NPFMC BSAI Abundance-based Halibut PSC workshop

Alaska Fishery Science Center

September 12, 2016

The North Pacific Fishery Management Council (NPFMC or Council) held a public workshop to provide a presentation on the discussion paper being prepared by the interagency workgroup on management approaches for Bering Sea-Aleutian Islands (BSAI) abundance-based prohibited species catch (PSC) limits for halibut. The purpose of the workshop was to provide a public preview of the discussion paper prior to the Council's review at the October 2016 Council meeting, to receive feedback on this discussion paper, to better inform the public of the progress on this initiative, and to better facilitate input from the public to the Council.

Attendees at the workshop included the following: Jim Balsiger, Linda Behnken, Mark Fina, John Gauvin, Nicole Kimball, Brent Paine, Shannon Carroll, Steve Martell, Heather McCarty, Peggy Parker, David Wilson, Ernest Weiss, Matt Reimer, Dan Hull, Simon Kinneen, Chris Oliver, Farron Wallace, Bill Tweit, Annika Saltman, Trent Harthill, Jeff Stephen, Alan Haynie, Chad See, Craig Lowenberg, Jamie Goen, Todd Loomis, Glenn Merrill, Austin Eastabrooks, Art Nelson, Paddy O'Donnell, Rebecca Skinner, Verner Wilson, Seth Macinko, Angel Drobnica, Carwyn Hammond, Jan Jacobs, Lori Swanson, Keith Bruton, Stefanie Moreland, Sinclair Wilt, Arne Fuglvog, Ian Stewart, Julie Bonney, Anne Vanderhoeven, Amanda Faig, Teresa Peterson, Matt Upton, Anne Hollowed, Jim Armstrong, and John Neilson

Members of the inter-agency workgroup that presented the paper included: Allan Hicks (IPHC), Jim Ianelli (NMFS AFSC), Dana Hanselman (NMFS AFSC), Kotaro Ono (UW/AFSC), Rachel Baker (NMFS AKRO), Carey McGilliard (NMFS AFSC) and Diana Stram (NPFMC).

Chris Oliver (Executive Director, NPFMC) provided opening remarks regarding the objectives of this workshop and intention to characterize some of the feedback received in this report. He then introduced the members of the workgroup listed above. The order or presentations and discussions followed the sections of the discussion paper. Following the clarifications and questions on the paper some additional comments were provided by the members of the public present. Specific ideas and feedback are summarized below in regards to the sections of the paper discussed.

Council Purpose and Need

Diana Stram reviewed the Council's purpose and need statement and the analysts' interpretation regarding objectives. She noted that in order to frame alternatives which address the Council's purpose and need that analysts needed to infer general objectives. Some concerns were raised regarding these inferences. Specifically:

- The implication that spawning stock biomass (SSB) is only in need of protection at low levels. What about protecting SSB at various levels?
- Avoid constraining groundfish when halibut is high versus low?
- Many objectives seem conflicting.

Diana noted that analysts are trying to provide some interpretation of objectives as a starting point for Council clarification. In order to draft alternatives (especially as it relates to control rules) the analysts are asking the Council for explicit and prioritized objectives. This will be addressed further in conjunction with control rules.

Data Considered

Jim Ianelli provided an overview of the NOAA data available that analysts considered in conjunction with the proposed biomass estimates and indications of whether or not these are available in the time frame for Council groundfish harvest specifications. Some clarifications were provided regarding the level of detail in some data sources compared with others. Additional information on observer data, slope surveys and ABL LL data were provided in the April 2016 discussion paper, but were already excluded from further consideration. Specifically, the NMFS bottom trawl slope survey was examined in greater detail earlier but largely omitted here due to the sparsity of information and the fact that it likely covers only a small component of the Pacific halibut stock. In response to SSC comments, a new data source was evaluated in more detail—the NMFS GOA biennial bottom trawl survey. This survey generally finds smaller Pacific halibut and this may reflect some complementary variability in recruitment trends from the Bering Sea.

Allan Hicks provided an overview of the IPHC setline survey conducted annually, including the rationale behind indexing O32 fish since this covers larger Pacific halibut. As an index of overall biomass, this component was based on weight (WPUE) instead of numbers, but members of the public noted that providing both numbers and weight would be useful. Allan noted that the survey index is consistent with the assessment estimates of a historical decline and a stable biomass over the last 5 years. These survey results are generally available in late November for the IPHC interim meeting. Figures showing the location of the survey stations were shown and there was a discussion regarding the desire to have a survey coverage map for all survey data considered. The analysts noted they will include such maps for the Council.

Considerations for developing an index

Allan discussed the information contained in Table 6 of the document for comparison of general features and timing of different data sources. He discussed the objectives that the workgroup analysts put forward as best describing the desirable features of an index.

These include:

- Addressing older and younger halibut and the entire geographic range of halibut.
- Consideration of spawning stock status to ensure a healthy population of halibut
- Different proportions of halibut recruiting to GOA and BSAI in different years.
- Information from which to derive an index is available in a timely manner.
- Information to be easily accessible and easy to calculate.
- Integrates multiple data sources.

Members of the public questioned why the workgroup focused on an index separately from a control rule. The workgroup members noted that in the April 2016 report this issue was raised but the Council explicitly requested that the workgroup focus on an appropriate index first and develop a control rule separately. With this Council request, the objectives noted in Table 7 served as the main guidance. The workgroup noted that the control rule could be tailored to the proposed index to meet specific objectives. The Council may also wish to revisit considering an index with a control rule concurrently.

Indices considered, but not carried forward

Allan Hicks provided an overview of the Pacific halibut assessment, noting that it represents an ensemble of models and integrates many sources of data. He noted that it meets some but not all of the objectives in Table 7. While the assessment provides good estimates of older halibut, it generally does not provide precise estimates of halibut younger than age 5 or 6. The assessment is available at the end of November, but it is not easily derived and embeds multiple assumptions in the models that make it more likely to result in abrupt changes that may be undesirable in an index.

Kotaro Ono then provided an overview of his geostatistical approach where he worked to incorporate spatial and temporal correlation over space (BSAI and GOA) and time in order to develop indices of abundance by age groups. While useful to evaluate assumptions on recruitment and migration this approach fails to account for the coastwide SSB and is fairly complex to derive.

Allan described how integrating the EBS trawl survey results combined with the coastwide assessment was done in the April discussion paper. The benefits of that approach are that it expressly integrates older and younger halibut, and considers the coastwide SSB. However, it fails to account for potential recruitment outside of the Bering Sea (i.e,, the GOA) and embeds all of the assumptions from the stock assessment

Members of the public suggested that abundance of Pacific halibut in shallow nearshore areas may also be important and are poorly represented in the surveys examined. Analysts indicated they would examine NMFS trawl survey data on halibut and nearshore locations and contact ADF&G scientists to see if data from nearshore regions have utility.

Questions arose regarding if migration patterns were implicitly assumed. Allan noted that young Pacific halibut in the EBS are assumed to leave that area and described some ongoing tagging studies to address these questions. It was noted that alternative weighting of indices might accommodate varying migration hypotheses.

Dana Hanselman provided an overview of an index considered in the April 2016 paper which uses EBS (only) survey plus the AFSC longline survey portion in the EBS, and the setline survey IPHC in the EBS. The index was weighted according to the individual survey variance. This index was omitted from further consideration since it weights older Pacific halibut more heavily and excluded consideration of recruitment that may occur in the GOA.

Proposed Abundance Index

Allan provided an overview of the proposed abundance index in the discussion paper. This proposed index is intended to address three primary components of the Pacific halibut population

1. The abundance of younger halibut in the EBS which may recruit to the coastwide stock and be encountered by non-directed fisheries in the EBS,
2. abundance of the coastwide halibut spawning stock,
3. recruitment outside of the EBS to the stock that may contribute to future spawning biomass.

The following goals were stated for this index:

- Healthy halibut stock
- Allowing young fish to recruit to adult stock
- Limit fishery restrictions when Pacific halibut abundance is high in the EBS

Allan discussed the workgroup's decision to weight the data sources equally, noting that analysts discussed a more complicated weighting scheme but decided that there were concerns about policy calls with weightings and that these were best left to control rule specifications. Weighting by the inverse of the variance of each index would give higher weight to more precise indices, and thus higher weight to that component. The decision to use the setline survey in lieu of the coastwide assessment was made because it is available annually, well designed, provides information on the O32 stock in weight, and is less subjective than a stock assessment, as described previously. The three surveys were standardized to 1 to combine into the integrated index. Questions arose about why the workgroup elected to use O32 for trend purposes when the IPHC setline survey is also reliable for O26, and asked if this was a scientific or policy decision. Allan noted that O32 was selected because the workgroup was interested in using the survey to account for the older fish index component. Questions were posed regarding the extent of the

IPHC setline survey and when and where expansion estimation is included, as well as whether hook sizes change between the surveys. IPHC staff indicated that the expansions are used to calibrate all years similarly, and that hook sizes have been constant.

The workgroup discussed the relative estimate of numbers from the EBS trawl survey and noted that the relative increase in 2006 was attributable to only 1 or 2 stations hence the variance on that estimate is high. The trawl survey data are incorporated in number of fish to indicate recruitment. It was suggested to include variance on the figures. Members of the public requested clarification on the rationale for choosing numbers over weight for this data series. Jim noted that the workgroup discussed this at length and that resulting variability could be dealt with in the control rule formulation. The intention of using numbers was to capture some of the inter-annual variability in smaller fish. If stability is desirable it would be preferable to make that an objective for management and address it elsewhere.

The third proposed index includes the GOA bottom trawl survey which accounts for the contribution of halibut in the GOA to the overall SSB. This is also included as numbers. The workgroup suggested using the previous year's estimate in off-survey years in the GOA. It was suggested to consider using the random effects model used in other NMFS assessments to smooth this It was s clarified that the random effects model succeeds in smoothing the time series but the off-year prediction for each current year would be the same as the last estimate in the time series so does not help that problem.

The workgroup proposed standardizing all three indices and weighting them equally. Previously alternative weightings were examined but the workgroup noted that it entered into a policy issue since trends differed. Thus, equal weighting was considered more appropriate and a clear way to separate the index from the policy choices that may enter into the control rule development. There was considerable discussion that this, by default, weights the survey index by the largest deviate from the mean and by default weighting to the heaviest observation error. The workgroup noted that the recommendation is to weight equally in the index regardless of implied variability and address that in the control rule application. Absent direction otherwise the workgroup would not be planning to explore alternative weights. The group noted that they had originally presented an integrated concept which involved alternative weighting in April and were encouraged to look at other options. There was considerable discussion regarding the policy implications of assigning weights at either the index level or the control rule level. These are objectives that the Council must articulate. The workgroup recommends that the most transparent method is to equally weight each index.

A question arose on why the GOA was included but surveys from other areas (e.g., lower 48 and British Columbia) were excluded. It was noted that these regions are covered in the coastwide survey.

Examples of index trends

The group discussed the examples provided of how changes in the individual components of the index change the overall index value. Questions were posed as to the relative correlation between the GOA and BSAI. It was noted that lack of correlation between the regions was a main motivation for including the GOA. Kotaro's work with the geostatistical model showed that there is limited correlation between the BSAI and GOA. The workgroup discussed the various ways to dampen inter-annual variation in the index but again noted that this could be addressed directly in the control rule depending upon the Council's objectives. Some concerns were raised regarding the temporal aspects of the 3 indices and what specifically they were indexing. Allan indicated that one additional concern could be non-linear relationships going into the coastwide biomass. For example, a low recruitment in the EBS may result in a decline in spawning biomass in later years, but a high recruitment with a similar deviation from the mean recruitment in the EBS may not result in a symmetric increase in spawning biomass. Another concern was the potential implicit weighting by covering some of the portions of the population by more than one data source. This was thought to be a low concern by the workgroup given the small size of those components. It was suggested to explicitly describe what is included in each individual index (and differences between using total halibut instead of O32 or at least evaluate the difference).

Control Rules

Diana provided an overview of the issues and objectives inherent in constructing control rules to apply to the index including the tools that can be used to achieve Council objectives. She listed some of these tools as well as decision points needed by the Council in order to proceed with the development of alternatives. These include explicit articulation and prioritization of objectives. Various potential control rules were provided as illustrative examples that related the change in the index to the proportional change in the PSC limit. Initially, the examples used the following data:

- Total bycatch mortality (i.e. bycatch in groundfish fishery combined trawl and hook and line) in two time frames:
  o 1997 - 2015 in 2 examples
  o 2008-2015 in 1 example

Regressions were shown with these data, and a generalized equation where any specific values could be used was also presented in the appendix. The group discussed the illustrative results and the implicit choices made by the shape of the control rule, floor, ceiling and data used for the examples. Figure 24 shows the objectives inferred from the Council's purpose and need as it relates to the control rule formulation. Diana noted that moving forward from here requires explicit prioritization of these objectives (and/or additional objectives). Once this has been completed we can devise measurable performance metrics to analyze whether they were being met.

Questions were posed regarding consideration of control rules for numbers of halibut. Diana clarified that this is still included in the Council's intent and once the Council provides more specific direction and a recommended abundance index we will continue to consider BCRs in numbers and in weight. Members of the public questioned how historical halibut mortality in numbers will be calculated. A question arose if the workgroup considered a multivariate control rule. For example, including something about the size composition of the survey might help act as a smoother that is driven by biological information. Furthermore, this may reflect the impact of how bycatch-at-size on downstream Pacific halibut stock (e.g, spawning biomass-per-recruit effects). This may also help with size composition changes due to deck sorting programs.

Members of the public expressed concern regarding PSC limits in numbers and the impact towards incentives to reduce mortality. This could dramatically change the structure of incentives, as rather than discarding big fish, would want to discard as many fish as possible. Another member of the public commented that the fishery often manages itself using rates of halibut bycatch, and the Council could consider this too.

Management Implications

Diana and Rachel reviewed potential management implications. Diana reviewed the proposed timing for folding annually establishing PSC limits into the BSAI groundfish harvest specifications process. Rachel reviewed issues with implementation for in-season management. Updates were provided on the various status of analytical issues described in the paper. Diana reviewed the next steps for the Council in October and particularly the need to articulate and prioritize goals and objectives for this action.

General comments

Some general comments, questions and discussion points are summarized below with responses from staff as applicable (in indents):

What is the anticipated outcome of the next Council meeting? Alternatives for analysis or objectives from which we could construct alternatives?

> The importance of getting the Council to define and prioritize objectives is key, following that crafting alternatives will be an iterative process

Is there a presumption that this is the only index, or may the Council look further at other indices or weighting indices and could the index be flexible to future improvements?

> It was noted that often a control rule and index are developed together. Choice of weights is policy-related. Would caution going forward with separating the control rule and index.

Council needs to specify objectives

> These need to be quantifiable -i.e. along the line of 'procedure achieves our objective X% of the time'. Objectives need to be ranked and have an associated time frame. We need to minimize bycatch by X% over Y years.

Why is this so much more difficult than doing the abundance estimate for each and every stock annually?

> More difficult because of the downstream effects, two management entities and multiple management objectives. If the only objective was to index PSC to abundance would be very simple - only decision would be starting point, but this doesn't balance the multiple objectives.

> Some other examples of stocks where this has been achieved include: Southern Bluefin tuna, where Australia catches younger Bluefin tuna, and Japan catches older Bluefin tuna. However, the common goal was the same in this setting, albeit a lengthy process upon which to agree.

When examining data from various surveys (per Table 6), perhaps additional criteria should be included. For example, it would be helpful to know if there have been vessel/gear changes in the various surveys that would affect how we interpret them, and if there have been such changes, are there conversion factors available.

> Standard protocols have been used throughout the time series for the surveys selected.

Did the Working Group consider different indices for the trawl and fixed gear fisheries that require PSC limits, given the different size selectivity of each? In other words, why attempt to address the objective of addressing both the older and younger population components (Table 7) using a single index rather than two?

> The Council has not yet indicated whether or not separate control rules should be employed by gear type. If the Council indicates that it wishes to consider this then separate indices and control rules could be considered by gear type.

What if we required the trawlers to keep the halibut they catch, rather than throwing them away?

> This would require major changes to multiple programs. The Council and the IPHC have yet to indicate that they would like to consider these modifications to current management.

This is not an assessment issue; we assess stocks with far less information. This is an allocation issue and confusing it with assessment and science is masking the overarching allocation issue.

> The group acknowledged that this is an important point.

Has the workgroup envisaged how they might test the performance of the proposed integrated index in meeting the objectives?

> Performance metrics will depend upon prioritized objectives for the alternatives. Once these have been articulated analysts can develop some candidate performance metrics to test against the alternative control rules applied to an abundance index and resulting PSC limits.

The illustrative control rules would not change anything for the directed fishery in the Bering Sea.

> The Council could put additional ideas forward as alternatives. This also related to how objectives are prioritized

How would the Council go about ranking objectives?

For competing objectives: something along the lines of "x amount of variability would be acceptable to us". Something quantifiable. A set of quantifiable and measurable bounds helps for an objective. This would allow for simulation testing.

It seems useful to construct a decision table for the Council

This was the intention of the Figure 24 and we will work to continue to develop this into a more explicit decision table following any changes and prioritization of objectives from the Council in October.