

**Centre for Independent Experts
University of Miami**

**Independent Experts Report of the Groundfish Assessment Review Meeting
Woods Hole 8 – 11 October 2002**

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Executive summary

The Groundfish Assessment Review Meeting (GARM) took place in Woods Hole on the 8 – 11 October 2002. The meeting peer reviewed stock assessments for 20 Northeast USA groundfish species.

The GARM meeting was competently chaired, organised, and supported by NEFSC staff. All of its terms of reference were addressed within the limited time available. Assessment co-ordinators were prepared for the meeting and presentations of data and model results were well structured. The ability, attitude, and team-work demonstrated by the meeting participants was of a comparable, high standard to the better quality assessment meetings that I have attended within the International Commission for the Exploration of the Sea (ICES), Canada, and the North Atlantic Fisheries Organisation (NAFO).

The procedures adopted for the assessment reviews follow similar protocols and standards to those used within ICES and NAFO. Each assessment was reviewed in detail, and suggestions and criticism were readily accepted and incorporated into the assessment models or taken forward within research recommendations.

The meeting was the most optimistic assessment meeting that I have attended. For the majority of stocks, fishing mortality has gradually been reduced and in response spawning stock biomass (SSB) is rebuilding.

Unfortunately, the trawl offset issue clouded what would otherwise have been a relatively straightforward assessment review. The attitude of the NEFSC staff to the data analysis required for resolving this issue was open-minded and thorough. The conclusion that there were limited or no effects of the offset on survey catch rates was robust to the type of analysis and the data sets used. Sensitivity tests of the assessments revealed that even if a substantial warp effect had not been detected by the statistical analysis, the conclusions that the stocks are currently being over-fished would not change.

Conduct of the meeting

Review

The meeting presentations and discussions were open and balanced, and sufficient time was allowed for each issue. It is unfortunate that the invitation to attend was not taken up by the fishing industry; this would have provided a useful opportunity for the industry to contribute to the process and add its experience on the state of the stocks.

The GARM meeting was well chaired and organised by Dr. Steve Murawski who, given the limited time available for the review of 20 stocks, kept the meeting on track and discussions relevant.

The GARM had high-quality background support from the NEFSC staff, prior to and during the meeting. Without this support, the meeting would have been considerably more difficult. The Web site and LAN set up for the meeting allowed rapid dissemination of information and results and both were extremely successful.

At the meeting, the assessment co-ordinators were well prepared. Suggestions and criticism were readily accepted and most of the additional work required by the GARM was completed during the evenings, after the meetings, in time for review the next day. The ability, attitude, and team-work demonstrated by the meeting participants was of a comparable, high, standard to the better quality assessment meetings that I have attended within ICES, Canada, and at NAFO.

The NEFSC Modelling Group provided invaluable support to the meeting on the issue of the trawl warp offset. The extraction and statistical analysis of the data used in the resolution of this issue required a substantial amount of effort by that group in a very short time period. Their input was much appreciated by the GARM and the external reviewers.

Recommendations

I have two minor criticisms that apply to the review procedure and logistics.

- I could have achieved more if I had earlier notice that the meeting was to take place. Reading of the papers and supporting documentation was carried out at short notice and more time to assimilate and link together the information would have been a distinct advantage.
- Although some of the important background documents were available on the Web site, many were not. Electronic versions of all the major texts referred to in the report should be accessible. This issue was raised during the meeting and will be addressed for the current report.

Data

Review

During recent years, there has been an increased pressure on the fishery to reduce fishing mortality. In general, this has led to high-grading and dumping when trip limits are exceeded. In some fisheries, the reduction in commercial landings has also led to the recreational fishery becoming a major proportion of the catch.

Data on the number of samples for length and age were presented at the meeting for each stock. The stock co-ordinators were aware that the level of sampling has been very low, and that this has created problems in the collation of assessment data sets. In recent years, the situation has improved as the level of sampling of the commercial catch has increased.

Recommendations

- The level of sampling of the commercial landings has increased in recent years and is described within the assessment texts as currently being "adequate". The magnitude of the error resulting from sampling should be enumerated annually.
- Calculations for the levels of random error associated with sampling for length and age distributions are routinely submitted to ICES Working Groups as part of a report on the quality and sources of the data being used for the assessment. This should be a routine part of the preparation of assessment data for the stocks examined by the GARM.
- In many cases, catch data are prorated from logbook information. If not currently available (there was no obvious reference in the stock assessment texts), a study of the levels of uncertainty that this raising procedure introduces to the catch data should be considered.
- The intensity of sampling of the discards and recreational landings does not appear to have been increased in line with their magnitude; consequently, increasing levels of uncertainty are associated with the assessment results.
- The retrospective patterns shown by the majority of the assessments, over-estimation of SSB, and under-estimation of F could be a direct result of under estimation of discard mortality.

The Review and Updating of Stock Assessments

Review

All of the assessment Terms of Reference for the GARM were covered. Assessment models were fitted to the updated survey and catch data and stock status determined for each of the stocks. The fitting procedures, model diagnostics, and results were discussed in detail, and the conclusions drawn about the stock dynamics are consistent with the model estimates and associated uncertainties.

Assessment co-ordinators were well prepared and organised. The presentations of data and model results were well structured. The procedures adopted for the assessment reviews follow similar protocols and standards to those used within ICES and NAFO. Each assessment was reviewed in detail and suggestions and criticism were readily accepted and incorporated into the assessment models or taken forward within research recommendations.

The age-based models that were applied to assess the recent stock dynamics are standard methods that are routinely used within other fisheries management institutions, and the review protocol adopted by the meeting was appropriate for those methods. The index based assessment methodology approach to the estimation stock status and reference points, that is being developed at the NEFSC, is more advanced than methods applied at other North Atlantic research and management organisations.

The potential influence of the trawl warp offset on model estimates was examined and discussed at all stages of the assessment process. Within each stock, the sensitivity of the assessments to the trawl warp issue was thoroughly explored in a consistent approach to the problem. The approach was discussed and developed prior to the meeting, which was a useful time saver.

Recommendations

- Single calibration series assessments were used by the GARM to examine the agreement between stock estimates derived from independent survey series. Caution is needed when applying this approach, in that the series should cover the whole age range and spatial distribution of the exploited fraction of the stock used in the assessment model. Discussions within the GARM showed that this issue was being addressed in the current approach and in the research recommendations.
- In only a limited number of cases were alternative model structures used to examine the robustness of the results to model structural uncertainty (e.g. VPA vs. ASPIC). Recent studies have shown that this uncertainty can be as significant as random errors about the assumed model. Given the uncertainty introduced to the assessment by the low levels of sampling in recent years, I would recommend a comparison with models that allow for uncertainty in the catch at age data.
- It was surprising that age based stock assessments were not being carried out for Gulf of Maine haddock and pollock. Ageing of these species is relatively straightforward. It should therefore be possible to construct age-based assessments even if only for recent short periods of time. Such models could be used to

evaluate growth over-fishing reference points for comparison with the index based analyses presented at the GARM.

- The level of mortality estimated for the Yellowtail stocks is very high for a flatfish species. This is especially the case for the Cape Cod stock, which is increasing under severe fishing pressure. A co-operative tagging study, carried out with the fishing industry, could provide valuable information on growth rates, ageing and stock identity. This information could help resolve this apparent anomaly.
- The bootstrap procedures used to derive confidence limits for F and SSB do not include all of the uncertainty in the assessment process. They are model conditioned and do not include errors in the catch data or retrospective bias. They are therefore under-estimates of the uncertainty in F and SSB. This problem is not unique to the GARM/Working Group models. It is a research area within fisheries science that is currently being actively explored. The GARM was up to date with the most recent thinking on these issues and its advice was given with regard to them.
- Further development of the index based assessment methodology should be encouraged, especially with regard to the estimation of the uncertainty associated with stock and reference point parameters.

Management Advice and Reference Points

Review

The GARM did not update any of the reference points established by the *Report of the Working Group on Re-Evaluation of Biological Reference Points for New England Groundfish*. For each stock, the recent dynamic history of the population and the fishery were discussed in detail in relation to the biomass and fishing mortality benchmark reference points. The sensitivity, of the stock status relative to reference point benchmarks, to the trawl warp issue was continually raised within the meeting and addressed using sensitivity analyses. The conclusion that the status of the stocks relative to management reference points is robust to the relatively minor changes in catchability that would have resulted from the trawl warp offset.

Recommendations

- At least two of the stocks for which the GARM provides management advice (pollock and Atlantic halibut) are not "closed" entities but are part of a much larger population complex. The units are not true stocks with negligible immigration and emigration, as required for a full understanding of the population and fishery dynamics. Whilst management of these stocks using reference points derived from the index method provides an indication of the relative exploitation status of the stock sub-unit, the stock dynamics could be controlled by events taking place outside of the management area, e.g. recruitment. As such, spawning stock and recruitment analyses and reference points for these stocks could be highly ambiguous. The GARM was aware of the problem and is monitoring the

situation. It is strongly recommended that the assessment and management of such stocks be addressed in spatial units that equate to the scale of their system dynamics.

- In some texts, B_{msy} is quoted when SSB values have been used for the determination of the reference point. Although the authors are aware of their meaning and glossaries are sometimes provided at the beginning of reports, if the reader is not aware of the potential for error or the text is extracted in isolation, this will lead to confusion and mistakes. It is strongly recommended that a common nomenclature is adopted for the SSB and biomass based reference points. This issue was discussed within the GARM and will be addressed.
- The majority of the stocks examined by the GARM are taken in mixed species fisheries. Changes in effort or TAC directed towards target species will influence the dynamics of other species. It was therefore surprising that the management advice was provided on a single stock basis without discussion of mixed fishery issues. F rebuild resulting in the recovery of one stock within the designated time frame may impose an indirect bycatch or discard mortality, on a second stock, that is too high for it to recover.

The Trawl Warp Issue

Review

The GARM was unanimous in its conclusion that that the magnitude of the trawl warp offset effect on survey catchability is relatively small relative to the natural and sampling variation inherent in all survey time series. Assessment results and the advice as to the state of the stock were shown to be robust to under-estimation bias at the level of the expected effects.

In my opinion, a level-headed and rigorous scientific analysis was applied to the trawl warp offset problem. Although the "gut feeling" of the participants was that there should be little or no effect, this was not allowed to influence the analysis or the interpretation of the results.

Numerous diverse data sets and methodologies were analysed in order to find an indication that the mis-marked trawl warps had had an effect on the catch rates from the surveys. These included trawl monitoring measurements, trawl damage indices, catch rates of species by depth, between and within survey series. In each case, the results of the analysis pointed to the conclusion that a reduction in survey catchability could not be detected during the period when the offset was present. This was not unexpected given the video evidence that the net was still fishing at the expected range of trawl offsets and that such offsets will fall within the natural variation induced by currents, wind and wave action, fishing on slopes, etc.

Sensitivity tests applied to the assessments revealed that even if a substantial (x2) effect were to be missed by the statistical data analysis, the conclusions that the stocks are being over-fished would not change.

Recommendations

- Although current statistical analysis have established that the trawl warp offset does not appear to have had a significant impact on the catchability of the survey series, this issue should not be closed after this GARM. It is my understanding that there are a series of experiments that will be conducted by the NEFSC and the fishing industry to examine the problem in more detail. The issue should therefore be placed on the agenda for next year's Working Groups and GARM.
- The detailed data analysis required for the resolution of the trawl warp offset issue has highlighted the importance of comparative towing calibration exercises when planning gear and ship alterations.

Documents reviewed

Historic

Brodziak, J., P. Rago, and R. Conser. 1998. A general approach for making short-term stochastic projections from an age-structured fisheries assessment model. In F. Funk, T. Quinn II, J. Heifetz, J. Ianelli, J. Powers, J. Schweigert, P. Sullivan, and C.-I. Zhang (Eds.), *Proceedings of the International Symposium on Fishery Stock Assessment Models for the 21st Century*. Alaska Sea Grant College Program, Univ. of Alaska, Fairbanks.

Mayo, R.K., E. Thunberg, S.E. Wigley and S.X. Cadrin. 2002. The 2001 Assessment of the Gulf of Maine cod stock. *Northeast Fish. Sci. Cent. Ref. Doc. 02-02*

NEFSC 2002. Working Group on Re-Evaluation of Biological Reference Points for New England Groundfish, . NMFS/NEFSC, Reference Document 02-04, 254p.

NEFSC (Northeast Fisheries Science Center). 2001. Assessment of 19 Northeast Groundfish Stocks through 2000. Northern Demersal and Southern Demersal Working Groups, Northeast Regional Stock Assessment Workshop. *Northeast Fish. Sci. Cent. Ref. Doc. 01-20*, 217p.

O'Brien, L. and N. J. Munroe 2001. Assessment of the Georges Bank cod stock for 2001. *Northeast Fish. Sci. Cent. Ref. Doc 01-10*, 126 p.

Stone, H. H Stock assessment of Georges Bank (5Zjmnh) Yellowtail Flounder for 2002 CSAS Research Document 2002/057

APPENDIX I

GARM Working documents

- A O'Brien L., N. J. Munroe, and L. Col. Georges Bank Cod.
- B Brodziak, J., M. Thompson, R. Brown, and N. Munroe. Georges Bank Haddock.
- C1 Legault, C. Georges Bank Yellowtail Flounder.
- C2 Legault, C. Georges Bank Yellowtail Flounder Sensitivities.
- D Cadrin, S. Southern New England Yellowtail Flounder.
- E Cadrin, S and J King. Cape Cod Yellowtail Flounder.
- F Mayo, R.K. and L. Col. Gulf of Maine Atlantic Cod Stock.
- G Wigley, S. E. Witch Flounder.
- H O'Brien, L., C.Esteves, and L. Col. American Plaice in the Gulf of Maine/Georges Bank Region.
- I Hendrickson, L. Georges Bank Winter Flounder
- J Terceiro, M. Southern New England/Mid-Atlantic Winter Flounder
- K Sosebee, K.A. Georges Bank/Gulf of Maine White Hake.
- L Mayo and L. Col. R.K. The 2002 Status of Pollock, *Pollachius virens* (L.) in NAFO Divisions 4VWX and Subareas 5 and 6.
- M Mayo R.K. and L. Col. The 2002 Status of Acadian Redfish, *Sebastes fasciatus* Storer in the Gulf of Maine-Georges Bank Region.
- N Wigley S. Ocean Pout
- O Hendrickson, L. Windowpane Flounder (Gulf of Maine-Georges Bank)
- P Hendrickson, L. Windowpane Flounder (Southern New England-Mid-Atlantic Bight)
- Q Cadrin, S. Mid Atlantic Yellowtail Flounder.
- R Brodziak, J. and M.Thompson Gulf of Maine Haddock.
- S Brodziak, J. Atlantic Halibut
- T Nitschke, P. Gulf of Maine Winter Flounder

- U Report of the NEFSC Methods Working Group. Evaluation of the potential effects of asymmetric trawl cables on R/V Albatross survey indices from 2000 to 2002.

APPENDIX II

STATEMENT OF WORK

Subcontract between the University of Miami and CEFAS (Dr. Chris Darby)

Groundfish Assessment Review Meeting

The purpose of requesting outside peer reviewers from the Center of Independent Experts (CIE) is to provide input to the Groundfish Assessment Review Meeting (GARM) for northeast USA stocks. The Northeast Multispecies Fishery Management Plan (Multispecies Plan) includes 20 groundfish stocks. The GARM meeting (scheduled for 8-11 October, 2002, in Woods Hole, Massachusetts), will provide scientific review of assessment information and ancillary analyses. The CIE reviewers are requested to provide input on assessment results and forecasts, and to help construct the final report of the meeting.

The GARM meeting is a regional process for updating stock assessments using existing models, VPA formulations, and other assessment approaches. Specifically, the GARM will:

- A. Provide updated catch information (landings and discards, where appropriate) for the 20 stocks to be assessed (see list below), catch-at-age data (estimated based on port sampling, where applicable);

Cod	Gulf of Maine Georges Bank
Haddock	Gulf of Maine Georges Bank
Yellowtail flounder	Georges Bank Cape Cod Southern New England Mid-Atlantic
Winter flounder	Gulf of Maine Georges Bank Southern New England
Acadian redfish	
American plaice	
Witch flounder	
Pollock	
Windowpane flounder	Northern Southern
White hake	
Ocean pout	
Atlantic halibut	

- B. Provide updated research vessel survey indices (through spring 2002) for all appropriate survey series, including NMFS spring and autumn series, Canadian series, and state surveys (as appropriate);
- C. Estimate fishing mortality rates (or appropriate proxies) for all 20 stocks (through 2001), and provide estimates of terminal year stock sizes;
- D. Evaluate stock status relative to applicable biological reference points (FMSY and BMSY) as provided in the Report of the Working Group on Re-Evaluation of Biological Reference Points for New England Groundfish (<http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0204/>);
- E. Provide updated estimates of F-Rebuild (the fishing mortality rate required to rebuild biomasses to BMSY by 2009) for all applicable stocks; and
- F. Comment on the potential sensitivity of assessment results to trawl warp marking discrepancies that occurred in surveys between spring 2000 and spring 2002.

Specific Responsibilities of the CIE Reviewer

The scientific expertise required is in the area of stock assessment and population dynamics.

The CIE reviewer's duties shall occupy no longer than 10 days: Several days prior to the GARM meeting for document review; four days to participate in the GARM meeting; one day following the GARM meeting to review the draft final workshop report; and several days to complete the report to be submitted to the CIE. No consensus opinion between the two CIE reviewers is sought.

Specific tasks and the schedule are itemized below.

1. Prepare for the GARM meeting by reviewing documents posted on the web prior to 8 October 2002.
2. Serve as active participant in the GARM meeting from 8-11 October 2002, providing input, comment, and scientific overview of analyses, and actively participate in drafting the final report and conclusions of the GARM.
3. Review the draft GARM report during the week of 14-18 October 2002, so that the NEFSC can meet the deadline for completion of the final document by 21 October 2002. The review comments should be provided to the Northeast Fisheries Science Center via Dr. Steven Murawski (508-495-2303, smurawsk@whsun1.wh.who.edu) no later than October 18, 2002.
4. No later than October 25, 2002, submit the written report¹ (see Annex I) addressed to the "University of Miami Independent System for Peer Review," and sent to

¹ The written report will undergo an internal CIE review before it is considered final. After completion, the CIE will create a PDF version of the written report that will be submitted to NMFS and the consultant.

Dr. David Die, via email to ddie@rsmas.miami.edu, and to Mr. Manoj Shivlani, via email to mshivlani@rsmas.miami.edu. This report shall include the comments provided under task 3 above.

ANNEX I: REPORT GENERATION AND PROCEDURAL ITEMS

1. The report shall be prefaced with an executive summary of findings and/or recommendations.
2. The main body of the report shall consist of a background, description of review activities, summary of findings, and conclusions/recommendations.
3. The report shall also include as separate appendices the bibliography of materials reviewed for the GARM and a copy of the statement of work.