

DRAFT REPORT
of the
SCIENTIFIC AND STATISTICAL COMMITTEE
to the
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
June 5-7, 2006

The Scientific and Statistical Committee met during June 5-7 at Fishermen’s Hall, Kodiak, AK. Members present were:

Gordon Kruse, Chair <i>University of Alaska Fairbanks</i>	Pat Livingston, Vice Chair <i>NOAA Fisheries—AFSC</i>	Keith Criddle <i>Utah State University</i>
Steven Hare <i>International Pacific Halibut Commission</i>		Sue Hills <i>University of Alaska Fairbanks</i>
Anne Hollowed <i>NOAA Fisheries—AFSC</i>	George Hunt <i>University of Washington</i>	Seth Macinko <i>University of Rhode Island</i>
Steve Parker <i>Oregon Department of Fish and Wildlife</i>	Ken Pitcher <i>Alaska Department of Fish and Game</i>	Terry Quinn II <i>University of Alaska Fairbanks</i>
Farron Wallace <i>Washington Dept of Fish and Wildlife</i>	Doug Woodby <i>Alaska Department of Fish and Game</i>	

Members absent:

Mark Herrmann <i>University of Alaska Fairbanks</i>	Franz Mueter <i>University of Washington</i>
--	---

B-7 Protected Species Report

The SSC received and reviewed multiple Protected Species reports from Council staff lead, Bill Wilson (NPFMC). As usual, the SSC commends Bill Wilson for his very thorough report on the many protected species issues. SSC comments are noted below under each specific item.

B-7 (a) GOA and BSAI groundfish FMP level consultation update. Formal section 7 consultation was reinitiated in April 2006 when NMFS Sustainable Fisheries submitted their biological assessment to NMFS Protected Resources. The Council’s SSL Mitigation Committee (SSLMC) has been reconvened to review proposals for changes to SSL protection measures as “the principal interface between the Council and the consultation” process. The SSLMC met twice since the April Council meeting to review research that has taken place since the last BiOp. The SSLMC recommends that the Council issue a call for proposals to change SSL protection measures in Pacific cod, Atka mackerel and pollock fisheries in the GOA and BSAI, with proposals due in early August. The Council will need to issue a call for proposals at this meeting in order to initiate a review process that would result in regulations commencing in 2008.

The SSC notes that the SSLMC minutes refer to the development of a “tradeoff tool.” The SSC has had concerns over the methods used in the past and notes that the same two methods, a modified “bump” analysis and the zone approach are being considered again for use. The last time the SSC saw this tool was in June 2004 when it was delivered during the meeting without lead time, and thus was not reviewed thoroughly by the SSC. The SSLMC apparently is proposing to use some sort of tradeoff tool as they work through proposals for changes to SSL

conservation measures. **The SSC or some other peer review body should review the tradeoff tool before it is used to inform Council decisionmaking.** If the tradeoff tool is revised during the summer, then at the October meeting, the SSC can review the application of the tool, rather than its formulation. One of the challenges of devising a tradeoff tool is that the tradeoffs involve different criteria measured in different ways that cannot be easily subsumed into a unified criterion or ranked in terms of absolute importance. The SSC has previously commented on the logical inconsistencies of summing scores across dissimilar criteria. The SSC notes that there are a variety of decision-making analytic tools that are specifically designed to evaluate the performance of alternatives in the context of multiple dissimilar criteria¹. We suggest that tests for outcome, event, and stochastic dominance could serve as appropriate measures for ranking alternatives. In addition, the SSC notes that there are a variety of decision analytic methodologies that could be used to elicit implicit weighted rankings of plural criteria. The analytic hierarchy process (AHP)², is one such methodology for reducing complex multiple criterion decisions to an internally consistent set of pairwise comparisons and could serve as a useful approach to assess tradeoffs.³

The SSC received a report from Jack Tagart (Tagart Consulting) on a compendium of SSL research reports since 2000. The Compendium is an annotated bibliography with summary sections by general topic and is available on the SSLMC web site. The SSC thinks this will be a useful document for the upcoming SSL discussions. The SSC notes that some work is missing, particularly theses. The compendium includes abstracts and posters from conferences in an effort to capture the most recent information. The SSC understands that the project is basically finished and modifications are not possible from the authors but **strongly urges language be added to the document highlighting the differential quality of citations.** Some users of the material may not be aware that abstracts and posters are often preliminary analyses that may not have undergone peer review and conclusions may change with further analysis and peer review. Abstracts printed in symposium books of abstracts are printed in advance and may not even represent work as it was actually presented at the conference.

¹ See for example:

- Keeney, R. and H. Raiffa. 1976. Decisions with multiple objectives. John Wiley and Sons 569 p.
- Bain, M. 1987. Structured decision making in fisheries management: trout fishing regulations on the Au Sable River, Michigan. *American Journal of Fisheries Management* 7:475-481.
- Brownlow, S. A. and S. R. Watson. 1987. Structuring multi-attribute value hierarchies. *Journal of the Operational Research Society* 38(4):309-317.
- Gass, S. 1983. Decision-aiding models: validation, assessment, and related issues for policy analysis. *Operations Research* 31(4):603-625.
- Healey, M. 1984. Multiattribute analysis and the concept of optimum yield. *Canadian Journal of Fisheries and Aquatic Sciences* 41:1393-1406.
- Hilborn, R. and C. Walters. 1977. Differing goals of salmon management on the Skeena River. *Journal of the Fisheries Research Board of Canada* 34: 64-72.
- Mackett, D. 1985. Strategic planning for research and management of the albacore tuna fishery. *Systems Research* 2(3):201-210.
- Walker, K. D., R. B. Rettig, and R. Hilborn. 1983. Analysis of multiple objectives in Oregon coho salmon policy. *Canadian Journal of Fisheries and Aquatic Science* 40:580-587.

² See for example:

- Saaty, T. L. 1990. Multicriteria decision making. University of Pittsburgh, Pittsburgh, Pennsylvania. 287 pp.
- Merritt MA and KR Criddle. 1993. Multiple criterion decision theory for judging management strategies and resolving conflict: a case study of the Kenai River recreational fisheries. Pages 683-704 in G Kruse, DM Eggers, RJ Marasco, C Pautzke and TJ Quinn II (Editors). *Management Strategies for Exploited Fish Populations*, Alaska Sea Grant, Fairbanks, AK.

³ It might be advantageous to ask Dr. Margaret Merritt (University of Alaska Fairbanks) to participate as facilitator for a session of the upcoming SSLMC meeting to assist the SSLMC team members to structure an AHP model of the tradeoff tool.

B-7 (b) The List of Fisheries (LOF) for 2006. Four of the 5 Category II fisheries listed in the 2005 LOF remain on the 2006 list; turbot longline was dropped. The SSC commented extensively on LOF analyses and issues in our minutes from February 2005 and October and December 2004. Some of the issues may have been addressed (e.g., double counting, assignment of killer whale takes to specific stocks) but others have not. From the February 2005 minutes:

“The SSC previously commented on the analyses and assumptions that went into the List of Fisheries for the 2005 report in our October and December 2004 minutes. Four main issues were highlighted: (1) the sampling of incidents of serious injury and mortality of marine mammals, which are rare events, and the appropriate length of time series of observations to use to estimate the frequency of these rare events, (2) the need for observers to estimate the frequency of serious injury and mortality in state-managed fisheries, (3) the assignment of observed mortalities to more than one marine mammal stock per occurrence, and (4) the appropriateness of procedures used to estimate incidents of serious injury and mortality for unobserved hauls and fisheries. The SSC feels that these issues remain to be addressed, but they are not easily resolved”.

In the future, the SSC requests that proposed rules for LOF be scheduled in a way that allows for SSC review before the end of the comment period. Also, the SSC requests that the authors work with the SSC to resolve outstanding analytical issues.

B-7 (c) Draft SSL Recovery Plan. The SSC appreciates the amount of work that has gone into this plan and recognizes the contentious nature of the discussions during its writing. SSC comments here will be cursory due to lack of time to review this large document. The SSC sees this as an important document that is likely to affect the upcoming FMP consultation and subsequent documents since those will need to be consistent with downlisting and delisting criteria, threats assessment, and associated conservation actions contained in the recovery plan. Because this document sets the basis for future actions, the SSC thinks it is important to do a thorough review. The deadline for comments will not allow the depth and quality of review that the SSC thinks is appropriate. **Therefore, the SSC requests that the Council ask for an extension on the comment period deadline. The SSC proposes to proceed with the review by establishing smaller workgroups to review specific elements of the recovery plan such as the PVA, threats, down-listing and delisting criteria, and the research plan or actions.**

During the presentation on the SSL Recovery Plan, most SSC questions concerned the following topics:

1. Availability of data on various hypotheses and ranking of various inputs.
2. Merits of comparing the western stock to the eastern stock.
3. Status of stocks relative to carrying capacity and evaluation of carrying capacity.
4. Use of growth rate-based vs. abundance-based criteria for downlisting or delisting.
5. Length of time over which rate must be maintained.
6. Ability to implement the adaptive management strategy, given previous obstacles to implementing such experiments.
7. Down-listing criteria that require that no two adjacent sub-areas can be declining significantly, with particular concern about the potentially low productivity in the western Aleutian Islands region and the Asian region, for which the U.S. has no regulatory authority.
8. The feasibility of obtaining comprehensive vital rate estimates (e.g., survival, fecundity) on a broad scale as a check on population growth rate in each region.
9. The need to hear a presentation and conduct a thorough review of the PVA presented in Appendix 3, including model structure, input, and assumptions.

10. The possibility of utilizing a PVA to develop a quantitative risk assessment of down-listing and de-listing criteria.
11. Development of a research plan that would produce data useful to support or falsify the three primary hypotheses regarding factors potentially affecting the western population (i.e, killer whale predation, prey availability affected by climatic variability, and prey availability affected by fisheries).
12. Concern about circular reasoning in the development of de-listing criteria for the eastern stock. The requirement that “the population has increased at 3% per year for 30 years” appears to be based on the observed historical trend and not based on any assessment of risk or status of the stock.

The SSC anticipates that these issues would be explored and dismissed or highlighted and refined in connection with the workgroup reviews proposed above.

B-7 (d) Seabirds. The SSC received presentations on two reports concerning seabird abundance and distribution by Ed Melvin and Michelle Wainstein (Washington Sea Grant) and two reports from Sunny Rice (with co-authors Torie Baker and Paula Cullenberg, Alaska Sea Grant) discussing the development of alternative seabird bycatch deterrence devices for small longline vessels.

The analysis of seabird distribution and abundance was based on several summer surveys and concluded that longline fishing posed little to no risk for the tubenose (procellariiform) seabirds or other species with conservation concern encountered as bycatch in Alaskan inside waters. This conclusion is based on the low abundance of tubenose birds in areas most frequently fished by these vessels, the overall low bycatch of birds in Alaska inside waters, and operational characteristics of small vessels that reduce the probability of interaction. Of all Alaskan inside waters surveyed, black-footed albatrosses were observed only in the mouth of Chatham Strait and Dixon Entrance (four ADFG statistical areas).

The SSC supports the development of an EA/RIR to analyze the feasibility of eliminating the requirements for seabird bycatch deterrents for longline fishing in inside waters, while at the same time upholding current deterrent requirements in all outside waters. This action would relieve requirements for vessels fishing only inside waters (at least 25% of longline vessels), and would help vessels fishing both inside and outside waters (up to 42% of longline vessels). A more formal assessment of bycatch risk and development of options to provide seabird bycatch protection in those areas should be pursued as management options are developed. In particular, the EA/RIR analysis should also explore an option to include the entrances of Chatham Strait and Dixon Entrance as outside waters, although they are presently considered inside waters, given the sightings of black-footed albatross in these areas.

Also, the definition of vessels possessing masts or rigging as applied to deterrent regulations may be made simpler by removing many of the vessels that fish inside waters only. The SSC recommends the analysis include other potential sources of information on seabird distribution in inside waters, noting the paucity of data (only one survey station) in state waters of Cook Inlet. The SSC concurs with the inclusion of data from agency longline surveys and also recommends pursuing additional collaborations with other surveys and observer programs (e.g., pot or trawl gear) to increase the spatial and temporal distribution information collection about seabird activity, especially in relation to long-term changes in climate and fisheries.

Small longline vessels have unique challenges in conforming to the same performance standards implemented for larger vessels due to physical and operational constraints (e.g., limited storage

space, rigging height, and financial ability). These projects were conducted to develop options for seabird deterrents on smaller vessels and to evaluate the necessity of deterrence devices for vessels operating in Prince William Sound (NMFS area 649), inside waters of Southeast Alaska (NMFS area 659), and the state waters of Cook Inlet.

The SSC also received two reports describing feasibility tests of alternative seabird deterrent devices designed specifically for small vessels. We applaud the collaborative approach with industry in developing options to address these problems. The authors tested several designs that would be acceptable under current regulation, such as using larger hoses to reduce entanglement with drag buoys, lighter-weight line for streamers, longer-length lines for streamers, and davits to deploy streamers when appropriate rigging is not present. The authors also tested the feasibility of designs that would not be permissible under current regulation, such as an integrated weight mainline or water spray devices. The projects did not compare seabird encounter rates, only practicality of deployment and compliance with performance standards.

The SSC does not recommend development of an EA/RIR for new seabird mitigation measures for small vessels at this time. Information provided indicated that additional information is needed before an EA/RIR can be prepared. The SSC encourages further development of these tools and supporting experiments to determine efficacy of bycatch avoidance methods. Researchers should continue to work with the fishing industry to develop bycatch reduction measures that meet acceptable performance standards when applied to the diversity of small vessels in the fleet. Further development and testing under fishing trials is necessary before an amendment can be developed.

C-1 IR/IU

C-1(b) IR/IU Data John McCracken (NPFMC staff) and Darell Brannan provided an update on the development of a program to gather vessel-level production, cost, and financial performance data for the non-AFA catcher processor sector. **The SSC strongly supports the regular collection of this data as a necessary input into retrospective analyses intended to determine whether amendment 80 is successful at achieving its intended purpose.** It will also serve as a basis for informing future Council decisions regarding the potential consequences of introducing similar management measures in other fisheries. **Because the non-AFA catcher processor sector includes a relatively small number of vessels and because there is considerable diversity in the size and configuration of the vessels, the SSC recommends that the data be collected as a census rather than a statistical sample.**

C-1(c) MRA Jeff Hartman (NMFS) provided an overview of the draft EA/RIR/IRFA for changes to the MRA accounting intervals. **The SSC supports release of this draft amendment for public review.**

C-3 CV Eligibility Jim Richardson (NPFMC) provided an overview of a staff discussion paper about a potential amendment to retract LLPs that have been relatively inactive. **The SSC notes that changes in the LLP could involve important distributional consequences for individuals and communities and that the character and magnitude of these impacts will need to be assessed if an amendment analysis is developed.**

C-5 Observer Program and Video Monitoring

Nicole Kimball (NPFMC staff) reviewed the status of Amendment 86, noting that the Council is slated to take final action at this meeting. Ms. Kimball noted that staff endeavored to adopt SSC recommendations in their analysis. **The SSC agrees that our prior concerns have been**

addressed and finds that the EA/RIR/IRFA provides a reasonable basis for Council decision-making.

Alan Kinsolving (AKRO Sustainable Fisheries Division) presented a discussion paper on the regulatory and implementation issues associated with adoption of electronic monitoring systems for catch monitoring. An appendix to the discussion paper described results from the pilot study of video monitoring of bycatch in the Kodiak-based rockfish fishery. **The SSC encourages further research and evaluation of video monitoring technology. Automated catch monitoring is a promising but evolving technology that is not yet appropriate as a stand-alone system for routine catch monitoring.**

Public testimony was provided by Mark Buckley (Digital Observer Inc.) and Julie Bonney (Alaska Groundfish Databank).

Miscellaneous notes:

- The AFSC and the AKRO plan to hold a workshop later this month to assess the use of a Norwegian-made technology called “Catch Meter” for automatic detection purposes. The technology utilizes neural networks to train the software to identify species.
- Even with state-of-the-art image compression systems, data storage requirements for the GOA rockfish fishery alone would approach 20 terabytes per year.
- Transferring data from hard drives to tape could raise legal concerns regarding chain of custody for evidence.
- Concerns about discarding outside the video field of view could be minimized by implementing paired video systems with different fields of view – one targeting the overall activities of the crew and another targeting approved discard locations.
- Using surveys as a platform to collect information to evaluate this technology offers the advantage that issues regarding confidentiality could be alleviated.

D-1 Groundfish Management

D-1 (a) Review of EFP to test halibut excluder for GOA cod trawl fishery Cathy Coon (NPFMC staff) presented the draft EA for issuance of an EFP to test a trawl gear modification intended to reduce bycatch rates of Pacific halibut in the Central Gulf of Alaska Pacific cod trawl fishery. John Gauvin (Marine Conservation Alliance Foundation) provided details on the proposed experiment, which had been modified to consider only 2 pairs of vessels to reduce the vessel effect. The SSC commented that it would be appropriate to re-do the power analysis with the changed design. There was also discussion about the significance level used in the power analysis and the possibility of the use of a recapture bag. The experiment has a performance goal of reducing halibut bycatch per metric ton of allocated groundfish by at least 40% over an unmodified net. This goal is based on an estimate of head size dimensions of Pacific cod and halibut relative to the escape opening. The SSC would like to see documentation regarding how the head dimensions were estimated. Although the EFP stated that the vessel fishing the net with the excluder would tow at a slower speed than the vessel with the unmodified net, Dr. Gauvin stated that both vessels will tow at the same speed and all paired tows will be side by side. **Based on the findings of the EA, the discussion of the experimental design, and the IPHC approval of the experiment, the SSC recommends approval of the EFP to allow conduct of this experiment.**

D-1(b) Progress report on trawl salmon excluder research John Gauvin (North Pacific Fisheries Research Foundation) and John Gruver (United Catcher Boats) provided an update on the latest trials with the salmon excluder. Trials in 2005-2006 showed good results on Chinook escapement after changing placement and size of the excluder and time of slowdowns. Future work includes focusing on maximizing the escapement at slowdown through the use of a flap that opens when tow speed decreases. The SSC commended the PI's for their advancements in gear modifications to reduce salmon bycatch.

D-2 EFH

Cathy Coon (NPFMC Staff) provided an overview of two discussion papers, the first on Bering Sea Habitat Conservation alternatives and the second on an evaluation of possible protection measures for St. Matthew blue king crab and eastern Bering Sea snow crab. The papers were intended to provide a framework to assist the Council in formulating a range of alternatives to minimize the effects of fishing on EFH in the Bering Sea. The alternatives currently envisioned are: 1) an open area approach, 2) gear modifications, and 3) other measures, including rationalization and a HAPC process. The presentation included reference to comments and recommendations made in May by the Crab Plan Team with regard to additional analyses needed to evaluate new habitat conservation measures.

The SSC received detailed public testimony from Dorothy Childers (Alaska Marine Conservation Council), Jon Warrenchuk (Oceana), John Gauvin (H&G Environmental Work Group), Peggy Murphy (Alaska Marine Conservation Council), and Michelle Ridgway (speaking on own behalf).

The SSC supports the recommendations by the Crab Plan Team (page 11 of their draft minutes), particularly those calling for analysis of the species composition of crab in trawl bycatch by sex and life history stage. This should be done in a spatial context, including those areas north of the Pribilof Islands that have had recent increased effort in the yellowfin sole fishery.

The SSC recommends that the Council should broaden consideration of alternatives to consider a wider array of potentially meaningful measures than currently envisioned. Specifically, analyses should consider these alternatives:

- 1) restricting open areas to areas traditionally fished with trawls;**
- 2) expansion of closed areas surrounding St. Matthew Island beyond the 3 nm closure in state waters to protect blue king crab and their habitat,**
- 3) additional closures of shelf break waters to conserve habitat in canyons (Middle, Zemchug, and Pribilof Canyons) and known skate nurseries;**
- 4) additional closures corresponding to special areas that may emerge from the analysis of crab life history stages; and**
- 5) consideration of closures specifically for research to assess the importance of benthic habitat for fish production.**

The SSC also supports an assessment of the effects of pelagic trawl gear on benthic habitats, as advised in a letter to the Council from the Alaska Regional Office of NMFS (June 1). The analysis should include a review of the current performance standard based on the number of crab captured, which, given the design and placement of large mesh on pelagic trawls, may be a poor indicator of effect on benthic habitats.

The SSC also requests that Council staff prepare an analysis of the efficacy of existing closures to protect Bering Sea Tanner crab, red king crab, and snow crab, given that

implementation of additional closed areas is predicated on the assumption that current closures have had their intended effects. The analysis should also include an examination of survey and fishery bycatch data for the northern areas, especially with respect to shifting distributions of fish and fisheries.

It was noted that Dr. Craig Rose (AFSC) is currently in the field conducting field studies with modified trawl gear intended to reduce trawl impact on soft bottom habitats found in the Bering Sea. Results from this study may be key in developing recommendations for specific gear modifications.

D-3 Crab Management

D-3(a)(1) Crab Overfishing Definitions The SSC received two reports from members of an inter-agency workgroup on progress toward refining alternative overfishing definitions for BSAI crab stocks. Jack Turnock presented the first report on an analysis by Turnock and Rugolo and the second was presented by Shareef Siddeek on an alternative analysis by Sideek and Zheng. There was no public testimony.

Compared to most groundfish species, modeling of crab life history is complicated and model parameterization and the choice of default values can and does vary substantially from one analytical team to the next. The SSC commends the two workgroup teams for the substantial progress they have made since April in developing simulation models to evaluate overfishing definition alternatives. While a number of differences between the two teams persist, both sets of analyses demonstrate that the proposed tier system is a considerable improvement over the current guidelines. The analyses provide a framework – in terms of an approach and models – for the development of the EA/RIR. The SSC encourages the Crab Plan team and the workgroup to continue to attempt to resolve remaining differences and to identify a recommended model for each species.

Because of the differences between the two team's approaches, it is not possible to directly compare model results. Members of the two teams have indicated it is unlikely they will reconcile their differences without outside mediation. While the Crab Plan Team may opt to go that route, it is conceivable that the end result would be a set of assigned model specifications that are satisfactory to neither team. An alternative the SSC heard, that merits serious consideration, is to split responsibility for the various crab species between the two groups. In the analyses presented to the SSC, in fact, one team was more focused on king crab while the other was more focused on snow crab. Such a division of responsibilities would allow the teams to concentrate their energy on a smaller set of species and to more fully develop the analyses of the overfishing definitions.

Whether the decision is made to co-develop models for all species or assign species to each team, there is a need to develop consistency in model output, analysis scenarios, and performance measures. For example, one team provided a concise comparison of how the proposed tier system performed in relation to the current system. Also, one team introduced measurement error in biomass estimation and its effect on performance statistics, while the other conducted a sensitivity analysis on certain parameters of the overfishing Tier formulas. **The SSC encourages the workgroup to meet and set a common ground for analyses. Some members of the SSC and/or Crab Plan Team may be able to assist in this effort.**

Some details that need consideration in the EA/RIR include:

1. The rebuilding plan uses mature male biomass as its currency, whereas the overfishing definitions are related to effective spawning biomass or total fertilized egg production. Consideration should be given to establishing a common currency by converting the rebuilding plan.
2. The Turnock/Rugolo study needs a complete description of model details and simulation methods and justification of arbitrary parameter values.
3. The Siddeek/Zheng study should downplay the deterministic analysis for clarity.
4. The Siddeek/Zheng study should use the term h for steepness (rather than sp) for consistency with other authors.
5. Both teams should consider the CIE suggestion of using a nonlinear, asymptotic function of mature male biomass as a proxy for total fertilized egg production.
6. Simulations should include the ADF&G control rule, so that one can examine whether the new overfishing definition will constrain ADF&G's TAC setting process.
7. The authors should consider whether eliminating management parameter β from the overfishing definition would simplify analysis and efficacy.
8. In Tier 3, the provisional range of F50% to F60% should be investigated. The SSC would like flexibility for assessment authors to recommend values within this range. Similarly in Tier 4, the value of γ (gamma) that converts natural mortality to the recommended fishing mortality rate should remain flexible in the definition. The teams appear to have chosen a reasonable range of values in their analyses for exploring this tier.

Council staff should spearhead the development of the EA/RIR by writing up the alternatives and review process related to overfishing and assessment as soon as possible.

D-3(a)(2) CIE review of crab overfishing definition issues Mike Bell presented a summary of the reports that he, Nick Caputi, and Patrick Cordue prepared for the Center for Independent Experts (CIE) on their review of the proposed crab overfishing definition analyses conducted by the interagency workgroup. There was no public testimony. Although the presentation was informative and well done, the SSC has not yet received the written CIE report. The CIE commented that the intent of the overfishing level definition should be described to distinguish it from acting as a default harvest strategy. The presentation stressed that the proposed tier system is much better than the status quo for making management decisions. It also pointed out the evaluation parameters involved, especially B (index of spawning biomass), may be difficult to develop but need to be defined and robust. They promoted developing a short-term approach to allow the new tier system to move forward while also developing medium- and long-term research programs to improve understanding of crab life histories and population dynamics.

We anticipate that the CIE report will be helpful to the interagency workgroup by promoting the development of common performance standards for the evaluation of the proposed tiered overfishing definition. The CIE also provided useful comments on the developing snow crab assessment model structure and assumptions, and also concurred with the list of outstanding research needs identified by the interagency work group and crab plan team. The SSC looks forward to receiving the CIE report.

D-3(a)(3) Snow crab model Jack Turnock (AFSC) gave a presentation on the development of the stock assessment model for snow crab. There was no public comment.

The SSC is pleased with the evolution of this model and envisions that it will soon be acceptable for biomass and status determination, as recommended by the Crab Plan Team. The model will be particularly useful if the alternative tier system under consideration is implemented. A variety of uncertainties remain that should be addressed before the model is adopted. **A revised model that**

addresses these issues should be vetted through the Crab Plan Team and presented to the SSC for approval before adoption. Issues identified by the SSC include:

1. There are troublesome trends in the residuals from the model fits. In particular, there is an unusual number of positive residuals in the period 1987 – 2001 (e.g., Figure 2), such that the model consistently underestimates biomass. The document would benefit from a more formal residuals analysis, in which deviations on a log scale are presented. The author should investigate the sensitivity of the model to the low biomass data from the 1985 and 1986 surveys. The author should investigate alternative weighting scenarios in addition to inverse variance weighting. Finally, retrospective analysis may assist in determining whether bias exists in the model.
2. The male maturity data needs additional examination. The logistic curve fitted to maturity of new-shell males does not fit well at smaller sizes. Better justification should be given for the logistic curve, or else a curve that matches the data should be used. A comparison of early and late survey data with respect to maturity is needed. Because the early surveys were restricted to the south, the survey range may affect the time series of maturity.
3. The document should explain the current rebuilding plan and gauge population status in regard to rebuilding goals.
4. The SSC agrees that shell condition may not be an accurate measure of age and awaits further investigation and resolution of this issue.
5. Having separate recruitment parameters by sex does not seem biologically plausible, unless there is evidence of differential mortality in the early life history. Only in 1981 is there any difference in estimated male and female recruitment, and this may be an artifact of uncertainty in the early data sources. Better justification is needed beyond the enhanced fit, or else separate parameters by sex should not be used.
6. The results from the spawner-recruit curve are not plausible, in that biomass during the entire time has been below the estimated B_{msy} level, even when the population boomed during two different cycles. This could be a consequence of the very high recruitment event of 1981. The sensitivity of B_{msy} to this data point should be investigated, as well as alternative spawner-recruit relationships.
7. Because the fishery occurs toward the south (in winter) but the population in the summer is more northward, it is unclear whether there may be differential exploitation by area. The author should further justify a single-area model and consider whether a spatial model or analysis is feasible.
8. The SSC recommends using points for observed values and lines for model values in figures.
9. More detail should be provided about the number of model parameters used and how many data points were used to fit the model. The model has a high number of estimated parameters. Efforts should be made to reduce this number.
10. A sensitivity analysis of the model to life history features should be undertaken.
11. A research priority should be fieldwork to understand variations in size, sex, and season, so that inferences about movement during the year and relative to the fishery can be made.
12. A sensitivity analysis should be conducted to examine the effects of the assumption that catchability is equal to 1.
13. Differential estimates of longevity were presented for males (18-20 years) and females (13-15 years), however the same natural mortality rate was used for both sexes. Therefore, a higher mortality rate for females than males seems appropriate, as was recommended during the February workshop. The effect of using a somewhat higher natural mortality rate for females should be explored through a sensitivity analysis. The

model consistently estimates more large females than seen in the survey. Examination of residuals should be included in the sensitivity analysis.

D-3(b) Crab Plan Team, Pacific Northwest Crab Industry Advisory Committee (PNCIAC) Reports Doug Pengilly (ADFG) provided an overview of the Crab Plan Team meeting held in Seattle during May 2006. There was no public testimony. The Plan Team noted the need for additional expertise and formed a committee to solicit ideas and personnel for potential membership. The SSC agrees that the Team needs additional expertise, particularly in the area of stock assessment.

The Plan Team requested clarification on their role in peer review of crab assessments. The SSC recommends a peer review system similar to that for groundfish: Stock assessment authors prepare the stock assessment document, which contains information, analysis, recommendations of tier level, biomass level, and OFL. The Crab Plan Team then provides review of the assessment and its recommendations to the SSC. The SSC then provides its review to the Council family. The difficulty will be in forming a schedule for review that is timely given scheduling constraints. This same problem occurred when considering TAC-setting in groundfish management and may require advice from NOAA on the requirements for accommodating public review as well, recognizing that the process for crab differs in that the State of Alaska sets the TAC, and not the NPFMC.

Arni Thomson presented the PNCIAC report. Members are concerned about an increase in discards of legal male king crab. The SSC shares this concern in that discards must be measured and accounted for in estimates of total fishing mortality and crab assessments. The higher the discards, the more uncertainty there is in the estimate of total removals and size distribution.

D-4 Ecosystem-based Management (No SSC quorum)

Diana Evans (NPFMC staff) presented the main recommendations from the last Ecosystem Committee meeting held in Seattle with regard to the development of an AI Fishery Ecosystem Plan (FEP). There was also a brief update with regard to progress in advancing an ecosystem approach to management beyond fisheries through the Alaska Marine Ecosystem Forum. It appears this Forum is still in the developmental stage and would involve an interagency level policy group that might begin with the Aleutian Islands in the definition of cross-sector ecological management goals. There was some recognition that this broader approach might intersect with the FEP efforts in the future.

The committee recommendations were to initiate the development of an FEP for the Aleutian Islands to meet a number of purposes, primarily to integrate information across FMPs, refine indicators, identify sources of uncertainty, and ultimately to assist the Council in setting management goals and harvest levels and in understanding cumulative effects of management actions. The committee recommended that Council form an AI Ecosystem Team to work with Council staff to develop the AI FEP. Members of the SSC present agreed that it would be useful to constitute such a team with membership that might contain individuals knowledgeable about groundfish, crab, habitat, seabirds and marine mammals. There was a question regarding the extent to which ADF&G fishery representatives could be involved and an acknowledgement that a broad range of expertise should be included. Involvement of academics and representatives of interest groups might also be desirable as team members to generate new, forward-thinking ways of applying the FEP. The Council might need to support travel costs for these types of individuals. Some efficiencies could involve utilizing some groundfish plan team members and this workgroup could potentially meet in conjunction with the groundfish plan team meetings.

The full SSC will discuss potential membership for the Ecosystem Team intersessionally and provide a list of possible members to the Council this summer.

Additional Items

The SSC gives its thanks to Lt. Dan Schaeffer for his organization of Coast Guard demonstrations and tour of the training center. They were highly informative and enjoyable! Finally, the SSC wishes to thank Jeff Stephan for arranging the use of the Fishermen's Hall for the SSC meeting.