

**Report to CIE**

**of**

**STAR Panel**

**May 16 – 20, 2005**

**Seattle, WA**

**Pacific ocean perch, darkblotched rockfish, and cabezon**

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## **Executive summary**

The STAR Panel (May 9-13) reviewed three stocks: darkblotched rockfish, cabezon and Pacific Ocean Perch (POP). All of these stocks had been assessed before and had been reviewed in 2003.

Because two of the stocks were well prepared, the Panel was able to devote more time to broader issues related to stock assessment which resulted in more research recommendations and findings that will be of use to other assessments and in turn, future STAR Panels. These findings included improved diagnostics and quantification of uncertainty in decision tables.

All the assessments were accepted by the Panel. The darkblotched rockfish was estimated to have a depletion at the start of 2005 of 20% with an upward trend. As with many other west coast groundfish stocks, the 1999 yearclass is quite strong. The cabezon assessment divided the resource into northern and southern sub-areas. Cabezon was not as depleted as the darkblotched with 28% estimated for the southern sub-stock and 40% in the northern. This POP assessment was an update and POP was estimated to have a depletion of 23% in 2005.

## **Background**

Three slope rockfish species were scheduled for review by this STAR Panel; darkblotched rockfish, cabezon and Pacific Ocean Perch (POP). All of these stocks had been assessed before by the authors presenting these drafts, which meant that they were all well acquainted with the data and history of their respective stocks.

The Panel and assessment team members who presented the assessments are as follows:

### Panel members

Steve Ralston, Chair, SWFSC  
Vivian Haist, CIE Reviewer  
Paul Spencer, AFSC  
Theresa Thou, Washington Dept of Fish and Wildlife  
Bob Mohn, CIE Reviewer  
Rod Moore, GAP Representative  
Merrick Burden, GMT Representative (POP, darkblotched)  
John DeVore, GMT Representative, (cabezon)

### STAT team members present

Jason Cope, (University of Washington) - Cabezon  
Owen Hamel, (NOAA Fisheries, NWFSC) - POP  
Jean Beyer Rogers, (NWFSC) - Darkblotched rockfish

Because two of the three draft assessments were well prepared, they required few re-runs, and the Panel managed to conclude in four days, a day early. Other factors contributing to the early completion included the familiarity of the authors with the stocks and the fact that there were only three stocks to review. Thus, the Panel was able to devote more time to broader issues related to stock assessment which resulted in more research recommendations and findings that will be of use to other assessments and in turn, future STAR Panels. Rather than having all of the Panel's

time consumed with getting base models for every stock, this Panel had the time, and talent, to investigate methodological issues concerning diagnostics and uncertainty.

### **Description of review activities**

The draft assessments and background material were written on a CD-ROM and received well in advance of the STAR. The POP and cabezon draft assessments were well prepared, and their presentations went smoothly. However, the darkblotched draft was inadequately prepared and could not have been reviewed in the state in which it was on the CD-ROM. The author did bring additional material to supplement the draft when it was presented the Panel. While the supplemental material helped, particularly in documenting the migration of the data and model from the 2003 to the 2005 assessment, it was still not well prepared which impeded the review process.

The chairman, Dr. Stephen Ralston, introduced the Panel and himself and gave preliminary comments. His familiarity with the STAR Panel Terms of Reference and his recent participation as the author of the starry flounder assessment in the April STAR helped the Panel members interpret and execute their roles. Volunteers were asked for to act as rapporteurs for each stock, and I opted for darkblotched rockfish.

Darkblotched rockfish was assessed in 2000 and then updated in 2003. It was assessed as a single stock ranging from California to the Canadian border. Darkblotched rockfish is a long-lived species and is difficult to age because of the frequency of check marks on the otoliths. A detailed description was given of the evolution from the 2003 model to a proposed base model. This assessment used a new GLM analysis (Helser et al, 2005) of the slope survey data and the SS2 analytical package. The Panel recommended considerable changes and exploratory re-runs for this resource. The analysis was accepted and showed a considerable depletion for 2005 (20%) with an upward trend supported by the strong 1999 year class.

The STAR Panel next reviewed the draft cabezon assessment report. Again, the California cabezon resource was last assessed in 2003. The new assessment divided the resource into northern and southern sub-areas. The assessment was performed using SS2. Cabezon was not as depleted as the darkblotched with 28% estimated for the southern sub-stock and 40% in the northern.

This POP assessment was an update, as a full assessment was conducted in 2003. The model code was identical to the 2003 assessment, and is implemented in AD Model Builder (ADM) as opposed to SS2. The ADM analysis included converged MCMC runs which aided the Panel in their review. POP was estimated to have a depletion of 23% in 2005. The converged posteriors from the MCMC also helped the Panel investigate some technical aspects of uncertainty which are reported below.

### **Summary of findings**

These resources were successfully assessed which can be attributed to the talent and dedication of the authors (and their support teams). As well as the assessments themselves, methods and insights were brought forward which will benefit other assessments and future STAR Panels.

A continuing source of uncertainty in balancing the models is determination of the effective degrees of freedom used to balance the model. Although this topic was covered in the 2004 Modeling Workshop, a generally accepted practice has not been seen. Some participants advocated a square root transformation, some the regression approach advanced by Dr. MacCall and in some cases arbitrary values were assigned. Dr Haist reported that a standard approach to the effective degrees of freedom has been established in New Zealand and the documentation for their CASAL program may prove useful. Presuming that the issue is not resolved at a future STAR, this topic should be referred to a future workshop.

Following below in italics are the specific questions from the CIE Terms of Reference:

3) *Comment on the primary sources of uncertainty in the assessment.*

In general, the sources of uncertainties for these three stocks were similar to those of other rockfish resources; stock definition, discarding and misreporting issues, natural mortality, etc. Unlike the reef rockfish reviewed in the previous STAR, these are slope species and survey data were available as an abundance estimate and for length frequencies. Aging for the darkblotched rockfish bears comment because it is usually difficult to age. A GLM based analysis of aged material showed that the reader was the most important factor. The Panel recommended that more investigations be made to aging and comparing ages from different techniques, age readers and labs for darkblotched.

As in the previous two Panels, the difficult in portraying the uncertainty for the decision tables received considerable attention. For example in the southern cabezon, the Panel felt that the uncertainty associated with the recent strong recruitment was the most serious component. The effects of this yearclass are transient and diminish as it ages through the stock projections. Such an uncertainty must be contrasted to the uncertainty associated with the dynamics of the stock, say  $M$  or  $h$ , which will continue through the projection duration. This situation suggests that the single dimension of uncertainty may not be adequate, especially when transients and dynamics are important sources of uncertainty.

The balance between objective and subjective criteria in capturing uncertainty also was discussed. Typically, the oldest and largest fish are often poorly sampled and may degrade the fit of the data and model. They may be omitted for this reason. However, if a more inclusive representation of the uncertainty is to be obtained, especially for  $M$ , it may be best to retain them. The Panel did not come to conclusions on this issue, but some members recommended a full Bayesian approach when possible.

The Panel looked at assigning probabilities to the states of nature in the decision table in a way which differed from either of the previous two STAR Panels. In terms of the measurement/model uncertainty dichotomy, it centered more on the measurement error. Assuming that the model description had sufficient freedom, the distribution of the model status, usually depletion or SSB, was integrated and cut-points assigned near the tails. The area to the outside of the cuts was doubled and that was used the estimation of the probability of occurrence, that is assigning equal mass on both sides of the cut points. This approach requires that the model estimate the dominant sources of uncertainty,  $h$ ,  $M$ ..., to avoid significant underestimation. The resultant probabilities matched the verbal descriptions well and avoided some of the problems seen early in this cycle of review. Cut-points giving approximately 15, 70 and 15% probabilities were advocated by the Panel to match the likely and unlikely qualitative description in the decision tables.

It may be possible to extend this approach even when the model is constrained with fixed  $M$  and/or  $h$ . A loose meta-analysis could be compiled for those stocks which estimate  $M$  and  $h$  in terms of a sensitivity ( $\text{var SSB}/ \text{var } M = x\%$ , or  $\text{var SSB}/ \text{var } h = y\%$ ). These sensitivities may then be used to extend the constrained model's variance estimates, especially among similar species with similar supporting data. I do not have a feeling for how many stocks would have to be done to develop a useful product. Again, intercessional analysis would be called for.

The question of risk plots (in terms of the probability of something bad happening) came up in two instances. The first was with respect to achieving rebuilding targets. Perhaps SS2 could develop a Hessian based probability of achieving rebuilding targets. Second was the problem of cabezon being near rebuilding threshold when a risk plot would be useful. Again, is there a possibility of SS2 giving an approximate risk curve for at least this situation? MCMC based risk analysis within SS2 is compromised by the slow, in terms of days, convergence experienced by many authors.

4) *Comment on the strengths and weaknesses of current approaches.*

As in the other STARs in this year, the data and their relationship to the model results do not get enough attention. For both the cabezon and POP assessments there was the opportunity to relate unfitted indices (CPUE based) to the model output. Although such an exercise would probably not change the understanding of the current stock status, it would develop a framework for investigating the relationship among the various indices. Also, divergences may then be attributable back to changes in regulations or discarding practices. A better understanding of how CPUE relates to abundance from relatively data-rich stocks would in turn help in the modeling and interpretation of the data-poor stocks.

Also related to the issue of the relationship between data and the assessment, is the potential problem of extrapolation of the stock-recruit relationship outside the range of observations. If the relationship of reproduction to parental stock is important, in the forecast it may have excursions into unobserved domains. This has implications for uncertainty and a flag should be raised when it occurs. Of course, the same sort of flag may be needed on when  $MSY$  is estimated and no data are available for the stock near its carrying capacity.

More biologically sophisticated modeling may be needed for stock and recruitment as well. It was mentioned that for cabezon that males are nest guards and their abundance may be a determinant of reproductive success. The presence of sufficient data to quantify the male's importance is probably unlikely however.

5) *Recommend alternative model configurations or formulations as appropriate during the STAR panel.*

This was done throughout the meeting. Under the Chair's recommendation such requests were written and given to the authors. This was done in a less formal fashion than in the previous two STARs, but seemed to work well nevertheless. I would still prefer a more formal request/issue/response point form format, especially when time is tight and miscommunication becomes more costly.

Two of the three assessments used SS2 and there were still a number of concerns with this package. In some cases clarification was sought and in others cases it was requests for new functionalities or enhancements. The author of SS2, Dr. Methot made himself available which quickly dealt with the clarifications. Most of the requests for enhancements were centered on projections and the production of decision tables, as opposed to the estimation of stock status. Also, he was very receptive to potential modifications. A question arose about how changes in growth were modeled. It might be useful if Dr. Method kept and made available a log of questions and answers.

The question was raised of the interface or exchange files between SS2 and Dr. Punt's program to do rebuilding analysis. We do it here for interest but formal run needed in future. There was a problem reported when SS2 performed projections requiring a constant harvest rates. The author had to do iterate catch streams to get an F near 0.034 which is the rebuilding rate. This should not be difficult to program. And finally, SS2 seemed to use a non-standard normalization of selectivities. In a couple of instances the maximum selectivity was not unity. This may be only a cosmetic concern, as fully recruited F is not currently reported in SS2 output.

## **Conclusions/Recommendations**

The STAR Panel successfully reviewed and made improvement to the three assessments. It also successfully deliberated on wider technical aspects of providing assessments. Hopefully, some of the 'value added' will radiate to the upcoming STAR panels.

I expressed concern in the previous two reports about the depth and rigour of the internal review process. One of the stocks for this Panel was not sufficiently prepared to be reviewed, especially in the form in which it was sent out before the meeting. Fortunately, with only three stocks to review, there was enough time to tolerate an ill prepared assessment. It is impossible to discriminate at the STAR between faults attributable to the author(s) and those attributable to the internal review process. Nonetheless, the system seems to have failed in this instance.

A number of technical details came forward at this Panel which would have wider spread application. There appears not to be a vehicle for their documentation and dissemination currently available. In my last Review, I mentioned this problem and proposed a website as a possible solution. As I will be at all of the last three STAR Panels, I can act as a vehicle for technical findings so that they can be distributed at least to that degree. Although the more significant technical findings are mentioned below, I realize that inclusion in a CIE report is not an ideal solution as it is slow and has limited distribution. However, no other avenue is at hand and this will insure at least some level of documentation. What gets selected as a "good idea" is also a consideration. Techniques which catch my interest is not a very objective criterion. In the future, I could ask the Panel if a given idea warrants inclusion.

In his cabezon assessment, Jason Cope brought forward a useful plot to aid in the determination of when to allow recruitment deviations to operate. See Figure 1 below. In a previous STAR, the rule of thumb was brought forward to only have recruitment deviations when there was information to support them. Cope's technique gives a quick and quantitative way to set the period for recruitment deviations. Another useful, though not commonly reported, diagnostic was presented in the cabezon assessment. A profile of the likelihood as a function of a key parameter (M, h,...) was seen to be discontinuous reflecting that the optimizer was getting caught in several local minima. I do not believe that a search for the occurrence of local minima is routinely performed, and should be

As Owen Hamel had posteriors for his POP assessment, a comparison could be made between these results and their Hessian approximations. See Figure 2. The usefulness of the Hessian as an approximation was an issue at an earlier Panel. The 90% confidence ranges were quite similar although there was bias between the Hessian and MCMC estimates. This is only a demonstration that in this instance the ranges are quite similar and the Hessian approximations can be used with some confidence in estimating uncertainty. He also tested MSY, M and six other outputs and the results were similar. More examples from other stocks would add weight to this conclusion and one's confidence in using the much more easily obtained Hessians to describe uncertainty.

Although it is a minor procedural point, when the Panel is faced with numerous updates it would be helpful to have copies of all the handouts and when possible link presentation figures to those in the documents. Often, and in previous Panels, the results of re-runs are only projected during their presentation. This practice makes it more difficult to consider the alternative runs and to document the course of the meeting.

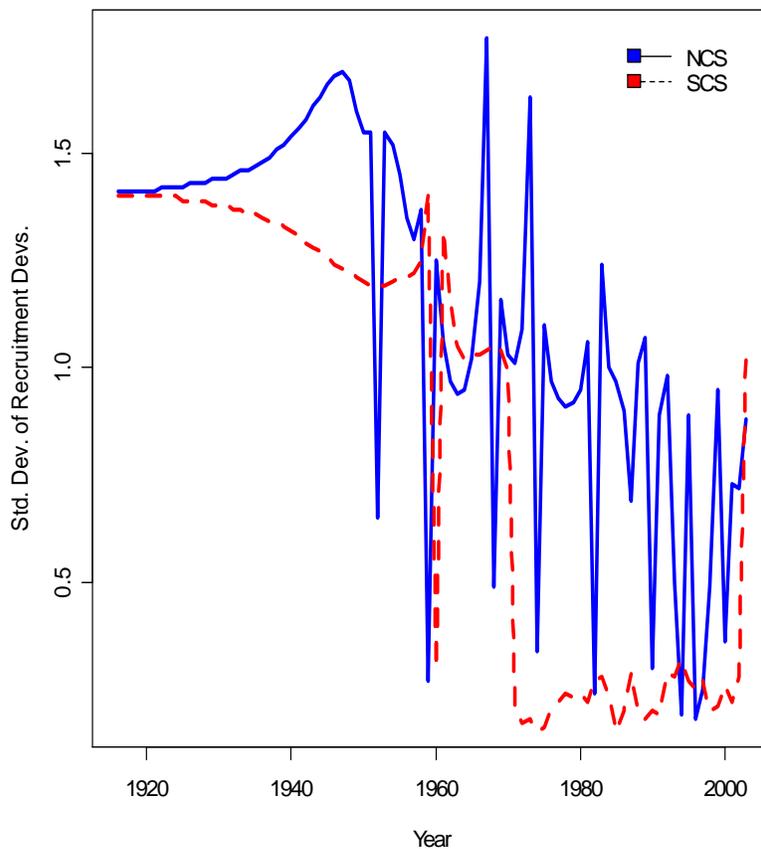


Figure 1. (from J. Cope, pers. comm.) A sample from the Cabezón assessment of the standard deviation for the recruitment deviations to aid in defining the years to enable the recruitment deviations. NCS and SCS are respectively the Northern and Southern cabezon sub-stocks.

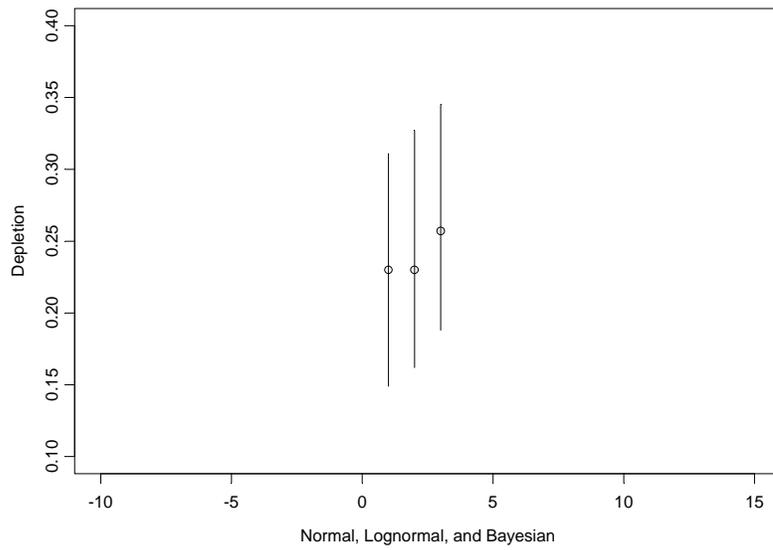


Figure 2. (From O. Hamel, STAR presentation) A comparison of the 90% intervals for POP depletion from the Hessian approximation under normal and lognormal assumptions and the Bayesian estimates.

## **Appendix A: Statement of Work for STAR slope rockfish Review:**

### **General**

External, independent review of West Coast groundfish stock assessments is an essential part of the STAR panel process. The stock assessments will provide the basis for the management of the Pacific ocean perch, darblotched rockfish, and cabezon stock assessments.

The consultants will participate in the Stock Assessment and Review (STAR) Panel of the Pacific Fishery Management Council (PFMC) for the review of the Pacific ocean perch, darblotched rockfish, and cabezon stock assessments. The consultant should have expertise in fish population dynamics with experience in the integrated analysis type of modeling approach, using age-and size-structured models, use of MCMC to develop confidence intervals, and use of Generalized Linear Models to process survey and logbook data for use in assessment models.

Documents to be provided to the consultants prior to the STAR Panel meeting include:

- Current drafts of the Pacific ocean perch, darblotched rockfish, and cabezon stock assessments;
- Most recent previous stock assessments for Pacific ocean perch, darblotched rockfish, and cabezon;
- An electronic copy of the data, the parameters, and the model used for the assessments (if requested by reviewer);
- The Terms of Reference for the Stock Assessment and STAR Panel Process for 2005-2006;
- Summary reports from the West Coast Groundfish data and modeling workshops held in 2004;
- Stock Synthesis 2 (SS2) Documentation; and
- Additional supporting documents as available.

### **Specifics**

Consultant's duties should not exceed a maximum total of 14 days: several days prior to the meeting for document review; the 5-day meeting; and several days following the meeting to complete the written report. The report is to be based on the consultant's findings, and no consensus report shall be accepted.

The consultant's tasks consist of the following:

- 1) Become familiar with the draft stock assessments and background materials.
- 2) Actively participate in the STAR Panel to be held in Seattle, Washington from May 16-20, 2005. *Participants are strongly encouraged to voice all comments during the STAR Panel so the assessment teams can address the comments during the Panel meeting.*
- 3) Comment on the primary sources of uncertainty in the assessment.

- 4) Comment on the strengths and weaknesses of current approaches.
- 5) Recommend alternative model configurations or formulations as appropriate during the STAR panel.
- 6) Complete a final report after the completion of the STAR Panel meeting.
- 7) No later than June 3, 2005, submit a written report consisting of the findings, analysis, and conclusions (see Annex I for further details), addressed to the “University of Miami Independent System for Peer Review,” and sent to Dr. David Die, via e-mail to [ddie@rsmas.miami.edu](mailto:ddie@rsmas.miami.edu), and to Mr. Manoj Shrivlani, via e-mail to [mshrivlani@rsmas.miami.edu](mailto:mshrivlani@rsmas.miami.edu).

## ANNEX 1: Contents of Panelist Report

1. The report shall be prefaced with an executive summary of findings and/or recommendations.
2. The main body of the report shall consist of a background, description of review activities, summary of findings (including answers to the questions in this statement of work), and conclusions/recommendations.
3. The report shall also include as separate appendices the bibliography of all materials provided by the Center for Independent Experts and a copy of the statement of work.

### Appendix B Bibliography of Materials Provided.

#### Draft assessment documents:

Cope, J.M. and A.E. Punt. (Draft, May 2, 2005). Status of Cabezon (*Scorpaenichtys marmoratus*) in California Waters as assessed in 2005. 170p.

Hamel, O.S. (Draft, April 29, 2005). Status and future prospects for Pacific Ocean perch resource in waters off Washington and Oregon as assessed in 2005. 57p.

Rogers, J.B. 2005 (Draft, May 1, 2005). Status of the darkblotched rockfish (*Sebastes crameri*) resource in 2005. 47p.

Rogers, J.B. 2005 (Draft). Darkblotched rockfish: Tables revised 05-05-05. 3p.

#### Previous assessments

Cope, J.M., K. Piner, C.V. Minte-Vera, and A.E. Punt 2003. Status and future prospects for the Cabezon (*Scorpaenichtys marmoratus*) as assessed in 2003. 147p.

Rogers, J.B., Methot, R.D, Builder, T.L., Piner, K. and M. Wilkens. 2000. Status of the darkblotched rockfish (*Sebastes crameri*) resource in 2000. *Appendix to: Status of the Pacific Coast groundfish fishery through 2000 and recommended Acceptable Biological Catches for 2001. Stock Assessment and Fishery Evaluation.* Pacific Fishery Management Council, Portland, OR. 79p.

Rogers, J.B. (July 11, 2003) Darkblotched rockfish (*Sebastes crameri*) 2003 stock status and rebuilding update. 56p.

Hamel, O.S., Stewart, I.J. and A.E. Punt. (July 15, 2003). Status and future prospects for the Pacific ocean perch resource in waters off Washington and Oregon as assessed in 2003. 124p.

Punt, A.E., Hamel, O.S. and I.J. Stewart. (July 2003) Rebuilding analysis for Pacific ocean perch for 2003. 27p.

STAR Panel. 2003. Cabezon. Report of STAR Panel meeting, September 15-19, 2003, Seattle Washington. 7p.

STAR Panel. (Draft, June 8, 2000). Darkblotched rockfish. Report of STAR Panel meeting, May 15-19, Newport Oregon. 18p.

STAR Lite Panel. 2003. Darkblotched rockfish, yellowtail rockfish, and cowcod. Report of STAR Panel meeting, May 28-29, 2003, Seattle Washington. 9p.

STAR Panel. 2003. Pacific ocean perch. Report of STAR Panel meeting, April 14-18, 2003, Seattle Washington. 8p.

Background Material:

Anon. 2005. Groundfish stock assessment and review process for 2005-2006. 22p.

GAO-04-606. (June 2004) Report to Congressional Requestors. Pacific groundfish: Continued efforts needed to improve reliability of stock assessments. 53 p.

Anon. 2004. Recreational CPUE statistics workshop. Workshop held June 29-30, 2004, Santa Cruz, California. 17p.

Anon. (February 16, 2005) Summary report from the West Coast Groundfish Data Workshop. Workshop held July 26-30, 2004, Seattle Washington. 24p.

Anon. (March 16, 2005) Summary report from the stock assessment modeling workshop. Workshop held October 25-29, 2004, Seattle Washington. 19p.

Hamel, O.S. 2005 (Draft April 29, 2005). Length and age composition calculations for the NWFSC west coast survey of groundfish resources for the 2005 assessment season. 3p.

Helser, T.E., Stewart, I.J., Whitmire, C., and B. Horness. (Draft, April 21, 2005). Model-based estimates of abundance for 11 species from the NMFS slope surveys. 142 p.

Methot, R.D. (Draft March, 2005) Technical description of the Stock Synthesis II assessment program, Version 1.17. 57p.

Methot, R.D. (Draft April 4, 2005) User manual for the assessment program Stock Synthesis 2 (SS2), Model Version 1.17. 47p.

Methot, R.D. 2004. Synthesis 2: Integrated analysis of fishery and survey size, age, and abundance information for stock assessment. Powerpoint presentation slides.