Bocaccio Rockfish STAR Panel Report

National Marine Fisheries Service
SWFSC Santa Cruz

June 25-29, 2007

Reviewers:

David Sampson, Scientific and Statistical Committee Representative, Panel Chair
Patrick Cordue, Center for Independent Experts
Norman Hall, Center for Independent Experts
Kevin Piner, NOAA Fisheries Service, Southwest Fisheries Science Center

Advisors:

Gerry Richter, Groundfish Advisory Subpanel Representative
John DeVore, Groundfish Management Team Representative

STAT Team:

Alec D. MacCall, NOAA Fisheries Service, Southwest Fisheries Science Center, Fisheries Ecology Division.

Overview

A STAR Panel met June 25-29th in Santa Cruz, CA to review a full stock assessment for bocaccio rockfish. An update to the 2003 stock assessment was given to the Panel two weeks prior to the review, an earlier update having been produced in 2005. At the meeting the STAT provided the Panel two additional documents: a new draft assessment with additional diagnostics and a response to the 2003 and 2005 STAR Panel recommendations. The Panel and STAT discussed what objectives should be set for the meeting given that only an update, rather than a full assessment, was available. Two objectives were agreed: to examine the assessment under the Terms of Reference (TOR) for an update in order to provide advice to the SSC prior to their review of the update; and, to explore the assessment to provide guidance for the next full stock assessment. The Panel examined the TOR for an update assessment and advised the STAT that the document appeared to meet the requirements for an update. The Panel recommended that the catch history in the final update document be "refreshed" with recent CalCOM landings data.

The STAT and STAR Panel agreed to use the available time during the review to explore some aspects of the model beyond the constraints of an update assessment. The Panel worked with the STAT to develop a new reference run that differed in two respects from the accepted base model (from the 2003 assessment): the last three points in the two recreational CPUE abundance time series were dropped to eliminate tension in the model and a fixed steepness parameter was included in the spawner-recruit relationship (h=0.44). Runs with alternative but plausible values for the assumed historical equilibrium catch showed that the new reference model's estimates of depletion were sensitive to the assumed historical equilibrium catch but the estimated biomass trajectories were not. The species composition of catches suggested that the distribution of

recreational fishing, and thus selectivity, had changed in recent years. However, several analyses, completed to explore the reliability of the model's estimates of a strong 2003 year-class, provided evidence to counter concerns that the apparent strength of the year-class might be due to recent changes in selection by the recreational fishery.

Prior to the next assessment, which should be a full assessment, there should be a thorough review and evaluation of all input data and assumptions. Also, the new assessment should be implemented using modern statistical stock assessment software.

Analyses requested by the STAR Panel

Round 1 requests

A. Re-examine the historical rockfish catch (back to 1916) using the ratio of bocaccio to total rockfish to estimate historical catches.

   Reason: This will determine if the assumed equilibrium catch of 2000t is reasonable.

B. Determine the co-occurrence of other species in RecFIN trips that caught bocaccio from 1993-2006. For trips that caught bocaccio, produce the proportion of those trips that also caught other species (only the top 20 or so).

   Reason: Attempt to distinguish near shore from offshore fishing using co-occurrence of species in the RecFIN source, to confirm no change in recreational fishery selection patterns in recent years.

C. Do a model run using steepness=0.44, lambda=1 on the S/R curve and remove the recent recreational CPUE values. Retune the CPUE and survey S.E.

   Reason: This is a working model to be used in the subsequent runs. Removing the recent cpue values removes the conflict with the triennial survey.

D. Do sensitivity runs to equilibrium catches of 1000 and 3000t using the working model (Request C). Output the biomass trajectory and depletion.

   Reason: Determine the effect of the magnitude of equilibrium catch on estimated abundance.

E. Do a new model run starting in 1916 with no equilibrium catch and ramping up catch to 2000t in 1930. This will be done using the working model (Request C). Output the biomass trajectories and depletion.

   Reason: To demonstrate the effect of assuming equilibrium conditions as opposed to assuming the population was not in equilibrium conditions with a similar magnitude of catch.

F. Do a new model assuming a logistic selectivity pattern (estimated) for the triennial survey and using the working model (Request C). Produce a table of likelihoods for all components, biomass trajectories and depletion. Show the fits to the triennial proportion at length data, CPUE series, and surveys.

   Reason: To see the effect of the current selectivity pattern on the estimates of recruitment in the recent period.

G. Produce a model with separate blocks of selectivity for the southern recreational fleet pre and post 2003. Use the working model (Request C). You may have to extend the last block including earlier years to get convergence.

Reason: Determine the effect of a constant selectivity on the magnitude of recruitment given that the fishery may have changed due to management.

Round 1 responses

The STAT provided full responses for requests A, C, and D and a partial response for E.

A. Data exist to reconstruct rockfish landings back to the 1916 and indicate that the assumed value of 2000 mt for historical average catch may be about 25% high. There are important spatial and temporal gradients in the development of the rockfish fishery that will require careful consideration in a thorough catch reconstruction.

C. This run configuration resulted in higher initial biomass and initial recruitment. Removal of the last three RecFIN CPUE points had little effect on the biomass trajectory. This configuration was adopted as a reference run for exploratory purposes.

D. The different assumed values for historical equilibrium catches produced minor differences in the biomass trajectories from the mid-60s on but appreciable changes in unexploited spawning biomass and depletion. The higher equilibrium catch resulted in higher unfished biomass but lower 1950 biomass. The lower equilibrium catch had similar unfished biomass as the run with 2000 t but slightly higher 1950 biomass. The run confirmed the sensitivity of the model results to the assumed equilibrium catch.

E. Because of array limitations in the SS1 software the request to start the catches in 1916 could not be accommodated. The Panel crafted a revised request for Round 2.

Round 2 requests

H. Do request B given below.

Determine the co-occurrence of other species in RecFIN trips that caught bocaccio from 1993-2006. For trips that caught bocaccio, produce the proportion of those trips that also caught other species (only the top 20 or so).

Reason: Attempt to distinguish near shore from offshore fishing using co-occurrence of species in the RecFIN source, to confirm no change in recreational fishery selection patterns in recent years.

I. Do request F given below.

Do a new model assuming a logistic selectivity pattern (estimated) for the triennial survey and using the working model (Request C). Produce a table of likelihoods for all components, biomass trajectories and depletion. Show the fits to the triennial proportion at length data, CPUE series, and surveys.

Reason: To see the effect of the current selectivity pattern on the estimates of recruitment in the recent period.

J. (a modification of request E).

Do a new model run starting in 1930 (due to SS1 constraints) with no equilibrium catch and catches after 1930 until the start of the measured catches set at 2000t. This will be done using the working model (Request C). Output the biomass trajectories and depletion.

Reason: To demonstrate the effect of assuming equilibrium conditions as opposed to assuming the population was not in equilibrium conditions with a similar magnitude of catch.

K. Do request G given below.

Produce a model with separate blocks of selectivity for the southern recreational fleet pre and post 2003. Use the working model (Request C). You may have to extend the last block including earlier years to get convergence.

Reason: Determine the effect of a constant selectivity on the magnitude of recruitment given that the fishery may have changed due to management.

Round 2 responses

H. The STAT examined RecFIN species composition data from the northern CA region (north of Point Conception). Data from southern CA were not readily available. The analysis of species caught during trips that caught bocaccio rockfish showed higher proportions of shallow-water species in recent years, implying that the recreational fishery shifted nearer shore where one might expect to find more small bocaccio. Thus the strength of the 2003 recruitment could be an artefact of changes in selection by the recreational fishery. The STAT noted that small bocaccio generally show up first in the southern recreational fishery, presumably because they recruit in the south and then move north.

I. In the 2003 base model the triennial survey selection was domed with a limited size range of small fish being fully selected. In the requested model, with asymptotic selection for the triennial survey, all sizes were fully selected. There was very little change in the estimated biomass trajectories or the estimates of recruitment.

J. The requested model, which started catches of 2000t in 1930, had a very different early biomass trajectory than the reference model or the 2003 base model, both of which assumed that the stock prior to 1950 was in equilibrium with annual removals of 2000t. The differing results may have been due to the very limited number of years available for the transition from unfished to fished conditions (due to the SS1 limit on array sizes). Also, the STAT reported that the model had difficulty converging.

K. The STAT accomplished this request by setting up a separate southern recreational fishery rather than with time-blocks. The two fisheries had identical descending limbs for their selection curves but the ascending limbs were free to change. The selection curve for the recent fishery was right-shifted and resulted in a slightly larger estimate for the 2003 year-class and slight lower estimates for earlier recruitment.

Third Round Requests

L. Do request H given below.

Determine the co-occurrence of other species in southern RecFIN trips that caught bocaccio from 1993-2006. For trips that caught bocaccio, produce the proportion of those trips that also caught other species (only the top 20 or so).

Reason: Attempt to distinguish near shore from offshore fishing using co-occurrence of species in the RecFIN source, to confirm no change in recreational fishery selection patterns in recent years.

Round 3 responses

L. The response to the original request (H) did not include an analysis for southern CA. The STAT obtained the required RecFIN data and conducted an analysis of changes in species composition, similar to the one presented in response H. The analysis showed higher proportions of deep-water species in recent years, implying that the recreational fishery shifted offshore where one might expect to find fewer small bocaccio. This finding is consistent with the results shown by response K: a shift in selection to bigger fish and a larger estimate for the strong 2003 year-class.

Final base model description

The update assessment had the same base model configuration as the 2005 update and the original 2003 assessment, but included length-compositions and survey index data for recent years and used refreshed modern landings data (post-1977).

Comments on the technical merits and/or deficiencies of the assessment

The same technical merits and deficiencies remain as in the 2003 assessment (see the 2003 and 2005 STAR Panel reports).

Areas of disagreement regarding STAR Panel recommendations

There were no areas of disagreement with respect to the update or the objectives of what would be accomplished during the STAR Panel review, either among the STAR Panelists or between the STAR and the STAT.

Unresolved problems and major uncertainties

The same unresolved problems and major uncertainties remain as in the 2003 assessment (see the 2003 and 2005 STAR Panel reports).

Concerns raised by GMT and GAP representatives during the meeting

No issues were raised.

Recommendations for future research and data collection

The 2003 and 2005 STAR Panel reports provide numerous recommendations, many of which are still relevant but have not been acted upon. The STAR Panel makes the following additional recommendations.

For the next bocaccio rockfish stock assessment

- The issues raised by previous STAR Panels should be thoroughly reviewed.
- The next assessment of bocaccio rockfish should be a full assessment and should use SS2 or some comparable modeling platform.
- All the bocaccio rockfish data need a critical review and potential revision before being included in the next assessment. Of particular concern are adjustments for bag-limit and other management-induced changes, the derivation of length-composition data, and the basis and selection of data sources to include in the assessment. The next assessment document should provide thorough and comprehensive documentation of the data sources and statistical models used in processing the data.
- Assumptions about stock structure and boundaries should be reviewed in light of information on catches of bocaccio rockfish taken off Mexico, Oregon, and Washington.
- The bocaccio rockfish catch history should be reconstructed using all available data including catch by gear and by region. The reconstruction should include an envelope of high and low values to set bounds for exploration of alternative catch histories. The STAR Panel notes that the SWFSC has made significant progress in retrieving detailed historical landings data, which will facilitate catch reconstructions. As has been recommended previously by a variety of STAR Panels, the reconstruction of historical rockfish landings needs to be done comprehensively across all rockfish species to ensure efficiency and consistency.
- Length frequency data, which are collected seasonally, should be modeled accordingly. This could be accomplished within the stock assessment model or externally by converting length-compositions to age-compositions, as has been done in New Zealand (Hicks et al. 2002).
- The new assessment model and data should be configured to explore cohort- and/or year-specific growth. Again, this could be done within the stock assessment model or externally by converting length-compositions to age-compositions.

For the longer term

- Age-reading of bocaccio otoliths should be pursued.
- Develop a fishery independent time series using fixed sites and volunteer anglers who use standard protocols and are properly supervised.
- Establish a meta-database that provides a comprehensive overview of all relevant data sources and sufficient information to correctly interpret the data.
- Establish an accessible database for rockfish catch histories by species, including envelopes of high and low values for each species to set bounds for exploration of alternative catch histories.

- Relevant raw data, updated in a timely manner, should be readily accessible to assessment authors in on-line databases that are user-friendly.
- Develop comprehensive descriptive analyses of recreational fisheries and fleets to assist in interpretation of recreational CPUE and length-composition data.
- Develop standard and validated methods for producing recreational CPUE indices that adequately deal with the influence of regulation changes and the peculiarities of the recreational data collection systems. The method of Stephens and MacCall for filtering recreational fishing trips is promising but remains largely unvalidated.
- Develop a concise set of documents that provide details of common data sources and methods used for analyzing the data to derive assessment model inputs.

Acknowledgements

The staff at the SWFSC Santa Cruz laboratory provided excellent hospitality and support for the STAR meeting. The Panel especially thanks Steve Ralston for making certain we were well provisioned.

References

Hicks, A.C., Cordue, P.L., and Bull, B. 2002: Estimating proportions at age and sex in the commercial catch of hoki (Macruronus novaezelandiae) using length frequency data. New Zealand Fisheries Assessment Report 2002/43. 51 p.