

# **BLACK ROCKFISH**

## **STAR Panel Report**

Southwest Fisheries Science Center  
LaJolla, CA  
May 24-28, 1999

### **STAR Panel Members:**

Richard Methot, NMFS Northwest Fisheries Science Center, STAR Chair  
Robert Mohn, Fisheries and Oceans, Canada  
Ray Conser, NMFS Northwest Fisheries Science Center, SSC Representative

Sam Herrick, Groundfish Management Team Representative  
Tom Ghio, Groundfish Advisory Panel Representative

### **STAT Team Members Present:**

Farron Wallace, Washington Department of Fish and Wildlife  
Annette Hoffman, Washington Department of Fish and Wildlife



## **Overview**

The STAR Panel reviewed the assessment for black rockfish, which is a recreationally important species along the coast of northern Oregon and Washington. The review took place during the week of May 24-28, 1999 at the Southwest Fisheries Science Center in LaJolla, California. The STAT Team provided substantial draft documents to the STAR Panel members and prepared an excellent presentation in the review meeting. The consensus of the STAR Panel is that the black rockfish assessment is sufficient for determining the relative status of black rockfish in the northern area and can serve as a basis for adjusting harvest management for 2000 by the Groundfish Management Team. The STAR Panel commends the STAT Team for the quality of their draft documents and their cooperative spirit and willingness to respond to the Panel's comments and requests for additional analyses.

## **General**

The report and presentation given to the panel was overall considered to constitute a very comprehensive treatment of the data and the modeling exercise was considered to encapsulate most of the biological concerns, although several issues were raised during the meeting. The panel agrees with the findings in the report.

As described below, several issues were handled during the meeting whereas other concerns deal with longer-term research issues, which need to be addressed in a longer time frame.

## **Questions and requests made during the meeting**

The following issues were raised with the intent to resolve them during the meeting. All the issues were handled to the panel's satisfaction.

1. The estimated catch variances within the model should be compared to variances calculated outside the model, and be constrained to be similar to those externally calculated variances.
2. The effect of reporting rate on model performance needs to be fully evaluated.
3. The estimated population biomass by SS and AD needs to be presented in a manner that facilitates comparison.
4. The table of catch-at-age needs to be made available so that exploratory calculations can be made.
5. Residual plots for the tag recovery data need to be presented.
6. There should be a likelihood profile covering a plausible range of female natural mortality.

## **Comments on the Technical Merits and/or Deficiencies of the Document**

### Stock ID and data area

The tagging data used in tuning the model were taken from a tagging study based in central Washington. A genetic study was also carried out which showed that there were two populations, one off Washington's coast and a second to the south mostly along the Oregon coast. The catch and aging data comprise the entire coast, but it was reported that 75-80% of the catch was from the area that produced the tagging estimates. So although the tuning data do not match the catch data the model should fit the bulk of the fishery fairly well but there is increased uncertainty in the areas to the north and south. The triennial survey showed no fish north of Washington. The STAR panel accepted this view of the stock structure but suggested that the implications of tuning to the central area be examined.

### Model choice (software)

Three models were presented. The first was an updated version of the 1994 stock synthesis model in which was presented only as a link to the last assessment. It is called the '1994' configuration. The second model (called 1998) was also SS and used the tagging data as a relative effort measure. The third model used AD model Builder and fit the number of returns in the tagging data. The different manner in which the tagging data were used was reflected in the response of each model to the tagging reporting rate. In the SS model higher reporting rate led to lower biomass; the opposite was seen in the AD model. The models will be denoted by SS and AD hereafter.

### Calibration of tagging analysis -

Although both models tuned to the tagging data, they handled it in different ways. The AD model fit the number of returns directly. Because tag returns were dominated by the first year or two after release the model was heavily influenced by the 1989-1991 period. The SS model used an F estimated from tag returns but treated it as a relative index of effort. The trend in the tagging index is strongly influenced by the unknown tag reporting rate which scales the 1988-94 data, but not the 1998. The 1998 tagging study was of a different design and had a known reporting rate. Tag loss and initial tagging mortality were estimated and included in the model.

### Natural mortality and catch curve estimates

A catch curve analysis was done on the sport, line and trawl fishery data. The data for each gear was combined for sexes and a regression was fit to the log of the catch at age. The first 2 ages were dropped from the sport and line fishery and the first 3 ages from the trawl fishery. Also, data were accumulated into 4 year blocks to smooth the estimates. This analysis was done to suggest bounds for levels of natural mortality. The estimates showed an increasing trend with time and a higher total mortality for females. In the longest data set, sport fishing, the females ranged from .25 to .4 while the males from .2 to .3. This analysis assumes stable age distributions and constant recruitment.

The 20<sup>th</sup>, 50<sup>th</sup> and 80<sup>th</sup> percentiles by age were plotted for the catch for the various fisheries. In all cases there was a trend to younger fish in the catch with the oldest percentile falling the fastest. The youngest percentile was flat suggesting no strong recruitment events over the 1986-98

period.

#### Retrospective analysis

A retrospective analysis of the 1994 model showed a trend that over-estimated biomass with the shorter data series. When the 1994 configuration using data to 1994 was compared with the 1994 assessment, the estimated populations were virtually identical. The AD model was run for the relatively short period 1986 to 1998 and a retrospective analysis was not presented.

#### Indices not considered

The authors rejected the triennial survey data as the number of captures as low (27 positive tows containing 233 fish to date). Sport fishery effort or CPUE data were not used, as was done in the 1994 assessment, chiefly because of a shift to live bait in the mid-90s which would affect catchability, and the lack of logbook data which would allow a spatial stratification of the data. Both of these indices were used in the 1994 assessment.

#### Noisy selectivity

Both the AD and SS models had 6 selectivities to be estimated (3 gear x 2 sexes). The SS used a double logistic and asymptotic models while the AD assumed an asymptote but the younger ages were not constrained. The selectivities in the AD runs were very noisy leading to more constrained models being developed during the meeting. From an analysis in which the log of the catch at age was compared to regression of the fully recruited ages, selectivities of 0.5 and 0.8 at ages 6 and 7 were imposed for sport and line fisheries and 0.1, 0.3 and 0.65 for ages 6-8 in the trawl fishery. These are consistent with the selectivities from the SS logistic curve. The STAR panel asked that this constraint be imposed on both sexes in the AD model, which was done.

#### Biological reference points

The target fishing mortality was defined from a yield per recruit analysis using the AD model formulation. A target of  $F_{45\%}$  was chosen as was previously used. For tag reporting rates of 50 and 95% this is equivalent to a fully recruited  $F$  of 0.14 and 0.15 respectively.

#### Model variance (quantifiable and qualitative)

The level of reporting rate from the external tags used in 1988-1990 was estimated from a single study interviewing sport fishermen to be 95%. The level affected all the estimates from the models but was not estimable within them. Thus a range was chosen from 20 to 95 % which was later restricted to 50-95%. 50% was chosen as a base case. The SS model tended to show similar dynamics as a function but the magnitude was quite sensitive. In AD runs when  $M$  was not fixed were insensitive to the reporting level, while those with constrained  $M$  were sensitive but in the opposite direction of the SS runs.

#### Decision table

The reporting rate was used to define alternative scenarios for a decision table with a target of  $F_{45\%}$ . Reporting rates of 0.5, 0.75, and 0.95 were considered.

#### **Areas of Disagreement**

There were no major outstanding disagreements among the members STAR Panel and the STAT Team representatives at the conclusion of the review.

## **Recommendations**

There were benefits to the multiple model descriptions which were presented and continuation of the practice is recommended. These models should include simpler models and analyses, e.g. catch curve, production models, size frequency information.

The black rockfish is recruited to the fishery before the 50% maturity age. Yield and SSB isopleths should be examined to assess the effect of changing size of capture.

The tagging study should be expanded to better define the stock and to produce better abundance estimates.

The STAR panel was concerned about the high  $M$  estimates, especially on females, and recommends that both model configurations and independent data be investigated.

Stock status data, either abundance or effort, which were not used in tuning, should be compared to model outputs in order to integrate this information.

The implications of using tagging data only from the central area (near Westport) to assess the population throughout the stock unit needs to be investigated.