesized that trawling in SW Bristol Bay may affect recruitment success, and hence the productivity of RKC in Bristol Bay (including reference points). Because of these concerns, and the associated uncertainties, the SSC agrees with the author's recommendation to modify the conclusions about effects of fishing on EFH in the 2005 EFH EIS.

To address concerns over population-level effects of fishing on recruitment, the SSC recommends that the Crab Plan Team review the basis for the current baseline used to determine productivity of RKC (1995-2010). In particular, if fishing has contributed to the decline in RKC recruitment after the 1970s, the recent baseline period may not be representative of the productivity of the stock.

To resolve some of the uncertainties about effects of fishing on RKC, the SSC recommends that research on the effects of habitat modifications on spawning and breeding females, particularly in nearshore areas, and on the implications for larval drift patterns and settlement receive a high priority. Such research could include:

Pop-up tagging studies to identify larval release locations as described in the discussion paper.

Retrospective analyses of existing data, in particular any information on nearshore abundance and distribution of females (e.g., OCSEAP, AKMAP), and larval stages (PROBES, Inner Front Program, see Ken Coyle for data).

A summary of available information on the importance of structural habitat to juvenile growth and predation (e.g., Ph.D. dissertation by Jodi Pirtle, UAF) to improve understanding of the links between productivity and habitat type and availability.

Development of a larval drift model (e.g., IBM) for red king crab.

Exploring temperature as a covariate may help to sort out differences in the overlap between trawl activity and RKC spatial distribution between warm and cold years.

In addition to the effects of fishing, an updated discussion paper may include a description of cumulative effects on RKC habitat from potential oil & gas development in Bristol Bay, potential mining in the Bristol Bay watershed, and climate change and ocean acidification.

C-6 GOA Pacific cod jig fishery management - Initial review/Final Action to revise GOA Pacific cod jig fishery management

Jeannie Heltzel (NPFMC) presented details from the Regulatory Impact Review (RIR) and Environmental Assessment (EA) for alternatives dealing with Pacific cod jig fisheries relative to Guideline Harvest Limit (GHL) state management in the GOA. There was no public testimony.

The document was clear and concise about the impacts of the proposed alternative. There are several substantive considerations and edits that should be addressed. In particular, many of the figures in Tables 2-3 through 2-5 appear to be inconsistent. Also, several table numbers do not agree with those reported in the text. More significantly, the document lacks a discussion of the extent to which this action would affect pot operators who stand to lose rollover GHL if the jig sector takes more of their allotment of Pacific cod in the GOA. The document acknowledges that impacts may exist, but there is no information to determine the likely economic and operational implications of these impacts.

The EA finds reduced risks and no significant adverse impacts on fish and other species based on speculation that the action will reduce fishing in inshore waters, but there is little justification for this conclusion. Given that the stated goal of the proposed action is to increase Pacific cod harvest opportunities for the jig sector, it is not a certainty that all of the increase will be in offshore waters.

This is one of those occasional actions where the Status Quo differs from the No Action Alternative. Under MSA and other applicable law, the No Action Alternative, and not the 'status quo', is the appropriate baseline (i.e., Alternative 1), against which action alternatives should be compared. The draft should be revised to make this comparison.

Because the Council proposes to take initial and final action on this measure at this meeting, there is the technical problem that the IRFA cannot be completed until after the Council formally adopts a preferred alternative. The result is a somewhat confused and inadequate RFAA. However, with relatively modest revisions and supplemental impact descriptions associated with roll-overs, this draft could be made fully compliant with E.O12866 and the Regulatory Flexibility Act. Specific edits were provided by the SSC to the analyst.

The SSC concludes that the document is acceptable for public review/final action at this meeting.

D-1 Scallop Fishery Management – Review Scallop SAFE

Diana Stram (NPFMC) and Scott Miller (NMFS-AKR) presented the Scallop Plan Team (SPT) report on the Scallop SAFE. No public testimony was provided.

The SSC previously reviewed the SAFE document in April 2010 and alternatives for implementing ACLs in October 2010. Several of the SSCs comments were addressed in the 2011 SAFE document. It was indicated that the following SSC comments will be addressed in 2012:

Review of stock boundaries using the format contained in the stock structure report.

Development of standardized surveys for other areas.

Presentation of camera sled biomass estimates for seven regions where this technology has been deployed.

Given the reliance on CPUE as an index of abundance, the SSC requested an evaluation of the difference in dredge selectivity between fishing regions including an analysis of the influence of bottom type on catch efficiency.

The SSC feels that these issues are important and looks forward to receiving this information next year.

Regarding the structure of the SAFE, the SSC has the following comments. Section 1.4 should include a general discussion of the issue of weak meats as it affects the stock and economics of the fishery. The Economic section should be moved to the end of the document. The ACL Section 2.10 should be moved to the section on Management (2.1) and focus on the recommendation for the upcoming 2011/12 fishing season. Annual total catch and ACL should be added to Table 2-4. A summary catch table based on appropriate management sub-units should be assembled to evaluate management by sub-area.

In addition to these structural changes, the SSC identified the following general issues:

Discards for the 2008/09 and 2009/10 seasons are shown in tables; however the tables should clarify whether the 20% discard mortality has been applied to the estimates. In addition, showing the discard weight and catch in the same weight type (round or shucked weight) or providing an additional column with the converted weights for the discards would be useful for comparison.

The SSC notes that local and traditional knowledge may be a useful source of information to assess the historical incidence of weak meats.

Catch recorded in round weights should include the conversion information used to estimate weight.
The ecosystem section should be expanded to include impacts of ocean acidification and dredging effects.
The SSC was informed that only preliminary catch estimates will be available to assess management performance relative to the ACL. This issue should be discussed with the ADF&G to identify whether catch estimates can be finalized on a shorter time frame.

While the definitions of OFL and ACL have been established by the NPFMC, the SSC encourages the SPT to continue to explore other methods for estimating biological reference points including Productivity Susceptibility Analysis (PSA), or Depletion-Corrected Average Catch (DCAC), as an example.

The SSC offers the following stock specific comments:

Table 3-3 shows the scallop density in the west bed was lowest on record in 2010 and has been declining for the past four years. In addition, this region was impacted by weak meats (2.5% in the west bed and 5.8% in the east bed). In response, the PWS West bed region was closed in 2009 and 2010/11.
The SSC requests that a table similar to Table 3-4 be developed for the west bed.

Confirm biomass estimates found in Table 3-3. There appears to be a problem with transposing values associated with different values of q.

Overall trends in PWS, shown in Figure 3-5 may indicate the beds are being fished down. The SSC requests that the SPT discuss what level of depletion is sustainable.

The SSC recognizes that the Council passed a motion in October 2010 to amend the Scallop FMP to establish annual catch limits for scallops; however, the Secretary of Commerce has not yet approved the FMP amendment. Assuming that the FMP will be amended to reflect the Council's motion, the amended FMP would redefine the overfishing limit (OFL) and establish an acceptable biological catch (ABC) control rule and statewide annual catch limit (ACL). The OFL would be redefined to include all estimated sources of fishing mortality and to establish an OFL of 1.29 million pounds of shucked meats. The ABC and ACL would equal 90% of the re-estimated OFL.

The SSC anticipates that an FMP amendment to implement the Council's October 2010 motion will be approved before the close of the 2011-12 scallop fishing season, at which time the FMP will include an ABC control rule and statewide annual catch limit. Accordingly, **the SSC recommends that the Council establish an ABC of 1.161 million pounds of shucked meats for the statewide weathervane scallop stock for the 2011-12 scallop fishing season, consistent with the control rule set forth in the Council's motion.** Assuming the FMP is amended to reflect the Council's motion, this would result in an ACL of 1.161 million pounds of shucked meats for the 2011-12 fishing season.

The economic assessment contained within the draft was succinct. The inclusion of the inflation adjusted real price series makes a very nice and informative contribution to the analysis. It would be advisable and appropriate to explicitly note that references to revenues are gross estimates and that all initial sales of scallops, whether fresh or frozen are post-primary processing transactions. That is, the landed product is (presumably) only shucked meats. To the extent practical, the SSC recommends that additional economic data be provided, possibly in an appendix. Examples of potentially useful data include port landings, crew size and wages.

The SSC has the following minor editorial comments:
Endnote b, attached to Table 1-1, requires further explanation. There also appears a set of sentences, bottom of page 22, that seem to contradict one another and this should be fixed. In Table 1-1, the column headings "Average Price/lb" and "Adjusted Price" should be changed to "Nominal Average Price/lb" and "Real Average Price/lb", respectively. The table should contain a footnote documenting the source of the inflation factor. The SSC has also identified a number of edits, minor errors, and typos that will be communicated directly to the authors.

D-2 (a) Halibut PSC discard EFP

Todd Loomis of the North Pacific Fisheries Foundation (NPFF) presented findings from an EFP to study the description and estimation of discard mortality of Pacific halibut in Bering Sea non-pelagic trawl fisheries. Gregg Williams (IPHC) also provided a description of the standard IPHC discard mortality assessment protocol and basis for the discard mortality rates applied to the assessment.

The basic design of the 2009 and 2010 experiments was to compare discard mortality as determined from the standard IPHC and recently developed RAMP (reflex action mortality predictor) assessment protocols. The study was also designed to develop a mortality curve for the RAMP assessment and investigate environmental and fishing-related factors affecting mortality of halibut discards.

The SSC appreciates the work of NPFF and IPHC in conducting these experiments and understands the complexities and difficulties in development of mortality predictors in a working fisheries environment. While no additional studies are planned, the SSC offers the following observations from the current study and recommendations for future work on this topic. The study showed that the RAMP protocol can be successfully utilized in a working fishery environment. However it did not achieve all of the stated objectives. Difficulties with small sample size (n = 11) during the 2009 study and lack of halibut samples from all categories of RAMP protocols during 2010 prevented full development of a RAMP curve and an analysis of factors that can affect discard mortality rate in halibut. Assessments of total mortality from RAMP and IPHC protocols were comparable during the 2010 study although the majority of fish were initially assessed as having a high probability of mortality. We suggest that the EFP report include a table of observed mortality rate by individual RAMP and IPHC assessment category, and investigate and identify individual RAMP categories that were most indicative of mortality. Future studies should consider using a longer holding period (the current study used a 3-day period) to more closely resemble the results of the long-term tagging data used to develop the IPHC discard mortality rates. Controlling for length of fish and potentially important environmental variables (e.g., temperature) should also be considered. The initial assessment protocol (IPHC vs. RAMP) used on each fish should be randomized or alternated to control for reduction in reflex reactions that can occur rapidly during the assessment process. These types of experiments would best be conducted on a research vessel dedicated to development of discard mortality rates where sample sizes can be increased and the aforementioned controls implemented.

D-2(c) Review draft salmon excluder EA/EFP

Mary Grady (NMFS-AKR) presented the draft Environmental Assessment (EA) for issuing an exempted fishing permit for testing a salmon excluder device in the eastern Bering Sea. John Gauvin (Gauvin and Associates LLC) gave an overview of the planned testing and current development stage of a salmon excluder device. There was no public testimony.

This EFP would allow for further improvement of the Chinook salmon excluder design developed in earlier studies and evaluate and/or modify to improve Chum salmon escapement. The experiment would be conducted from fall 2011 through fall 2012. The proposed action is not expected to have any

significant impacts. The SSC commends the investigators for their efforts in testing and developing gear modifications significantly reducing PSC rates in the pollock fishery. The EA appears to be complete and the application is well-written. The SSC suggests that the investigators consider more formalization of recording conditions surrounding net deployment to better understand factors influencing net performance relative to salmon bycatch. **The SSC recommends the Council approve the EFP application.**