DRAFT SSC MINUTES
C-1 BSAI Halibut Abundance-based Management PSC Limits

The SSC received an overview of the Draft Environmental Impact Statement (DEIS) for abundance-based management (ABM) of PSC limits from Diana Stram (NPFMC), with presentations from: Carey McGilliard (AFSC) and Jim Ianelli (AFSC) on the simulation model; Sam Cunningham (NPFMC) and Anna Henry (NPFMC) on the draft economic impact analyses; and Mike Downs (Wislow Research Associates LLC) on the Social Impact Assessment. Public testimony was received from Bob Alverson (Fishing Vessel Owners Association), Gerry Merrigan (Freezer Longliner Coalition), Mateo Paz-Soldan and Simeon and Phyllis Swetzof (City of St. Paul), Linda Behnken (Alaska Longline Fishermen's Association), John Gauvin (Alaska Seafood Cooperative), Heather McCarty (Central Bering Sea Fishermen's Association), Arne Fuglvog (Northstar Fishing Company), Chris Woodley (Groundfish Forum) and Steve Martell (Sea State Inc.). Additional written comments were received from the Halibut Association of America, the Alaska Marine Conservation Council, Aleut Community of St. Paul, North Pacific Fisheries Organization, Peter Thompson (Kodiak) and Hailey Thompson (Kodiak),

The SSC commends the efforts of the ABM working group in producing a DEIS that includes an exceptionally clear background in the Executive Summary to help readers understand the alternatives and options, a helpful history of the action since the Council first considered linking halibut PSC to measures of halibut abundance, and extensive backgrounds on the affected groundfish and halibut fisheries. The analytical team has done an enormous amount of work to a high standard and has done it very quickly to provide timely advice. The analysis does an excellent job of fulfilling the SSC's request to select a baseline biological and an IPHC simulation model, and to focus on contrasts among alternatives, both those proposed by stakeholders and those designed to bookend potential effects. The economic analysis is thoughtful regarding the types of costs and benefits that each fleet experiences through halibut, either as PSC or directed catch. The SIA is exceptionally thorough at illuminating the geographic distribution of fisheries that are engaged with halibut and the form of each community's engagement. The resulting report provides a scientific basis for designing ABM alternatives that strike a balance between the benefits of PSC and directed fishing.

Importantly, the report highlights two limitations of the current alternatives in achieving the Council's goals. First, the analysis concludes that the spawning stock biomass (SSB) displays "low variation amongst alternatives." (Table ES-4). This arises because decreases in PSC mortality lead to corresponding increases in directed fishery mortality. **The SSC emphasizes that, within the range of plausible alternatives, any differences in the age/size profile between PSC mortality and directed fishery mortality do not result in appreciable differences in halibut SSB when halibut mortality is shifted from PSC to the directed fishery.** Importantly, this is a property of the system that is robust across the range of plausible alternatives. **As such, the SSC concurs with the analysts' conclusion that "implementation of an abundance-based management of halibut PSC is an allocation decision rather than a conservation decision."** (p. 250).

Second, the analysis shows that the relationship between halibut PSC per-unit groundfish in the trawl fishery and the trawl-survey halibut biomass ranges from moderate to nonexistent and is highly variable (e.g., p. 150). This finding was also supported by public testimony to the SSC. Therefore, there is limited empirical support that the trawl-survey biomass index reflects what halibut encounter rates will be in the groundfish trawl fishery. Rather, the halibut encounter rates realized, and the associated likelihood of PSC-dependent fisheries foregoing considerable groundfish catch, are highly variable year-to-year. **The SSC emphasizes that a result of the analysis is that the groundfish fleets' ability to avoid halibut is poorly related to indices of abundance.**

The primary differences among the alternatives are likely in economic and social performance metrics, which are not yet developed and calculated on an alternative-specific basis. Because of this limitation, in addition to some shortcomings of the simulation model and performance metrics (as detailed below), **the SSC finds that the document in its present form is not yet ready for release** and would like an opportunity to review a revised DEIS prior to releasing it for public review. Moreover, this delay allows time for the Council and the workgroup to review the present set of alternatives and assess whether additions are needed to achieve the Council's goals. If the Council continues analysis of these alternatives or a modified set of alternatives, the SSC has the following recommendations for the simulations, alternatives and associated performance metrics.

Potential improvements to the simulation model

This simulation model has been valuable in establishing a scientific understanding of the dynamics of the halibut population, management, and fleet benefits and costs while also demonstrating substantial information gaps in halibut demography. Despite the lack of effects on spawning stock biomass across alternatives, the simulation model is an appropriate tool to evaluate trade-offs associated with allocating different portions of the total simulated mortality between PSC and the directed fishery. However, the SSC had some concerns and recommendations about the current implementation of the simulation model:

- A critical feature of the model is the process that simulates IPHC management with regards to setting TCEY. The resulting portion of the TCEY that is allocated to the BSAI region determines the amount of halibut available to the directed fishery, which is obtained by subtracting the previous year's O26 PSC usage from the specified BSAI TCEY. Rather than simulating the full specification process, the analysts adopted a shortcut that predicts the total annual halibut mortality (a proxy for TCEY) that might be specified by the IPHC based on a simple linear relationship between SSB and total mortality estimated over recent years (2007-2018). While an approximation based on recent history may be adequate for examining small changes in SSB from the status quo, the SSC had a few concerns and comments about the approach as implemented:
    - The linear relationship between SSB and total mortality is simply extrapolated for simulated SSB values below or above the range observed over the recent period. This becomes particularly important at low stock abundances, when a decreasing portion of total mortality / TCEY is allocated to the directed fishery. **Therefore, the SSC recommends that the analysts implement a simple version of the "30:20 control rule" to further reduce TCEY at very low levels of stock abundance as it better approximates the current IPHC management approach.** While this is unlikely to lead to SSB differences among alternatives, it will likely provide larger contrast in economic and social metrics among fisheries.
    - The analysts also noted that the model could be extended to simulate some form of the IPHC assessment and the control rule within the simulation model, but that this would require considerable effort. The SSC suggests that this additional effort is unlikely to add much benefit for the purpose of comparing alternatives.
    - The time period of the linear relationship encompasses an earlier period of relatively high (and variable) SSB and a more recent period of lower SSB, reflecting strong temporal autocorrelation. The SSC suggests that, in addition to implementing a 30:20 rule, the analysts should consider: (1) using alternative time periods or better justifying the relatively arbitrary time period (2007-2018) in the document, (2) allowing for temporal autocorrelation in the regression and/or different variances at low and high stock abundance, and (3) down-weighting earlier years, as halibut management has changed considerably over time. Giving more weight to recent years may better reflect future

management. These changes may or may not affect the relative performance of different alternatives with respect to Council objectives and are offered as suggestions without being prescriptive.

- The current analysis assumes that PSC usage is a constant proportion of the PSC limits (Fig. 6-20), which is fixed at recent (2016-2018) average usage, thereby omitting critical dynamics and uncertainties that are described in the fleet operations background. This assumption cannot be validated with the available data and any behavioral changes to avoid PSC cannot be predicted. An obvious flaw of this approach is that it precludes the use of a performance metric that captures the risk of reaching or exceeding PSC limits. **Therefore, the SSC recommends incorporating interseason variability in halibut encounters and corresponding PSC usage rates, along with a performance metric related to foregone groundfish catch.** While this will not forecast the frontier of the fleet's halibut avoidance efforts, it is a critical bookending to contrast with the current assumption of constant proportional usage. Forward simulations could account for the effects of deck sorting by drawing from historically observed halibut bycatch rates in each fleet and applying recent discard mortality rates to determine PSC usage. A simpler approach may be to simulate PSC usage with some associated uncertainty to quantify (in a relative sense, for comparisons among alternatives), the probability that PSC usage in the groundfish fishery is below the PSC limit in any given year.
- Based on a previous SSC recommendation, the analysts simulated future abundances under a plausible range of variability in recruitment (and other parameters) over a long timeframe (April 2019 SSC minutes). The analysts chose a time horizon of 20 years, resulting in a limited range of spawner abundances and, in many cases, the simulations had not reached equilibrium (Appendix 4). The SSC suggests two enhancements to (1) **consider a wider range of recruitment variability, specifically a low recruitment scenario to evaluate the performance of the rules at low abundances** (see previous point) and (2) consider some model runs over a longer time frame to examine if the relative rankings among alternatives are sensitive to adopting a longer simulation period. Consideration of changes to weight-at-age would become more critical as the timeframe for model simulation increases.

The SSC offers some additional minor comments regarding possible improvements to the model and presentation of results:

- The SSB is currently simulated with random noise (independent random draws from a log-normal distribution) with an option to let the error follow a first-order auto-correlated process. This option was not implemented in the current model runs. The SSC suggests that the analysts consider implementing this option in future model runs.
- Forward simulations in the model use weight-at-age values for halibut from the 2018 stock assessment that include an unrealistic "spike" in weight-at-age at around age 23 that may reflect small sample sizes. For these forward simulations, it would be preferable to use a more realistic weight-at-age scenario, perhaps by combining weight-at-age over several recent years or smoothing the relationship.
- In Figure 6-2, the violin plot shows a lower value for the maximum usage than other, comparable alternatives (e.g. 3-1a, b). These values should be checked.
- To evaluate the Council objective that PSC limits should be indexed to halibut abundance, the analysts correlated PSC limits for the trawl fishery (which tends to catch smaller halibut) with current SSB. Because any benefits from these PSC limits affect SSB at a future date, the SSC suggests that trawl fishery CPUE should be correlated to future SSB (see Figures 6-9 and 6-10), reflecting the lag between the reduction in PSC and potential benefits to SSB in the future.

- It was difficult to track the differences in the subset of alternatives (Table 2.4) and visual aids, such as shading or color coding, might be helpful to track the effects of the various elements. Additionally, connections between the elements and options of each of the alternatives and the results of the model simulations could be enhanced, potentially through an expansion of section 6.1.5.

Further evaluating present or new alternatives

The current analysis represents a considerable investment in a framework for understanding the tradeoffs among fleets, and the SSC has the following recommendations to extend this tool to better assess current and new alternatives:

- The value of abundance-based PSC limits would be brought out better if they could be more explicitly contrasted with fixed PSC limit policies.
    - Clarify the representation of SSB performance in table ES-4 to establish that the SSB is not different among the alternatives.
    - Throughout the document, consistently compare alternatives 2 and 3 with the appropriate options under alternative 1, to highlight the additional value of the abundance-based system rather than simply lower PSC limits. In particular, Alternative 1.c (zero PSC) provides an important upper bound on the potential stock effect of abundance-based PSC.
- **The SSC recommends including an alternative, for comparison purposes, that allows regulatory flexibility for adjusting PSC limits within season, after seasonal halibut PSC encounter rates are observed.**
- The SSC supports implementing the stakeholder-proposed alternatives in a way that is consistent with the intent of the proposal (i.e. update Alternatives 3.3a and 2.4)
- Stakeholders have expressed concern about the complexity of some of the alternatives, specifically those that use a primary and secondary index for determining PSC. To consider model complexity explicitly, the SSC suggests that the analysts, with input from management, rank the complexity of different alternatives based on challenges in both communicating and implementing the alternatives in management.
- The SSC found the metric used to assess flexibility (the average ratio of PSC limits to 'trawl selected biomass' over 20 years) to be problematic. If PSC reflects abundance, the ratio will tend to be highest at the lowest levels of abundance in the presence of a floor, and it will decrease as abundances increases in the presence of a fixed PSC limit or ceiling. Given the high variability in PSC usage, it is not clear if a higher value for the ratio implies higher 'flexibility' for the fleet at high abundances.
- In Figure 6-15, the distribution of relative changes in PSC usage may be more usefully shown as an absolute change (i.e., the magnitude of change without the sign) to better evaluate relative performance of alternatives.

Beyond Abundance-Based Management

The SIA demonstrates the critical role that directed halibut catch plays in numerous communities throughout Alaska. The SSC sees that these communities have borne the bulk of the burden associated with declining halibut biomass, and that there is currently no assurance that the burden of future reductions in TCEY will be shared among stakeholders. At the same time, the PSC fleets face highly variable encounter rates, and in a high encounter year, face a very costly avoidance problem, against which higher PSC limits provide insurance. In the absence of a strong relationship between halibut PSC mortality and measures of

abundance, the SSC encourages the Council to consider allocation approaches that allow for in-season flexibility. For example, the Council currently relies on in-season management to reallocate groundfish apportionments across sectors to facilitate full utilization of groundfish TACs. One option for managing halibut allocation would be an in-season intersector rollover provision, whereby PSC limits could be transferred between groundfish sectors or from the groundfish sector to the directed halibut fishery. Another option would be a within-sector interseason rollover provision comparable to the salmon savings plans used to provide individual incentives to avoid salmon PSC in the pollock fishery.