Pacific Ocean Perch (POP)

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

STAR Panel:
Steve Ralston – NOAA Fisheries, SWFSC (Chair)
Vivian Haist – Center for Independent Experts (outside reviewer)
Bob Mohn – Center for Independent Experts (outside reviewer)
Paul Spencer – NOAA Fisheries, AFSC
Theresa Tsou – Washington Department of Fish & Wildlife

PFMC:
Merrick Burden – Groundfish Management Team (GMT) representative
Rod Moore – Groundfish Advisory Panel (GAP) representative

STAT Team:
Owen Hamel – NOAA Fisheries, NWFSC

Overview

This assessment represents an update, as a full assessment was conducted in 2003. The model code is identical to the 2003 assessment, and is implemented in AD Model Builder. Several updates to the input data were provided, including catch biomass through 2004, fishery size composition in 2003 and 2004, NWFSC slope survey biomass through 2004 and age compositions in 2001, 2003-2004, and the NWFSC triennial survey biomass estimate in 2004 and age compositions from 1995 and 2004. Additionally, the survey biomass estimates were recalculated based upon updated estimates of stratum area sizes. The initial proposed base case produced biomass and recruitment time series very similar to the results from the 2003 assessment.

Uncertainty in the assessment results was evaluated via two methods: (1) a series of sensitivity analyses examining the effect of altering selected aspects of the input data or model specification and (2) an MCMC integration that produced marginal posterior distribution on quantities of interest. The sensitivity analyses were used to examine the effect of changes in the maturity curve, fishery selectivity, exclusion of survey indices, and weighting of the fishery size and age data. In addition, additional fishery age (1994, 2003-2004) and length (1991-1992) composition data became available after the initial assessment document was produced, and the effect of including these data was examined as a sensitivity analysis. The MCMC passed all the diagnostic convergence tests.

Based on the evaluation of the sensitivity analyses, the panel adopted the updated fisheries data as part of the base case.

List of Analyses Requested by the STAR Panel

Issue 1: Given the existence of an MCMC run, the panel requested a number of analyses using the posterior distribution: (1) a comparison of the estimated parameter variance from the Hessian approximation to those from the posterior distribution and (2) projections comparing the effect of using either the maximum of the posterior density (MPD) point or the posterior distribution. In either case, the recently updated fisheries data were used.

The point estimates and Bayesian medians were close to each other for a number of parameters, and the Hessian approximation (assuming either a normal or lognormal distribution) seems to capture the uncertainty observed in the posterior marginal distributions. The panel and assessment author concluded that the Hessian-based approximation produced reasonable results and captured the range of uncertainty in the parameter values, and that this analysis should be included in the final document.

Projections were based upon constant F policies (0.01 or 0.02) over 20 years using a deterministic stock-recruitment curve. These fishing mortality rates were selected to represent current harvest rates and the OY-specified harvest rate. Using the MPD results as a starting point and F=0.01, the stock reaches the rebuilding target of 15,000 mt in

2023; the target is reached about four years earlier when the median from the posterior is used as a starting point.

Issue 2: Given the generally accepted uncertainty in natural mortality (***M***), the original CV of 0.1 on this parameter may be unduly constraining. The panel requested increasing the CV on ***M*** to 0.3 and examining the effect on depletion and other model results.

The effect of increasing the CV on ***M*** to 0.3 was a higher estimate of ***M*** with more density in the upper end of the marginal posterior distribution relative to the initial run, although the depletion distribution and point estimate were similar to the initial run. In the 2003 assessment, a concern was that the increase in ***M*** with a higher CV was artificial and perhaps inconsistent with rockfish life-history information. ***M*** is also related to steepness, and could give non-plausible steepness values. Overall, the wider prior on ***M*** had only a small effect on MPD estimates of quantities of management interest (e.g., current biomass and depletion). Although the higher CV more accurately reflects uncertainty in ***M***, additional work should be done to investigate potential conflicts in the data that result in a higher estimate of ***M***, before a less informative prior is adopted.

Final Base Model Description

The final base model adopted by the panel was the initial base model proposed by the assessment author, with the addition of the updated fishery age and length composition data. This is appropriate considering this POP analysis is a stock assessment update. This model had a 2005 depletion level of 23%. A decision table was produced in which the states of nature (in terms of spawning biomass and depletion) were defined as portions of the posterior marginal distributions corresponding to the lower 25%, the middle 50%, and the upper 25% of the density of the distributions.

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

The panel notes the high quality of the assessment, particularly the clarity of the written assessment and the thorough evaluation of the sensitivity analyses. It was especially useful to have produced a well-behaved posterior distribution, as this allowed comparison of estimated variances produced from the Hessian-based approximation and those from the posterior distribution.

Interpretation of parameter uncertainty from posterior distributions produced from MCMC runs is a general area of interest, but proper evaluation is sometimes hindered because MCMC runs may not pass all convergence criteria. Thus, the comparisons of variances in this assessment may be of general interest beyond this particular assessment.

One area that could be addressed in the future is the methodology for producing the decision table, as the approach taken in this assessment did not define *a priori* states of nature and then apply a series of harvest policies to each of those states. Although decision tables may not be as critical for updates of species managed under rebuilding

plans, because a separate rebuilding analysis will be conducted, a decision table of the form identified above would be helpful in the assessment review.

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 POP stock assessment.

Prioritized Recommendations for Future Research and Data Collection

Long-range goals for future assessments

A number of sensitivity analyses related to time-varying maturity or maternal effects could be investigated. For example, one could investigate whether studies have been done to allow determination of age and/or weight-specific fecundity. Additionally, sensitivity analyses concerning differential larval survival by age of spawner would be of interest – part of this will incorporate changes to stock age distribution over time. Finally, sensitivity analyses and projections using the new maturity information, or even time-varying maturity, would be illuminating.

The Panel recommended a study to compare paired surface readings of otoliths to break and burn age estimates, so that biased age comps can be adjusted. One study exists that is used in the BSAI POP assessment, but archived otoliths may provide the source of additional material specific to west coast POP.

Some issues and potential problems for doing Bayesian integration using the ADMB MCMC algorithm were discussed and are identified here, as they would have general applicability to assessments based on Bayesian estimation. These included:

- Using ADMB "bounded dev" vectors. These vectors generate large contributions to the objective function when they are not mean zero, which will happen when the MCMC procedure begins.
- While the likelihood for priors that are uniform for parameter X are constant, and therefore often ignored in defining the objective function, likelihoods for parameters with log-uniform priors are not constant, so these can't be ignored.
- Arbitrary priors (often called "penalties") on functions of parameters can result in poor MCMC performance. For example, so-called "smoothing penalties" on second, third, or higher order selectivity parameters to generate smooth curvature for MPD estimation, will not perform well in the MCMC.