

Considerations for Setting Multi-year Acceptable Biological Catch Limits

Scientific Uncertainty Subcommittee

Scientific and Statistical Committee

Mid-Atlantic Fishery Management Council

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Introduction

The Mid-Atlantic Fishery Management Council has the flexibility to set multi-year annual catch limits and regulations (i.e., specifications). In order for the Council to use this option, the Scientific and Statistical Committee (SSC) must provide multi-year advice on acceptable biological catch (ABC). The SSC has not provided multi-year ABC recommendations during the past three years, partially over concerns about the ability to respond to population changes in future years. Multi-year ABCs may provide significant benefits, but these must be weighed against potential costs. It is highly likely that multi-year ABCs are not appropriate for all situations. This document describes the potential trade-offs inherent in providing multi-year ABC recommendations, items to consider when providing multi-year ABCs, recommendations for situations in which the SSC would and would not make multi-year ABC recommendations, and recommendations for situations when the SSC would consider changing multi-year ABCs before their full term.

Potential Benefits

Increasing the use of multi-year ABCs may provide a number of benefits to the SSC, Council, Northeast Fisheries Science Center (NEFSC), and stakeholders. Potential benefits include reducing the workload required by setting annual ABCs, increased clarity about future allowable catch levels, and the potential for more thorough analyses, which may lead to better decisions.

Multi-year ABCs may reduce the workload of the SSC, Council staff, and NEFSC scientists. A substantial amount of work underlies each ABC decision. In recent years, the SSC has met 3-4 times per year to set annual ABCs for each of the MAFMC stocks (except tilefish). To support annual decisions, annual updates of stock assessments, indices of biomass/abundance, and catch are often requested of the NEFSC. Additionally, annual ABC recommendations require that MAFMC staff develop and submit documents to satisfy several federal statutes associated with each change in management. Multi-year ABCs could result in fewer decisions that would need to be made, which could reduce the frequency or length of meetings, the frequency of assessment updates, and avoid the need to annually revisit documents to comply with federal statutes.

Multi-year ABCs may provide increased clarity about future allowable catch levels. If multi-year catch levels are specified, and adhered to, the Council and stakeholders will have a clearer picture about future biological constraints on the fishery. Even in the event that multi-year ABCs are revised, a transparent process for their specification would also provide increased clarity for future allowable catch levels. More stable advice may lead to improved compliance as previous research has suggested that stability of regulations leads to increased compliance (Citation).

Multi-year ABCs have the potential for better and more effective decisions. The MAFMC SSC's current approach of specifying annual ABCs may be suboptimal if the information used to make recommendations has a low signal to noise ratio. In other words, if interannual variation in the data or assessment results is substantially larger than changes in stock size, basing changes in catch limits on those data may not be prudent. With multi-year ABCs there may be potential for more time to be dedicated to each assessment to allow for a more complete exploration of the data and analyses. Assessment improvements may increase the signal to noise ratio.

Potential Costs

Multi-year ABCs also have potential costs associated with their use. Most concerning among these is the potential for overfishing or underfishing¹.

Multi-year ABCs have the potential to result in decisions that do not perform as well as annual ABCs. Using old data/estimates for ABC recommendations is likely not optimal if the estimates are indicative of changes in stock size and the stock biomass fluctuates substantially over time. In these cases, use of multi-year ABCs may result in overfishing or underfishing relative to the management objectives. Overfishing could occur if harvest levels did not decrease in the face of an unexpected decrease in stock size. Likewise, underfishing could occur if harvest limits remained static, but stock size increased unexpectedly. These apprehensions could be somewhat alleviated by setting the time limit for multi-year ABC recommendations such that there is a small chance of serious problems arising during the period of concern.

Multi-year ABCs may also lead to increased pressure to not respond to changes in stock size if the ABC recommendations are seen as a promise of continuity of catch levels for the duration of the recommendation. Pressure to deviate from multi-year ABCs will likely be asymmetric with a greater interest in increasing catch levels than decreasing catch levels. Clear guidance on when and how multi-year ABCs can be changed will likely be necessary to avoid ratcheting catch levels up.

Multi-year ABCs may require new analyses to allow the SSC to review and assess their performance. The SSC has typically received a combination of updated versions of accepted assessments, indices of biomass/abundance, and catch for setting multi-year ABCs. Alternative data or analyses may be necessary to evaluate the performance of multi-year ABCs.

¹ Here overfishing and underfishing are relative to a desired target level that is determined by fishery management goals and objectives. This may not correspond with the federal definition for overfishing.

Additional guidance may be required on how to handle overages and underages. There may be a desire to allow quota underages to carry forward into future years or for overages to count against future years allowable catches. While this is not exclusively a problem for multi-year ABCs, it would be prudent to develop a policy to handle such cases. For example, the North Pacific SSC often updates projections with their most recent estimates of realized catch or new survey values.

Considerations for multi-year ABCs

Multi-year ABCs share many considerations with annual ABCs, but there may also be additional concerns surrounding their use. This issue is complicated to a degree because the considerations will depend on the implemented approach.

Timing of information. It is a reasonable policy to match ABC recommendations with the stock assessment cycle. For example, if stock assessments are conducted every three years, three-year ABC determinations make sense, particularly if new information will not be available in the interim period. This is the primary reason that other Councils use multi-year ABCs. Several other Councils (see Appendix A) use multi-year ABCs such that ABC recommendations are made in cycle with stock assessments.

Quality of information. The signal to noise ratio of the information provided on which to make ABC recommendations is another important consideration. If the information provided are not thought to indicate changes in stock size, they should not be used to change ABCs. For example, the MAFMC previously decided not to change the ABC for Atlantic mackerel despite a large decline in trawl survey CPUE. Part of the justification for not making a change was that CPUE was not thought to be indicative of changes in stock size.

Life-history and fishery characteristics. The life-history of the species likely also plays a role in determining whether multi-year ABCs are desirable for a stock. Populations with large, unpredictable fluctuations in abundance or biomass from year to year are likely less well-suited for multi-year ABCs than stocks with more stable dynamics. From a life-history perspective, high variation is more likely in short-lived species than long-lived species. Thus, most of the species that have multi-year ABCs tend to be longer lived (Appendix A). A caveat to this argument is the size of the precautionary buffer. Thus, multi-year ABCs may be appropriate for stocks with highly variable dynamics if ABCs include a large precautionary buffer.

Fishery characteristics may also be important to consider for multi-year ABCs. The more stable a fishery (e.g., fishing mortality or stable catch), the more likely that multi-year catch recommendations will not cause additional problems.

Lastly, ratios of important variables may be useful to categorize species into groups of ones that are suited to multi-year ABCs and those that are not. For example, relative fishing mortality (catch divided by an index of abundance), the variance of recruitment divided by catch, or variance of recruitment divided by maximum age may be useful statistics for classification.

Stock status. The status of a stock relative to overfished or overfishing designations is also an important consideration for use of multi-year ABCs. Multi-year ABCs are likely not well suited for stocks that are overfished or are undergoing overfishing.

Method of specifying ABCs. The method for determining the ABC is an important factor in developing an effective multi-year ABC policy. The most common method for specifying multi-year ABCs appears to be from projections of the population (Appendix A). This would lead to different ABCs each year depending on the strength of cohorts moving through the population. Another approach would hold the ABC constant over a pre-specified period. The constant approach would be simpler in that it would not rely on projection assumptions, have the benefit of no anticipated changes during the period, but may be more prone to over- or underfishing.

The performance of the method for determining ABCs probably also interacts with the length of time for which the ABCs are specified and whether performance “check ups” are conducted. In particular, population projections become increasingly uncertain the farther they are forecasted into the future. Performance check ups would be pre-scheduled opportunities for SSC to review the ABC and consider making changes. In order for performance check ups to be useful, updated information would be required. The North Pacific SSC revisits multi-year ABCs annually, while several of the other SSCs do not seem to revisit their ABC decisions between assessments (Appendix A). Multi-year ABCs are often specified for 2-3 year periods, and this range seems reasonable.

The final question is whether an increased buffer is necessary as the projection period increases. Based on the propagation of errors, we know that longer term forecasts are more uncertain than shorter forecasts. However, the current MAFMC ABC control rule does not include an increased buffer for longer projections. The lack of an increased buffer for longer projections is similar to the approaches of the other Councils (Appendix A).

Recommendations

Multi-year ABCs are likely not appropriate for all situations given their potential tradeoffs. Multi-year ABCs appear to be particularly appropriate for some stocks and situations, but any multi-year ABC should be accompanied by a clear statement about when and how the SSC could make changes to the ABC during the inter-ABC period. Several metrics outline the use of multi-year ABCs: information availability and timing, exploitation rate of the stock, stock status, and life history characteristics.

Multi-year ABCs should be used:

- 1) When no new information will be provided in the interim period. If no new information will be available, then it does not make sense to annually revisit the same information. This appears to be primary reason multi-year ABCs are used by the other SSCs (Appendix A).
- 2) When the fishery has low exploitation rates. In particular, long-lived species with low exploitation rates are not likely to suffer large changes in biomass during a relatively short multi-year ABC period (short relative to the potential rate of change of biomass).

Multi-year ABC considerations – *Draft document for discussion purposes only*

- 3) Other combinations of life history and information availability. We have not yet fleshed out specifics for this category.

Multi-year ABCs should not be used:

- 1) When new information is imminent. Given the likelihood that new information will cause a change in the ABC, it seems practical to mesh the period of ABC recommendations with the periodicity of new information.
- 2) When current information suggests major changes coming in stock size. If major changes are known to be coming in stock size because of recent cohort strengths, we may not want to specify multi-year ABCs.
- 3) Other combinations of life history and information availability. We have not yet fleshed out specifics for this category.

Criteria for deviating from multi-year ABC recommendations. To be as transparent as possible, situations under which the SSC would change its recommendation should be clearly described, and the SSC should abide by these restrictions. Several potential sources of information to review include some that the SSC routinely receives already and some new ideas. In particular, the subcommittee thought that changes in indices larger than a particular percentage amount may require revising ABCs, but that smaller changes would require no update to the ABCs. Potential variables to monitor include changes in catch above a certain % (particularly down), changes in an index or estimate %, and changes in the spatial distribution of the stock or fishery. Other information will be necessary to understand causes of changes, particularly changes in the fishery, such as market dynamics, which can be provided by the Fishery Performance Reports.

Recommendations for further exploration

Appendix A. Practices of Other Councils

The MAFMC SSC Scientific Uncertainty Subcommittee asked several members of other Council's SSCs or staff about their practices and experience in specifying and using multi-year ABCs.

Gulf of Mexico (from Rick Leard)

Our SSC has not considered developing a policy on multi-year ABCs per se. However, they have on occasion recommended ABCs for two to three years. What they have attempted to do is to make recommendations from one stock assessment providing multi-year yield streams until a new stock assessment is completed with updated numbers. This has not been very successful because our stock assessment process (Southeast Data Assessment and Review) considers the needs of three councils and the Atlantic and Gulf States Marine Fisheries Commissions. Consequently, the SSC has been uncomfortable with making recommendations more than 2 to 3 years out, and we have typically been unsuccessful in getting stock assessments or updates more frequently than approximately 5 years. Additionally, in considering multi-year projections, the SSC has looked at the status of the stock being assessed, e.g., is it overfished or undergoing overfishing? Are the yield projections going up in time or down, and why? Consequently, the multi-year projections that we have gotten from the SSC have been more on a case-by-case basis. Furthermore, the SSC has not revisited the ABC recommendation except in the case of a new assessment or update, and the Gulf Council has set ACLs based on the SSC recommendations that remain in place until new recommendations are made.

New England (from Chris Legault)

The New England SSC has been setting multi-year ABC's for a couple years now. Generally they seem to be working, with the exception of groundfish where the projection horizon got too long (we were asked to set ABC's for 2013 based on assessments with terminal year 2007). We've been providing ABC's for three years with the expectation that the third year would be replaced by a new assessment and projection, but this doesn't always happen due to scheduling issues. The scallop PDT looks at the survey information every year to see if there is a need to change the multiyear catch advice, but other stocks are generally not examined between ABC specifications. The goal of the multi-year advice is to reduce the amount of work that has to be done setting specifications and to give some stability to advice over time. Of course new assessments with divergent results from the previous assessment put a strong wrinkle into the stability goal.

North Pacific (from Pat Livingston)

We have a type of multi year ABC setting process that has been set up in which we provide two years of ABC recommendations and, depending on the type of stock assessment and whether there is an annual survey planned, we annually update the recommendations in a certain way. We use a standard projection model for modeled stocks in order to come up with the scenario for projecting the year 2 ABC, which is then revised after the first year catch has been taken and if a new survey was done. I can try to find a detailed description of that process if that would help you. It was initially done as an amendment to our groundfish FMPs in 2005.

Two-Year OFL and ABC Projections (from 2011 Bering Sea and Aleutian Islands groundfish SAFE report)

Proposed and final specifications are adopted annually, for a two year period. This requires the Team to provide OFLs and ABCs for the next two years in this cycle (Table 1). The proposed 2012 and 2013 specifications will become effective when final rulemaking occurs in February or March 2012. The 2012 specifications (from Council recommendations in December 2010) will already be in place to start the fishery on January 1, 2012, but these will be replaced by final specifications recommended by the Council in December 2010. This process allows the Council to use the most current survey and fishery data in stock assessment models for setting the next two years' quotas, while having no gap in specifications. The 2013 ABC and OFL values recommended in next year's SAFE report are likely to differ from this year's projections for 2013 because of new (e.g., survey) information that is incorporated into the assessments. In the case of stocks managed under Tier 3, 2012 and 2013 proposed ABC and OFL projections are typically based on the output for Scenarios 1 or 2 from the standard projection model using assumed (best estimates) of actual catch levels. For stocks managed under Tiers 4-6, 2013 projections are set equal to the Plan Team's recommended values for 2012.

Pacific (from Martin Dorn)

The Pacific Council has not dealt with issue in a meaningful way. For groundfish, OFLs and ABCs are set on a two-year basis, rather than annually. The OFLs are from applying the FMSY proxy to non-stochastic projection using the last accepted stock assessment (ideally with the catch stream updated, but not consistently). The ABC buffer comes from a p-star approach with a sigma (uncertainty in the OFL) that is not adjusted to reflect greater uncertainty from the length of the projection. Good luck on your efforts.

South Atlantic (from Carolyn Belcher and John Carmichael)

Short answer, we do not have a policy in place. We have recommended using truncated sections of projections because of the forecast uncertainty and generation time (e.g., black sea bass recommended projection values for 2 years, to be followed up with an update assessment). So in essence, it has been handled on a species by species basis. Where using the projections will be problematic is when overages occur. The P* assigns the probability of rebuild to the entire time series, rather than the multiplicative probability of individual years. At one point Kyle indicated this could be done, but could be difficult to do in a timely fashion, i.e., annually.

The SAFMC does not have formal policies for multi-year decisions. They handle it on a case by case basis. In some cases the recommendations are very specific and clear as to how the ACL may change year to year, while others lack such actual specification. In many instances they are set 'until changed'. Some are set 'until the next assessment'. The type of data available to set the assessment is often an influencing

factor. Another is stock status, as overfished stocks include rebuilding schedules that provide an annual ABC-ACL. However, in some cases, possible increases based on stock rebuilding are not automatic. I'd say the trend is toward less automatic increases based on rebuilding projections.

The SSC is similar to the Council in this regard. There is no formal policy for multi-year ABCs. Each stock and its available data are evaluated. Usually the SSC will provide a time-specific ABC if the SSC feels an assessment has important uncertainties that could influence future values. For example, when recently reviewing black sea bass, the SSC provided an ABC for 2 fishing years, with a request that the projections be updated before the ABC is recommended for later years. This is based on a history of overages and projection scenarios showing that actual landings heavily influence future landings. Therefore, the projections of future years may not be accurate if overages continue.