

**REPORT ON THE
SOUTHERN CALIFORNIA ROCKFISH
STAR PANEL
9-13 MAY, 2005
LONG BEACH, CALIFORNIA**

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EXECUTIVE SUMMARY

A STAR Panel considered draft assessments of cowcod, scorpionfish, gopher rockfish, and vermilion rockfish from May 9-13, 2005 at the NMFS Southwest Regional Office in Long Beach, California. This was an ambitious undertaking considering that two species is the normal maximum number, and also because three of the four species for this STAR Panel had not been previously assessed. At the Chair's instigation, assessment authors were sent pre-meeting requests for analyses and model runs in an attempt to expedite the process.

The draft assessment documents were adequate in terms of the meeting process. However, the scorpionfish assessment was clearly a "work in progress" and the gopher and vermilion authors were, perhaps, anticipating that the Panel would recommend changes to base models. The cowcod document was essentially complete, but the base models presented were substantially changed during the meeting.

The draft assessments did not contain adequate model diagnostics in terms of an in-depth analysis of standardized residuals and the relative weightings of data sets. Also, most authors attempted to use any and all data that were available without due consideration to the quality of the data relative to model assumptions. Also, generally, they estimated far more parameters than were supported by the data. My two main pre-meeting requests were for the production and presentation of standardized residuals and for a "reality check" on the abundance indices used in the assessments.

The STAR Panel and assessment authors worked together productively and amicably during the meeting. The presentations were good and the STAT Teams were responsive to Panel requests. All Panel recommendations for base models were adopted by the STAT Teams. There was only one minor area of disagreement, in the gopher assessment, where the Panel and STAT Team attributed different relative probabilities to the three final models.

The draft cowcod assessment was substantially modified during the meeting. The assessment author had updated the time series used in the previous assessment and had included data from new sources. However, he agreed with the Panel's recommendation to remove three data sets, including two abundance time series which had been used in the previous assessment. The final model was very simple, using only two data sets and estimating three parameters. This was entirely appropriate given the quality of the data which were available.

The draft scorpionfish assessment was unusual in that eight stocks had been assessed, seven off southern California and one off Mexico. The Panel recommended that a single southern Californian stock be assessed and the assessment author readily agreed. Various model configurations were explored during the meeting and most model runs were problematic in that the historical exploitation rates were implausibly high. This problem was eventually solved by the STAT Team. The base model was relatively simple, and the

dimension of uncertainty was defined by the inclusion or exclusion of an abundance time series.

The base model from the draft gopher assessment was very similar to the model eventually recommended by the Panel and accepted by the STAT Team. Various model configurations were considered during the meeting. The main issue which arose for the assessment was the relative weighting of the CPUE and length frequency time series. The emphasis factor on the CPUE time series was used to define the main dimension of uncertainty.

The vermilion assessment considered a northern and a southern stock with separation at Point Conception. A major issue in the draft assessment was the choice of a Beverton-Holt or Ricker stock-recruitment relationship. During the meeting it became apparent that the Ricker relationship, although quite plausible in theory, lead to pathological model behaviour. Beverton-Holt relationships were used, with steepness at 0.65 (typical rockfish value) or 1 (indicating no relationship; an approximation of periodic very high recruitment). In the north, two bracketing runs used the different values of steepness. In the south, two level of emphasis on the CPUE time series were used to bracket uncertainty.

The STAT Teams and the STAR Panel worked long hours in order to get through the ambitious agenda. The meeting was successful, and all assessments were improved by the process. In general, all assessments were moved towards simpler models, with much greater scrutiny of data sets before they were accepted into a base model. All of the assessments are highly dependent on CPUE time series which may not adequately track abundance. The value of the vermilion assessment is uncertain if genetic evidence that it consists of two species is confirmed.

BACKGROUND

A STAR Panel considered four southern Californian rockfish assessments from 9-13 May 2005 at NMFS Southwest Regional Office in Long Beach, California. This was the second STAR Panel in an ambitious 2005 schedule aimed at assessing 23 groundfish species. Of the four species considered, only cowcod had been previously assessed. Therefore, three STAT Teams (scorpionfish, gopher, vermilion) had the difficult task of defining stock boundaries, constructing catch histories, and compiling and calculating input data with no guidance from previous assessments of their species.

This report presents my personal view on the four rockfish assessments considered by the Panel and makes some recommendations with regard to some aspects of the STAR Panel process. This report is best read in conjunction with the STAR Panel Reports which contain further details of the meeting and other recommendations concerning the assessments.

REVIEW ACTIVITIES

Meeting Preparation

Prior to the meeting, I read the draft assessments and consulted the supplied background material (Appendix 1). At the request of the Chair, pre-meeting requests for analyses and/or model runs were supplied. The Chair collated the requests from the Panel members and forwarded them to the STAT Teams. This unusual approach was fully warranted given the rather daunting prospect of considering assessments for four species (compared to the suggested maximum of two species).

I had two main pre-meeting requests which applied to all species. First, because there was a general lack of model diagnostics, I requested the calculation and presentation of standardized residuals for each time series. In particular, I wanted the standard deviation of the standardized residuals (sdstr) for each time series to check if appropriate relative weightings were being used. The sdstr of each time series should be approximately equal to 1. If an sdstr is larger than 1, then the time series is being given too much weight; if it is less than 1, then it is not getting enough weight. If the sdstr are all approximately equal to 1, then the time series are said to have their “natural weightings”. If a run does not have its natural weightings, it is internally inconsistent in that its residuals are not compatible with the assumed effective sample sizes and c.v.s. Natural weights will be achieved if iterative re-weighting procedures, as recommended by the October 2004, Seattle Modeling Workshop, are properly followed (Anon. 2005 b).

My second general request was for a “reality check” on time series used in the assessments. It was clear from the level of variation in some time series, and in their unusual trends, that they were not appropriate indices of abundance.

I had specific requests with regard to the scorpionfish and cowcod draft assessments. The scorpionfish assessment had divided the southern Californian Bight into seven stocks (with an eighth stock off Mexico). I requested a detailed justification for the use of so many stocks (the Panel’s pre-meeting request included a request for a single-stock run). For cowcod, I noted the contrary trends in the CalCOFI time series and the CPFV time series and requested runs which excluded each time series in turn (there were actually already runs which de-emphasized each time series – which has a similar effect to exclusion).

Meeting Attendance

A narrative of the meeting is given below. Full details of requested analyses and final model runs are in the STAR Panel Reports.

9 May

The meeting was convened at 8 am and began with a round of introductions. The first presentation was on the scorpionfish draft assessment. Available data and biological

parameter estimates were covered. The only source of at-age data was obtained from a publication (Love et al. 1987) which tabulated data from 1-11 years with a plus group at 12 years. The raw data could not be obtained (it appears they have been lost). The justification for the use of so many stocks was re-iterated as being based on catch distribution and catch rates. However, the assessment author noted that since completing the multiple assessments, he had concluded that a single stock (in U.S. waters) was appropriate. The Mexican “stock” may or may not be a separate biological stock. However, the lack of data on the stock makes any assessment problematic. Attempts to obtain data from the Mexicans were fruitless.

The draft assessment results were presented, and the “sum over all stocks” was compared to the Panel requested single-stock run. Results were similar. A problem was identified by the author in that the exploitation rates appeared unrealistically high (exceeding 0.9 for the maximum age). The Panel and STAT Team agreed that the base model should use only a single stock in U.S. waters. Clarification of analyses and model runs to be performed was interrupted by the arrival of lunchtime.

After lunch, presentations were made on cowcod. This was the only species, of the four being covered, which had previously been assessed (Butler et al. 1999). Subsequent to the early assessment, a visual survey of cowcod conservation areas (CCA) had been undertaken in 2002 using a submersible (Yoklavich draft). The first cowcod presentation covered this survey, the initial results, a formal review of the survey and results, and the revision of the results in response to the reviewers’ comments. The reviewers had seven points of concern. Each point was examined, but only three of them made a difference to the biomass estimate. The revised estimate, which had been used in the draft cowcod assessment, was 22% lower than the original. It was still very high in comparison to the assessment results of Butler et al. (1999). The issue of scaling-up the CCA visual survey estimate to the whole cowcod stock was then addressed.

Two alternative methods for producing an expansion factor were discussed. The first method used the CalCOFI larval time series, but this was dismissed (by the STAT Team) because it produced a very imprecise expansion factor estimate. The second method used recreational CPUE and habitat area estimates, inside and outside the CCA, and gave an expansion factor of 1.55 with a standard error of 0.06. It was acknowledged that the achieved precision was unrealistic. During a question and answer session, the Panel clarified the method and concluded that there was a problem with the time frame used as it included early years when relative cowcod abundance outside the CCA was higher than it was at the time of the visual survey. A request was made for a revised expansion factor based on a more appropriate time frame.

The second cowcod presentation covered the draft assessment. Available data and assumed biological parameters were presented with three proposed base models. Each model used all available abundance time series with two models using a sparse time series of length frequency data. There was much discussion about each data source.

The CalCOFI larval time series was used as an index of spawning biomass. The Panel and the STAT Team were concerned that so very few cowcod larvae were ever captured during this survey. It showed implausible variation in spawning biomass abundance and the meeting concluded that the time series was driven by factors which were not related to the year-specific spawning biomass of cowcod (see STAR Panel report for further discussion). The outfall trawl survey series conducted by Californian Sanitation Departments was also eventually rejected by the meeting (it was used in one subsequent run, but was eventually dropped). Few cowcod were ever captured during the surveys which necessarily avoided cowcod's preferred habitat of rough/rocky bottom. The surveys also had very limited coverage relative to the distribution of the stock.

The length frequency data were very sparse and were also not used in the final runs. We preferred to assume that fishing selectivity was equal to female maturity. This is a decision that we may have revisited if we had had more time.

The meeting closed for the day at 6.30 pm after discussion on various model runs to be tried for scorpionfish. All runs were to be for a single stock, with M fixed at 0.25 and Beverton-Holt steepness fixed at 0.7. For most species, assessment authors had been estimating steepness. This was an approach I discouraged as it was clear that there was little or no information in the available data on steepness (because there were no direct observations of recruitment and spawning stock size was poorly determined).

10 May

The meeting resumed at about 8 am with a presentation on the draft vermilion rockfish assessment. This assessment was unusual in two respects. First, it was noted that genetic differences had been detected in two samples of vermilion rockfish from southern California. No further information on where the fish were from was available. It therefore appears that vermilion rockfish consist of at least two species (nonetheless, they were being assessed as a single species – although with two stocks, north and south of Point Conception). The second unusual feature of the assessment was that a Ricker stock recruitment relationship had been fitted in some runs in preference to the more common Beverton-Holt relationship. The Ricker relationship gave a better fit to the data primarily because of strong recent recruitment estimates (which were more easily explained by a Ricker – but the same would be true of many assessments).

Discussions concerned the best approximation to the actual recruitment relationship. Beverton-Holt with a steepness of 1 perhaps approximated best what might be happening: periodic very high recruitment, with little relationship to stock size. Beverton-holt with a steepness of 0.65 was retained as an option, as a general default for rockfish (Dorn 2002). The Ricker relationship was accepted as a valid alternative, but in the absence of some external evidence in support of the relationship (e.g., cannibalism), the Panel were not greatly supportive of its use.

The RecFIN CPUE indices derived by species association (Stephens and MacCall 2004) were discussed. Both the northern and southern time series showed large variations

inconsistent with genuine abundance indices. The southern time series had a very large increase from 2001 to 2003, and the southern time series showed a large jump from 1996 to 1997, with all subsequent points in the time series being higher than previous points in the time series. GMT and GAP representatives noted that there had been regulation changes which would have influenced vermilion catch rates in 2002 and 2003. The Panel recommended that these years be dropped from both time series for future runs. The STAT Team appeared to agree to this at the time. The Panel also requested some diagnostics for the RecFIN CPUE time series (in particular, how many records were available for use each year and how many were used – this relates to the species association filter, only records which caught species associated with vermilion are used in the subsequent GLM).

The number of recruitment deviations being estimated was also discussed. A large number had been estimated before the period when the cohorts appeared in the data. This meant that the deviations were being used to fit abundance indices rather than length frequencies. The Panel adopted a policy, for all species, of recommending that recruitment deviations were only estimated for cohorts which were represented in length frequency or age frequency data (we relaxed this for gopher – see below).

The next presentation covered the draft assessment of gopher rockfish. Only one stock north of Point Conception was assessed, because there was very little data available for an assumed southern stock. There was much discussion on the catch history for gopher. There was a period in the 1980s when reported commercial catches appeared to drop to zero. This was due to the use of a “group gopher” category. The base model used the reported catches and a sensitivity run used the author’s best estimate of catches. The Panel recommended that the best estimates should be used in the base model. The RecFIN CPUE series had been constructed using the same species association approach as for vermilion. The Panel noted that it showed the same pattern as northern vermilion with a large jump from 1996 to 1997 and all subsequent points being higher than the pre-1997 points. GMT and GAP representatives noted a bag limit introduction in 2003 which would have influenced catch rates; it was agreed to drop the 2003 point from the RecFIN time series.

There was discussion on discards and what was assumed in the model runs. The draft documentation was not complete in this regard and full details were requested. A number of model runs were requested, each to fix steepness at 0.65 (rockfish default), and estimate recruitment deviations for cohorts observed in length frequency data (this was later relaxed to give the model more freedom to fit the CPFV CPUE time series which required a low biomass in the 1980s – which could really only be achieved with low recruitment).

The second round of presentations began with a return to scorpionfish. The sanitation surveys had been combined into a single time series as requested. The main problem of implausible exploitation rates was only rectified when the c.v. of length at age was not estimated in the model but was fixed to a smaller value. Estimates had ranged from 0.11 to 0.25, the higher value being far too large (single cohorts were being fitted to the main

modes in length frequency data). A fixed value of 0.05 was used. There was discussion on what were suitable values for rockfish and there were some attempts during the meeting to obtain values estimated for other rockfish assessments. Scorpionfish runs using a range of values from 0.025 to 0.1 were requested.

The new model runs for cowcod were presented and discussion centered on a suitable prior for the visual survey proportionality constant (q). The mean had been chosen to correspond to the available estimate of the expansion factor (1.55) and an arbitrary c.v. of 50% had been used. It was decided to try alternative values: a c.v. of 75%, with a mean q (of 0.75) corresponding to an expansion factor of 1.3. The large c.v. was a reflection of the great uncertainty associated with the expansion factor and with the extent of any biases for the survey within the CCA. The lower mean allowed for the over-estimation associated with the use of the early timeframe for the CPUE based estimation of the expansion factor. The meeting closed for the day at 5.45 pm.

11 May

The meeting resumed at 8 am with an update on vermilion runs. There was more discussion on stock-recruitment relationships and there was agreement on some base model runs which included deleting the 2002 and 2003 points in the CPUE time series.

Gopher was revisited, with details of requested analyses presented. There was discussion on a management action in 1997 which saw commercial longliners shifted further offshore allowing recreational fishers better access to the kelp beds (gopher rockfish preferred habitat). This offered a plausible explanation for the increase in the RecFIN CPUE indices since 1997. However, a similar pattern was not present in the CPFV series.

There was a discard component in the likelihood for gopher which caused some discussion and subsequent investigation. It was not clear what was being fitted – there were no discard data other than estimates of annual tonnage. The intent was just to include an extra component of total catch (i.e., discards + landings), but something else was clearly happening.

Scorpionfish was revisited again with further results available. The removal of the sanitation time series had a large effect on assessment results, producing a very low estimate of current biomass. However, this was due to low estimates of recent recruitment which were not supported by the data. It was agreed that the recent recruitment deviations should not have been estimated and a new run was requested where the recent deviations were not estimated.

Cowcod was revisited. Sensitivities to natural mortality (M) and steepness (h) had been explored. A revised expansion factor based on just 1990s CPUE data was supplied (1.33) which corresponded almost exactly to the mean q of 0.75 which had already been used. The model's fit to the CPFV time series was sufficiently bad that a request was made to fit the model using a power term in the relationship between CPUE and biomass (the

model could not fit the early steep decline of the CPFV time series). This improved the fit visually but still gave a very poor pattern of standardized residuals.

Vermilion was revisited. The focus was on three runs for the southern stock using alternative stock-recruit relationships: Beverton-Holt, $h=0.65$, 1, and Ricker. The Ricker run gave an implausible biomass trajectory with an enormous 1999 cohort followed by very weak recruitment as the strong cohort feed into the spawning biomass (i.e., the stock size was estimated to be to the right of peak recruitment, so as biomass increased, recruitment fell).

Before the meeting closed for the day, the “primary dimension of uncertainty” was decided for cowcod. Model results had shown a similar level of sensitivity to both M and h , but h was selected as it was likely to be more important for rebuilding results. There was some discussion on how the first STAR Panel had dealt with instructions to bracket model results with regard to “a primary dimension of uncertainty”. It appeared that they had used a likelihood profile based confidence interval on the base model to define the extent of uncertainty (on current biomass) and had then chosen two alternative values of a parameter which delivered point estimates corresponding to the confidence interval. I urged that such an approach not be considered for this STAR Panel or any other. The derived confidence interval was based on asymptotic approximations which were almost certainly violated. Even if the confidence interval were a reasonable approximation, it is inappropriate to assume that it captures an appropriate level of uncertainty. Structural uncertainty is likely to be greater than parameter uncertainty on a single base model and it is essential that such dimensions of uncertainty are explored.

12 May

We resumed with scorpionfish projections. The model results were not sensitive to the c.v. of length at age provided it was kept within a plausible range. The greatest dimension of uncertainty appeared to be the future level of recruitment, but there was no capacity within the stock synthesis 2 (SS2) software to vary the average level for projections (or at least, no one at the meeting knew how to do it). We eventually settled on just two runs, one including the sanitation time series and one excluding it. This gave a large range of current biomass in terms of depletion.

During the discussion on projection results, it was noted that the catches in 2005 and 2006 could not be altered by management action on the basis of this assessment. In the previous STAR Panel, projections had been done for assessments using F based rules from 2005. This had given inappropriate catches in 2005 and 2006. We noted that the models had to be run up to 2006 with projections done from 2007 onwards.

Vermilion was revisited with revised model runs presented for the south. The author had reinstated the 2002 and 2003 CPUE points without consulting with the Panel. However, on further consideration of our original recommendation, it was concluded that the biggest problem with the 2002 and 2003 points was in the north rather than the south. Eventually, because of the difficulty of deciding how much impact the regulations would

have had catch rates in those years, and whether the impacts were any greater in those years than others, it was decided to leave in all years in the vermilion CPUE time series.

Gopher was revisited with a closer look at the construction of the catch history and the use of discards. Another possible influence on the RecFIN CPUE time series was noted with a change in the late 1990s with regard to “raiding” party boats. Model runs were requested exploring the effect of including or excluding the RecFIN CPUE time series.

Subjective probabilities were assigned to the model runs put forward for scorpionfish and cowcod. The same approach was used in both cases with each member of the Panel and the STAT Team assigning a probability to each run. The individual probabilities were then averaged. The arbitrariness of this approach “offended” one member of the Panel who did not participate. However, the GMT representatives made it clear that if we did not assign specific probabilities to the runs, then they would do so (albeit by treating them as equally likely).

There was, at last, a presentation on the number of records that were available and were used in the vermilion RecFIN CPUE analysis. Overall, a very low percentage of records was retained for the analysis. The large spike in the northern time series in 1997 corresponded to the retention of most of the “positive records” (being when vermilion were caught). There did not appear to be a firm basis for rejecting individual points in the time series. We had concerns that the species association method may not have worked well with these data, but had no recourse other than to use the series.

Gopher runs were requested to be run that night with different levels of emphasis on the CPFV time series. We had agreed to eliminate the RecFIN time series given concerns about the management changes in the 1990s (in 1997 in particular), and that no diagnostics were available for the time series, and because the results were insensitive to its inclusion or exclusion.

13 May

The gopher runs were presented. Emphasis levels had been tried at 0.5, 1, 5, 10, and 100 (but the run at 100 had failed to converge). With increasing weight on the CPFV series the visual fit naturally improved. The run with emphasis set at 1 had a $sdstr = 0.5$ which suggested that more weight should be placed on the CPFV series. However, there was insufficient time to determine the natural weight for the CPFV series. Instead, we rationalized the use of alternative emphasis factors by noting that the determination of appropriate relative weights was problematic due to potential unrepresentativeness of the length frequency sampling. We chose emphasis level as the primary dimension of uncertainty, with runs with emphasis at 1, 5, and 10. There was a disagreement between the Panel and the STAT Team on the relative probabilities to assign to these runs. Most of the Panel saw them as almost equally plausible, but the STAT Team strongly favored the two runs with the higher emphasis levels.

Final vermilion runs were presented. The Ricker runs were abandoned as they gave implausible results. For the northern stock, two Beverton-Holt runs were chosen with steepness as the dimension of uncertainty: $h = 0.65, 1$. In the south, the emphasis level on the RecFIN CPUE series was chosen as the dimension of uncertainty. There is little justification for putting extra weight on such a time series (the variation is non-random and too large for it to be a genuine abundance time series) but the subsequent results are sensible. The upturn from 2001 to 2003 in the RecFIN series is supported by length frequency data showing a very strong 1999 cohort.

The rest of the day was spent reviewing the draft STAR Panel reports which members had mainly written outside of meeting hours.

14–17 May

I used opportunities as they arose to finish my draft STAR Panel report (cowcod). A complete draft (incorporating comments from Panel members obtained at the meeting) was emailed to the Panel and appropriate meeting participants on 17 May.

18–27 May

Draft STAR Panel reports were circulated for comment. They were completed by the Panel Chair after receiving what were, I believe, mainly editorial suggestions.

SUMMARY OF FINDINGS

The draft assessment documents were in various states of completion. The cowcod assessment document was essentially complete containing three base models with projection results. The scorpionfish document was very large as it contained assessments for eight stocks, but it was clearly a “work in progress”. The gopher and vermilion draft documents were much shorter and the authors were perhaps anticipating changes to be made to the assessments during the STAR Panel meeting.

None of the draft assessments provided adequate model diagnostics. I requested the calculation and presentation of more diagnostics, in particular, standardized residuals, prior to the meeting and some authors responded appropriately. Other authors struggled with the appropriate presentation of diagnostics and by the end of the meeting I had still not seen, for every assessment, what I would consider a full set of appropriate diagnostics (for the base models).

Another problem, common to all assessments, was an attempt to use any data that might possibly contain a relevant signal, in the assessment. In the case of cowcod, this was mainly driven by the previous assessment, with the current author feeling compelled to include data that was previously used (despite his concern about the quality of the data). In the case of the other species, particularly for vermilion and gopher, the absence of a “reality check” led to the inclusion of dubious abundance indices. Prior to the meeting, I

requested that authors perform a reality check on their data. The cowcod author was the only author to do so, and he identified that the CPFV time series was the best of a “bad lot”. The other authors would have done well to follow his example and give an objective assessment of the quality of their data relative to model assumptions.

The GMT and GAP representatives at the meeting were helpful when it came to the interpretation of CPUE indices as they were most familiar with recent management changes. However, their knowledge was sometimes “patchy”, and they sometimes did not know the years when changes occurred, or the areas which were affected. The assessment authors were meant to address relevant management changes in their draft documents but this was not adequately done for any of the assessments (the best effort was for gopher, but there was no mention of changes in 1997 which were potentially highly relevant to CPUE time series). It might be better if the onus is put on the GMT and GAP to document relevant management changes for each species prior to stock assessments (see Conclusions and Recommendations).

The draft scorpionfish assessment inappropriately assessed eight stocks. The author agreed with the Panel’s recommendation to move to a single southern Californian stock. The assessment then came together fairly quickly. The assessment author and other members of the STAT Team did a excellent job on this assessment during the meeting. The model structure and the number of estimated parameters are appropriate for the limited data which are available. The assumed stock structure is probably wrong, but at least it is parsimonious. The fish off Mexico could well be part of the “stock” and may be contributing larval input to southern California.

The draft cowcod assessment was essentially complete. However, the Panel recommended that several data sets be eliminated from the base model. The assessment author agreed with the recommendation and the subsequent assessment contains a single CPFV CPUE time series and the visual survey estimate (with an informed but diffuse prior). The steep decline of the CPUE time series cannot be fitted by the model unless hyper-depletion is assumed, but even then the residual pattern is inconsistent with the assumed error structure. The visual survey estimate does not greatly influence the assessment results as only point estimates have been obtained (full Bayesian results may be different). More important than the current assessment is what data will be collected in the future and how then will the stock be assessed. It is important that an informed prior for the visual survey q be properly developed and that a full Bayesian assessment be conducted. More consideration needs to be given to the CPFV time series and whether hyper-depletion is a realistic possibility.

The base model of the draft gopher assessment was quite close to the final base model. A very dubious RecFIN CPUE series was eliminated from the base model, but this had little effect on the results (because of its low weight due to its poor fit). The “natural weights” for the remaining data sets were never established for gopher. It may be that the base model is close to the natural weightings (the base model had an emphasis factor of 5 on the CPFV series which, at emphasis level 1, had a sdstr of 0.5). The validity of the

assessment results are of course entirely reliant on the CPFV CPUE time series being a genuine (unbiased) abundance index.

The vermilion assessment has a similar dependence on the reliability of CPUE time series. At first glance, the RecFIN time series do not appear to be candidates for tracking abundance. Any genuine signals are potentially obscured by the large variation of the indices and trends caused by changes of fisher behaviour as a result of management actions or other causes. The current assessment is probably the best that can be done with the available CPUE time series. There may be some potential to produce better RecFIN CPUE time series. If vermilion rockfish are two (or more) species, the value of the current assessments is uncertain. The assessment author provided some excellent insights and suggestions, on this assessment and others, during the meeting.

CONCLUSIONS AND RECOMMENDATIONS

A very ambitious schedule has been adopted for 2005 with the assessment of 23 groundfish species. This STAR Panel reviewed four assessments, three of which were the first assessments for the species. We needed one more day (or one less species) to do justice to all of the assessments. The “natural” weightings were never established for the gopher base model, and diagnostics for the “species association” CPUE analyses were barely explored for any of the assessments.

My conclusions with regard to the assessments are:

- The assessments were much improved by the STAR Panel process.
- Major dimensions of uncertainty were appropriately identified for each assessment.
- Bayesian assessments were not possible in the available time; the assessments are therefore deficient in not providing interval estimates of parameters or stock status for individual model runs.
- The assessments provide the best currently available scientific information on the status of the stocks.

I have a number of recommendations:

GMT and GAP representatives should jointly document and circulate the following, prior to each STAR Panel:

- the catches to be assumed for each species (and each fishery) in the two future years which cannot be affected by the management actions as a result of the new assessment
- previous management actions which are likely to have affected catch rates and hence are relevant to the interpretation of CPUE.

Modeling and/or data workshops should agree on and document:

- a standard minimum set of diagnostics to be produced for each CPUE time series
- a minimum standard for accepting time series as abundance indices (there should be a required reality check)
- a standard minimum set of diagnostics to be produced for each base model run (this should include standardized residuals and sdstr by time series)

Given that so many assessments are planned for a single year (every two years) it is necessary, for the purpose of efficiency, and in order to achieve consistency across species, to try to deal with as many generic issues as possible. The 2004 data, recreational CPUE, and modeling workshops, made a good start, but further focused efforts are needed. Three issues which arose in this meeting were the need for:

- determination of “best estimate” catch histories for all groundfish species
- determination and documentation of previous management actions and their likely effects on catch rates of groundfish species and the hence the interpretation of CPUE
- a full evaluation of the effectiveness and robustness of the species association CPUE method (Stephens and MacCall 2004).

REFERENCES

(see Appendix 1 for further references)

- Dorn, M.W. 2002. Advice on west coast rockfish harvest rates from Bayesian meta-analysis of stock recruitment relationships. *N. Amer. J. Fish. Mngt.* 22: 280-300.
- Love, M., B. Axell, P. Morris, R. Collins and A. Brooks 1987. Life history and fishery of the California scorpionfish, *Scorpaena guttata*, within the Southern California Bight. *Fish. Bull.* 85:99-116.

APPENDIX 1: MATERIAL PROVIDED

For cowcod, various documents were supplied relating to the review of the visual survey: reviewer's reports (3), survey team response, review minutes. Also, in addition to the documents listed below, various input and output files were supplied: example files for SS2, and SS2 assessment files for the draft scorpionfish assessment.

- Anon. 2004. Recreational CPUE Statistics Workshop June 29-30, 2004 Santa Cruz, California. Report of the SSC Groundfish Subcommittee.
- Anon. 2005a. 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
- Anon. 2005b. 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.
- Butler, J.L., T. Barnes., P. Crone, R. Conser 2003. Cowcod Rebuilding Review. 9 p.
- Butler, J.L., L.D. Jacobson, J. T. Barnes 2003. Biology and population dynamics of cowcod (*Sebastes levis*) in the southern California Bight. *Fish. Bull.* 101: 260-280
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APPENDIX 3: STATEMENT OF WORK

Consulting Agreement between the University of Miami and Patrick Cordue

April 29, 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 gopher rockfish, cowcod, California scorpionfish and vermilion rockfish 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 gopher rockfish, cowcod, California scorpionfish and vermilion rockfish 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 gopher rockfish, cowcod, California scorpionfish and vermilion rockfish stock assessments;
- Most recent previous stock assessments for cowcod (gopher rockfish, California scorpionfish, and vermilion rockfish have 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; 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 Long Beach, California from May 9-13, 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 May 27, 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 Shrivlani, via e-mail to 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.