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New England Fishery Management Council

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To: Paul J. Howard, Executive Director
From: Dr. Steve Cadrin, Chairman, Scientific and Statistical Committee
Date: March 30, 2009

Subject: Monkfish Amt. 5 – Methods for Determining Annual Catch Limits

The SSC was asked to review the Monkfish Plan Development Team's proposed methods for determining Annual Catch Limits according to three terms of reference:

1. *Review and provide guidance on the PDT's approach to setting reference points, including MSY, OFL, ABC and ACL. In particular, the Council seeks SSC input on consideration of scientific uncertainty in setting the ABC and ACL.*
2. *Review and provide guidance on the use of proactive and reactive accountability measures. In particular, the Council seeks SSC input on consideration of management uncertainty in setting the AMs.*
 - a. *Proactive AMs – The Council is considering use of Annual Catch Targets (ACT) and Target Total Allowable Landings (TTAL) as proactive AMs. The Council seeks input from the SSC concerning the two methods for establishing ACTs proposed by the PDT that utilize different approaches for considering management uncertainty.*
 - b. *Reactive AMs - Council could include in-season actions to be taken to prevent the ACL from being exceeded, and/or post-season actions in the event of an ACL overage. The Council seeks SSC input on what types of reactive AMs would be appropriate for consideration.*
3. *The Council seeks the SSC's guidance on an appropriate and reasonable range of assessment results that could be used to address the issue of the timing of the assessment. Since the terminal year of the last stock assessment was 2006, since short-term projections are not technically feasible, and since another assessment is scheduled for mid-2010, about the time the Council will be submitting Amendment 5, it is considering adopting a set of control rules for establishing the values associated with the various reference points and catch targets that will automatically update when the assessment is completed.*

On March 17 2009, the SSC reviewed the Council request, presentations by the Monkfish Plan Development Team, and seven background documents:

1. Initial Report of the Monkfish PDT to the NEFMC's Scientific and Statistical Committee
2. Haring, P., and Maguire, J.J., 2008. The monkfish fishery and its management in the northeastern USA. In: ICES Journal of Marine Science. 65: 1370-1379.
3. Northeast Data Poor Stocks Working Group. 2007. Monkfish Assessment Summary for 2007. Northeast Fisheries Science Center Reference Document 07-13.
4. Richards, R.A., Nitschke, P. C., and Sosebee, K. A.. 2008. Population biology of monkfish *Lophius Americanus*. In: ICES Journal of Marine Science. 65: 1291 -1305.

5. Northeast Data Poor Stocks Working Group. 2007. Monkfish Assessment Report for 2007. Northeast Fisheries Science Center Reference Document 07-21.
6. Presentation - Initial Report of the Monkfish PDT to the NEFMC's Scientific and Statistical Committee
7. Presentation – Monkfish Assessment Summary

The background information, general approach and details of the PDT's proposal were reviewed and discussed. The SSC developed consensus recommendations for the Council on methods for determining Overfishing Level of catch (OFL), interim methods for deriving Acceptable Biological Catch (ABC) and provide input on the Annual Catch Target (ACT) and accountability.

The 2007 Data Poor Stocks Workshop advanced the monkfish stock assessment as a basis for fishery management by developing an analytical model (Statistical Catch At Length, SCALE) that synthesizes all recent information available on the fishery and the resource (catch data, survey data, size distributions and life history). However, substantial sources of uncertainty remain in the SCALE analysis. Although the DPSW accepted the model to estimate stock size and fishing mortality, it was not a reliable basis to determine conventional MSY reference points. Yield-per-recruit was used to derive F_{max} as a proxy for F_{MSY} , and the average estimated biomass during the assessment time series was used as a data-poor proxy for B_{MSY} . The SSC recognizes the uncertainties described in the DPSW report (natural mortality rate, growth rate, magnitude of discards, uncertain survey indices, under-reported historical catch, and a short assessment series). The SCALE model was also not considered to be a suitable basis for projection by the DPSW; as stated in the 2007 assessment summary, "Further work is necessary to develop a complete forecasting approach." These uncertainties influence both components of OFL: the F_{MSY} proxy and stock biomass projections. Therefore, the SSC concludes that the information currently available for monkfish does not support a conventional approach to determining OFL and ABC as provided in National Standard 1 guidelines.

In lieu of a method that conforms to NS1 guidelines, the SSC recommends an interim method for determining ABC based on the product of the average exploitation rate during the recent period of stable or increasing trend in biomass in both management units and the most recent estimate or index of exploitable biomass. The data-poor default method for determining an interim ABC produces catch advice that is substantially less than the nominal OFL, but is not directly associated with overfishing (i.e., it is not directly based on OFL and its uncertainty).

Nominal estimates of OFL (derived from F_{max} and estimates of 2006 exploitable biomass from the SCALE model) are approximately 23,000mt for the northern management unit and 28,000mt for the southern management unit. Next month, Monkfish PDT will prepare analyses for an ABC recommendation by the SSC. As an example of results from the proposed ABC method, the product of exploitable biomass and mean exploitation rates since 1997 in the north, and since 1999 in the south applied to the most recent estimate of exploitable biomass produces an ABC of approximately 18,000mt for the north (78% of OFL) and 15,000mt for the south (52% of OFL). Although the interim ABCs are not derived as a function of scientific uncertainty, the resulting reductions from OFL are consistent with data-poor situations.

The PDT should apply projections of the assessment model to evaluate the consequences of these ABC scenarios in the short term to confirm that they maintain low probability of overfishing. Given the substantial uncertainties in the stock assessment, sensitivity analyses (e.g., alternative model

estimates that assume different values of natural mortality) may account for uncertainty in OFL more effectively than stochastic projection.

The PDT's proposal to define the annual catch limit (ACL) as equal to the ABC is consistent with the final guidelines to implementing National Standard 1. The buffer between ACL and ACT should account for management uncertainty, avoid exceeding the ACL and avoid reactive accountability measures. The magnitude of recent catch has low risk of exceeding the OFL or the proposed interim ABC. In 2006, total catch was 7,187mt in the north (32% of OFL) and 9,561mt in the south (34% of OFL). According to the PDT's estimate of 2007 landings and status quo discard rates, total catch in 2007 was approximately 5,400mt in the north (24% of OFL) and 8,800mt in the south (31% of OFL). Any reduction in the magnitude or rate of discards would reduce both scientific and management uncertainty.

SSC Recommendations:

- 1. The SSC endorses the proxy reference points for F_{MSY} and B_{MSY} as well as the estimate of stock size derived by the 2007 Data Poor Stocks Workshop. However, considerable uncertainties in the assessment model preclude its use to determine probability of exceeding the projected Overfishing Level of catch.**
- 2. An interim Acceptable Biological Catch should be derived as the product of the average exploitation rate during the recent period of stable or increasing trend in biomass for each management unit and the most recent estimate of exploitable biomass. Therefore, the method of determining ABC should be considered an interim proxy until Overfishing Level of Catch and its uncertainty can be projected.**
- 3. Catch targets should be less than the interim ABC to avoid reactive accountability measures.**