Darkblotched Rockfish

STAR Panel Meeting Report
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NOAA Fisheries
Northwest Fisheries Science Center
Seattle, Washington

STAR Panel:
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Overview

Darkblotched rockfish was most recently assessed in 2000 and then updated in 2003. It is assessed as a single stock ranging from California to the Canadian border. Darkblotched rockfish is a long-lived species and is difficult to age due to frequent check marks in the otoliths.

The assessment was presented by the author, Dr. Jean Rogers. As well as the draft assessment, the author's presentation and an addendum of additional runs were given to the Panel. Considerable care was given in the documentation to describe any changes from the 2003 model to the current one. Also, the slope survey abundance estimates were re-estimated using a new GLM post-stratification procedure (Helser et al. 2005)

The Panel accepted a base model for this resource and a decision table produced, wherein natural mortality was chosen as the dominant dimension of uncertainty. Because age estimation is unusually difficult for this resource, the range on M was broadened to qualitatively reflect this additional uncertainty. A description of the base model is given below. Quantitative estimates of the probability of the states of nature were not possible due to the base model specification.

Stock depletion at the start of 2005 is estimated to be 0.17 with an upward trend. As with many other west coast groundfish stocks, the 1999 yearclass is quite strong.

List of Analyses Requested by the STAR Panel

After the initial presentation of this assessment, the following suggestions came from the STAR panel for additional analysis and model runs.

1) *Profile M across model version C in Table 13 of the addendum*: This run was requested to get a better feeling for an appropriate value of M for this stock. Including the age data in the fit would help define M. There was some conflict in the data in that the total likelihoods favoured a higher M, although lower natural mortality values fit the age composition data better.

2) *Investigate the effect of assigning a selectivity for the foreign fishery based on the ascending limb of survey selectivity*: The survey selectivity would be more consistent with the tendency of the foreign fishery to use smaller mesh gear. Only a slight change was seen in results as only catch in 1966-68 is affected. Although a slight improvement to the fit resulted, it was decided to maintain the simpler base model.

3) *Profile on steepness*: The base model estimated steepness at the limit of 0.95, which is considerably higher than that for most other rockfish. The profiling did not produce any reason to choose a lower steepness, so 0.95 was retained in the base model.

4) *Halve the weight in the likelihood component for the length composition data*: As the length data were believed to be dominating the model's fit, resulting in growth

parameters that did not fit to the age data well, de-emphasising the length data was recommended to see how the other components would respond. Only an incremental effect was observed, which fit some survey data better. However, the original weighting was retained.

5) *Provide standardized residuals and stock-recruit curves*: The stock-recruit curve for the base case showed noise around the median and little curvature. Again this supported the retention of h = 0.95. Standardized residuals for the surveys appeared well behaved. Those for length frequencies did as well, although a few high residuals were seen.

6) *Produce a sensitivity run to discriminate between the impact of the new (GLM post-stratified) survey estimates on the AFSC and NWSFC surveys*: When the new model results were used for the AFSC survey alone, a considerable impact was noted. The Panel concluded that the shift to the GLM analysis of the survey data had a significant effect on model outputs. The Panel agreed the GLM standardization was an improved approach to using the NMFS survey data

7) *Re-sample survey data in SS2 to get a better insight into survey uncertainty*: This will require significant changes to SS2, and was postponed until a later time.

After reviewing the responses to the first set of requests, most of the rest of the week was spent trying to define a base model. To assist in that process the following two additional analyses were requested.

8) *Re-run the model with perturbations to the growth parameters. Also show a plot of the age-length data with the base model growth curve, bracketed by two trial curves*: As age and growth are considered to be a major source of uncertainty, try sensitivity runs with the L1 parameter perturbed up and down by 1 cm and the L40 parameter by 2.5. The higher growth rate fit the age data a bit better than the base model. The sensitivity was considerable and about equal to the magnitude of M, when it ranged from 0.05 to 0.09.

9) *Provide more information on aging problems, especially comparison of ages from a single reader*: This was done and it was concluded that these issues deserved future attention to try and make better use of age data collected prior to 2004.

Final Base Model Description

The final darkblotched rockfish base model that was accepted by the Panel included the following characteristics:

Data

Full catch history with discard estimates
AFSC survey (new GLM model) abundance index
NWFSC survey (new GLM model) abundance index
P.O.P. survey abundance index
Shelf survey abundance index

Fishery length frequencies
AFSC survey (new GLM model) length composition
NWFSC survey (new GLM model) length composition
P.O.P. survey length composition
Shelf survey length composition
Shelf survey age composition (2004)

Model

Beverton-Holt spawner- recruit relationship (***h*** estimated at 0.95)
Model starts in 1928
Recruitment deviations estimated for the period 1968-2003
Natural mortality (***M***) fixed at 0.07 yr^{-1}
CV of length-at-age fit in model as constant for all sexes and age (initial value 0.06)
Selectivities estimated for fishery and all surveys.

To evaluate uncertainty in the decision tables, M was ranged from 0.05 to 0.09. This is extended beyond the probable range in order to include some of the uncertainty in age estimates. Probabilities of unlikely, likely, and unlikely are given to the low, base and high states of nature in the decision table. They are based on a qualitative comparison to the other stocks reviewed by this Panel. Quantitative estimation using the Hessian from the base model was not possible because both M and h were fixed and the Hessian would considerably underestimate uncertainty.

Comments on the Technical Merits and/or Deficiencies in the Assessment

The Panel commends the STAT team for their cooperation during the meeting in conducting exploratory model runs and for providing good documentation of changes to the model since the last assessment.

The model was a standard SS2 formulation. However, the updated AFSC and NWFSC surveys were an important innovation for this assessment.

The principal deficiencies were related to the difficulty in aging and the poor fit of a von Bertalanffy growth model to the age data.

Explanation of Areas of Disagreement Regarding STAR Panel Recommendations

No areas of disagreement remained unresolved.

Unresolved Problems and Major Uncertainties

The aging issues mentioned above remain unresolved. Future work should evaluate the possibility of recovering useful information from age data collected prior to 2004. More attention also has to be given to the related problem of estimating natural mortality.

Prioritized Recommendations for Future Research and Data Collection

It is recommended that alternatives to von Bertalanffy growth be investigated. These could be represented as other parameterizations, non-parametric fits to the data, or even size-at-age vectors. SS2 should be generalized to alternative growth models.

An investigation into possible survey stratification based on "hot spots" would be of considerable interest. As well the abundance estimates, these locations also affected the length-frequency data, as hot spots had a preponderance of large fish. This initiative may help in subdividing the stock into more homogenous units and could have implications for assessment models.

More methods to estimate M should be tried with this stock. The related problem of aging also requires more attention before the next assessment. An attempt should be made to understand and correct the biases in the age data that were excluded in this assessment.

Formal recommendations for re-weighting and appropriate diagnostics to aid in re-weighting need to be developed. This recommendation is not specific to the stocks reviewed in this Panel, but is seen as a topic for general consideration.