Draft Report on the 2002 Assessment of Yelloweye Rockfish off the U.S. West Coast

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Draft Report on the 2002 Assessment of Yelloweye Rockfish off the U.S. West Coast

R.I.C.C. Francis

Prepared for

The Center for Independent Experts

University of Miami

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National Institute of Water & Atmospheric Research Ltd
301 Evans Bay Parade, Greta Point, Wellington
Private Bag 14901, Kilbirnie, Wellington, New Zealand
Phone +64-4-386 0300, Fax +64-4-386 0574
www.niwa.co.nz

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Reviewed by:

E.M. Poulter
Director, Operations

Approved for release by:

E.M. Poulter
Director, Operations

Formatting checked

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Executive Summary

The 2002 assessment of yelloweye rockfish off the U.S. west coast was reviewed by a Stock Assessment and Review (STAR) panel of the Pacific Fishery Management Council. The panel met 11-14 August 2002 at the Northwest Fisheries Science Center of NOAA/NMFS in Seattle. Although there are significant uncertainties (primarily relating to catch per unit effort (CPUE) data and stock structure), it seems clear that the yelloweye stock is substantially depleted. The assessment model used is of international standard, and the performance of the stock assessment team in presenting the assessment and responding to the STAR panel was excellent. Four areas in which the assessment might be improved are described.

The ten recommendations in this report are intended to:

– Improve the CPUE data (recommendations 1 and 2);

– Improve the error structures for age- and size-composition data; (3 and 4);

– Improve ageing-error assumptions (5);

– Include more uncertainty about the stock-recruit relationship (6);

– Ensure management measures are robust to uncertainty about stock structure (7);

– Improve the STAR process (8);

– Clarify the role of the Center for Independent Experts (CIE) reviewer (9);

– Improve documentation of assessments (10).

1. BACKGROUND

This report reviews the 2002 assessment of yelloweye rockfish off the U.S. west coast, at the request of the University of Miami (see Appendix 1). The author was provided with various documents (Appendix 2) and participated in the Stock Assessment and Review (STAR) panel of the Pacific Fishery Management Council (PFMC) which considered the assessment.

2. REVIEW ACTIVITIES

The STAR panel met 11-14 August 2002 at the Northwest Fisheries Science Center of NOAA/NMFS in Seattle. Those attending the meeting included:

STAR Panel Members

Dave Carlile, Alaska Department of Fish and Game
Chris Francis, National Institute of Water and Atmospheric Research, New Zealand
Han-Lin Lai, NOAA/NMFS Northwest Fisheries Science Center (Chair, SSC)

PFMC Committee Representatives

Brian Culver, Washington Department of Fish and Wildlife, representing the Groundfish Management Team
Rod Moore, West Coast Seafood Processors Association, representing the Groundfish Advisory Panel

STAT (Stock Assessment Team) Members

Rick Methot, NOAA/NMFS Northwest Fisheries Science Center
Kevin Piner, NOAA/NMFS Northwest Fisheries Science Center

Others

Ian Stewart, University of Washington
Rob Jones, NWIFC/GMT
Steve Joner, Makah Tribe
Allan Hicks

Rick Methot and Kevin Piner presented their preliminary assessment (item 1, Appendix 2) and additional material, including more details of the CPUE (catch per unit effort) data and analyses. The panel discussed this material and requested various changes in the analyses (Appendix 3). These changes were made, and modified analyses were presented and discussed. The STAR panel, with input from others present, drafted their report.

3. FINDINGS

I was impressed by this assessment and the way it was presented by the STAT. The size-based stock synthesis model used is consistent with international best practice in stock assessment, and includes a degree of complexity that is appropriate for the quantity and quality of available data. Features of the model that I found particularly appealing included the way ageing error was incorporated; the ability to allow selectivities to vary over time; and the re-estimation of the growth function to adjust for the effect of size selectivity. STAT members were always clear in their presentations, helpful in response to requests for clarification or further analyses, and deft in their use of visual aids. I found both the use of profiling and the exploration of different data emphases particularly helpful in understanding the role of the various data types and the robustness of the assessment.

I support the general finding of the assessment that the stock is substantially depleted. Despite some uncertainties associated with the data and model assumptions (see below), there is clearly sufficient evidence of this depletion to justify consideration of management action. It was notable that, although some quantities (e.g., the steepness of the spawner-recruit relationship) were not well estimated, the degree of depletion was relatively insensitive to some important uncertainties (natural mortality and the degree of emphasis on spawner-recruit deviation). An additional fact supporting the conclusion of substantial depletion is that yelloweye catches fell significantly, well before they were constrained, to any great extent, by management actions.

The assessment document presented to the panel before the meeting (item 1, Appendix 2) was far from complete and was not updated during the meeting. Thus it is not possible to comment on any greater detail of the conclusions of the assessment.

There were no significant areas of disagreement amongst those present during the STAR meeting.

3.1 Key areas of uncertainty

The main areas of uncertainty in the assessment concern CPUE and stock structure.

CPUE data are of fundamental importance in this assessment because this is the only data type which provides direct evidence of biomass trends. However, there is always doubt as to whether any fishery-derived CPUE series is proportional to abundance. Also, the data used were, in my view, rather weak, as CPUE data sets go (but I have no criticism of the way the data were analysed and entered into the model). The weakness of the data derives from, inter alia, the very limited amount of auxiliary information (e.g., no location, target species, or vessel size, and no fishing time — except in one state), and the relatively small part of the fishery that was covered (part of the sport fishery and none of the commercial fishery). The Oregon data available were aggregated by year, port, and month without any indication of how the data were compiled, or even the sample size in each cell. One potential recreational CPUE series, from MRFSS data, was not used because there was insufficient time to evaluate the data.

The baseline model assumed a single coast-wide stock and complete mixing. Given the apparently sedentary nature of the species, this is unrealistic. There may be some inter-generational mixing via larval dispersal, but very little is known about this and, in any case, it would have only limited effect because of the great longevity of yelloweye. Despite the implausibility of the stock-structure hypothesis the data allow very few alternatives. One alternative that was pursued was separate assessments by state, and also by adjacent pairs of states. In principle, one could introduce movement into the model — in the form of migration or diffusion — but there would be little point in this with the present data sets, which are unlikely to contain any useful information about movement.

3.2 Areas for possible improvement

I found four areas in which it might be possible to improve the assessment. None is serious enough to compromise the assessment.

The assumed error distributions for the size- and age-composition data could be improved (see Recommendation 3).

The combining of several small size or age samples from consecutive years is problematic. The intent — to use data that might otherwise be ignored — is laudable. However, I believe it would be better to enter these data as they are, but specify a realistic error structure for them (see Recommendation 3).

It is desirable that key assessment outputs have some associated measure of uncertainty (e.g., a standard error or confidence interval). This was provided for

model parameters via likelihood profiles. However, the profile approach doesn't work for derived quantities like depletion.

Given that the shape of the stock-recruitment curve is not well estimated, and that there is some evidence that recruitment in this region may be more dependent on the environment than on parental biomass, it would have been useful to have seen a model run without a stock-recruit relationship.

4. RECOMMENDATIONS

4.1 The assessment

1. The detailed Oregon sport catch and effort data, if they still exist, should be used in the next assessment (the current assessment was forced to use aggregated data without even sample size information).

2. The MRFSS recreational catch and effort data should be evaluated to see whether they could provide an additional CPUE series (because of time constraints the STAT considered it "prudent to exclude these data until further evaluation can be made").

3. Bootstrap resampling should be used to derive more appropriate error distributions for the size and age data. The aims of the resampling would be to determine: (a) whether the multinomial distribution provides a reasonable approximation for the error distribution for these data; (b) if so, what are the effective sample sizes; and (c) if not, what is the best alternative parametric form for the error distribution, and what are appropriate parameter values. The resampling could be carried using only the larger samples, but could be used to infer a sampling distribution for the smaller samples.

4. Small samples of size and age data should not be combined across years. They should be entered as they were collected, but with error distributions derived from the resampling work described in Recommendation 3.

5. The replicate ageing data (see Table 13 and Figure 10 in the 2001 assessment report) should be further analysed to check the ageing-error assumptions used in the assessment (which were the same as in 2001) and to obtain estimates of possible bias. When these data were briefly examined during the STAR process, there was some doubt as to whether the current ageing-error assumptions were correctly derived from them. This should be checked. Also, these data should be

used to estimate the likely extent of bias in the age estimates (it is apparent from the plotted data that at least one of the two sets of age estimates must be biased). The effect of this degree of bias could be estimated as a sensitivity analysis in the next yelloweye rockfish assessment.

6. Future assessments should include, as a sensitivity analysis, model runs without a stock-recruit relationship.

4.2 Other

7. As the stock structure of yelloweye is unclear, management measures should be designed to be suitable for all plausible structures.

8. The STAR process for yelloweye would have been more effective if the panel had been provided with a full assessment report before the meeting. I understand that this was an unusually hurried process, and I don't mean this to be a criticism of the STAT. However, with regard to the four terms of reference for STAR panels (see p. 5, item 4, Appendix 2) I note that the first ("reviewing draft stock assessment documents ...") was only very partially followed, and the fourth ("reviewing summaries of stock status ...") not at all.

9. The Statement of Work (Appendix 1) should clarify the reviewer's role in the STAR process. It was unclear to me whether I should consider myself a formal member of the STAR panel and a co-author of its report, or an independent reviewer. Having a contract with the CIE, rather than the PFMC, I was unsure as to my responsibilities with regard to the latter. I note that the PFMC guidelines (item 4, Appendix 2) refer to various parties to the STAR (e.g., NMFS, GMT, GAP, SSC, STAT) but make no mention of the CIE reviewer.

10. Stock assessments, including key data sources, should be thoroughly documented. Time was wasted during the panel meeting, and some questions were not resolved, because the CPUE data and analyses were not fully documented. This is important for any current assessment (so that the STAR panel is fully informed), and for future assessments (so that future panels don't waste time).

APPENDIX 1: Statement of Work

This appendix contains the Statement of Work that formed part of the consulting agreement between the University of Miami and the author.

General

The consultant will participate in the Stock Assessment and Review (STAR) Panel of the Pacific Fishery Management Council (PFMC) from August 11-14, 2002. The STAR panel will review the yelloweye rockfish.

The consultant's duties shall not exceed a maximum total of 14 days: Several days prior to the meeting for document review; the five-day meeting; and several days following the meeting to complete the written report. The report is to be based on the consultant's findings, and no consensus report shall be accepted.

The consultant will be provided with the most recent yelloweye rockfish assessment report and electronic copies of the data, parameters, and model used for the assessment (if requested).

Specific

1) *Become familiar with the current yelloweye rockfish stock assessment;*

2) *Understand the primary sources of uncertainty in the assessment;*

3) *Comment on the strengths and weaknesses of current approaches;*

4) *Recommend alternative model configurations or formulations as appropriate during the STAR panel;*

5) *No later than August 30, 2002, the consultant will submit the written report*[1] *addressed to the "University of Miami Independent System for Peer Review," and sent to Dr. David Die, via email to ddie@rsmas.miami.edu, and to Mr. Manoj Shivlani, via email to mshivlani@rsmas.miami.edu.*

Signed_____

Date_____

[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.

Annex I to Appendix 1: Report Generation And Procedural Items

1. *The report should be prefaced with an executive summary of findings and/or recommendations.*

2. *The main body of the report should consist of a background, description of review activities, summary of findings, conclusions/recommendations, and references.*

3. *The report should also include as separate appendices the bibliography of all materials provided and a copy of the statement of work.*

APPENDIX 2: Materials Provided

The author was provided with the following materials.

1. Methot, R.; Wallace, F.; Piner, K. (draft) Status of yelloweye rockfish off the U.S. west coast in 2001 [stet]. *An incomplete draft of the assessment report for 2002*.

2. Wallace, F.R. (2001) Status of yelloweye rockfish resource in 2002 for northern Californai and Oregon waters. Appendix to: Status of the Pacific Coast Groundfish Fishery Through 2001 and Recommended Catches for 2002. *The assessment report for 2001*.

3. Methot, R. (2000) Technical description of the stock synthesis assessment program. NOAA Technical Memorandum NMFS-NWFSC-43. *Description of the computer program used in the assessment.*

4. Anonymous (undated). Groundfish stock assessment and review process during 2002. *Goals and objectives of the STAR process, including the responsibilities of the various parties involved and terms of reference for the*

5. baseout.cvs. *A spreadsheet containing detailed output from the initial baseline run, and a later version for the final baseline run.*

APPENDIX 3: Changes Requested and Completed During STAR Panel Meeting

(extracted from the draft report of the Panel)

1. Analysis of Washington sport CPUE data

Because of the substantial number of zero catches observed, the panel requested the STAT team use the delta-GLM to re-analyze Washington sport CPUE data with year, month and port effects. The results revealed a more substantial decline of the predicted annual CPUE than the original GLM.

2. Analysis of Northern California sport CPUE data

Following the analysis in the 2001 stock assessment, analysis of Commercial-Passenger Fishing Vessel (CPFV) CPUE data was carried out by delta-GLM with year, month and port effects. Because data are sparsely distributed over the three factor-levels, the panel requested that the months be grouped into quarter, and ports into port groups (based on the likely fishing grounds for boats from a port group). Based on the advice of the GAP advisor and other knowledgeable sources, four port groups were formed along the California coast. During the exploratory data analyses, depth was found to be an important factor. CPUE information from depths less than 19 fathoms and greater than 100 fathoms were removed from the model. Yelloweye rockfish are rarely encountered in these depth strata and changes in sampling efforts within them over time could introduce bias into the CPUE index.

3. Sample sizes for size and age data

The panel requested that the assumed sample sizes for the size and age data be reduced. The model uses these sample sizes as an indication of how precise these data are, and thus how much emphasis to put on them. Initially, the sample sizes were set equal to the actual sample sizes. This is not appropriate because of the structure of these samples. Typically the fish in one sample come from just a few trips, and fish caught in the same trip tend to be more similar to each other - in size and age and age - than they are to fish from different trips. Thus the effective sample size is less than the actual sample size. The suggested procedure for reducing the sample sizes was seen as a temporary *ad hoc* solution. A better approach, using bootstrap resampling, is suggested below. [See Recommendations, above].

4. High California line catch in 1981

The high catch of the Southern California line+others fisheries in 1981 was primarily contributed from line fisheries. The STAT team investigated the data and concluded that there was no irregularity in this reported catch, and thus, has no reason to exclude it from the data. However, the stock assessment model assumed that there was no high catch prior to 1981 (because the model started from 1950). The panel requested that sensitivity analyses be conducted to evaluate the influence of possible high catches before 1981 in Southern California.