12/14/2017 Review of Atlantic Halibut Assessment

An ad hoc subcommittee of the Scientific and Statistical Committee reviewed the Halibut Assessment Report for 2017 prepared by Dr. Paul J. Rago *for the* New England Fishery Management Council. The draft reviewed by the Review Panel was dated 1 December 2017.

The Review Panel comprised Jeremy Collie (Chair), Steven Cadrin, and Chris Legault. The Panel met by conference call on 14 December 2017 to review the Assessment Report and address the Terms of Reference. In additional to the Review Panel, participants on the conference call included Jason McNamee (SSC Chair), and members of the Council, NEFSC staff, and PDT members.

Terms of Reference were adopted from the standard ToRs for Operational Assessments[a]. They are provided in table form below with consensus responses from the Report author and Review Panel. The Review Panel summarized its findings in a bulleted list:

- The First and Second Derivative (FDS) approach is the best scientific information available with which to base catch advice for the US stock of Atlantic halibut.

- The FSD approach is scientifically valid as a basis for catch advice (i.e., to determine an ABC). Performance of the FDS method for setting catch limits was tested by simulation on known data and by comparison with two other halibut stocks with age-structured assessments. Simulation results suggest that this control rule can provide reasonable catch advice when productivity is changing temporally.

- Application of the FSD method to the US stock area requires several choices, including which indices to include, the number of years over which to calculate slopes, and the gains to apply to the first (***Kp***) and second (***Kd***) derivatives. These choices are explored and justified in the Assessment Report.

- Catch advice is based on harvest control rule parameters ***Kp***=0.75 (recent catch is adjusted by 75% of the perceived rate of change) and ***Kd***=0.5 (relative weight of 50% for the second derivative's impact on catch advice). The review panel noted that the choice of ***Kp***=0.75 is analogous to setting the ABC at 75% of OFL in the sense that 75% of the apparent increase in relative abundance is applied to the catch ratio. Bootstrap analyses of the model forecasts suggest an 80% confidence interval of 109 to 138 mt and median of 123 mt for 2018. Note that this could change based on updated runs.

- Simulation runs estimated the frequency of overfishing. This simulation framework could potentially be extended to specify OFL, but this requires further work.

- The choice of relative abundance indices to include was constrained by the guidelines on Operational Assessments[a]. The inclusion of discard-to-kept-all (d/k) indices was justified by the Report author on the basis that the discard information is already included in the stock assessment. The Review Panel questioned whether the d/k ratio provides an unbiased measure of halibut abundance, given that some of the variation could be due to variation in the catch rates of the other species (i.e. in the denominator k) and the potential impact of management measures on discard rates. However, alternative standardizations based on discards per trip or discards per day fished (Fig. 5) and including retained halibut (e.g., t/k) had very similar temporal patterns, alleviating concerns with the d/k ratio. Future halibut assessments need to evaluate the available relative abundance indices more systematically.

- Stock Status: Based on the information reviewed, the Panel recommends that the stock be classified as overfished, but overfishing status unknown.

- Research recommendations for a future assessment:

  - Stock structure – investigate the stock identity of the US stock with respect to the Canadian Atlantic halibut stock.
  - Data-limited size-based approaches may be possible as more length-frequency samples become available.

- The sensitivity of catch projections to assumptions about discard mortality was investigated. Assumptions about discard mortality do not affect the catch quota estimated with FSD as long as the balance of landings among gear types remains constant. However, if the balance of discards shifts to a less lethal gear, there may be some room for increased landings or less penalty for discards (Page 29). Future assessment should consider gear-specific discard rates for Atlantic halibut – especially for gillnets as these are based on dogfish. The assessment method, management allocations and catch monitoring should apply consistent assumptions about discard mortality.

- Updates requested to be provided as an addendum to the report:

  - Addition of Canadian catch and calculation of US discards with the "D2" approach.
  - Adjusted catch for gear-specific discard mortality rates of 76% for trawls, 30% for gillnets and 10% for hook gear.

a Source: **NRCC. 2011. A new process for assessment of managed fishery resources off the Northeastern United States. Internal Report.** With edits made by NEFSC on 6/16/2017.

b The Peer Review panel is asked to recommend what the stock status appears to be. NOAA Fisheries still has final responsibility for making the stock status determination based on best available scientific information.

c Model name abbreviations are: FSD First and Second Derivative, RYM Replacement Yield Model, and DCAC Depletion-Corrected Average Catch.

Term of Reference[a]	*Response*
1. Update all fishery-dependent data (landings, discards, catch-at-age, etc.) and all fishery-independent data (research survey information) used as inputs in the baseline model or in the last operational assessment.	Completed. Report Table 1 contains updated landing, discards, and survey indices. Table 1.5 adjusts the discard estimates by assumed discard mortality rates, by gear. These data are plotted in Figures 1,2,3, and 3.5. Appendices 1 and 4 provide more detail on the relative abundance indices.
2. Estimate fishing mortality and stock size for the current year, and update estimates of these parameters in previous years, if these have been revised.	Not available. This is a Plan B assessment. An attempt was made to apply the Depletion Corrected Average Catch (DCAC) model but the results were judged not credible because they relied on unverifiable assumptions. See Table 13. Figures 12-14.
3. Identify and quantify data and model uncertainty that can be considered for setting Acceptable Biological Catch limits.	A parametric bootstrapping method was developed to estimate the uncertainty of the Catch forecast based on the FSD[c] model. Inputs include the precision of the NEFSC bottom trawl survey biomass estimates and precision of the discard-to-kept-all ratio, derived from trips observed by NEFSC observers and at-sea monitors. See Appendix 1. Figure 21-22. Effects of alternative estimators of discards, accounting for potential survival of captured fish, is addressed. See Figures 28-29. Table 1.5
4. If appropriate, update the values of biological reference points (BRPs).	Not available. The BRPs for RYM[c] have been rejected. An attempt was made to use the DCAC[c] model for this purpose but the results were judged not credible because they relied on unverifiable assumptions.
5. Make a recommendation about current stock status (overfishing and overfished) with respect to updated status determination criteria[b].	Available data, previous judgements of peer review panels and recent literature on Atlantic halibut all suggest that abundance is low compared to historical values. Abundance may have peaked as early as the 1820s, nearly two centuries ago. Absent information that the stock has rebuilt, the overfished status from the 2015 Operational Assessment continues to hold. Fishing mortality could not be estimated. However, several lines of evidence suggest that the stock has increased about 3-fold in the last decade. (See Tables 8-10, and 12). See comments in TOR 8.
6. Perform short-term projections; compare results to rebuilding schedules.	The FSD method can be used to project catches for one year in advance. Longer-term projections are possible but rely on progressively less information about population trend and therefore have increasing uncertainty. See Figures 21, 22.

7. Comment on whether assessment diagnostics—or the availability of new types of assessment input data—indicate that a new assessment approach is warranted (i.e., referral to the research track).	The previous assessment model (RYM) was rejected at the 2015 Operational Assessment. This assessment proposes a new approach that relies on rates of change in one or more abundance indices to adjust catches annually. The proposed approach could be expanded to consider alternative measures of rates of change in relative abundance. Prospects for an age-structured analytical assessment in the near term are considered slim given the low landings, paucity of age data, uncertainty about stock structure, and lack of a dedicated survey to monitor a species with apparent low catchability in trawls.
8. Should the baseline model fail when applied in the operational assessment, provide guidance on how stock status[b] might be evaluated. In that guidance, include qualitative written statements about the condition of the stock that will help to inform NOAA Fisheries about stock status. Should an alternative assessment approach not be readily available, provide guidance on the type of scientific and management advice that can be.	The previous assessment approach was rejected at the 2015 Operational Assessment. This assessment utilizes the guidelines for a Plan B assessment described in NRCC 2011. Without a measure of scale (catchability), it is impossible to quantitatively define biomass status or fishing mortality. Available data, previous judgements of peer review panels and recent literature on Atlantic halibut all suggest that abundance is low compared with historical values. Abundance may have peaked as early as the 1820s, nearly two centuries ago. Despite apparent increases in relative abundance in recent years, there are no compelling data to refute previous conclusions that the stock is overfished. Increases in relative abundance over the past decade for US stock area are consistent with trends in the much larger Canadian stock. The DFO assessment uses an analytical model, which suggests that fishing mortality rates have been low during this period of increase. Such considerations support the notion that fishing mortality rates in the US have been sufficiently low to allow population growth. Canada does not use the same definitions as the US for overfishing, but the similarities between their respective trends would lead to a tentative conclusion that overfishing is not occurring.