

Groundfish Science Review

Terms of Reference – 01/21/03

INTRODUCTION

This document presents terms of reference for peer review of the stock assessment and population dynamics science supporting the New England Fishery Management Council's (NEFMC's) Northeast Multispecies Fishery Management Plan (FMP). Specifically, the review will focus on three major terms of reference:

- Effects on the accuracy and present usefulness of trawl survey data due to uneven trawl warps and other recently-discovered gear-related trawl survey problems. These evaluations will be based on gear testing cruises and related workshops conducted during autumn 2002 as well as any other information available to the reviewers.
- Estimates of stock biomass and fishing mortality targets and thresholds for the complex of stocks comprising the groundfish resource, and,
- The adequacy of projections of stock rebuilding to achieve the biomass targets, consistent with time frames as mandated under the Sustainable Fisheries Act.

These three focus areas were originally proposed by the staff of the NEFMC. Specific comments appropriate to three terms of reference provide guidance to the review committee recognizing that reviewers are likely to be unfamiliar with the specifics of the Northeast Multispecies FMP and, the provisions of the Sustainable Fisheries Act. Overall, the terms of reference generally concentrate on the adequacy of the science currently available to support fishery management plan development.

For each subject area, a brief objective statement is provided to give an overall context for the terms of reference to the reviewers. Within these subject areas, specific questions are provided with the intent of providing a minimum set of questions to consider in formulating the group's responses. It is envisioned that the reviewers' responses will take the form of detailed reviews of the information and conclusions reached in the various supporting documents and verbal presentations made to the group, along with their own summaries and opinions regarding the adequacy of existing science in supporting fishery management decisions. The reviewers are encouraged to pay particular attention to alternative methods presented by independent experts, if any, in concluding whether the conclusions of the Report, or other approaches, represent the best science available.

TERMS OF REFERENCE

1. TRAWL SURVEY ISSUES AND INFLUENCE ON MANAGEMENT ADVICE

Considering the results of the Groundfish Assessment Review Meeting (GARM), subsequent results from experimental trawl comparisons, and other appropriate information, provide an evaluation of the significance of potential differences in trawl survey catchability resulting from recently-discovered survey gear problems on management advice for groundfish stocks managed under the Northeast Multispecies Fishery Management Plan.

In responding, reviewers should consider the following:

- A. Are conclusions regarding use of 2000-2002 trawl survey data adequately supported by analyses reported by the GARM? Were analyses sufficient to detect differences in survey catches arising from unequal warps and other survey problems? Did the sensitivity analyses presented in the GARM report adequately bound the range of potential effects inferred from analyses of historical and comparative data? Did the GARM adequately characterize the uncertainties in estimated stock sizes and rebuilding mortality rates potentially arising from unequal warp offsets?
- B. Was the design and analysis of data from experimental trawl comparisons adequate to estimate the magnitude of differences resulting from the use of unequal trawl warps and other experimental treatments? Were estimates of the power of these experiments to detect statistical differences in fish catches between treatment and control survey configurations adequately described?
- C. Advise on the significance of differences in species composition and relative catch rates resulting from side-by-side tows performed by commercial and government vessels in the recent trawl experiment with respect to model- and index-based estimates of stock size and fishing mortality rates.
- D. Comment on the precision of model-based calculations of stock size and fishing mortality rates in relation to variability in trawl survey catches and other sources of information included in assessments. Are the methods used for incorporating uncertainty into management advice sufficient? How should other sources of uncertainty (e.g., model selection, estimates of total removals) be incorporated?

2. BIOLOGICAL REFERENCE POINTS

Review the fishing mortality and biomass targets and thresholds established for the 20 groundfish stocks included in the Northeast Multispecies FMP. Consider the adequacy of technical analyses supporting estimates of F_{MSY} , B_{MSY} or their proxies, as provided in the *Report of the Working Group on Re-Estimation of Biological Reference Points for New England Groundfish Stocks (the “Report”)*. Comment on issues related to the simultaneous achievement of B_{MSY} values for the groundfish complex.

In responding, reviewers should consider the following. Of particular note, the NEFMC’s Science and Statistical Committee recommended that additional work was needed “...specifically to explore the implications of the uncertainty in the stock recruitment relationship.” For this reason, more specific questions are included in order to add clarity to the issues to be addressed by the reviewers.

- A. Comment on the technical basis for the estimation of F_{MSY} and B_{MSY} , and choices regarding the use of parametric (Beverton-Holt, Ricker, other candidate models, etc.) and non-parametric stock-recruitment relationships applied to yield per recruit estimates, surplus production models, or proxies for biomass and fishing mortality rate targets and thresholds.
- Are the Working Group assumptions (growth, maturity ogive, natural mortality, partial recruitment) appropriate for estimating a B_{MSY} proxy, which establishes a minimum biomass threshold and a rebuilding target?
 - Comment with reference to specific species on whether the use of Beverton-Holt type stock-recruitment curves, as opposed to the use of dome-shaped (Ricker type) curves, represent reasonable scientific judgment employing sound methodology and appropriate data sources. Is there a theoretical or practical basis to detect overcompensation (Ricker curve) from the stock-recruitment curve for each groundfish species based on the magnitude of the intrinsic rate of population increase (r) and the carrying capacity (K) parameter estimates from ASPIC production models?
 - Could alternative non-equilibrium production models for groundfish species be examined for estimating F_{MSY} and B_{MSY} thresholds?
- B. Comment on the justification for changing the overfishing threshold to $F_{40\%}$ (the proposed proxy for most groundfish stocks) from $F_{20\%}$ that generally defined overfishing before Amendment 9, or from the F_{MSY} estimates in Amendment 9? Are the proposed proxies for F_{MSY} (e.g., $F_{40\% \text{ MSP}}$ for Georges Bank haddock, $F_{50\% \text{ MSP}}$ for Acadian redfish, etc.) more appropriate to achieve MSY, given the groundfish stock dynamics? Are the proposed proxy reference points overly conservative or too liberal for a fishing mortality threshold that complies with the Magnuson-Stevens Act?
- Reconstruction of the theoretical S-R curve can be done indirectly for each groundfish species by merging results (YPR, SSB/R) from the Thompson-Bell yield-per-recruit model and expected equilibrium yield (mt) from various stock production models. Are the resulting F_{MSY} values similar to the $F_{40\%}$ values (e.g. for haddock) from the Y/R curve? Is $F_{40\%}$ a suitable proxy for F_{MSY} under these conditions?

- C. Evaluate evidence for density-dependent regulation of population size (e.g., simultaneous occurrence of various stocks at higher population sizes, predator-prey, and growth rate information) for the groundfish complex. Are potential non-stationary stock dynamic processes (i.e., environmental variations in recruitment survival) and/or trophic limitations adequately accounted for in estimates of B_{MSY} ? Is there evidence that B_{MSY} values estimated for the 20 groundfish stocks cannot be simultaneously achieved?

3. STOCK REBUILDING AND RELATED PROJECTIONS

The Sustainable Fisheries Act requires that various resources be rebuilt to B_{MSY} in no more than 10 years, unless life history attributes of individual stocks dictate a longer rebuilding period (e.g., Georges Bank cod, Acadian redbfish, etc.). Considering the uncertainty in stock dynamics and the ability to achieve target rebuilding fishing mortality rates for all stocks in the complex simultaneously, comment on stock projection methodology used to advise on management strategies intended to achieve stock rebuilding goals.

In responding, reviewers should consider the following:

- A. Evaluate the adequacy of projection methods used to guide the attainment of B_{MSY} , specifically focusing on estimates of uncertainty in starting stock sizes, recruitment, and implementation uncertainty in the attainment of target fishing mortality rates. Comment on potential biases and precision of stock projection methodologies.
- B. Are stock projection methodologies sufficient to distinguish the relative merits of various management scenarios?
- C. The Magnuson-Stevens Act requires that overfished stocks be rebuilt to a biomass level consistent with producing the maximum sustainable yield from the fishery. Is there a scientific basis for arguing that an intermediate biomass target meets that requirement?

