Agenda Item D.5.a
NMFS Report 1
June 2019

NATIONAL MARINE FISHERIES SERVICE REPORT ON PHASED-IN APPROACHES TO CHANGING HARVEST LIMITS: SCOPING

Introduction

The Council recently adopted the Science and Statistical Committee (SSC) recommended increases to sigma values, which more fully account for scientific uncertainty in groundfish and coastal pelagic species (CPS) assessments. This report focuses on groundfish but also applies to CPS fisheries. The new sigma values have increased both overall to more accurately reflect the uncertainty in estimating Overfishing Limits (OFL), and on an annual schedule to reflect increasing uncertainty in OFL projections over time (https://www.pcouncil.org/wp-content/uploads/2019/02/G3a_SSC_GFCPS_Subcms_Report1-Steepness_Prior__Sigma_Review_MAR2019BB.pdf). As a result, absolute buffer sizes between the OFL and Acceptable Biological Catch (ABC) have increased, most noticeably for less informed stocks (e.g. Category 2 and 3), and for those that are assessed infrequently. This will ultimately lead to decreases in the annual catch limits (ACL) for a number of stocks for the 2021-2022 biennium, within the Pacific Coast Groundfish Fishery Management Plan. The final adopted sigma values and buffers as a percent of the ABC appeared in the SSC Report 1 from the March 2019 meeting (https://www.pcouncil.org/wp-content/uploads/2019/03/G3a_Supp_SSC_Rpt1_Sigma_MAR2019BB.pdf). Tables 3 and 4 from the March SSC statement show a comparison of the buffer sizes under the new and old sigma values, as a percentage of the OFL. Tables 1 and 2 in that report show the new schedule of sigma values and buffer sizes on their own.

Using a Category 1 stock and a P* of 0.45 as an example, Table 3 in the SSC statement shows that the reduction to the OFL for scientific uncertainty (size of the buffer between the OFL and ABC) was previously static each year at 4.4 percent under the old sigma value. The new buffer sizes (resulting from sigma value increases) increase to 6.1 percent of the OFL in Year 1, and then again each year; e.g., 7.8 percent in Year 5, and ten percent of the OFL in Year 10.

The increase in the amount of reduction from the OFL is more substantial for Category 2 stocks. The same table shows that the buffer for scientific uncertainty was previously static each year at 8.7 percent of the OFL under the old sigma value. The new buffer size increases to 11.8 percent of the OFL in Year 1, and then again each year; e.g. 15.1 percent in Year 5, and 19 percent of the OFL in Year 10.

While supporting the new method as the best available science, the Groundfish Advisory Panel stated in its March 2019 report (https://www.pcouncil.org/wp-content/uploads/2019/03/G3a_Supp_GAP_Rpt1_MAR2019BB.pdf), that “more time is needed to discuss and consider the best way to implement the new sigma value approach”; and that these reduced ABCs, and the resulting reductions to ACLs “stand to protect against potential

overfishing but fail to protect against lost potential economic and community opportunities". The lower ABCs are expected to have higher negative socioeconomic impacts for participants targeting highly attained stocks, especially high attainment Category 2 and 3 stocks.

The Groundfish Management Team (GMT) also commented in detail in its report at the March Council meeting (https://www.pcouncil.org/wp-content/uploads/2019/03/G3a_Supp_GMT_Rpt1_MAR2019BB.pdf), and illustrated the effects of the sigma value changes on ABCs of specific stocks including black rockfish, canary rockfish, and arrowtooth flounder. The GMT also asked for additional time to carefully plan implementation of the new sigma values.

There are several approaches available to mitigate short-term negative socioeconomic impacts from these sometimes dramatic decreases to the ABC and ACL. These approaches vary in their effect on the ABC, risk of overfishing, potential specificity versus overall reach throughout the management process, and term of action (years). They include:

1) increasing the frequency of some stock assessments (including catch-only updates) and adding new faster/higher capacity statistical techniques to enable more frequent assessment of certain stocks;
2) allowing a longer period within the ten-year OFL projection period of the stock assessment, in which future catch is assumed as less than the full ACL;
3) increasing certain ACLs;
4) making case-by-case ABC phase-ins;
5) adjusting the ABC control rule in the FMP to allow the SSC to recommend phased-in reductions to the ABC over a maximum three-year period;
6) increasing the maximum P* value allowed in the FMP, which would allow the Council select a higher risk tolerance for the probability of overfishing.

Table 1 at the end of the document compares these approaches by key features, using nominal rankings.

Approach #1: Increasing frequency of some types of assessments

Increasing the frequency of some types of assessments could mitigate the effects of sigma increases in two ways. The first is by offsetting the time penalty component of the new sigma methods. For instance, performing a full benchmark or update assessment would start the "sigma clock" again at Year 1, pushing the time penalty portion of the new sigma forward, and beginning again with the corresponding lowest default uncertainty in projected OFL values. Although more frequent stock assessment could offset the time penalty, assessment capacity is limited, particularly for full benchmark assessments.

In addition to incorporating the most recent actual catch values, which corrects for under-attainment of previously-assumed removals since the last assessment, benchmark and update assessments also use GMT-expected catch levels for the first two years of the ten-year OFL projection period for some stocks, rather than assuming full ACL removals in all projected years. This influences the values of projected OFLs (further discussed in Approach #2).

In contrast to full benchmark or update assessments, catch-only update assessments are much faster to perform, and the workload is much lower. The main benefit of a catch-only update is correcting for under-attainment of previously-assumed removals since the last assessment can produce a significant increase in OFLs, especially for low attainment stocks. Although catch-only assessments do not start the "sigma clock" again at Year 1, they do allow the use of GMT-expected catch levels in the first two years of the projected period for some stocks, rather than assuming full ACL removals.

Other methods may be available in the future that could enable more frequent assessments.

Approach #2: Re-examining assumptions about future catch

As mentioned under Approach #1, different assumptions about future catch levels in the assessment of some stocks (setting future fishery removals at typical attainment levels or model-based predictions, versus full ACL removals) influence the level of the projected level of the OFL itself.

Assumptions of GMT-expected future catch levels could potentially be utilized for longer periods than two years for stocks whose catch and management measures are more stable among years (less uncertain), and whose management measures are specified with more predictable associated impacts. This would require thorough stock-specific analysis, approval from the SSC and update to the Terms of Reference. The application of this approach is limited, as it would make the biggest difference for *low* attainment stocks, while socioeconomic impacts are most acute when ABC reductions are made to high-attainment stocks.

Approach #3: Increase the ACL

For many stocks, the Council recommends a buffer between the ABC and ACL to account for management uncertainty. The Council could recommend a higher ACL (i.e., reduce the management uncertainty buffer) without an FMP amendment to mitigate an ABC reduction short-term. However, the ACL is already set equal to the ABC for many stocks, so the option is not available in most cases. Maintaining a buffer for management uncertainty is also critical for many stocks (e.g., stocks caught in sectors with low observer coverage, uncertain and/or untimely inseason catch monitoring, few or ineffective inseason accountability measures, etc.), and thus may not be desirable.

Approach #4: Case-by-case phase-in actions

In the absence of a provision within an ABC control rule in the FMP, phasing in of ABC changes may be considered on a case-by-case basis. The NS1 guidelines allow the SSC to recommend an ABC that differs from the result of the ABC control rule, but must provide an explanation for the deviation (see 50 CFR 600.310 (f)(3)). The phased-in reductions to ABC could be evaluated by means such as re-running projections based on the most recent stock assessment, to determine whether the reductions can be accomplished safely without undue risk of overfishing.

The NMFS NS1 Working Group drafted a NOAA technical memorandum (TM) to guide Councils in developing phase-in ABC control rules. The TM is still under internal review, and the phase-in approaches in the present report are discussed in detail within it.

Approach #5: Phased-in ABC reduction

The current National Standard 1 (NS1) Guidelines at 50 CFR 600.310(f)(2)(ii), revised in 2016 (https://www.federalregister.gov/documents/2016/10/18/2016-24500/magnuson-stevens-act-provisions-national-standard-guidelines), allow Councils to develop a control rule (or a feature of its overall control rule) that phases in decreases to an ABC over a period of time, not to exceed three years, as long as overfishing is prevented each year.

"… Councils can develop ABC control rules that allow for changes in catch limits to be phased-in over time or to account for the carry-over of some of the unused portion of the ACL from one year to the next. The Council must articulate within its FMP when the phase-in and/or carry-over provisions of the control rule can and cannot be used and how each provision prevents overfishing, based on a comprehensive analysis.

(A) Phase-in ABC control rules. Large changes in catch limits due to new scientific information about the status of the stock can have negative short-term effects on a fishing industry. To help stabilize catch levels as stock assessments are updated, a Council may choose to develop a control rule that phases in changes to ABC over a period of time, not to exceed 3 years, as long as overfishing is prevented each year (i.e., the phased-in catch level cannot exceed the OFL in any year). In addition, the Councils should evaluate the appropriateness of phase-in provisions for stocks that are overfished and/or rebuilding, as the overriding goal for such stocks is to rebuild them in as short a time as possible."

Phasing in substantial changes to ABCs increases fishery stability by allowing fishers time to plan ahead for decreased catch limits. Minimizing interannual variability in quotas and catch levels can decrease management uncertainty. Future management outcomes often become more difficult to accurately predict in circumstances of dramatic change (Patrick et al. 2013). However, phasing in ABC decreases can inadvertently encourage overfishing under some circumstances, which can deplete stocks or slow rebuilding. Risks can be higher for some stocks than others due to factors such as life history, data quality and frequency of assessment.

The NMFS NS1 working group also summarized core principles for phased-in ABC decreases as described in the NS1 guidelines: 1) the phased in ABC level must prevent overfishing, 2) comprehensive analysis must show how the control rule prevents overfishing, and when the rules can and cannot be used, 3) the impact of phase-in for rebuilding stocks on rebuilding status must be explicitly considered, and the goal remains to rebuild in the shortest time possible.

The Council would need to develop and adopt the specific circumstances under which it would accept the SSC-recommended phased-in reductions to the ABC over a period of 3 years or less. For instance, in addition to factors like stock vulnerability to overfishing, part of the criteria could be based on a threshold of average annual attainment, or percent ABC reduction necessary to qualify for consideration. The circumstances are not limited to the recent sigma changes, but

could be any situation where new scientific information suggests that we need to make a large reduction to the catch limit. Theoretically, the shape of a phase-in could follow any function, e.g. linear, exponential, or even a simple flat delay; the SSC can choose how to structure the reduction over the three years.

Approach #6: Adjust maximum P* in FMP

The Council Stock Assessment and Fishery Evaluation (SAFE) document, "Status of the Pacific Coast Groundfish Fishery" (https://www.pcouncil.org/wp-content/uploads/2019/01/SAFE_Nov2018_Final.pdf), speaks to the definition of P* and decision by the Council of which value to use:

"The overfishing probability metric (P) is technically defined as the probability of overfishing a stock based on the scientific uncertainty in estimating the OFL. … Either P* is interpreted narrowly as the actual probability of overfishing, or P* is considered more broadly as the Council's level of tolerance towards the risk that the OFL will be exceeded. Both viewpoints have merit but the latter view has more utility in the Council process, and is a more accurate representation of how the P* value is decided."*

Default P* values are assigned to reflect an a priori risk tolerance according to the category of the assessment; the criteria for which are summarized in Appendix F., of the Terms of Reference (TOR) for Groundfish and Coastal Pelagic Species Stock Assessment Review Process for 2019-2020 (https://www.pcouncil.org/wp-content/uploads/2019/04/Stock_Assessment_ToR_REVISED_2019-20_APR2019_Final-2.pdf). The categories are based on data quantity and quality, and are referred to as data rich, data moderate, and data poor (categories 1-3, respectively). Sigma values are also set (more formulaically) in alignment with the same categories.

However, even within Category 1 stocks, which are the best informed, assessments can vary substantially in both the degree of uncertainty, and how that uncertainty is distributed and characterized within the assessment model (PFMC SAFE, 2018). Such factors can include, but are not limited to, number and influence of parameters in the assessment which are either estimated outside the model or fixed, which correspondingly lead to biomass variances and underestimate the actual total uncertainty.

Also,

"For the most part, the relative uncertainty in estimating the OFL is addressed with the SSC's sigma specification, which is only intended to broadly distinguish between assessments along the data-limited to data-rich continuum. The Council's P decision is therefore most appropriately considered as a risk assessment given many sources of uncertainty regarding the true state of nature for a stock."*

Higher tolerance for risk (and higher P*) results in a smaller buffer between the ABC and OFL, and vice versa. The value of P* must reflect a probability of overfishing lower than 50 percent, consistent with the NS1 guidelines.

Under this approach, the Council would raise the maximum P* allowed in the FMP. The Pacific Coast Groundfish FMP currently allows the Council to set P* at a maximum level of 0.45. The Council must still recommend ABCs that result in a less than 50 percent probability of overfishing (meaning P* must still be below 0.5), and could still set different P* values for different stocks.

In discussing P*, with its associated effect on the size of the OFL-ABC buffer, it should be noted that the Council frequently sets the ACL equal to the ABC for high-attainment stocks. Setting the ACL equal to the ABC means that there is no buffer for management uncertainty. As an example, in the case of ACL=ABC and a Category 1 stock; it would mean that when considering a P* across the range between 0.40 and 0.49, a buffer from 11.9 percent to as low as 1.25 percent (respectively) would be the **only** buffer between the OFL and the ACL. Using a Category 2 stock as an example (and a P* range from 0.40 to 0.49), the corresponding buffer size would vary from 22.4 to 2.48 percent, respectively.

The potential effect of increasing P^*_{max} vastly exceeds the capacity necessary to offset the recent increases to sigma.

Summary: merit, potential impact and risk of each approach

Non-ABC control rule based approaches (Approaches 1 through 4) do not require changes to the management framework or regulations or FMP. As such, they carry none of those associated risks or administrative burden. There are practical, fiscal, workload, and analytical constraints on how much the NWFSC can increase its current assessment capacity.

There is little additional burden to changing the ACL to mitigate an ABC reduction in the short term. However, the ACL is already set equal to the ABC in many cases, which limits the availability of this approach.

There are advantages and disadvantages to both FMP-based approaches (Approaches #5 and #6), some of which involve significant conservation risk, both short and long term.

The ABC phase-in is a straight-forward approach, both operationally and analytically. It is also well bounded with low to moderate risk.

While allowing for precise control of buffer size, inflating the value of P* max could provide potential for misuse.

Raising the maximum P* value presents a higher conservation risk than other approaches, has a much farther reach in its range of impact across the management process, and through time. It is also the least transparent approach, and presents somewhat higher process complexity, analytical

and administrative burden. Elevating risk tolerance through P* in order to permanently or in the long term, offset increased buffer size that reflects best scientific information available could erode the functional integrity of the OFL-ABC buffer.

The goal should not be to manipulate harvest control rule components in order to negate legitimate changes to current scientific information.

Specific guidance

NMFS recommends that the Council consider the following when developing a plan forward:

- Consider both FMP and non-FMP changes to address the recent sigma changes.
- If FMP-based approaches are considered (Approaches #5 and #6), identify criteria that would warrant mitigating reductions in ABCs (i.e., percent utilization, percentage change in ABC), as well as criteria that would disqualify a stock for mitigation of ABC reduction (i.e., stocks that are overfished, in the precautionary zone, or experiencing overfishing; stocks that have other conservation concerns) prior to setting ABCs to ensure that the approaches are applied consistently across stocks and do not result in conservation risk.
- Adhere to the core principles of the revised NS1 guidelines, identified by the NMFS working group, when developing mitigation approaches.

Timing

For the groundfish and CPS fisheries, both FMP-based approaches would require FMP amendments. NMFS can prepare the 2020-2021 biennial harvest specifications as an FMP amendment, and approve/implement any FMP-based approaches concurrent with that action.

If FMP-based approaches are considered (Approaches 5 and 6), NMFS recommends that the Council develop the *a priori* criteria for their application at the September 2019 Council meeting. The SSC can then consider applying the approaches when developing ABC recommendations for groundfish and CPS at the November 2019 Council meeting.

Table 1. Summary comparison of potential approaches to mitigate ABC reductions in the short term, by key features, using nominal rankings within attribute. "Administrative burden" includes additional fiscal responsibility and/or decision-making workload. "Theoretical applicability across stocks" refers to how widely the method could be used across different stocks in the FMP; e.g. although changing the ACL can be done for virtually any stock, many ACLs are already set equal to the ABC, and cannot be raised higher, thus the applicability of this to mitigate a reduced ABC is limited.

Approach	Requires FMP change	Risk level	Potential effect on ABC	Term of action	Analytical requirement	Administrative burden	Theoretical applicability across stocks
Increase assessment frequency/add methods	No	Low	Moderate	Moderate	High	High	High
Catch assumptions	No	Low	Low	Long	Low	Moderate [a/]	Low
Increase ACL	No	Moderate	None	Short	Low	Low	Low
Case-by-case phase-in actions	No	Moderate	High	Short	Low	Low	High
ABC phase-in	Yes	Moderate	High	Moderate	Moderate	Moderate	High
Change maximum P*	Yes	High	High	Long	High	High	High

a/ Requires changing the stock assessment review TOR