



New England Fishery Management Council

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To: Tom Nies, Executive Director
From: Scientific and Statistical Committee
Date: April 21, 2014

Subject: Use of multiple models in stock assessment and development of catch advice

On several occasions when commenting on terms of reference for stock assessments and developing catch advice, the SSC has recommended consideration of multiple models. The rationale for this recommendation is that a final model might be only marginally better in a statistical sense than other comparably plausible models, and dismissing those other models can mean loss of useful information. However, the SSC has previously not provided detailed guidance on how multiple models should be utilized for different objectives, including estimation of reference points and status determination, and evaluation of uncertainty and development of catch advice. Therefore, the SSC began a process to develop more detailed guidance.

An ad hoc sub-group of SSC members compiled background literature and prepared several presentations to initiate a discussion of this issue at the March 2014 meeting. The SSC recognized that the complexity of the issue meant several meetings will likely be needed to develop and revise recommendations.

Alternative plausible models that corroborate the final model should increase confidence in the outcomes and reduce uncertainty, thereby changing perceptions of risk. On the other hand, alternative plausible models at odds with the final model provide additional information on the magnitude of uncertainty and risk. However, when only a single model is considered and opposing perceptions are therefore not known, it is possible to develop a false sense of confidence and higher risk tolerance than when contrasting models are considered. Using multiple models provides more information, not less, which should be recognize and accounted for in generating catch advice.

Currently, the SAW/SARC process urges work groups and review panels to arrive at a single consensus model for estimation of reference points and status determination. The SSC see the benefits of this approach in terms of avoiding ambiguity, and is supportive of the objective. However, the SSC does not feel this outcome should be required, and in those instances when two or more models cannot be meaningfully distinguished, multiple models should be moved forward. At present, we lack clear guidance for how to utilize outcomes of multiple models, procedures need to be determined soon in light of this advice. Development of catch advice using the outcomes of the SAW55 Gulf of Maine cod assessment illustrated some of these difficulties.

In those instances when a single consensus model can be selected, the SSC still sees value in summarizing and conveying the outcomes of other plausible models that were considered but rejected. That information can help characterize uncertainty and gauge risk. The assessment process currently considered dozens, and perhaps hundreds, of model permutations, including entirely

different types of models and different configurations of a given type. Since that work is already taking place, the SSC sees potential for that information to be more effectively summarized and communicated without imposing undue additional burden on the assessment process.

Ultimately, the SSC concluded that consideration of multiple models can and should better inform development of catch advice. However, this approach also entails important challenges that need to be better resolved. Therefore, the SSC plans to continue discussions among the ad hoc sub-group formed to prepare for this agenda item, with the aim of developing more detailed guidance for review by the whole SSC at a later date. The SSC plans to request that time be allocated at a future SSC meeting for that review.

Summary of recommendations

- 1. An ad hoc SSC sub-group will continue to develop more detailed proposals for use of multiple models. The SSC plans to request time at a future meeting to review those recommendations.**