SCIENTIFIC AND STATISTICAL COMMITTEE REPORT ON
FISHERY MANAGEMENT PLAN AMENDMENT 23 –
ANNUAL CATCH LIMITS

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (MSRA) established several new fishery management provisions pertaining to National Standard 1 (NS1) of the Magnuson-Stevens Fishery Conservation and Management Act. On January 16, 2009, the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register to amend the guidelines for NS1 that provide guidance to the Councils in revising their Fisheries Management Plans (FMPs) to conform to the new MSRA requirements. Specifically, there is now a need to implement overfishing levels (OFLs), annual catch limits (ACLs), annual catch targets (ACTs), and accountability measures (AMs) by 2011 for most species, and by 2010 for those species designated as being subject to overfishing. The major task for the Scientific and Statistical Committee (SSC), however, is to satisfy provisions of the MSRA to redefine the Acceptable Biological Catch (ABC) to account for scientific uncertainty.

The Council has decided to framework how ABCs will be calculated in its groundfish and coastal pelagic species (CPS) fishery management plans (FMPs). The SSC provided a conceptual framework in April 2009 to account for scientific uncertainty when calculating ABCs for “data-rich” stocks with a history of multiple assessments. They recommended quantifying the variability in biomass estimates from stock assessments as a basis for evaluating the size of a scientific uncertainty buffer (i.e., the difference between the OFL and the ABC) and the risk of overfishing the stock.

The groundfish and coastal pelagic species subcommittees of the SSC met in Seattle, Washington September 1-2, 2009 to discuss implementation of the NMFS guidelines and, in particular, how to calculate the scientific uncertainty buffer that defines the difference between the OFL and the ABC. That meeting considered three general approaches to defining scientific buffers for groundfish and CPS species, and agreed that defining these buffers based on a value of P^* (the probability of exceeding the OFL) was most appropriate. This scientific buffer would be based on a tier system, with different tiers for species with different levels of information. The size of the buffer for data-rich stocks would be determined using information on “between” and “within” assessment variation in biomass estimates, and with buffers for data-poor species being set larger than data-rich species. While this is only a first step in quantifying scientific uncertainty, the SSC endorses this approach.

The SSC recommends that the method of translating a value of P^* into a scientific buffer should be frameworked in the environmental assessment (EA) because methods for doing this translation are still evolving and because no methods currently exist that can capture all sources of scientific uncertainty. The SSC intends to use the approach it outlined in April as the basis for providing ABC recommendations at the March 2010 meeting. While not perfect, in particular because it does not address assessment bias, this approach captures many key sources of scientific uncertainty to the extent currently possible. Specifically, two sources of scientific uncertainty will be computed: (a) the statistical uncertainty that is captured within each stock assessment and (b) a measure of the remaining scientific uncertainty which cannot be captured within a stock assessment, but can be inferred from changes over time in estimates of biomass from stock assessments. Dr Stephen Ralston and assessment authors will be working to collate the information needed to compute the between-assessment variation in biomass estimates for data-rich species, and hence the magnitude of this second source of uncertainty, with a view to providing an example at the November meeting of how the approach can be applied to calculate scientific buffers.

The SSC concurs with the need to revisit the OFL and ABC values for: (a) species with ABCs computed by multiplying survey swept-area biomass estimates by $0.75*M$, (b) Restrepo’s method of computing 50% of the average catch over a period of years when catches are stable, and (c) species complexes that are aggregates of single species. This task will need to be completed at the March 2010 meeting and may involve a special meeting of the SSC groundfish subcommittee in early 2010.

The SSC notes that it has focused its attention on approaches for determining scientific uncertainty and calculating scientific buffers, given a measure of scientific uncertainty and a choice for P^*. The SSC expects that the Council will choose values of P^* for each tier level; the SSC is willing to work with Council staff to develop tools to illustrate the trade-offs between the probability of overfishing and the size of scientific buffers.

Finally, the SSC notes that it is in the somewhat unusual role of developing methods and also reviewing them. However, methods development has occurred primarily by members of the groundfish and CPS subcommittee and additional review can be provided by SSC members who are not on these subcommittees. The methodology will likely be presented at the National SSC meeting in November, and further review of the methods will also occur as part of the review of the EA.

SSC Groundfish and CPS Subcommittee Report on Implementation of National Standard 1 for West Coast Groundfish and Coastal Pelagic Species.

September 1-2, 2009 Seattle, WA

Background:

The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (MSRA) established several new fishery management provisions pertaining to National Standard 1 (NS1) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which states, "Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each fishery for the United States fishing industry." On January 16, 2009, the National Marine Fisheries Service (NMFS) published a final rule in the Federal Register to amend the guidelines for NS1 that provide guidance to the Councils in revising their Fisheries Management Plans (FMPs) to conform to the new MSRA requirements.

The MSRA and amended NMFS guidelines introduce new fishery management concepts including overfishing levels (OFLs), annual catch limits (ACLs), annual catch targets (ACTs), and accountability measures (AMs) that are designed to better account for scientific and management uncertainty and to prevent overfishing. These important aspects of the MSRA are required to be implemented by 2011 for most species and by 2010 for those species designated as being subject to overfishing. A new definition and control rules for specifying an Acceptable Biological Catch (ABC) which, under the new NS1 guidelines, factors scientific uncertainty into the specification, will likely take considerably more thought.

The Council decided to framework these guidelines in its groundfish and coastal pelagic FMPs under an ambitious amendment schedule targeting the November, 2009 Council meeting to synchronize with the groundfish biennial specifications process which starts at that meeting. The Scientific and Statistical Committee (SSC) provided a conceptual framework in April for factoring scientific uncertainty in the ABC rule for stocks with a history of multiple assessments. They recommended quantifying variability in assessment outcomes as a basis for evaluating the size of a scientific uncertainty buffer (i.e., the difference in yield between the OFL and the ABC) and the risk of overfishing the stock. The SSC and Council staff will also coordinate development of ABC control rules to synchronize with the 2011-12 biennial specifications process. Development of ABC control rules and ACL considerations for target and overfished species will be prioritized, with unassessed species as the next priority. The Council asked for ABC control rules that are based on relatively simple and understandable metrics.

Considerations:

The Groundfish and Coastal Pelagic Species (CPS) subcommittees of the Pacific Fisheries Management Council's (PFMC's) Scientific and Statistical Committee (SSC) met in Seattle Washington on September 1-2, 2009 to discuss implementation of the NMFS guidelines under the Council process, and particularly how to implement the scientific uncertainty buffer which defines the difference between OFL and ABC.

Dr. Richard Methot presented the NOAA Fisheries Office of Science and Technology view on how ABC, ACL and ACTs will relate to OFLs under the new NS1 guidelines. All of these are expressed in terms of total catch (i.e. landings and discards combined), whether in biomass or numbers. The talk focused on incorporating scientific uncertainty to define the difference between the OFL and the ABC. Dr. Andre Punt presented methods considered for the Bering Sea and Aleutian Islands crab stock given uncertainty estimates.

The three general approaches to defining buffers for groundfish and CPS species considered were:

1. Create a Tier system whether the size of the buffer between the OFL and the ABC will the same for all species in each tier but differ among tiers; the size of the buffer would increase with increasing tier number (from well-assessed Tier 1 species up through increasingly data poor species).
2. Use P* (a probability of exceeding "true" OFL (the OFL level which would be defined given perfect information about the stock and the proxy SPR fishing rate)). This can include a tier system as above. The relationship between P* and the size of the buffer would be calculated using the Tier 1 (well assessed) species.
3. Use a decision-theoretic approach.

The meeting agreed that the decision-theoretic approach required too much information and was too complex to implement in the limited timeframe. It was also not clear that the example presented for crab was defining its objective in a way that reflects avoidance of overfishing. The meeting also noted that adopting approach 1 (fixed buffers by tier) would mean that species would differ a tier in terms of the probability of exceeding "true" OFL which adopting approach 2 (fixed P* by tier) would mean that species within a tier would differ in terms of the buffer applied.

The P* approach associated with a tier system appears the most appropriate approach at this time. One additional difficulty is that currently projections can only correctly estimate buffer for a single year forecast. While methods to approximate the correct buffer in multi-year forecasts were discussed, the subcommittees concluded that forecasting while using the buffer for the single year forecast for multiple years would be acceptable until appropriate multi-year forecasting software is developed.

Dr. Stephen Ralston presented a method for estimating historical between-assessment variability as one component of uncertainty to consider. The subcommittees agreed that this was a reasonable way to estimate uncertainty external to individual assessments. However, a number of improvements to the method were suggested, and further discussion of the method is needed prior to it being used. These suggestions include:

1. using only full assessments (or the most recent update of a full assessment in lieu of the full assessment itself);
2. limiting the time frame for comparison between assessments (certainly not considering the earliest periods which may generally reflect B_0, and perhaps more limited than that); and
3. not including early assessments that used considerably less sophisticated assessment methods, or which were severely data limited.

Dr. Ralston agreed to work on the method and to produce results for a larger suite of species using several approaches, while assessment authors and others would be tasked with producing the retrospective time series as well as the measures of uncertainty from the most recent assessments.

General Conclusions:

The SSC subcommittees propose the following method for determining the scientific uncertainty in OFL values: for species with successful assessments develop estimates of between (external) assessment uncertainty (using retrospective multi-species meta-analyses) and within (internal) assessment uncertainty (using asymptotic estimates of uncertainty) within individual assessments. For CPS stocks, consider grouping with groundfish or analyzing separately (the latter less likely to be successful due to the few assessed species within CPS).

The SSC subcommittees suggest providing the council with graphs of isopleths for the relationship of P* to buffer (proportion of catch) given internal and external variance estimates, using log-normal approximation (see figures 1 and 2 for examples) to aid in Council decision making. These figures could be annotated with lines denoting the internal assessment uncertainty.

While the P* values chosen by the Council will determine buffers for future assessments, there should be some flexibility for specific decisions about ABC within this framework to account for perceived unaccounted for of uncertainties. Given greater uncertainty with a greater number of forecast years, there is more incentive to do new assessments for species important to the fishery.

The SSC subcommittees suggest revisiting OFL and ABC values for species with ABCs defined via Roger's method of considering survey area swept biomass estimates and applying $F= 0.75*M$ or Restrepo's method of half of average catch over a period of years, and for species complexes which are made up largely of such species. Revisiting, updating and improving these methods, as well as examining uncertainty associated with them would be a key off-year science project. The results of the uncertainty examination will provide a stronger basis for developing buffers which are at least as risk-averse as those developed based on assessment uncertainty. Since OFL and ABC values for many data-poor species are based on analyses that have not been updated for some time, consideration should be given to establishing an additional buffer that reflects the timeliness of the information used to establish the OFL and ABC values.

There are species for which only one full assessment has been conducted. The buffer for these species will also be computed using the outcome of the further application of Ralston's method.

For many species within complexes, discard, often from fisheries without observers, is the largest component of catch which may therefore be poorly known. For those species with low vulnerability due to closures and other fishery management actions, this may be of little concern in the near term.

The SSC subcommittees note that vulnerability scores would affect ACLs rather than ABCs, and factors such as in-season tracking issues would affect ACTs. Since being in the precautionary zone of relative spawning output is in a sense an indication of increased vulnerability, the 40-10 rule and similar catch-reduction rules could be applied to ABCs as part of the determination of the ACLs.

Finally, the SSC subcommittees note that any system for defining scientific uncertainty is necessarily approximate. Specifically, although the method outlines attempt to capture all quantifiable scientific uncertainty, there are sources of uncertainty (e.g. caused by climate change, stock structure uncertainty, the validity of F_{MSY} proxies, etc.) which cannot be addressed at present (and probably not in the foreseeable future). Many of these sources of uncertainty should be more important on a longer time-scale.

Near-term Approach:
The following stock assessment authors and Council Staff will be asked to provide retrospective assessment time series as well as biomass CV's from the most recent assessments and a description of parameters estimated or fixed within those assessments to Steve Ralston by October 2, 2009:

- Jason Cope: Cabezon
- Paul Crone: Pacific mackerel
- John DeVore: Sablefish and Dover sole
- John Field: Chilipepper rockfish and Bocaccio
- Melissa Haltuch: Petrale sole
- Owen Hamel: Darkblotched rockfish, Pacific ocean perch, shortspine thornyhead and lingcod
- Xi He: Widow rockfish
- Kevin Hill: Pacific sardine
- Ian Stewart: Pacific hake and canary rockfish
- John Wallace: Yellowtail rockfish

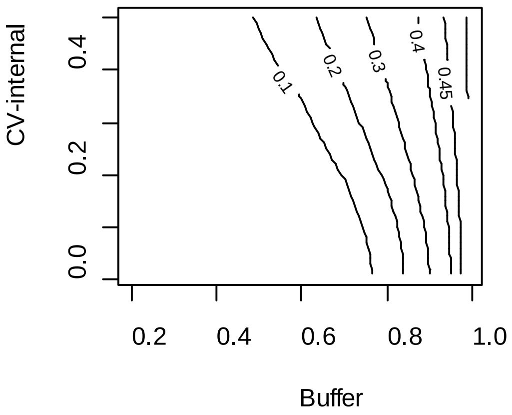
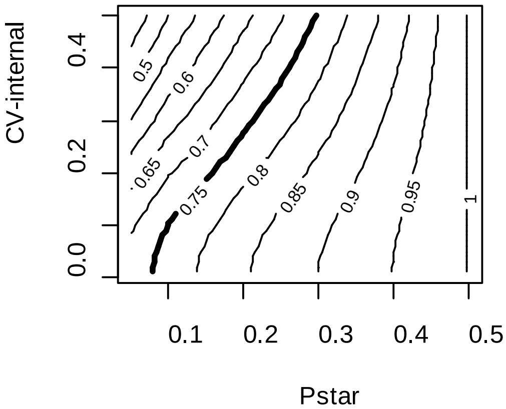


Figure 1. Isopleths of P* values associated with a buffer (Proportion that ABC is of OFL) and the internal (to the assessment) CV and the external CV (to be provided by Ralston's analysis). The value of P* is computed as the cumulative probability below the buffer for a lognormal distribution with median 1 and CV^2 given by the sum of the internal and extra variances.



CV-internal
0.0
0.2
0.4
0.1
0.2
0.3
0.4
0.5
Pstar
0.5
0.6
0.65
0.7
0.75
0.8
0.85
0.9
0.95
1