University of Miami Independent System for Peer Review

Review of kelp greenling, widow rockfish, boccacio and blackgill rockfish stock assessments: August 1-5, 2005 STAR Panel

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Executive Summary

The kelp greenling and blackgill rockfish stock assessments were full assessments, boccacio was an update assessment, and widow rockfish was originally an update assessment, but was elevated to a full stock assessment at the request of the STAT. The kelp greenling, widow rockfish, boccacio and blackgill rockfish assessments appropriately use the available data and adequately represent the uncertainty in the assessments. Modifications and refinements to the assessment methods are possible, but major improvements to the assessments will only be achieved with the collection of additional data. The assessment for kelp greenling is very uncertain and provides little information that can be used for management of this stock. Alternative management approaches may be more appropriate for this species until adequate data is available to reduce the uncertainty. The assessments for the other species are more certain. Widow rockfish is assessed to be less depleted and more productive than in the previous assessment. The boccacio stock has been depleted to low levels and is now rebuilding. Blackgill rockfish is assessed to be less depleted than boccacio and widow rockfish.

a) Primary sources of uncertainty
The main uncertainties in the kelp greenling assessment are the unknown level of historic catch, stock structure, imprecise indices of abundance, poor spatial coverage of sampling, selectivity of the shore-based recreational fishery, and lack of information for all the biological parameters.

The main uncertainties in the widow rockfish assessment are the imprecise or possibly biased indices of abundance and the stock-structure.

No new uncertainties were identified for boccacio.

The main uncertainties in the blackgill rockfish assessment are the unknown level of historic catch, stock structure, selectivity of the oldest individuals, and lack of information for all the biological parameters.

b) Strengths and weaknesses of current approaches
The current approaches for all species appear to be appropriate. The assessments present a reasonable description of the uncertainty in the assessments. The widow rockfish and boccacio stock assessments should be moved to the more flexible and efficient Stock Synthesis II modeling environment.

c) Suggested research priorities to improve the stock assessment.
Small increases in data could lead to substantial improvements in three of the four assessments. Good age-frequency data is only available for widow rockfish. Representative age-frequency data, with associated length information, would provide the most effective and timely information for the kelp greenling, boccacio, and blackgill rockfish stock assessments. The indices of abundance for all species are poor and reliable fisheries independent indices would greatly improve the assessments.

Additional information can be found in the STAR Panel reports. In general, this report focuses on topics not covered in the STAR Panel reports and topics that require additional detail.

Background

This section provides a short description of the kelp greenling, widow rockfish, boccacio and blackgill rockfish stocks and assessments. A more complete background can be found in the individual stock assessment and STAR Panel reports.

Kelp Greenling
This is the first quantitative assessment of the population status of kelp greenling along the west coast of the United States. The population was divided into a northern stock (Oregon) and a southern stock (California) and these were assessed separately. There is much less historical catch data for the Oregon stock and the results for this stock were imprecise. The results for the California stock were considered implausible by the STAR Panel and the inconsistencies could not be resolved. Therefore, the assessment of the California stock was not considered appropriate for management advice.

Kelp greenling is primarily a nearshore species. The management of kelp greenling is mainly limited to recently imposed regulations or regulations that are combined with those for other species. Until recently, the majority of removals have been made by the recreational sector. Kelp greenling have been a component of the recreational sector for several decades, but the amount of removals is very uncertain before 1980. The commercial fishery started catching kelp greenling in significant amounts in the mid 1990s as part of the live-fish hook and line and pot/trap fisheries.

The data available for this species is very limited and there is little information about the biology of the species. The catch data is very uncertain prior to 1980. There is no fishery independent survey for this species because most surveys are conducted at depths outside the range of kelp greenling. Indices of abundance were based on recreational CPUE. Only two years of catch-at-age data are available for the Oregon stock. No reliable catch-at-age data are available for the California stock. Biological information is lacking and even the growth rate is based on very limited data.

The stock assessment was conducted using Stock Synthesis II. The model was an age and sex-structured statistical catch-at-length analysis. Recruitment was modeled as varying around a Beverton-Holt stock-recruitment relationship. The model included separate fisheries for the recreational modes and the commercial sectors. The Oregon stock assessment included age-length data which provided information on growth.

Widow rockfish
Widow rockfish was originally designated an update assessment, but was elevated to a full assessment at the request of the STAT. The last assessment for widow rockfish was 2003. The stock is assumed a single mixed stock. However, growth parameters for the

northern and southern areas are used in the model calculations. There is uncertainty about the northern extent of this stock. There is a large amount of catch-at-age data for this assessment, but lack of reliable abundance indices.

A midwater trawl fishery for widow rockfish developed rapidly in the 1970s. Trip limits were introduced in 1982 to curb the expansion of the fishery. Further management restrictions have been implemented since. The stock has been designated overfished and rebuilding analyses carried out.

The assessment was updated to include new data for 2003 and 2004. In addition, the Triennial Trawl Survey was included in the analysis for this assessment and a prior is applied to the steepness of the stock-recruitment relationship.

Bocaccio
Bocaccio has previously been designated as overfished. A rebuilding analysis has been carried out and a rebuilding plan developed. A full assessment was carried out in 2003 and this is an update assessment. Catch data was updated for 2000 and later. Length-composition data was updated for 2003 and later; including data from the southern California recreational fishery for the first half of 2005. The recreational CPUE based indices of abundance were not updated due to biases caused by management restrictions. The 2004 Triennial Trawl Survey was included in the analysis. The CalCOFI survey data was updated including the January 2005 survey data. All other aspects of the assessment were consistent with the previous assessment to comply with the terms of reference for update assessments.

Blackgill rockfish
Blackgill rockfish is primarily a commercial species with little or no recreational catch due to its depth range. Information on catches of blackgill rockfish are uncertain prior to 1978 and were substantially updated after the STAT report was received. Catches have declined steadily since a peak in 1982.

The only previous assessment was conducted in 1999 using a simplistic assessment method. The current assessment was conducted using Stock Synthesis II. In addition to survey indices of abundance and length-frequency data, age-length data for the 1998 AFSC Shelf Survey have been included in the assessment to provide information on growth. The NWFSC Combined Survey was excluded from the assessment

Description of Review Activities

I spent the period of 1st-5th of August 2005 in Santa Cruz at the Southwest Fisheries Science Center, attending the Stock Assessment Review (STAR) Panel for kelp greenling, widow rockfish, boccacio and blackgill rockfish. I was assigned rapporteur duties for kelp greenling. Several background documents were provided and they are listed in appendix A. These documents were reviewed before the STAR Panel meeting.

A list of clarification questions and possible analyses was prepared for the STAT, some of which were sent to the STAT before the STAR Panel.

STAR Panel meeting
The meeting started with presentations of the draft stock assessment reports (the members of the STAR Panel and STAT Teams are listed in Appendix B). These presentations included descriptions of the fishery and historical management, the stock assessment model, the data used in the assessment, biological parameters, and initial results. The stock assessments were then discussed and a list of additional requested analyses was created by the STAR Panel for each species. An iterative process followed that alternated between the presentation of results and the request for additional analyses. Finally, the STAR Panel generated a report for each species summarizing the assessment, listing the requested analyses, and providing recommendations. I prepared the initial draft of the kelp greenling report. These reports include input from the CIE reviewer and should be consulted for additional information.

CIE Report
The period following the STAR Panel meeting was used to synthesize the information and results provided at the meeting to generate this report.

Summary of findings

The final assessments developed during the STAR Panel meeting are considered to be an appropriate use of the data and description of the uncertainty for the kelp greenling, widow rockfish, boccacio and blackgill rockfish stocks. However, there are still several uncertainties that need to be investigated and/or reduced. In particular, age-length data for kelp greenling, boccacio and blackgill rockfish would greatly improve the assessments. The following gives a summary of the assessments of the stocks and the areas of concern that need to be addressed, and other topics of interest.

Status of the kelp greenling stock and its uncertainties
It was only possible to produce a credible assessment for the Oregon stock. To be consistent with the shore based recreational fishery length-frequency data, the California assessment estimated an asymptotic selectivity curve for this fishery. An asymptotic selectivity was not expected for a shore based fishery and is not consistent with the dome shaped selectivity estimated for the Oregon stock. In addition, the exploitation rate for this fishery was too high to be plausible for a shore based fishery unless local depletion is occurring. Unfortunately, the length-frequency data for this fishery is not representative of the whole California stock. The samples came from the northern part of the stock and may represent larger individuals as seen in the Oregon stock. The results were substantially different and the exploitation rates were more plausible when a dome shaped selectivity was used for the shore based fishery. Several scenarios were run where the dome shaped curve estimated in the Oregon assessment was used for the California assessment. However, due to the differences in growth between the two stocks, the Oregon selectivity was considered as inappropriate for the California

assessment for similar reasons the length-frequency data was considered inappropriate. A comprehensive spatial coverage of length-frequency sampling for the shore based recreational fishery is needed to solve this problem.

The assessment for the northern stock assessment is highly uncertain. The absolute biomass is more uncertain than the depletion levels and estimates of ABC will also be uncertain.

The main uncertainties in the kelp greenling assessment are the unknown level of historic catch, stock structure, imprecise indices of abundance, poor spatial coverage of sampling, selectivity of the shore-based recreational fishery, and lack of information for all the biological parameters. See the kelp greenling STAR Panel and STAT reports for additional information.

Status of the widow rockfish stock and its uncertainties
The main uncertainties in the widow rockfish assessment are the imprecise or possibly biased indices of abundance and the stock-structure. Widow rockfish is assessed to be less depleted and more productive than in the previous assessment. See the widow rockfish STAR Panel and STAT reports for additional information.

Status of the boccacio stock and its uncertainties
No new uncertainties were identified for boccacio. The boccacio stock has been depleted to low levels and is now rebuilding. See the boccacio STAR Panel and STAT reports for additional information.

Status of the blackgill rockfish stock and its uncertainties
The main uncertainties in the blackgill rockfish assessment are the unknown level of historic catch, stock structure, selectivity of the oldest individuals, and lack of information on all the biological parameters. Blackgill rockfish is assessed to be less depleted than boccacio and widow rockfish. See the Blackgill rockfish STAR Panel and STAT reports for additional information.

RecFIN CPUE data
The inability to access the raw RecFIN catch and effort data reduced the reliability of the recreational based CPUE indices of abundance. The raw data would allow for better identification of targeting and the determination of zero catch versus zero effort. The access problems with this data should be rectified.

Effective sample size for catch-at-age and catch-at-length data
It is well recognized that the actual sample size for catch-at-age and catch-at-length data is higher than the effective sample size that should be used in statistical catch-at-age and catch-at-length models. The effective sample size is lower because: 1) the samples are often correlated due to fish in the catch grouping by size or age, and 2) the population dynamics model does not include all the processes that cause the age and length distributions to change over time (e.g. temporal variation in growth or natural mortality). An iterative procedure is used in most assessments to determine the effective sample size.

Often a regression of the effective sample size versus the observed sample size is used. The widow rockfish assessment identified a problem with this regression method if the regression does not go through the origin. Low sample sizes in the most recent years were increased by the regression causing the estimation of a large recruitment, which would influence projections. Guidelines are needed on the most appropriate method to estimate the effective sample size.

Need for age-length data

The results from assessments that are mainly based on length-frequency data are often sensitive to the growth parameters and variation of length-at-age. This is particularly true for models that start from an exploited condition. The average length and the standard deviation of length for the maximum age determine the maximum sized fish predicted by the model. If there are lots of fish of these sizes in the data, the exploitation rates will be estimated low. However, if there are no fish of these sizes in the data, the exploitation rates will be estimated to be high. An alternative explanation for the missing length data for old ages is that the selectivity curve is dome-shaped. It is difficult to differentiate between these hypotheses. Therefore, there is a need for reliable estimates of both the mean length at age and the variation in length at age. This information generally comes from age and growth studies. Unfortunately, the methods used to collect the data often introduce bias into the estimates. It might appear intuitive that a sample of fish that covers the full range of lengths would be needed to get a good estimate of the parameters of the growth curve. Therefore, sampling is designed to collect a fixed number of fish from several predefined length categories. However, this introduces bias into the estimates of both the mean length at age and the variation in length at age. The distribution that is desired for stock assessment purposes is the distribution of length-at-age. However, the appropriate way to analyze the data is by modeling the age-at-length. To move from age-at-length to length-at-age, conditional probability is used, which requires the proportion at age in the catch and can only be done inside the population dynamics model. Stock Synthesis can include age-length data and this method should be advocated for future assessments. The benefit of this approach is apparent in the estimates of mean length at age from the kelp greenling assessment, which shows the downward adjustment for length specific selectivity. It is recommended that age-length data be collected for all stock assessments that are based on length-frequency data.

Spatial structure

Spatial stock structure is a major uncertainty in many of the groundfish assessments. This uncertainty is in both the spatial structure within US waters and the interactions with stocks outside the US borders. There is the possibility of local depletion, particularly with kelp greenling, which has a major component of the fishery based on shore based recreational fishing. The catch from this component in California has decreased greatly since the mid 1980s, and it is unlikely that the number of people fishing (or targeting kelp greenling) has declined at the same rate. Under this assumption, the amount of kelp greenling available to the shored based fishers has decreased substantially. So, either the whole population has declined or local depletion is occurring. In many cases, the availability of data restricts the spatial structure that can be modeled. For example, lack of historical catch data for the kelp greenling caught in Oregon causes problems when

combining Oregon with northern California. In some cases, management boundaries may require different spatial structure compared to those supported by biology.

Recruitment indices
A recruitment survey was used in the widow rockfish assessment. However, the fit to this survey was poor. In the previous assessment, the STAR Panel suggested to fix the power parameter at 3 for the relationship between the index and recruitment. This is because if estimated, the power parameter was much higher and considered unrealistic. Inclusion of the recruitment index in the assessment and estimation of the power parameter produced similar results to excluding the index. However, due to the poor fit to the data, it is inappropriate to fix the power parameter, and if not treated correctly in projections, this could cause substantial bias. The projections should include the uncertainty in the recruitments estimated in the stock assessment model and the recruitments predicted outside the stock assessment model from the relationship with the index. The former automatically takes the uncertainty in the index into consideration. The latter would need to include the parameter uncertainty in the power parameter and the uncertainty in the relationship between recruitment and the index (i.e. the standard deviation of the likelihood function).

Years for annual recruitment deviates
The rationale for the years for which recruitment deviates are estimated has differed among assessment authors. The choice of years is complicated by the lognormal bias correction factor that is applied to the recruitment deviate. Some suggestions are included in a document supplied by Rick Methot. However, this problem needs more consideration and guidelines developed to direct assessment authors. One method that has been used is to estimate the annual recruitment deviates for all years and then look at their standard errors to see in which years there is information about recruitment. Alternatively, the choice could be based on when the deviates start to fluctuate. Another method is to work back from the length or age frequencies to determine what cohorts are represented in the data.

Suitability of surveys
Many of the species assessed live in rocky habitat that is not suitable for trawl surveys. Therefore, the surveys may only be measuring the fringes of the populations. The survey may only be measuring the expansion and contraction of the spatial distribution of the population resulting in a nonlinear relationship between the index and abundance. More consideration about the appropriateness of the surveys and alternative survey methods is needed.

Selectivity
The Stock Synthesis software has a wide range of selectivity configurations, both age based and length based. The assessment authors have used different selectivity specifications. In some cases, the selectivity configuration may cause convergence problems. There is a need for some guidelines on what assumptions are appropriate (asymptotic or dome shaped, length based or age based) and which configurations should be used and what parameters estimated.

Uncertainty
The guidelines require additional analyses to bracket uncertainty in the assessment. The rationale for developing these analyses differs between assessments. In some cases, sensitivity analyses to model parameters, model structure, or data inclusion, which give different results than the base-case, are selected to represent the uncertainty. In other cases, a single parameter (e.g. M or h) is used to represent the uncertainty in the current depletion level estimated in the base-case (i.e. calculate the 75% confidence interval on the depletion level from the base-case, profile over M to see which values give depletion levels equal to the upper and lower bounds, then use these to represent the uncertainty) In the case of rebuilding analyses, the productivity of the stock, which is related to M and h, may be more important than the current depletion level. Also, what level of uncertainty is required; is it 75%, 95%, or something else? Guidelines are needed on how to represent uncertainty.

Stock Synthesis II improvements
Several improvements to Stock Synthesis are desirable.

1) Ability to fit to weight-frequency data
2) Estimation of the standard deviation of the lognormal likelihood function
    a. Analytical MLE
    b. Analytical Bayesian
    c. As a free parameter

Synthesis of assessments
I think that it would be of great benefit for someone to go through all the assessment reports and STAR Panel reports from this years round to summarize what decisions were made and why, and to summarize the assumptions and data used in each assessment. This could then be used to determine what research is needed and to create recommendations on several aspects of the assessment procedure as mentioned above.

STAR Panel process
CIE representatives should not be rapporteurs. It is difficult to critically evaluate an assessment and provide input into discussions and take notes at the same time. This leads to either less input by the CIE reviewer or poor reporting. This comment is relevant to any experts on the STAR Panel. However, this leads to a conundrum because you often need expertise in an area to be able to understand the discussion and take notes.

There is a need for more documentation of requested analyses and subsequent results. The STAR Panel is required to include the rationale for the requested analyses, but this is seldom done. Results are often only presented to the Panel and handouts would greatly facilitate the understanding and comparison of results.

Five days is insufficient to adequately evaluate four assessments. Finishing within the five days requires a Chairman that understands the assessments and makes decisions. In this case, the Chairman drives the discussions, which makes it difficult for the STAR Panel members to follow the discussions and have input. Pushing the assessments

through the system results in quick decisions that may not be the most appropriate. Having multiple stocks creates confusion about remembering which results or decisions refer to which stocks. I think it would be beneficial if the STAR Panel members had 30 minutes or so of quiet time after each presentation to look over the results and think about the assessment before making the requests for analyses. In this case, it would be beneficial to have the SS2 results spreadsheet so all the results are available.

It was encouraging to see the involvement of industry both on the STAR Panel and at the meeting. Industry members, particularly those with a historical knowledge of the fishery, are able to provide information to help interpret the data and stock assessment results. The scientists that are analyzing the data often do not have this type of knowledge.

Conclusions/recommendations

In general, the kelp greenling, widow rockfish, boccacio, and blackgill rockfish assessments appropriately use the available data and represent the uncertainty. Modifications and refinements to the assessment methods are possible, but major improvements to the assessments will only be achieved with the collection of additional data. The STAR Panel reports list numerous recommendations for both species and these reports should be referred to for the majority of recommendations. Additional recommendations can be found above in the findings section. The priority for future assessments is to collected representative age-length data and length-frequency data. A longer term priority is to develop adequate fishery independent surveys for these species.

Appendix A: Bibliography of materials provided

I. Current Draft Stock Assessments

A. Widow rockfish

1. Status of the widow rockfish resource in 2005. Xi He, Donald E. Pearson, E.J. Dick, John C. Field, Stephen V. Ralston, and Alec D. MacCall. Draft.

B. Blackgill rockfish

1. Stock assessment of blackgill rockfish (Sebastes melanostomus) population off the West Coast of the United States in 2005. Thomas E. Helser. Draft.

C. Bocaccio rockfish (Update)

1. To be sent separately via email later in the week. Please review 2003 bocaccio assessment for reference.

D. Kelp greenling

1. Status of Kelp Greenling (Hexagrammos decagrammus) in Oregon and California Waters as Assessed in 2005. Jason M. Cope and Alec D. MacCall. Draft

II. Background Materials

A. 2004 Workshop Reports

1. Recreational CPUE Statistics Workshop, June 29-30, 2004, Santa Cruz, California. A Report of the SSC Groundfish Subcommittee –Based on a Meeting Held at the Southwest Fisheries Science Center Santa Cruz Lab, June 29-30, 2004.
2. A Summary Report from The West Coast Groundfish Data Workshop held July 26-30, 2004 in Seattle, Washington. Northwest Fisheries Science Center. February 16, 2005.
3. A Summary Report from the Stock Assessment Modeling Workshop held October 25-29, 2004 at the Northwest Fisheries Science Center, Seattle, Washington. Northwest Fisheries Science Center, FRAM Division. March 16, 2005.

B. SS2 Documentation

1. Technical Description of the Stock Synthesis II Assessment Program. Version 1.17. Richard D. Methot. March 2005.
2. User Manual for the Assessment Program Stock Synthesis 2 (SS2), Model Version 1.17. Richard Methot. April 4, 2005.
3. PowerPoint Presentation: SYNTHESIS 2: Integrated Analysis of Fishery and Survey Size, Age, and Abundance Information for Stock Assessment. Richard Methot.
4. SS2 Model and Examples

C. STAR Panel Terms of Reference

1. Groundfish Stock Assessment and Review Process for 2005-2006. The Scientific and Statistical Committee (SSC) of the Pacific Fishery Management Council. 2005.

D. GAO Report

1. Pacific Groundfish: Continued Efforts Needed to Improve Reliability of Stock Assessments. United States General Accounting Office, Report to Congressional Requesters. June 2004.

III. Previous Stock Assessments and STAR Panel Reports

A. Widow rockfish

1. Status of the widow rockfish resource in 2003. Xi He, Stephen V. Ralston, Alec D. MacCall, Donald E. Pearson, and Edward J. Dick. 2003.
2. Widow rockfish STAR Panel Meeting Report. 2003.
3. Status of the Widow rockfish resources in Y2K. 2000. Erik H. Williams, Alec D. MacCall, Stephen V. Ralston, and Donald E. Pearson. 2000.
4. Coastwide Widow Rockfish STAR Panel Meeting Report. 2000.

B. Blackgill rockfish

1. Stock Assessment for Blackgill rockfish. 1998. J.L. Butler, L.D. Jacobson, and J.T. Barnes.
2. Star Panel Report on the Blackgill Rockfish (Sebastes melanostomus) Assessment. 1998.

C. Bocaccio rockfish

1. Status of Bocaccio off California in 2003. Alec MacCall.
2. Bocaccio STAR Panel Report. 2003.
3. Status of Bocaccio off California in 2002. Alec MacCall.
4. Bocaccio STAR Panel Report. 2002.

IV. Documents provided during the STAR Panel

1. A prior for the steepness based on a persistence principle. Xi He, Marc Mangel, and Alec MacCall.
2. Natural mortality of blue rockfish, *Sebastes mystinus*, during their first year in nearshore benthic habitats. Adams and Howard.

Appendix B: Members of the STAR Panel and STAT teams

Andre Punt, Scientific and Statistical Committee (SSC) Representative, STAR Panel Chair
Michael Schirripa, Northwest Fisheries Science Center (NWFSC)
Tony Smith, Center Commonwealth Scientific and Industrial Research Organization (CSIRO)
Robert Mohn, Center for Independent Experts (CIE)
Mark Maunder, Center for Independent Experts (CIE)

Pete Leipzig, Groundfish Advisory Subpanel (GAP) Representative
Susan Ashcraft, Groundfish Management Team (GMT) Representative
John Field, Groundfish Management Team (GMT) Representative

Stock Assessment (STAT) Teams
Widow rockfish – Xi He, Donald E. Pearson, E.J. Dick, John C. Field, Stephen V. Ralston, and Alec D. MacCall, Southwest Fisheries Science Center
Blackgill rockfish –Thomas Helser, Northwest Fisheries Science Center
Kelp greenling – Jason Cope, University of Washington and Alec MacCall, Southwest Fisheries Science Center
Bocaccio rockfish – Alec MacCall, Southwest Fisheries Science Center

Appendix C: Statement of work

Statement of Work

Consulting Agreement between the University of Miami and Quantitative Resource Assessment, LLC

July 5th, 2005

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 widow rockfish, bocaccio rockfish, blackgill rockfish, and kelp greenling resources off the U.S. Pacific coast.

The consultants will participate in the Stock Assessment and Review (STAR) Panel of the Pacific Fishery Management Council (PFMC) for the review of the widow rockfish, bocaccio rockfish, blackgill rockfish and kelp greenling 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 widow rockfish, bocaccio rockfish, blackgill rockfish and kelp greenling stock assessments;
- Most recent previous stock assessments for widow rockfish, bocaccio rockfish, and blackgill rockfish (kelp greenling has not been assessed previously);
- 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 Recreational CPUE Statistics workshop and the West Coast Groundfish data and modeling workshops held in 2004.
- Stock Synthesis 2 (SS2) Documentation
- 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 Santa Cruz, California from August 1-5, 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; and
6) Complete a final report after the completion of the STAR Panel meeting.
7) No later than August 19, 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, and to Mr. Manoj Shivlani, via e-mail to mshivlani@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.