Cabezon

STAR Panel Meeting Report
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NOAA Fisheries
Northwest Fisheries Science Center
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STAR Panel:
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Vivian Haist – Center for Independent Experts (outside reviewer)
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John DeVore – Groundfish Management Team (GMT) representative
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STAT Team:
Jason Cope – University of Washington

Overview

The STAR Panel (hereafter the Panel) reviewed the draft cabezon (*Scorpaenichthys marmoratus*) assessment report, dated May 2, 2005. This document presents the second quantitative assessment of the California cabezon resource, following the initial assessment conducted in 2003. The assessment addressed all recommendations made by the 2003 STAR panel, to the extent possible. This has resulted in some significant modifications to the analysis and data sources.

Major changes for the 2005 assessment include: (1) separate analyses for a northern California (NCS) and a southern California (SCS) sub-stock, (2) use of the new SS2 assessment model (rather than a cabezon-specific model), (3) extension and improvement of historical catch estimates, (4) exploration for evidence of fine-scale spatial structure, and (5) investigation of alternative abundance indices. The analysis separates catch into two commercial fishing fleets (live and non-live) and four recreational fishing fleets (man-made [piers and jetties], shore-based, Private Boat and Rental [PBR], and Commercial Passenger Fishing Vessels [CPFV]). The primary abundance index fitted by the model was the California CPFV logbook catch rate series, standardized through GLM analysis. Additional abundance indices that were investigated in the SCS or NCS model fits were: (1) a Monterey nearshore reef adult survey (NCS), (2) the TENERA nearshore benthic reef survey (NCS), (3) a Southern California Power Plant impingement index (SCS), and (5) a CalCOFI larval index.

A broad range of sensitivity analyses were conducted that adequately encompassed the key axes of uncertainty. These included: (1) uncertainty in the historic catch series, (2) uncertainty in natural mortality (M), (3) sensitivity to inclusion/exclusion of individual data series, (4) sensitivity to stock-recruitment parameters including steepness (h), recruitment variability (σ_r) and the years in which deviations were estimated, (5) sensitivity to the assumed variance of the length-frequency data (effective N), and (6) the estimated variance of length-at-age.

The Panel commended the high quality of the draft assessment, in particular the thorough and detailed investigation into uncertainties arising from model structure and data. The Panel thanked Jason Cope for his efforts to produce the additional requested runs and data analyses and his cooperation and assistance during the review process.

List of Analyses Requested by the STAR Panel

Discussion after the initial presentation of the cabezon assessment, and review of the results of sensitivity runs (Tables 17, 18, and 19 in the draft report), resulted in the Panel requesting additional analyses to address some particular issues. These were:

Issue 1: For the SCS cabezon sub-stock, exclusion of the 2000 mean catch weight data point for the *man-made* fleet decreased the high estimate for the 2000 year-class, which then significantly reduced the estimated 2004 spawning biomass. The Panel questioned

how inclusion/exclusion of this data point affected fits to the abundance indices and if there was support for this large year-class in other length data sets.

Results presented to the Panel showed that while removal of the 2000 *man-made* fleet mean weight data point slightly degraded the fit to the 1999 *man-made* fleet mean weight data point, it's removal had little impact on the other data sets. For the *PBR* fleet length frequency data, exclusion of the 2000 mean weight resulted in a better fit to the smallest length category in the 2002 observations and resulted in a poorer fit to the smaller length categories in the 2003 observation. That is, the 2002 *PBR* length data does not support the base case model estimate of the 2000 year-class but the 2003 *PBR* length data does support the estimate.

The Panel noted that the strong 2000 year-class was generally consistent with all the SCS cabezon data observations and also, that this is consistent with what has been seen in other west coast groundfish species. Thus, the Panel concluded the 2000 *man-made* fleet mean weight data point should remain in the base case model.

Issue 2: Of all sensitivity runs conducted for the NCS cabezon sub-stock, inclusion or exclusion of the TENERA scuba survey index had the greatest effect on the assessment and estimates of stock depletion. The initial base case model structure did not include this data because the survey represents only a small geographic area and because it is a SCUBA survey that may not consistently record the highly cryptic cabezon. The Panel requested additional model outputs showing fits to the TENERA data, other model data, and biomass trajectories when the model is fit with and without this abundance index. Also the Panel suggested that GLM analyses of the CPFV data, conducted by major port, would be useful to investigate if there is evidence for localized depletion of cabezon.

Model fits to the CPFV data did not show much difference in the fits with and without the TENERA data. The major influence in the TENERA data was in the longer cycle in the abundance trend. That is, inclusion of the data resulted in a smaller initial stock that is currently more depleted.

The port-specific GLM analyses of the CPFV data indicated distinct abundance trends in different localities. In particular, trends in Morro Bay and Monterey showed marked declines in the abundance index between the mid-1970s and mid-1990s. However, CPFV abundance trends in Half Moon Bay and at Big Sur did not show much decline over the 1960-2000 period.

The Panel agreed with the decision to exclude the TENERA data from the base case model structure. This data may be useful if more spatially disaggregated modelling is attempted for cabezon in the future, but localized abundance trends and concern with the consistency of a SCUBA survey limit its value in the current assessment model.

Issue 3: The base case "effective" sample sizes for length-frequency data were, in some instances, extremely large in one or two years (>1500). The concern was that these samples may have exerted too much influence in the model fit. A run that constrained sample sizes for all years within a data series (i.e., a fishery) to be equal, but that iteratively re-weighted the effective sample sizes among data series was requested.

Results showed little difference in the major parameters of management interest (e.g., depletion, terminal biomass). The initial biomass was slightly higher, but not enough to consider this an important sensitivity, or to cause concern with the base case run.

There was discussion about methods to weight "composition" data, given that a variety of methods are currently in use. In general, where there are large among-year differences in the number of samples taken, the actual differences may overestimate the relative precision of the data, although differences in sample size likely do affect precision. A workshop or other process to investigate appropriate weighting methods would be valuable.

Issue 4: Presentation of standardized length frequency residuals (Pearson residual) for the base case run was requested. The Panel wanted to see if the distribution of these were approximate standard normal and if there were extreme outliers.

The residual patterns looked fairly reasonable. That is, there were few extreme (< -4 or > 4) outliers. One very large residual was the result of a single 6 cm fish, which is considerable smaller than any other measured cabezon. This data point should perhaps be eliminated. Another sequence of larger residuals (for a single data set) may suggest down-weighting or removal of that data.

Issue 5: The panel requested a run based on a single sex model structure (single growth curve and natural mortality rate).

There was confusion about the purpose of this request, and as a results, the run that was completed addressed issues related to the reproductive contribution of male cabezon. A single-sex model with two growth morphs was run. This allowed calculation of a spawning stock biomass that included the contribution of male cabezon, and led to a discussion about the importance of nest-guarding male fish to the reproductive output of the stock, and how this might be measured. Future research directed to developing reproduction metrics that include the importance of nest-guarding males would be valuable.

Issue 6: Raggedness in the relationship between steepness and other measures (e.g., 2005 spawning stock biomass) suggested the model may be stopping at local minima. A few methods that might explore whether some of the minima were local were suggested (smaller steps in the steepness profile, starting the minimization from neighbouring steepness points, etc.).

Results indicated that the estimation had stopped at some local minima. This was not considered to be a major concern for this assessment. Rather it is useful to be aware that local minima issues exist. Documentation of local minima examples would be useful as there may be some generalizations about when they are more likely to be encountered. Profiles of model outputs such as likelihood values, depletion, and spawning biomass across values of a fundamental model parameter (steepness, sigmaR, M, etc.) may be a useful diagnostic to identify local minima issues.

Final Base Model Description

The author suggested the following list of issues requiring resolution to determine the cabezon base case runs: (Panel responses follow in bold)

Base Case Major Issues:

1) One stock or two sub-stock model: Two sub-stocks.
2) Which indices to include: As in the initial base cases (e.g., exclude TENERA survey).
3) Whether RecFIN converted weight data should be used as artificial lengths or mean weights: As in the initial base case (as mean unconverted weights).
4) Inclusion of 2000 mean-weight data point for man-made fleet: Include, but use as an axis of uncertainty for the SCS decision table.
5) Which years to estimate recruitment deviation: As in the initial base case.

The Panel supports the authors' decisions regarding all other aspects of the base case model structure and data. The Panel suggests the following regarding presentation of uncertainty in decision tables:

SCS sub-stock: Results from the base model indicate that depletion (spawning biomass in 2005 ÷ virgin spawning biomass) is estimated to be 28.3%. The strength of the 2000 year-class dominates the uncertainty in stock depletion and 2005 spawning stock biomass, so the Panel suggested it as an appropriate axis for representing uncertainty in current stock status. Variation in the size of the 2000 year-class and in stock depletion can be attained through alternative weighting of the 2000 mean-weight data point (e.g., adjust the CV of the data point). The Panel suggested using weightings that result in depletion levels of 0.2 and 0.35 to bracket uncertainty in the assessment. These depletion levels were based on the analytical estimates of the standard error of the depletion parameter (Hessian approximation at the MPD). The associated probability for the 0.2 depletion level was then twice the cumulative density (CDF) at a depletion of 0.2, where normal distribution was assumed. At the other end of the CDF, the probability associated with the 0.35 depletion level was 1 minus twice the cumulative density at 0.35 depletion.

NCS sub-stock: Base model results indicate that depletion is currently estimated to be 40.1%. Although inclusion/exclusion of the TENERA abundance index series had the largest influence on NCS depletion estimates, the assessment authors suggested, and the Panel concurred, the survey was not likely to be representative of the entire NCS sub-stock. Thus, the Panel suggested that uncertainty in the natural mortality rate would be a

useful axis to represent uncertainty for the NCS sub-stock (Female/Male natural mortality rates equal to: F0.2:M0.25, F0.25:M0.3 [base], and F0.3:M0.35). The selected natural mortality rates resulted in a range of estimated 2005 spawning stock biomass that were consistent with the uncertainty in that parameter estimated from the covariance matrix. The process for assigning probabilities to the different states of nature was the same as that used for the SCS sub-stock.

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

The process of analyzing data for the two California sub-stocks was a considerable improvement on the previous assessment. Using selectivity parameters from the NCS analysis in the SCS model fit was a credible way to deal with the missing data issues. A broad range of sensitivity analyses were conducted, encompassing both data and model structure uncertainty. So, while there is considerable uncertainty in the estimates of historic cabezon catch and this can't be improved, the effect of the uncertainty on the assessment is known.

Explanation of Areas of Disagreement Regarding STAR Panel Recommendations

There were no significant areas of disagreement.

Unresolved Problems and Major Uncertainties

There were no unresolved problems or issues with the current cabezon stock assessment.

Prioritized Recommendations for Future Research and Data Collection

Specific to cabezon assessment:

The Panel supports the research recommendations in the draft assessment document. In particular:

1) Continuation of the fishery independent surveys work in Morro Bay (nearshore trap survey and mark-recapture analysis), and if possible extension of this type of survey to other areas.
2) Sex-specific dynamics are likely important for cabezon. Research to investigate: (a) how best to model male reproductive contributions, and (b) the utility of color to distinguish sexes in catch sampling, would be useful.
3) Age and growth studies, in particular for the SCS sub-stock.

Additionally, the panel noted that while this is a council sponsored stock assessment, it deals on with nearshore California fisheries. If a full coastwide assessment cannot be completed in the future, the assessment document should minimally include summaries of fisheries statistics (e.g., landings, value, etc.) for the States of Oregon and Washington.

Generic for assessments:

In addition to the recommendations specific to the cabezon assessment, the Panel had a number of recommendations that were generic for all assessments. These were:

1) Decision table analysis – the expression of uncertainty for the SCS and the NCS decision table analyses was expressed in different ways. For the SCS uncertainty is conditioned on the size of the 2000 year-class, which results in large uncertainty in current depletion (0.20 to 0.35). For the NCS uncertainty is conditioned on the natural mortality rate, which introduces uncertainty in stock dynamics as well as current status. The Panel believes the different approaches were appropriate to capture key uncertainties in the two cabezon assessments, but suggests that more specific guidance on methods and approaches for bracketing uncertainty would be useful to panelists.
2) Fitting to composition data – the Panel suggests a workshop or other forum to investigate and provide guidance on (a) appropriate methods to determine effective sample sizes, (b) approaches to looking at and interpreting residual patterns, and (c) approaches to dealing with extreme outliers.
3) RecFIN data system – certain improvements to the RecFin data system, possibly the development of a research RecFIN data system, would improve the utility of this data source for stock assessments. Also, investigation of data collection and the data analysis procedures used in the early years of the program may help inform decisions related to the reliability of the data and improve the credibility of this data source.