North Pacific Fishery Management Council

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SCIENTIFIC AND STATISTICAL COMMITTEE
REPORT TO THE
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
April 3–5, 2017

The SSC met from April 3rd through 5th at the Hilton Hotel, Anchorage, AK.

Members present were:

Farron Wallace, Chair *NOAA Fisheries—AFSC*	Chris Anderson *University of Washington*	Jennifer Burns *University of Alaska Anchorage*
Robert Clark *Alaska Department of Fish and Game*	Jason Gasper *NOAA Fisheries—Alaska Region*	Brad Harris *Alaska Pacific University*
Anne Hollowed *NOAA Fisheries—AFSC*	Seth Macinko *University of Rhode Island*	Franz Mueter *University of Alaska Fairbanks*
Terry Quinn *University of Alaska Fairbanks*	Matt Reimer *University of Alaska Anchorage*	Ian Stewart *Intl. Pacific Halibut Commission*

Members absent were:

Lew Coggins *U.S. Fish and Wildlife Service*	Sherri Dressel, Vice Chair *Alaska Department of Fish and Game*	George Hunt *University of Washington*
Gordon Kruse *University of Alaska Fairbanks*	Dayv Lowry *Washington Dept. of Fish and Wildlife*	Kate Reedy *Idaho State University Pocatello*
Alison Whitman *Oregon Dept. of Fish and Wildlife*		

B1 Bering Sea Fishery Ecosystem Team Nomination

The SSC reviewed the qualifications of Davin Holen for membership on the Bering Sea fishery ecosystem team. The SSC finds Davin to be well qualified, with appropriate expertise that will assist the team. The SSC recommends that the Council approve his membership on the team.

B2 Fur Seal Status, Management, and Research Priorities

We received presentations by AFSC Director Doug DeMaster on the current status of the Center's budget and on the process that the center uses to identify and respond to research needs. Mike Williams, Tom Gelatt, and Jeremy Sterling (NMML) presented on the management of and research on eastern Bering Sea fur seals (Pribilof Islands and Bogoslof Island). The SSC appreciates the comprehensive presentations and the excellent overview of past and ongoing research activities. Public testimony was provided by Jon Warrenchuk (Oceana) and Lauren Divine (St. Paul Ecosystem Conservation Office).

The SSC requested an overview of northern fur seal research in December 2016, after reviewing the Bering Sea ecosystem considerations documents and noting the relative lack of marine mammal information in these documents. Recognizing the management challenges posed by declining trends in the northern fur seal populations on St. Paul and St. George Island, the SSC requests that we receive regular updates on northern fur seal research and other marine mammal research priorities at our April SSC meetings.

Given the wealth of available information that was presented, **the SSC recommends that additional fur seal indices could be included in the Ecosystem Considerations documents.** The current indices consist of pup counts from index sites on St. Paul and St. George Islands, respectively. However, the evidence presented suggests that there are several ecologically distinct groups based on foraging patterns and diet composition that may not correspond to islands. We learned that analysts are currently evaluating trends in pup counts within and among rookeries and these analyses may suggest a more ecologically meaningful way to summarize pup counts in the future. Additional indices capturing important variability in other population parameters could also be considered for the annual ecosystem assessment.

To integrate much of the available information on vital rates and population trends**, the SSC recommends further work towards the development of an age- or stage-structured population model for northern fur seals**. Given differences in trends among subpopulations, the development of a meta-population model that accounts for movement among these subpopulations may be most appropriate. A population model would provide a tool for evaluating alternative hypotheses about the causes of population declines and may become critical to assessing risks to the population if population trends continue on their current trajectory. While much information has been collected on fur seal vital rates, information on the age structure of the population is lacking and the SSC encourages work towards determining age compositions, as well as the development of alternate metrics for population monitoring.

The SSC recommends that several additional research activities that are currently underway by NMML be maintained, as they are providing data that is critical to work focused on understanding the ongoing population declines at St. Paul and St. George, and the increase on Bogoslof Island. These include supporting the program so that it can sustain the effort to collect data on known-history fur seals (i.e. tagged animals) that are critical to estimating vital rates needed for population modelling efforts. In comparison to historic data, current age at first reproduction is ~ 1 year younger, and pregnancy rates are similar. However, we heard testimony that the absence of good data on emigration rates is likely biasing survival estimates downward, and the SSC agrees that research focused on understanding intra- and inter-island movements by tagged seals among haulout sites should be prioritized.

Biologists have collected a remarkable amount of information on fur seal movements and diving behavior that clearly shows that seals from St Paul, St George, and Bogoslof Islands utilize large and overlapping regions of the North Pacific during winter months, but use relatively distinct regions of the Bering Sea during the summer months. Additionally, movements from the colonies in late fall appear to be strongly influenced by weather and oceanographic events. The SSC supports continuing research efforts to link biotic and abiotic environmental indices with season-specific foraging behaviors, and the consequences to pup growth and survival.

Northern fur seal diet is being investigated through the study of scat and spew collected on the rookeries, and through the use of stable isotopes (whole tissue and compound specific) as biomarkers of past diet. This work has indicated significant intra- and inter-island variability in diet during summer months that tracks differences in summer foraging locations, and appears correlated with population trends. Research effort focused on estimating the proportion of pollock of different age-classes in the diet of northern fur seals through behavioral metrics appear promising, and the work being done using the SailDrone to monitor fish distribution in waters occupied by tagged fur seals offers needed insights into how diving patterns are linked with prey behaviors. There is interest in explicitly including Northern Fur seal predation in ecosystem models such as CEATTLE and aligning northern fur seal foraging data with AFSC's Bering Sea Ecosystem models.

C1 Scallop SAFE and OFL/ABC Specifications

The Scallop SAFE was presented to the SSC by Quinn Smith (ADF&G, Scallop Plan Team chair), and Jim Armstrong (Council). There was no public testimony.

The SSC supports the Scallop Plan Team's recommended OFL = 1.29 million lb (585 t) and ABC = 1.161 million lb (527 t; based on 90% of the Maximum ABC). These values represent no change from those adopted in recent years and are derived from historical catch statistics. Total scallop harvest off Alaska in the 2015/16 season was 264,532 lb (120 t) of shucked meats, which represents 22.8% of ABC/ACL. Area-specific harvest limits were met in the Yakutat, Kodiak NE, Unimak Bight, and Bering Sea Districts; however, in other areas fishing was less successful. Prince William Sound beds remained closed, and in District 16 the fleet harvested less than 5% of the GHL. Managers closed Shelikof after 54% of the GHL was harvested due to catch rates below the minimum performance standard. The Kodiak Southwest district closed at 44% of the GHL caught due to hitting the Tanner crab bycatch cap. The preliminary total catch estimate for the 2016/17 season is 233,009 lb (106 t) of shucked meats, which is only 20.1% of the ABC.

Management of the scallop fishery appears to be conservative, despite recent poor fishery performance. Minimum catch rate and bycatch levels are both used to close in-season fishing, GHL harvest rates of 5-10% are thought to be low relative to natural mortality, actual discard mortality rates are likely below the 20% currently applied, and scallop stocks are distributed in beds outside of commercial areas. Regardless, the SSC remains concerned by the downward trends overall, and in many individual areas, the high rates of parasites and weak meats in some areas, as well as the high degree of uncertainty in the biological dynamics supporting this fishery.

The SSC acknowledged the new additions to the SAFE document and the developments in methodology presented in this analysis. These improvements addressed many of the SSC's previous questions and requests. **There were several avenues recommended for continuing future research:**

- The SSC strongly supports the 2016 survey sampling and continued efforts to implement a statewide scallop survey. This will provide for fishery-independent GHLs that do not rely on standardization of fishery CPUE, and may support a refinement of the OFL/ABC approach based

only on historical landings and discard mortality. This will also require further consideration of dredge efficiency, and aggregate survey catchability.

- Progress on assessment modelling remains a priority for this species. With fishery-independent survey abundance estimates and associated age information available for some beds, this path appears promising. Efforts should first rely on bed-specific modelling, but could be extended to incorporate meta-population considerations (and possibly genetic information) in the future. The SSC is encouraged that ADF&G is in the process of hiring a Biometrician II to tackle this modelling in the near future.
- The SSC reiterates the need to compare and evaluate survey-based scallop abundance estimates and fishery CPUE. This can be approached both through time-series, as well as calibrations for which fishery-independent information is only recently available. Fishery CPUE standardization efforts should be continued, including an effort to provide standardized values on a similar scale as those observed in the raw data (back-transformed).
- The ageing protocol represents an important framework for future aging efforts. The SSC recommends using this protocol, but emphasizes that validation of some sort (perhaps O^{18}-based methods) is still required to determine the relationship between age estimates and true age. Specifically, the methods in the ageing protocol should not be confused with actual bias or precision. There are existing methods (e.g., Punt, A.E.; Smith, D.C.; KrusicGolub, K.; Robertson, S. 2008. Quantifying age-reading error for use in fisheries stock assessments, with application to species in Australia's southern and eastern scalefish and shark fishery. Can. J. Fish. Aquat. Sci. 65:1991-2005) available to deal with precision correctly – naïve estimates of reader agreement disregard the joint probability that matching age estimates are both incorrect, and therefore tend to overstate precision. The SSC reiterates its concern that a 'plus group' may be required for older ages at which reader agreement and/or relative bias may be unacceptable. The current protocol recommends that if ages cannot be resolved, the samples should be excluded (p.11, #3). However, this would bias the age distribution; it is preferable to aggregate these ages, rather than exclude them.
- The SSC recommends continuing to consider collecting data (survey and fishery) and managing in numbers rather than shucked or round weight – both of which appear seasonally variable.
- The SSC continues to look forward to improved estimates of discard mortality rates, based on information provided in previous analyses.

The SSC notes that both observer and VMS data are collected during scallop fishing but are not currently included in the Catch In Areas (CIA) database. The SSC recommends that ADFG staff work with NMFS staff to include these data in the CIA database so that they will be included in future fishing distribution and EFH fishing impacts analyses.

The SSC also endorsed the SPTs research priority list and will be merging this list with the master list when it considers research priorities in June.

The SAFE is inconsistent in the specification of units: lb or lbs, million lb, M lb, Mlbs. Future SAFE's should be consistent.

C3 Salmon Genetics

The SSC received an overview of published reports on the Gulf of Alaska (GOA) and Bering Sea and Aleutian Islands (BSAI) Chinook and chum salmon prohibited species catch (PSC) genetics from Chuck Guthrie (NMFS-AFSC), Jeff Guyon (NMFS-AFSC), Chris Kondzela (NMFS-AFSC), and Bill Templin (ADF&G). Public testimony was heard from Julie Bonney (Alaska Groundfish Databank). The presentation provided stock composition estimates by FMP area. The reports also provided new information on stock composition, including spatial and temporal stock composition, a description of a data access tool developed by the Alaska Fishery Information Network (AKFIN), and the age composition of genotyped chum salmon. The new spatial and temporal strata were defined as groupings of ADF&G statistical areas and fishery season (i.e., "A" and "B" season for Chinook and "early" and "late" season for Chum).

The SSC appreciates the new information provided in the reports as well as the improvements to workflow. These workflow improvements, including the AKFIN tool and spatial stratification, create opportunity to improve stock composition estimates. Further, the age analysis for chum salmon used in the genetic stock identification analyses further improves our knowledge on the composition of chum PSC in the BSAI. **The SSC supports these continued efforts to assess the composition of PSC and appreciates the authors attention to addressing sampling and stratification issues identified by the SSC**.

Moving forward, a key challenge is putting this information into context with clear management objectives. We noted in our April 2015 and April 2016 minutes that PSC management objectives as they relate to the use of stock composition information is unclear. This lack of clarity has been an impediment to improving the utility of the stock composition analysis as it relates to PSC management. We recommended in our April 2016 meeting that analysts …"conduct an exploratory data analysis to attempt to depict spatial and perhaps temporal patterns of stocks of origin likely to be of most interest to the Council and industry." The 2015 stock composition reports provided a first attempt to increase resolution.

The SSC supports continued work on refining the spatial and temporal resolution of stock composition. The BSAI should be the initial focus of this effort given the sampling methods and availability of data, and current industry salmon avoidance processes. **The SSC has the following recommendations regarding the BSAI analysis**:

- The salmon genetics workgroup should continue to investigate methods to assess and display the persistence of Alaska origin genetic stock groupings across years, and by appropriate spatial and seasonal resolution (e.g., A and B or late and early seasons). A relative risk model using the historical genetic information is another approach for the workgroup to consider. The SSC also recommends that the spatial and temporal strata used to report 2015 stock composition be retrospectively applied to composition data derived from 2014 and 2013 samples, and earlier years if possible.
- The SSC reiterates its April 2016 recommendation that a dialog between users and providers of stock composition information is needed to improve the utility of these analyses for management.

The SSC recommends the salmon genetics workgroup seek advice on appropriate spatial resolution and other appropriate analysis elements from potential industry users.

- Gaps in information may also become apparent during the dialog with industry users and during the analytical process; these should be documented by the workgroup.

An important data gap in the GOA is the unknown contribution of hatchery origin Chinook to PSC. Stock composition for Chinook in the GOA has been stable since genetic collections began in 2010, with a component from coastal southestern Alaska and the northwestern GOA (~15%). However, most hatchery stocks are not CWT'd; these fish are instead marked with adipose clips and/or otolith marks. As noted in the SSC's April 2016 minutes, pairing adipose clip status and otolith banding with genetic information is a method that could be used to evaluate hatchery contribution within the reporting groups. The SSC notes that the collection of stock composition information by the observer program in the GOA comes at the expense of other sampling priorities. **To avoid a large additional data collection burden, the SSC suggests that adipose fin status (i.e., presence/absence) and collection of otoliths be considered by the workgroup for addition to the existing genetic sampling protocol in the GOA.** This information should be incorporated in future stock composition reports as it becomes available. **The SSC notes that few wild fish are adipose clipped in southeastern Alaska, and thus recording adipose status when genetic samples are collected maybe a low-cost method for estimating Alaska hatchery contribution to the genetics information. Collection of otoliths would be required to distinguish hatchery from wild stocks originating from the lower 48 and Canada; these areas have a mixture of adipose clipped wild and hatchery fish.**

The SSC has the following general comments and recommendations for the reports:

- The SSC request the reports be updated with new baseline groupings as they become available.
- Map symbology should be keyed for all spatial maps (e.g., the grey shading scale), with information on the maps indicating whether data was filtered out for confidentiality.
- The SSC notes that early season samples of Chinook were unavailable from the Shumagin Island stratum (page 13 in GOA Chinook report). The SSC requests the authors explore why samples were not collected (e.g., where tender deliveries not sampled?).
- The SSC notes chum salmon PSC in the GOA is low (<3,000 fish) in comparison with Chinook catches. Chinook data collection and analysis development should take priority over further development of Chum analysis in the GOA.

C5 GOA Rockfish Program Review

The SSC received a presentation from Darrell Brannan (Contractor) on a proposed work plan for a program review of the Central GOA Rockfish Program. The objective of the work plan is to describe the proposed scope of the program review and to serve as a starting point for a discussion of what should be included in the review. The intent of the review is to evaluate the Rockfish Program with respect to the original policy objectives that the Council had intended to address through the program.

Programmatic reviews are critical for evaluating the extent to which the objectives of a program have been met, and whether the program has resulted in any unintended and/or unforeseen negative

consequences. The MSA states that all Limited Access Privilege Programs (LAPP) must include provisions for regular monitoring and review; however, there is currently not a "checklist" of required elements that must be included in a LAPP reviews. Therefore, the Council has the flexibility to request whatever information they deem necessary to evaluate the Rockfish program. There are several documents that may guide the Council in requesting appropriate, relevant information. For example, NOAA has produced a Catch Share Policy document that provides policy recommendation for nine guiding principles in the development and evaluation of catch share (or LAPP) programs. Further, the Council has undertaken several recent programmatic reviews of other LAPPs (e.g., the IFQ halibut and sablefish program), and the SSC has made extensive comments in regards to these reviews that are also highly relevant for reviewing the Rockfish Program.

Overall, the current work plan is carefully designed and includes a comprehensive list of items to be evaluated. **The SSC appreciates seeing the work plan for this review at this stage of the process, and recommends to the Council that this be a standard practice for all programmatic reviews.**

As with previous programmatic reviews of North Pacific LAPPs, the SSC highlights several challenges. The Rockfish Program was not designed and implemented in a way that facilitates a causal analysis of the program. Making a causal claim about the Rockfish Program requires construction of a careful counterfactual of what a trend would have looked like in the absence of the program, which would make this analysis an overwhelming, if not impossible, project. Further, the plan document points out that data limitations may preclude certain Council objectives from being measured—e.g., profitability, value of quota shares. Therefore, it will be challenging for the analyst to make definitive statements as to whether or not the Rockfish Program met some of the policy objectives.

In light of these challenges, the SSC has the following recommendations:

- The Summary/Conclusion section should identify the pieces of evidence for (or against) achieving each program objective, highlight major questions that remain unanswered, and point out performance indicators whose status is currently unknown. Such a discussion could serve as a useful starting point for initiating more in-depth analyses of particular items of concern.
- A section that highlights particular data deficiencies and gaps in data collection that are important for evaluating the impacts of the program. Such data deficiencies highlight the importance of designing data collection strategies that facilitate retrospective program evaluations, which are a necessary component of evidence-based policy making.
- Whenever possible, the analysts should state an expectation for a change in any performance metric that is consistent with a program objective, and then evaluate whether the metric changed in that particular direction. For some measures, however, the extent or degree of the change is more important than the direction, so similar measures from similar fisheries may provide useful context for interpretation.

The SSC was also informed by the analyst that limited funding may prevent the hiring of a social science contractor to conduct the community/social impacts section of the review. Further, the program review does not include an Office of Management and Budget (OMB) time budget, and thus, formal surveys are not expected to be utilized to collect additional data. Instead, the authors will rely on data collection efforts associated with previous Council analyses (e.g., AFSC's 2014 GOA Trawl Social Survey). The

SSC notes that previous data collection efforts were not designed specifically to address the issues related to the Rockfish Program. Further, previous data collection efforts were also limited by restricted funding and abbreviated timelines. Therefore, passing down suboptimal data from previous data collections creates a downstream "snowball" effect in data quality that negatively affects the "best scientific information" that can be used for the community/social impacts of the Rockfish Program.

In light of these issues, the SSC has the following recommendations:

- The Council should secure funding for a social science contractor to assess the community and social impacts of the Rockfish Program.
- For future programmatic reviews, the Council should anticipate the metrics, and associated data requirements, for complying with LAPP program review requirements, and develop a systematic plan for capturing the appropriate data.

The SSC also has the following recommendations for the analysts:

- The analysts should contact NOAA Habitat Conservation Division staff to obtain bottom contact time series information that spans before and after the implementation of the Rockfish Program.
- The analysts should draw upon previous reviews of the Rockfish Pilot Program to inform their review of the Rockfish Program, in particular to identify the extent to which the benefits of the Pilot program were maintained under the Rockfish Program, which was a stated objective of the Council.
- The analysts should also consider changes in the between-vessel variance for particular performance metrics (e.g., bycatch), in addition to the average. The variance is informative about whether all program participants are responding to design elements of the program, and thus whether additional gains might be feasible.
- The analysts should draw upon production relationships, cost decomposition techniques, or expert information to characterize how any observed changes in the timing of landings at processors affects the nature of processing operations and employment.

C6 EFH Omnibus Amendment

Steve McClean (NPFMC) presented the EFH Omnibus Amendment. Jon Warrenchuk (Oceana), John Gauvin (Bering Sea Trawlers Association), and Lori Swanson (Marine Conservation Alliance) provided public testimony.

The Magnuson-Stevens Act defines Essential Fish Habitat (EFH) as "*those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity*." The National Marine Fisheries Service (NMFS) and regional Fishery Management Councils (Councils) are required to describe and identify EFH in fishery management plans (FMP), minimize to the extent practicable the adverse effects of fishing and non-fishing activities on EFH, and identify other actions to encourage the conservation and enhancement of EFH. Regulations require a review of EFH every five years.

The EFH Omnibus Amendment ties together multiple elements of the EFH 5-year review process. The SSC reviewed the elements of the EFH analyses at several stages of development. The key elements include: a) the update and refinement of EFH text descriptions and EFH maps for managed species; b)

development of the fishing effects model; c) the update and refinement of the EFH non-fishing effects analyses, and d) introduction of a quantitative, evidence-based analytical framework to assess the effects of fishing on spawning, growth, and growth to maturity of managed species. **The SSC agrees that the EFH Omnibus Amendment Environmental Assessment (EA) is ready for public review.**

The EA represents a substantial improvement in all elements of the EFH 5-year Review. In particular, the SSC commends the analysts for a remarkable body of work that has significantly advanced the NPFMC's ability to map and evaluate the impacts of fishing on EFH. The following comments are aimed at three major achievements in this 5-year review: 1) EFH mapping, 2) the fishing effects model, and 3) the species-specific EFH fishing effects review.

EFH Mapping

The EFH designation employed improved analytical techniques and considered new data to provide more complete and objectively derived maps of EFH at different seasons and species' life stages. Species-specific EFH maps were created for the early life stages using Maximum Entropy (MaxEnt) models of NMFS ECOFOCI egg and larval data. Post-juvenile seasonal distributions were based on MaxEnt models of presence-only data from commercial fishing activities derived from the catch-in-areas database. Seasonal adult distributions were derived using General Additive Models (GAMs). Winter, Spring and Fall maps were based on observer data-derived fishery CPUE. Summer maps were derived from NMFS bottom trawl survey CPUE data. The detailed analytical methods and modeling results are available in a series of technical memoranda. **The SSC previously reviewed this information and agreed that the revised EFH maps are a marked improvement and represent a reasonable basis for defining EFH. The SSC requests that these technical memoranda are incorporated into the final version of the Omnibus EFH Amendment using hyperlinks.**

The Fishing Effects Model

The fishing effects (FE) model represents a substantial leap forward from the Long-term Effects Index (LEI) approach used in the 2005 and 2010 EFH Reviews. Specifically, the FE model took advantage of new habitat and fishing data, and increased the resolution of the analysis to capture trends in habitat impacts at a high temporal resolution (monthly). These improvements facilitate a quantitative assessment of the effects of fishing on EFH. **The SSC had reviewed the FE model at several stages of development and agrees that it provides a sound basis for evaluating the spatial and temporal impact of fishing on EFH.**

Overall the SSC considers the Fishing Effects Assessment document to be a useful foundation for the evaluation of the effects of fishing on EFH. **The SSC agrees with the conclusions of the document that given current understanding of stock delineations that the effects of fishing on the EFH of fisheries species managed by the NPFMC are minimal and temporary.** For example, the FE model suggests that the cumulative effect of all NPFMC managed fishing activities (GOA and BSAI combined) is that about 1.5% of the area designated as EFH is in a disturbed state.

The SSC recognizes that this analysis is the first of its kind and will benefit from continued research to refine the parameterization of the FE model. We encourage this type of research and suggest that prioritization of which parameters are most influential in the outcomes would assist in this process.

Specifically, we encourage continuation of studies that examine the potential benefits of gear modifications. The document provides insight into locations where habitat impacts are intensely and lightly impacted. This might provide an opportunity for future comparative approaches.

Species-specific EFH fishing effects review

The SSC appreciates the careful consideration that the stock assessment authors provided in assessing the effects of fishing on the EFH of each NPFMC-managed stock. The stock assessment authors evaluated the quantitative evidence for potential links between habitat impacts and a series of metrics representing *spawning, feeding, breeding and growth to maturity*. To our knowledge, this is the first attempt to formally close the EFH fishing impacts assessment loop in a complete analytical framework. **The SSC concurs with the assessment authors' findings that no stocks needed mitigation review at this time.** However, it is important to note that if a *more than minimal and not temporary* impact had been detected, the process provided a clear avenue for research leading to a species-specific mitigation plan.

The SSC makes the following comments to improve EFH EA readability and access to all information necessary for decision making. Improved documentation of the information considered in the assessment will assist greatly in the 2022 EFH Review and the Center for Independent Expert review planned for 2019-20.

1. The EFH descriptions found in Appendices 1-5 only contain maps of adult EFH. The SSC requests that maps of other seasons and life stages be made accessible to the reader by hyperlinks or by inclusion in the appendices.
2. The SSC requests that the discussion of the methods used to map EFH include a short summary of the strengths and weaknesses of the GAM and MaxEnt approaches to aid in map interpretation.
3. The SSC requests that the results of sensitivity analyses conducted on the FE model be made available through hyperlinks or other mechanisms to Council documents. These sensitivity analyses provided confidence in the model outcomes and would assist future reviewers in fully evaluating the model.
4. The SSC requests that maps of fishing effects by species-specific CEA are included in the assessment through hyperlinks. If the authors are willing to release their full discussions of the assessment of effects of fishing on EFH, then the SSC requests that these are included as an appendix to the document.

Finally, the SSC notes that for the purposes of this assessment, corals were considered a living structure. However, techniques are emerging that would allow assessment of corals to be assessed as an ecosystem component. The SSC encourages the analysts to consider this going forward, but acknowledges that this work will require considerable research and suggests the council consider this a subject of future staff tasking.

C7 Halibut Abundance-Based PSC Limits

A discussion paper on this topic was presented by an inter-agency workgroup with members Diana Stram (NPFMC), Jim Ianelli (AFSC), Allan Hicks (IPHC), Carey McGilliard (AFSC), Dana Hanselman (AFSC), and Rachel Baker (NMFS Alaska Region), with input from Alan Haynie (AFSC). Public testimony was given by Dale Smith and Howard Amos (Nunivak Island Fishermen's Group), Mark Fina

(US Seafoods), Gerry Merrigan (advisor to FLC), Arne Fuglvog (Iquique US), John Nielson (advisor to AMCC), Karl Haflinger (Sea State), Steve Martell (Sea State), Linda Behnken (ALFA), and Peggy Parker (HANA). The SSC last visited this topic in October 2016 and made several suggestions for further study, especially examination of multiple abundance indices and objectives. The SSC appreciates the fabulous job of the workgroup on the discussion paper and notes that they were very responsive to comments and suggestions made by the SSC and Council.

There are two primary questions at the core of this issue: *what indices can best represent the abundance of halibut in the Bering Sea*, which is a scientific question, and *what represents the best suite of alternatives for allocating halibut fishing mortality between directed and non-directed fisheries*, which is a policy question. The workgroup focus for this document was on the first question.

To explore these issues, the workgroup developed four strawman alternatives (ABM1,…,ABM4), each consisting of three indices to address various aspects of abundance and recruitment and a control rule for each index to adjust the PSC limits. These strawman alternatives demonstrated the decisions necessary to implement an abundance-based PSC limit and the calculations involved. Further, the combinations of indices and harvest control rules were evaluated against a set of principles that an abundance-based index should meet, and their performance was illustrated by plotting what historical PSC limits would have been had a strawman alternative been implemented in the past. From these illustrative examples, **the SSC noted that the Council will eventually have to make decisions about a myriad of details, including:**

- How often to change PSC limits (e.g., annually, every 5 years).
- If annual, should there be a constraint on how much PSC limits can change from year to year?
- Should a 3- or 5-year running average of PSC limits be used to promote stability?
- How many indices to use and which ones (from Appendix A).
- The baseline PSC_0, i.e., the starting value, when all indices are at their averages.
- The functional form to combine the indices (the document shows multiplicative adjustments, but others should be considered, e.g., minimum or maximum value of the standardized indices).
- The weighting term b_k for each index.
- Whether to establish a cliff, floor, and/or ceiling (see Figure 5) for each index, and if so, at what values.
- Or instead, whether to establish a cliff, floor, and/or ceiling for PSC only, and if so, at what values (if these are established for the indices, then the ones for PSC are implicitly defined).
- Whether to develop indices and control rules by sector.
- Whether to expand PSC adjustments to the GOA.

The SSC commends the analysts on making excellent progress towards providing information for the Council to make these decisions. However, the SSC believes that the current document does not yet have sufficient information to make such decisions at this point. **The SSC encourages the workgroup to revise the discussion paper to provide more clarity and better rationale for the Council to determine true alternatives, rather than strawmen. The SSC has the following recommendations for future iterations of the discussion paper:**

- There needs to be further development of a framework for evaluating the strawman alternatives using appropriate performance metrics and comparing them to measurable objectives that represent the Council's goals.
    - The computer simulation model in Appendix B is a useful start; however, a more complex analytical framework is required to inform the public on the likely outcomes associated with a particular alternative. This will be particularly true if the analysts attempt to incorporate the incentives associated with each alternative.

    - The workgroup will also be required to further develop a suite of performance metrics related to changes in groundfish bycatch and directed halibut catch, how often the directed fishery has to be shut down, costs or benefits to the two fisheries, social considerations, etc. The workshop conducted in February 2017 is a great start for the future development of measurable objectives and performance metrics.
    - The framework should be designed to inform the public on the tradeoffs associated with altering PSC limits to the groundfish fisheries and the directed halibut fisheries. This could be done using the simulation model within an optimization framework or a viability analysis.
- The SSC recommends further discussion with respect to the proposed indices to aid in determining whether (or to what extent) they represent the segment of the population that they are assumed to represent.
    - Currently, indices are evaluated according to a set of principles, and whether or not they meet the principle. But it's not clear which index is better at meeting a particular principle and the extent to which a principle is met.
    - The characteristics of these indices should be discussed further in terms of life history, data collection (quality and frequency), measurement error, and the extent to which indices represent what is actually encountered in the water by the fisheries.
- The SSC recommends that the analysts further investigate the strawman alternatives using an "all else equal" approach that changes one aspect of the index or control rule at a time.
    - Currently, there are several moving parts to all the different ABMs, and their implications are not evaluated in isolation. Thus, it is not clear what causes the differences in the PSC multipliers across ABM models. An "all else equal" approach thereby allows analysts to isolate the effects of each moving part.

The SSC also suggests the workgroup consider the following issues:

- The document doesn't address where the ceilings and floors should be set. With the exception of ABM3, the concept of a floor suggests that some fishing mortality would always be allowed. It is unclear whether this was the intent of the work group or not.
- Effort to develop biologically-based thresholds for the cessation of fishing (directed or bycatch) could be considered (see discussion of AEQ approach below).
- It may be helpful for the workgroup to receive guidance on overall PSC limit floor, ceiling, and starting point ranges to guide future analyses, but given the complexity of the indices and parameters of the control rules presented it may not be advisable to try to limit specific tools related to indices and control rules at this stage. Rather, the indices and control rules should be optimized to meet larger objectives and constraints on overall PSC limits.
- Clearly recruitment is an important component of any sustainable population. However, in a population where interannual variability is buffered by multiple age groups (the storage effects) a single poor year-class may not pose a significant risk to the sustainability of the population. Furthermore, the skill of juvenile abundance in trawl surveys in predicting future recruitment is imperfect, and careful consideration should be given to whether a recruitment index is the best approach. Understanding the size distribution and abundance of halibut in the Bering Sea will be needed to estimate the probability of halibut capture in the groundfish fisheries. Since the NMFS bottom trawl survey is effective at sampling smaller size groups of halibut, it may be more useful to consider this survey as an index of the probability of encounter of groundfish fisheries with halibut. EBS survey indices based on numbers (as in ABM1) would be sensitive to incoming year-classes while providing an index of the probability of encounter.
- Although the absolute values of potential indices are analytically unimportant given the method developed by the working group, several of the examples contain indices that are at or near the example floors toward the end of the time series. Careful consideration to what length of time-

series appropriately reflects the mean and variability of each index is necessary. It may be undesirable to have indices (e.g., spawning or setline survey biomass) that are unlikely to exceed a value of 1.0. Standardizing indices such that the (PSC_0) is consistent with recent dynamics (or re-parameterizing the control rules similarly) may aid in transparent interpretation, and expectations consistent with current rather than historical fishery behavior, regulatory environment, biology and population dynamics.

- In their April 2016 Purpose and Needs statement the Council identified interannual stability in PSC as a goal. The analysts should expand the section on Stability Considerations to include an examination of factors which may influence the inter-annual variability of derived PSC limits. For example, applying a smoother to each of the abundance indices before combining them might stabilize the interannual variability in the limit. Exploration of bi or triennial PSC limits is also warranted (as noted above).
- A status quo alternative (static PSC limit) should be added for contrast with any future evaluation: This will allow for explicit comparison with the performance of all potential alternatives.
- The incentives section (7) provided a very helpful discussion that should not get lost in the detailed evaluation of future alternatives. Incentives provide a supplement (and potentially even an alternative) to index-based approaches. With strong incentives, PSC would be inherently abundance based, as the fisheries would use only as much PSC as needed and this level would go up and down with abundance of halibut to some degree. If incentives are to be explicitly included in future analysis, modeling will need to do better than the assumption that the PSC limits are caught each year (they are generally not reached under current management). This is likely to be very challenging for the analysis.
- The calculation of AEQ (adult or yield equivalents) should be considered to provide the public an indication of currency, i.e., one ton of bycatch is equivalent to some fraction of directed halibut catch. This approach could be a way of providing scientific support for the slope of the control rule. Although adult equivalents is appealing in concept, including it in further investigation is challenging because the equivalency depends on the allocation among fisheries, selectivity, overall fishing rate, and biology and therefore cannot be calculated or summarized outside the context of a specific alternative.
- The workgroup should attempt to make future analysis robust to potential changes to the IPHC's harvest policy, particularly with regard to size-limits. As an example, it may be preferable to use all setline survey catch as an index rather than O32 survey catch.

C10 Lead Level 2 Observers

The SSC received a presentation from Alicia Miller (NMFS) on the Initial Review Draft of the RIR. Public testimony was provided by Chad See and Gerry Merrigan (Freezer Longline Coalition) and Michael Lake (Observer Provider). The analysis considers proposed changes to observer requirements for freezer longline vessels in the BSAI and GOA groundfish and halibut fisheries intended to address the perceived potential for shortages in the availability of Lead Level 2 (LL2) non-trawl observers. The analysis also considers an alternative that requires NMFS funding of an at-sea training program intended to increase the pool of LL2 non-trawl observers.

The SSC recommends releasing the analysis for public review, pending some minor changes to improve readability of the document. In general, the SSC commends the analysis for the breadth and depth of the analysis.

The SSC notes that the problem of LL2 observer availability is largely created by the structure of observer requirements implemented for the freezer longline fisheries. The analysis notes that the freezer longline fleet stands alone amongst catch share fisheries in terms of observer requirements for catcher-processing (CP) vessels in catch share programs. Other CP catch share fleets are required to carry two observers (one of which must be LL2), the freezer longline fleet is allowed to carry only one observer if the vessel opted to utilize flow scales to weigh retained Pacific cod. This single observer has to meet advanced training requirements (i.e., LL2 qualifications) specifically tailored to non-trawl operations. These experienced observers are more likely to have the skills necessary to deal with unexpected sampling issues, address flow scale problems, and reliably collect data during fast-pace processing and 24/7 operations. It is thought that the combination of a single observer option with advanced non-trawl observer experience (in order to qualify as a non-trawl LL2 observer) has created a "catch-22" scenario in which the supply of LL2 observers could be restricted due to limited opportunities for junior observers to obtain the requisite experience to qualify for the LL2 endorsement .

Of the five metrics used in the analysis to assess the alternatives, the SSC is focused on two: data quality and observer health and safety. The SSC is concerned with any degradation in data quality and believes the analysis does not provide the Council with adequate information to assess potential impacts on data quality. Related to data quality issues, **the SSC supports the agency recommendation to move options 2.2 and 2.3 to alternatives considered and not carried forward as these would put less experienced observers onboard these vessels**. Additionally**, the SSC recommends that the "substitute" observer described under option 2.1 undergo the same training requirements and pre-cruise meetings (as needed) described in option 3.2**. Table 17 in the RIR notes that less experienced observers would have reduced data quality, which seems to be mitigated by the gear-specific training described in Option 3.2. Given these new alternatives**, the SSC recommends the analysis include a broad overview of the administration of training and pre-cruise meetings, including its relation to data quality and safety, but also recognizing these trainings are, by necessity, a matter of Observer Program policy**.

This potential bottleneck in the supply of non-trawl LL2 observers was first noted during creation of the voluntary co-op in the freezer longline fleet by the Council. This became a reality in the 2014 season when there were five instances (out of 378 trips) of freezer longline vessels having to delay departure on a fishing trip by up to four days while waiting to be assigned a non-trawl LL2 observer. No observer shortages have occurred since these five incidences in 2014. In essence, the freezer longline fleet solved the potential observer shortage problem by taking an extra (entry-level) observer on trips, thus generating the experience opportunities for these observers to eventually qualify as non-trawl LL2 observers. Only a small number of the total fishing trips in any year involve trips with a second observer (for example, Table 16, p.48, indicates that out of 358 freezer longline trips in 2016, 10 featured a voluntary second observer).

The purpose and need statement (and hence the alternatives and the analysis itself) treat the problem of the LL2 observer shortage as being one of observer supply and availability. However, Table 11 (p. 42) clearly indicates that observer retention is also a contributing factor. Despite significant new entry into the pool of qualified non-trawl LL2 observers each year, the total pool of qualified non-trawl LL2 observers is not growing. This is compounded by the data in Table 12 (p. 42) indicating that approximately half of the qualified LL2 pool do not make trips**.** In addition, cumulative stress and workload associated with

working on these vessels likely contribute to the difficulty in finding qualified observers to deploy in this fishery. This latter issue is of particular concern to the SSC since it highlights concerns about observer health and safety. The observer accounts from this fishery provided in Appendix E in the RIR are harrowing and the SSC suggests that regardless of the particular Council action taken on the present agenda item, further attention to observer working conditions is critical. Some of these conditions are related to the long hours observers are required to work to maintain the sampling schedule. The Council should reconsider whether requiring a single observer is adequate for these vessels given their operational characteristics, including long haul backs resulting in difficult sleep schedules and potentially unsafe situations.

D3 BS Fishery Ecosystem Plan

We received a report form Diana Evans (Council staff) on recent progress towards developing a Fishery Ecosystem Plan (FEP) for the Eastern Bering Sea. A discussion paper describing the concept for an FEP was developed in 2015 following extensive scoping. Given widespread support among stakeholders for an FEP the Council created a scientific and technical Bering Sea FEP Team in December 2016 to write the FEP. The SSC appreciates the update on the Team's progress and on discussions with and feedback from the Ecosystem Committee. Public testimony was received from Steve Marx (The PEW Charitable Trusts) Jon Warrenchuk (Oceana).

The SSC is encouraged by the Team's progress and strongly supports the design of the FEP as a strategic planning document that provides a process for developing and prioritizing specific actionable items in the form of "Action Modules" to address ecosystem concerns and strengthen the Council's approach to Ecosystem Based Fishery Management (EBFM). The SSC believes that the FEP could provide an excellent framework for engaging in and promoting broader strategic discussions that build on and extend existing EBFM measures.

At these early stages of developing the FEP, the SSC considers it most important for the Council to agree on a set of strategic objectives that can guide the further development of the FEP. The objectives should be clearly linked to, and flow from, the Council's Vision Statement and Implementation Strategy for an Ecosystem Approach. In particular, the document should clarify how the strategic objectives, which are focused on a process rather than outcomes, are not only consistent with the Implementation Strategy, which calls for fishery management to explicitly take into account and be responsive to changes in the ecosystem, but also provide a clear avenue towards the development of appropriate thresholds for Council action and metrics for evaluating progress.

The SSC did not fully assess the current draft objectives at this meeting. Therefore, to get clarity on the overall strategic goals and objectives of the FEP in the context of the Council's overall goals for fishery management in the Bering Sea, the SSC requests a review at the June meeting that focuses on the goals and objectives of the FEP alone, including the newly added objective on engaging stakeholders and the public. This would provide an opportunity for the SSC, the public, and the Council to weigh in on whether the objectives are appropriate and adequate to guide the development of the FEP and to ensure that the FEP truly adds value to existing documents and processes.

With regard to the proposed structure of the FEP, the SSC has several recommendations to improve the utility of the document.

- The SSC suggests promoting the goals and strategic objectives (currently sections 6 and 7) to directly follow section 2 on the "Purpose of the FEP", which would appropriately highlight the importance of the strategic objectives in guiding the rest of the document and any actions arising from its implementation. The section should include or be followed by a brief section outlining the overall approach that the FEP takes to achieving these objectives.
- The document should include a section that explicitly discusses how the FEP informs or links to other strategic planning efforts. These include, for example, the PSEIS, the annual ecosystem assessment, the current process for setting research priorities, the EFH/HAPC process and other ongoing efforts.
- The FEP should clarify that it is exclusively focused on fishery management or, if appropriate, include a section on how the FEP links to other (non-fishery) management advice for the Bering Sea ecosystem such as marine mammals.
- The SSC was encouraged to see that the FEP strives to provide a clear path for turning strategic objectives into Council action via development of action modules and "on-ramps". The document should clearly articulate a process for selecting and prioritizing action modules and for developing "on-ramps" for Council action. This process could address the need for clear and transparent approaches regarding when environmental conditions necessitate Council action and what actions would be implemented. This will also help to elevate the Ecosystem Considerations Chapter from a report card to an actionable body of information.
- The SSC recognizes that there will be considerable overlap in the research activities and analytical approaches that emerge from the Plan Teams, stock assessment authors, and the FEP. To minimize duplication, the SSC requests that any proposed analyses under the action modules are vetted through the Plan Teams and the SSC.
- Similarly, the SSC requests that any proposals for alternative assessment approaches, system level caps, harvest control rules and bycatch limits continue to be submitted through the existing Council advisory bodies (the Plan Teams and the SSC) for approval.
- The SSC agrees with limiting section 5 to a brief synthesis of the Bering Sea ecosystem that highlights connections among major components of the ecosystem in the form of conceptual diagrams, but cautions the Team against developing a series of conceptual models that focus on specific ecosystem components.