

**Report on the  
Workshop for Data Limited Stock Assessments Methods  
(or Review of Assessment Methods for Data-Poor Stocks)**

*Santa Cruz, Ca, 25-29 April 2011*

Prepared for:  
The Center for Independent Experts  
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Dr Kevin Stokes  
Stokes.net.nz Ltd  
59 Jubilee Rd  
Khandallah  
Wellington 6035  
New Zealand  
Ph: +64 (04) 973 7305  
E-mail: kevin@stokes.net.nz

## EXECUTIVE SUMMARY

The Review of Assessment Methods for Data-Poor Stocks was held at the Southwest Fisheries Science Center, Santa Cruz, from 25-29 April 2011. The review was in response to a Pacific Fisheries Management Council (PFMC) request with a primary objective of providing a list of endorsed methods for use with data-poor stocks in the PFMC Groundfish FMP. Two methods already used for estimating OFLs in the 2011-2012 biennial specifications process were reviewed during the meeting, as well as other methods using the same or slightly extended data sets. The meeting was constructive and useful. The Panel Report was agreed with no major differences of opinion. The process was sound with good involvement from the Technical team, the Panel, appointed advisors, and the public.

DCAC and DB-SRA are methodologically sound and can be implemented without further external review to estimate sustainable yields and OFL respectively. Estimates are likely to be risk averse, or risk neutral if bias corrected (the method already employed for this purpose is adequate but it is worthwhile further investigating alternatives). This does not hold universally and overly optimistic priors on depletion could lead to risk prone estimates of DCAC and OFL. While the methods are sound, there is still therefore a need to ensure that the main data input (removals) and priors used by the methods are the best available, especially depletion.

There is scope to develop other methods that include indices of abundance and/or composition data. If this is done it is recommended that comprehensive simulation testing be used to ensure there is adequate understanding of the performance and limitations of the techniques. In principle, it is preferable to use methods that include abundance indices. If composition data only are additionally used, great care is needed as the true information content of such data is often less than presumed. While the simple methods have the advantage of estimating depletion (and hence status), their use will likely lead to assessments and processes of similar complexity to standard data-rich assessments. The costs and benefits of movement to use such methods therefore need to be carefully considered.

Implementation of methods that rely on removals data and priors on biological and fishery-related quantities needs to use the best available information to ensure credible and reliable outputs. For the Pacific region much work has already been done to improve estimates of removals and this work needs to be finalized. It is recommended that a dedicated workshop be convened for this purpose. Similarly, review of priors is important. Priors on  $B_{MSY}/B_0$  and  $F_{MSY}/M$  can be derived from consideration of data-rich stocks. Derivation of priors for depletion could also be based on comparison with data-rich stocks – notable in this case, however, is the need somehow to account for exploitation pattern and history similarities. The susceptibility scores from PSA may therefore be one route to deriving depletion priors (or of bias correcting after application of a common depletion prior). The use of stakeholder knowledge to derive or ground-truth depletion priors might also be considered.

## BACKGROUND

The re-authorized Magnuson-Stevens Act (2006) requires that Annual Catch Limits (ACLs) be set for all stocks in Fishery Management Plans (FMPs). These ACLs need to be based on the best available science. The need to assess a large number of stocks, many of which are of minor economic importance, poses problems due to data availability but also (human) resource limitations. There is therefore an interest in simple-to-apply assessment methods that use restricted data sets (historical removals and possibly trend or size-composition information).

Terms such as “data-poor” and “data-limited” have been used somewhat loosely in various settings. The distinction between data-poor and “poor data” is also not often made. The distinction between un-assessed and data-poor is also sometimes vague with many stocks not so much data-poor as not prioritized for assessment due to low value and constraint on human resources. The interests motivating the *Review of Assessment Methods for Data-Poor Stocks* are both how to assess stocks that are truly data-poor and how assessment methods developed could be used to help in prioritizing higher level assessments of currently un-assessed stocks.

In the Pacific Fisheries Management Council (PFMC) region, OverFishing Limits (OFLs) were developed for nearly all of the stocks in the Groundfish FMP in early 2010 (for the 2011-2012 biennial specifications process). Those OFLs were developed using two new assessment methods that are based on historic removals: Depletion-Corrected Average Catch (DCAC) and Depletion Based - Stock Reduction Analysis (DB-SRA). The new methods were developed and applied at the Southwest Fisheries Science Center (SFSC). The work was reviewed by the Groundfish Subcommittee of the PFMC’s Scientific and Statistical Committee (SSC) and subsequently endorsed by the full SSC. Neither the new methods nor their application were subjected to the level of review provided by a formal Stock Assessment Review (STAR) process. Consequently, in June 2010, the PFMC requested a formal, STAR-equivalent, review of data-poor methodologies:

*“The Council also requested a formal review of methodologies for determining harvest specifications for data-poor stocks. Such methods include catch-based approaches as well as those that might be considered rudimentary assessments, and should include the methodology used in the current biennial specifications process as well as reasonable alternatives to that methodology.”*

Source: <http://www.pcouncil.org/wp-content/uploads/0610decisions.pdf>

The *Review of Assessment Methods for Data-Poor Stocks* is the result of that request. The primary objective of the review meeting was to provide a list of endorsed methods for use with data-poor stocks in the Groundfish FMP. DCAC and DB-SRA (already used for estimating OFLs in the 2011-2012 biennial specifications process) were reviewed during the meeting, as well as a method implemented using the assessment platform Stock Synthesis that is intended to be comparable to DB-SRA. Some methods that use survey indices or time series of length composition data in simple assessments models were also reviewed.

## REVIEW PROCESS

The Review of Assessment Methods for Data-Poor Stocks took place at the NMFS SFSC, Santa Cruz, California, from 25<sup>th</sup> to 29<sup>th</sup> April 2011. The meeting facilities were excellent and the arrangements by PFMC and NMFS staff first rate. The STAR ftp arrangements worked well and all materials were able to be downloaded in advance to allow prior reading, as well as being efficiently during the review meeting.

The meeting was chaired by Martin Dorn, chair of the PFMC SSC. The Panel comprised the chair and three other members - one CIE appointee (Stokes), and two PFMC SSC appointees (Punt, Berkson). Another CIE appointee (Roa-Ureta) was scheduled to participate but was unfortunately unable to attend. The Panel size and expertise nevertheless seemed appropriate and Panel members worked well together during the meeting and in preparing the Panel Report. Under the guidance of the chair, all Panel members provided agreed inputs to the Panel Report and worked jointly on editing. The Panel Report was finalized on 11<sup>th</sup> May 2011.

The meeting was attended by a number of PFMC Advisors, a very strong Technical Team and a wide range of other participants including academic, NMFS, State and industry personnel. Full details of all meeting participants are provided in Appendix 3(A). All discussions took place in open forum. The process was transparent and good opportunities were provided for input by all participants. The Technical Team was excellent, providing high quality materials in advance, working efficiently and expertly in response to all requests, and participating actively in all discussions. The Technical Team and Advisors were given the opportunity to comment on a late draft of the Panel Report and made a number of useful suggestions and edits that were adopted.

The Terms of Reference (ToR) for the meeting are given in Appendix 2, Annex 2. The final agenda is included at Appendix 3(B). The time allotted was ample to allow reasonable consideration of ToR. The meeting was friendly, cooperative and constructive and the conclusions and recommendations should help the PFMC and SSC to make informed decisions with respect to assessment of data-poor stocks and planning higher level assessments where appropriate for sustainability or utilization reasons.

The meeting followed a simple format. For each method reviewed, a set of questions was addressed by the Panel:

- 1. What are the data requirements of the method?*
- 2. What are the conditions under which the method is applicable?*
- 3. What are the assumptions of the method?*
- 4. Is the method correct from a technical perspective?*
- 5. How robust are model results to departures from model assumptions and atypical data inputs?*
- 6. Does the model provide estimates of uncertainty? How comprehensive are those estimates?*
- 7. What level of review is appropriate for assessments conducted using the method?*

Methods considered were of two types:

1. *“Catch-only”- using removals data and minimal life history information (includes DCAC and DB-SRA).*
2. *“Simple assessment” - using removals data, minimal life history information and trend indices and/or length composition data.*

## **REVIEWER’S ROLE IN THE REVIEW ACTIVITIES**

The role of the reviewer is set out in the CIE Statement of Work, Attachment A, attached here in Appendix 2, Attachment A. As usual for CIE reviews, the role of the reviewer is laid out, including the requirement to produce a report structured to respond to the terms of reference for the work under review. The workshop in question, however, did not follow the usual format for (e.g.) stock assessments, with clear terms of reference laid out. Rather, the workshop was set up at the request of the PFMC to conduct *“...a formal review of methodologies for determining harvest specifications for data-poor stocks.”* The objective of the meeting was laid out as *“... to provide a list of endorsed methods for use on data-poor or data-limited stocks in the Pacific Council’s Groundfish FMP.”* The final Workshop agenda (see Appendix 3(B)) specified that for each method to be reviewed, a standard set of questions should be addressed. Those questions and the methods presented provided the “shape” for the meeting and the Panel Report. This report considers each method within broad type (catch-only or simple assessment methods) and includes a simple summary of each method and discussion of key issues. The Panel Report is structured similarly but includes for each method a description, discussion and explicit responses to the 7 questions posed.

The CIE reviewer (Stokes) participated in meeting discussions and contributed to the Panel Report and editing. As agreed amongst the Panel during the meeting, the CIE reviewer drafted the sections on *DB-SRA* and on *Tradeoffs to consider in modeling platforms* as well as contributing to major initial and final editing. The Panel Report is include as a separate attachment.

## SUMMARY OF FINDINGS

The summary of findings is split in to 4 sections. Sections 1 and 2 deal with “catch-only” and “simple assessment methods” respectively. Section 3 considers other issues discussed during the review meeting and covered in the Panel report. Section 4 covers issues not considered during the meeting.

### *1 Catch-only Methods*

Three “catch-only” methods (i.e., not utilizing indices of abundance and/or compositional data) were considered: DCAC (Depletion-Corrected Average Catch), DB-SRA (Depletion Based - Stock Reduction Analysis), and SS-CO (a simple implementation of the Stock Synthesis platform that uses Catch Only). DCAC and DB-SRA have already been used during 2010 to estimate Over Fishing Limits (OFL; i.e.,  $F_{MSY} \times B_{current}$ ). A key role of the meeting was to review (and hopefully endorse) these two methods and to provide any necessary advice as to current and future implementation.

DCAC (MacCall, 2009) is a simple extension of the potential yield formula that provides estimates of sustainable yield biased low compared to MSY and OFL. DCAC data input is the sum of removals over a specified time period, spanning any chosen start and end point. Other inputs to DCAC are priors on each of  $B_{MSY}/B_0$ ,  $F_{MSY}/M$  and  $M$  as well as on the change in biomass in a specified period,  $\Delta$ . Note that  $B_0$  is the unfished or virgin biomass, not the biomass that would be expected at a given time in the absence of fishing (i.e.  $B_0$  where 0 signifies time zero not  $B_0(t)$  where 0 signifies  $F=0$ ).

During the review meeting, a number of requests and responses were made that explored the behavior of DCAC. For DCAC, it is clear that the approach generally is an improvement over the use of average catch methods, at least for stocks where  $M$  is less than 0.2, and that DCAC estimates of sustainable yield are generally less than OFL, though this may not hold if the assumed depletion is less than the real depletion. Importantly, as DCAC estimate relates to a specified period (to which  $\Delta$  applies), the estimate may not be appropriate for setting an OFL if the stock has declined since the specified period. These limitations can all be dealt with practically.

As for all of the methods considered at the workshop, the key data input is removals. It is important to emphasize that removals include all catch including discards. The issue of estimating removals series is considered below (see 3).

DB-SRA (Dick and MacCall, in press) combines elements of DCAC with stochastic stock reduction analysis. It requires the same prior inputs as DCAC but uses a time-series of removals to estimate  $B_0$  and (derived values of) MSY and OFL. DB-SRA is implemented using a hybrid production function combining the Pella-Tomlinson function at higher biomass and the Schaefer form at lower biomass (alternative functions could be implemented). While DCAC could be used to make one-off estimates of sustainable yield DB-SRA could in principle (but with care) be used more regularly to provide estimates of OFL. For DB-SRA,  $\Delta$  is again input as a prior but

the interpretation is different than for DCAC. For DB-SRA  $\Delta$  relates to the difference between biomass when unfished and at a given later point. DB-SRA estimates of OFL are biased, generally being below the “true” OFL but potentially above if  $\Delta$  is assumed low (i.e. that depletion is not as great as the true value). To date, the approach taken to correct for the bias has been to compare OFL estimates derived from category 1 assessments with DB-SRA-derived OFL estimates for the same stocks and to calculate a general correction factor. This approach is practical but alternatives are possible (see below).

During the review meeting, a number of requests and responses were made relating to DB-SRA. These included checking how the hybrid production function operated at low biomass and investigating the performance of DB-SRA for a variety of stocks depending on the year in which  $\Delta$  is applied. The latter of these requests was made in order to develop practical advice on DB-SRA implementation. Limited testing demonstrated some sensitivity to a range of factors but more thorough analyses need to be conducted. Given the sensitivity and lack of thorough exploration it is recommended that unless new information on depletion (i.e.  $1-\Delta$ ) is available, updates for individual stocks should ensure that  $\Delta$  be consistently applied to a specific year.

SS-CO is an attempt to implement a DB-SRA-like method using Stock Synthesis 3 (SS3), the commonly used assessment platform in the Pacific region. The rationale given for using SS3 rather than independently coded DB-SRA is that the flexibility of SS3 could provide the means of extending DB-SRA to stocks with complex life-histories. Like DB-SRA, SS-CO uses a time-series of removals as the primary data input. Because SS-CO is implemented using SS3, development for, and modifications at, the review meeting used only the built-in Beverton-Holt stock-recruitment function. Parameterization of SS-CO was therefore necessarily different to DB-SRA. In the method SS-CO-1 brought to the meeting, priors on  $M$ ,  $h$  and  $R_0$  were input while  $\Delta$  was emulated through use of a pseudo survey. During the meeting it was recognized that there is a difficulty with SS-CO-1 in that it effectively places two conflicting priors on  $R_0$  – one uniform prior directly input and one (non-uniform prior) effectively through  $\Delta$  (i.e.  $B_{current}/B_0$ ). The method was therefore not supported by the Panel on technical grounds and some effort was put in to re-developing the SS-CO method to circumvent the problem. Exploration focused on development of SS-CO-2 in which priors for  $M$ ,  $h$  and  $\Delta$  were input and SS3 was used to solve for  $R_0$ . SS-CO-2 uses Sample-Importance-Resampling (SIR) rather than MCMC (as used for SS-CO-1).

During the review meeting, a number of requests and responses were made relating to SS-CO. These related both to developing SS-CO-2 and to comparing SS-CO-1 with DB-SRA. Development of the SS-CO-2 method showed promise and should be pursued. The comparison of SS-CO-1 with DB-SRA was extensive and suggested that SS-CO-1 performed better than DB-SRA in many respects. However, the simulation testing was based on an operating model with dynamics more similar to those assumed in SS-CO-1 and the results are therefore not surprising. Given the technical difficulties with SS-CO-1 the comparison is also tenuous. Nevertheless, the simulation approach taken is appropriate and should be pursued if further development of SS-CO (or “simple methods”) is undertaken.

Generally, DCAC and DB-SRA are already well developed. They are theoretically clear, technically sound, well implemented and tested and could be used with confidence (given understanding of limitations) to estimate sustainable yield or OFL respectively. A primary purpose of the review was to endorse (or not) methods for use with data-poor stocks. DCAC and DB-SRA can both be endorsed for implementation. For both, there is a need to ensure that the best possible data on removals is used and there is a need to review and agree all parameter priors. Care is needed to ensure the interpretations of  $\Delta$  (different in the two methods) are clear and the year of application of  $\Delta$  needs to be specified and agreed for DB-SRA. For DB-SRA implementation, it would be useful to further investigate bias correction options although a workable method already exists and can be used. SS-CO methods cannot yet be endorsed but further development is encouraged including simulation testing /comparison. However, while it is arguably beneficial to implement DB-SRA-like methods in SS3 to allow for flexibility and future development for more complex cases (e.g. sex changing species), care is needed to ensure that such developments are not made because they can be using SS3 as opposed to from first principles (as for DCAC and DB-SRA) and to meet a clear management need.

During the meeting there was consideration of the possibility of bias correction using the productivity and/or susceptibility scores from Productivity-Susceptibility-Analysis (PSA). The idea is to derive depletion priors for stocks or groups of stocks as opposed to the currently implemented practice of using a common prior for all stocks derived from simple comparison of depletion estimates for assessed stocks using standard assessment and DB-SRA. PSA scores are composites based on generally available information or following well laid out means of translating simple information. As PSA scores can usually be developed for all stocks, regardless of stock assessment type, they do provide a potential means of integrating information from well-assessed stocks to help prior development for data-poor stocks. More specifically, they provide a potentially good way of bias correcting by category, based on a standardized method.

Bias correction, of course, is a *post hoc* treatment. An alternative way of improving DB-SRA estimates of OFL for each stock would be to develop stock, stock-type and/or region specific priors. This could also be done by comparison with fully assessed stocks and again could use PSA as a basis for grouping.

## ***2 Simple Assessment Methods***

Three “Simple Assessment” methods were considered: SS-CL (an implementation in the Stock Synthesis platform that uses Catch and a time series of Length composition data), XDB-SRA (eXtended Depletion Based - Stock Reduction Analysis; extended by using a time series of survey Indices), and SS-CI (an implementation in the Stock Synthesis platform that uses Catch and a time series of survey Indices).

An example SS-CL assessment for aurora rockfish was provided by Ralston, He and Dick. The example was implemented using the standard SS3 assessment platform but used only removals data, normal life history/fishery information or assumptions, and length composition data. No

indices of abundance were used. The general argument in support of trying such methods is reasonable – as fisheries are exploited the age and length structure contracts and in principle length composition data can therefore provide information on mortality rates. This is the same principle that underlies catch-curve analysis and is well-known in fisheries. While the principle is reasonable, there are many difficulties in practice. Notwithstanding difficulties such as density-dependent or evolutionary changes in growth rates, or constancy of selectivity, (which affect all assessments using compositional data, including when index data are available) there is the major issue of trying to extract a signal from data that are generally poorly sampled, often with correlations that reduce the effective information content. For assessments where credible indices of abundance are available it is normal to try to give weight to those indices rather than to composition data. There are difficulties in knowing how best to weight composition data and arguably they are often over-weighted relative to index data. For SS-CL the relative weighting issue does not exist but the issue of representativeness of composition data remains, along with the question of just how much information can be extracted. Francis (In Press) provides a useful discussion on data weighting and also how the information content of composition data can be very low due to correlations in sampling. The bottom line is that whilst it is attractive in principle to use composition data, the real information content may be much lower than realized and great care is needed in application.

No specific requests were made relating to SS-CL during the review. During the presentation of the aurora rockfish example the Panel was concerned that the model seemed to fit too well. In particular, it was noted that a very large reduction in log-likelihood resulted from the use of just a few length samples. This was interpreted as likely due to model mis-specification (and also depends on the weighting scheme used). There was general agreement that as presented the problems could not be readily resolved. It is important that this should not be taken as a dismissal of using SS-CL methods generally. It is also worthwhile considering that specific stock examples/implementations are not the ideal way of developing methods. The contrast with DCAC and DB-SRA development from first principles is relevant in this respect. If SS-CL methods are to be considered then either working from first principles to develop specific methods is necessary or it would be useful to explore through simulation studies the conditions under which SS-CL could provide reliable estimates of depletion and OFL. Consideration of case specific implementations is not an efficient way to develop methods as general conclusions cannot readily be drawn.

XDB-SRA and SS-CI both attempt to extend the concepts used in DB-SRA and SS-CO (above) and to provide for inclusion of abundance indices. Neither method was sufficiently fledged for full consideration during the review. A number of requests during the meeting were developmental in nature and responses from the Technical Team were useful in progressing some of the ideas discussed, most notably use of the SIR algorithm to overcome convergence problems associated with MCMC. Neither method was endorsed for use. As for all other methods, rather than using case specific examples to develop the methods, simulation approaches are the likely best course to understanding the nuances of the methods and their sensitivities and limitations.

During the meeting a simulation study was presented in which DCAC and DB-SRA were evaluated as well as various simple catch-at-age models (in SS3) for which varying degrees of sparse data were available. The study demonstrated the power of the approach (as well as being helpful in evaluating the various methods). The poor performance of the SS-CI-type models in SS3 was notable, highlighting the need for further work in this area.

Simulation testing was a common theme during the meeting and it was generally recognized as the best way forward for investigating the performance of methods against known “truth” and also for comparing method performance. There was concern that simulation testing was often not sufficiently difficult. Without necessarily going to extremes, the essential need is to test methods to the point of breakdown in order to define which methods can be used under what conditions to provide necessary support to management.

If the “simple” methods can be developed (using simulation testing), and assuming suitable indices of abundance can be developed, it will be possible to estimate not just OFL for stocks but also depletion. All simple methods may in principle therefore be able to inform status determination. The Panel discussed how estimates of depletion from such models might best be used, recognizing that estimates are not as reliable as for higher level assessments. It was recognized that how to use such estimates is a SSC matter but the unanimous view was that a sensible approach would be to accept estimates of depletion of (say) 25% or above but for values below 25% not to accept the estimates but rather to trigger fuller evaluation (where possible).

### ***3 Other matters considered during the review meeting***

The issue of review requirements for each method was considered for the catch-only methods and SS-CL. It was not considered explicitly for the SS-CI and XDB-SRA as the structured questions were not addressed. No further review is needed of DCAC and DB-SRA methods; they are theoretically sound and already implemented. They can be used as intended. For DB-SRA the issue of bias correction might be further investigated but there should be no need for external review of any approach finally adopted. In application DCAC is designed to provide one-off estimates of sustainable yield. Review could be undertaken directly by the SSC Groundfish Sub-Committee (or SSC). For DB-SRA implementation could be more regular and care is needed as to the year of application of  $\Delta$ . Again, review of implementation could be undertaken directly by the SSC Groundfish Sub-Committee (or SSC). For both DCAC and DB-SRA, however, prior to further implementation, it would be useful to review priors and, especially for DB-SRA, removals data (see below). All other methods require further development and additional methods review before adoption. The same applies to SS-CL generally, ideally with consideration of simulation testing. If SS-CL is used case specifically then there will be a need for extensive STAR Panel review as for any complex stock assessment.

For all methods (and indeed for higher level assessments) there is a need to use the best available data on total removals. It is good that Pacific coast historical catch reconstructions are already in hand, at least for California and Oregon. There is a clear need to complete this task for Washington. There is also a need to ensure best possible splitting of removals north and south of latitude 40°10' N. If data-poor methods such as DCAC and DB-SRA are to be applied with confidence, this work needs to be finalized.

Similarly, if there is to be confidence in the use of the data-poor methods, the best possible agreement as to priors needs to be achieved. Many priors are technical ( $B_{MSY}/B_0$ ,  $F_{MSY}/M$  and  $M$  for DCAC and DB-SRA and also  $h$  for SS-CO etc) and can be derived from meta-analyses of higher-level assessments, comparisons with similar stocks in other areas, etc. Priors on depletion, however, are potentially more problematic. The PSA approach outlined above (see 1) is one way forward. An alternative is to use assessment methods which share parameters. Yet another is to include knowledge from stakeholders. There was discussion on this during the review meeting with public comment suggesting there is interest and value in this approach. From experience with the assessment and management of data-poor stocks elsewhere I share the view that use of stakeholder knowledge can be valuable either to construct priors or to ground truth priors derived using meta-analyses. Use of stakeholder input also helps to create buy-in to the final results.

A recurrent theme during the review was the advantage/disadvantage of using a standardized assessment platform (SS3) versus bespoke programs to implement specific methods. There are clear advantages to using a standardized program. It allows ease of communication amongst those familiar with the program (both relating to model definition and consideration of diagnostics). It can facilitate development and validation. There are also advantages to using stand alone programs for specific tasks. They can be more flexible for novel implementations, be simpler to communicate to those unfamiliar with specific larger packages and, for different reasons, can facilitate development, validation and use. Perhaps the primary disadvantage of larger packages relates to the way in which models and methods can be developed without due attention to first principles. In the review meeting context, the examples of DCAC and DB-SRA, and SS-CO-1 are perhaps instructive. The former were developed first from theory and then implemented successfully, as opposed to SS-CO-1 which was implemented in SS3 in an attempt to emulate DB-SRA but proved to be technically problematic. It is not uncommon for packages to be used just because they can be; sometimes it is not the best approach. Further disadvantages of larger packages relate to standard software development and maintenance issues and whether or not rigorous software engineering approaches to documenting, updating, validating, maintaining, etc can be achieved.

The review meeting concentrated on methods to estimate specific outputs of interest to management in the US context where there specific requirements to estimate OFL and to determine stock status. Related to the issue of simulation testing, the review meeting briefly discussed the use of Management Strategy Evaluation (or MPE – Management Procedure Evaluation) as an alternative approach to dealing with data-poor stocks (see e.g. Bentley and Stokes 2009). The approach of developing management procedures (i.e. a combination of data

specifications, assessment method and control response) to directly set ACLs or ABCs has been used in New Zealand, Australia and south Africa with considerable success. In New Zealand, for example, the approach is used for some stocks to inform annual ABC decisions directly based on management procedures adopted to provide performance consistent with legal requirements. If legally implementable, the approach provides a powerful way of assessing and managing data-poor stocks. In the three countries indicated, there are current research projects to move forward in this respect.

#### ***4 Other matters***

DCAC and DB-SRA can produce outputs of relevance to the management system. They can be implemented relatively easily and updated very easily. If the processes are put in place to provide confidence that the best data and assumptions are used as inputs, there may be little advantage in moving towards more complicated models that can use slightly wider data sources. How much energy is expended on the “simple” methods needs to be considered in the context of both likely data availability and the process requirements of implementing those more complicated methods. Experience elsewhere suggests that the most time-consuming, process-intensive and contentious assessments are often the intermediate level ones (i.e. “simple” in the terminology of this workshop). It is worth remembering that being roughly right (and comprehensible) is sometimes better than being more precisely wrong. The main reason for trying to move towards “simple” methods is the ability to estimate depletion. This is laudable but it comes at a price.

## **CONCLUSIONS AND RECOMMENDATIONS**

DCAC and DB-SRA are methodologically sound and can be implemented without further external review to estimate sustainable yields and OFL respectively. Estimates are likely to be risk averse, or risk neutral if bias corrected. This does not hold universally and overly optimistic priors on depletion could lead to risk prone estimates of DCAC and OFL. Care is needed to avoid this. While the methods are sound, there is still need to ensure that the main data input (removals) and priors used by the methods are the best available. This will likely require a separate, regional process to review removals history. Review of priors should include meta-analysis of fully assessed stocks and could be reviewed by the SSC or subcommittee. There is scope to develop SS-CO (the SS3-implemented counterpart of DB-SRA) but it is not obvious that there are significant advantages to this. If the method is further developed in SS3 then it should be subject to at least limited external review and comparison with DB-SRA.

Estimates of OFL from both DB-SRA and potentially SS-CO should be bias corrected to be risk neutral. The method already employed for this purpose is adequate but it is worthwhile further investigating the use of PSA as a basis for bias correction by type or stock, or of using meta-analysis to derive more specific priors for stocks or types.

If the so-called “simple” methods are to be developed further then it is recommended that simulation testing be used to ensure there is adequate understanding of the performance and limitations of the techniques. It is further recommended that before use, these methods be subject to further “off year” STAR Panel review. In principle, it is preferable to use methods that include abundance indices (thus avoiding the need for priors on depletion and instead estimating it). If composition data only are additionally used, great care is needed as the true information content of such data is often less than presumed. While the simple methods have the advantage of estimating depletion (and hence status), their use will likely lead to assessments and processes of similar complexity to standard data-rich assessments. The costs and benefits of movement to use such methods therefore need to be carefully considered.

Implementation of any methods that rely heavily on removals data and priors on biological and fishery-related quantities needs to use the best available information to ensure credible and reliable outputs. For the Pacific region much work has already been done to improve estimates of removals and this work needs to be finalized. It is recommended that a dedicated workshop be convened for this purpose. Similarly, review of priors is important. Priors on  $B_{MSY}/B_0$  and  $F_{MSY}/M$  can be derived from consideration of data-rich stocks. Derivation of priors for depletion could also be based on comparison with data-rich stocks – notable in this case, however, is the need somehow to account for exploitation pattern and history similarities. The susceptibility scores from PSA may therefore be one route to deriving depletion priors (or of bias correcting after application of a common depletion prior). The use of stakeholder knowledge to derive or ground-truth depletion priors might also be considered.

Methods such as DCAC and DB-SRA, or “simple” methods as considered during the review, offer the potential to estimate sustainable yield/OFL, or even depletion, for data-poor stocks. A powerful alternative, if possible in the management/legal context, is to move directly to development of management procedures tested using comprehensive simulations (i.e. MSE).

# APPENDIX 1

## BIBLIOGRAPHY

*Prior to the Workshop, materials were provided via a dedicated ftp site ([ftp://ftp.pcouncil.org/pub/Data-Limited\\_Review\\_April\\_2011](ftp://ftp.pcouncil.org/pub/Data-Limited_Review_April_2011)). The ftp site is anonymous, making access quick and convenient. The materials were extensive and comprehensive, and relevant to all terms of reference in varying degrees. The documents included papers prepared specifically for the workshop, reference documents, and general information papers. During the workshop a number of presentations were given, and additional materials were provided on request. The presentations and responses to requests were all made available during the meeting using the dedicated ftp site which functioned well during the meeting and in advance. A (local) directory listing of all files provided in advance and during the meeting is provided below for completeness.*

<i>Zhou et al. - Modified hierarchical Bayesian biomass dynamics models for assessment of short-lived invertebrates a comparison for tropical tiger prawns - Abs137.pdf</i>	<i>Background documents circulated during workshop</i>
<i>Ralston et al. - A meta-analytic approach to quantifying - Abs174.pdf</i>	<i>Background documents circulated during workshop</i>
<i>1_CoverLetter_DataLimitedReview_April25-29_2011.doc</i>	<i>Administration</i>
<i>2_Data-Poor_Methods_DRAFT_for_review_panel.pdf</i>	<i>Administration</i>
<i>3_Agenda Data-Poor Review Panel.pdf</i>	<i>Administration</i>
<i>4_Participants for the Review of Data-Limited Assessment Methods_2011.doc</i>	<i>Administration</i>
<i>5_Driving_Directions_to_NMFS_SWFSC_Santa_Cruz_Lab.doc</i>	<i>Administration</i>
<i>A1_Dick and MacCall 2010 NOAA-TM-NMFS-SWFSC-460.pdf</i>	<i>Primary workshop document</i>
<i>A2_Dick and MacCall, DB-SRA, In Review.pdf</i>	<i>Primary workshop document</i>
<i>A3_MacCall_2009_DCAC.pdf</i>	<i>Primary workshop document</i>
<i>A4_a_Wetzel_Data_Limited_CAA_STAR.docx</i>	<i>Primary workshop document</i>
<i>A4_b_Wetzel_and_Punt_DataPoorHL_STAR0414_UPDATED.pdf</i>	<i>Primary workshop document</i>
<i>A5_DBSRA_Extension.pdf</i>	<i>Primary workshop document</i>
<i>A6_Cope_DBSRA_SSS_doc_Updated_4-12-11.doc</i>	<i>Primary workshop document</i>
<i>A7_SS_fit_to_length_comps.pdf</i>	<i>Primary workshop document</i>
<i>aurora.ppt</i>	<i>Primary workshop document</i>
<i>CA Catch Reconstruction.Final.pdf</i>	<i>Reference material</i>
<i>DB-SRA_Development_Dick_and_MacCall.pdf</i>	<i>Workshop presentation</i>
<i>DCAC -- Distributions.ppt</i>	<i>Workshop presentation</i>
<i>DCAC and DB-SRA Application_final.pdf</i>	<i>Workshop presentation</i>
<i>DCACforSTAR.ppt</i>	<i>Workshop presentation</i>
<i>PSA_vulner_v_depletion_Apr2011.xlsx</i>	<i>Workshop presentation</i>
<i>S1_1112GF_SpexFEIS_100806-FINAL_feb21_.pdf</i>	<i>Background documents circulated in advance</i>
<i>S2_CA_Catch_Recon_NOAA-TM-NMFS-SWFSC-461.pdf</i>	<i>Background documents circulated in advance</i>
<i>S3_OR_historical_reconstruction.pdf</i>	<i>Background documents circulated in advance</i>
<i>S4_Rockfish Simulator Documentation.pdf</i>	<i>Background documents circulated in advance</i>
<i>Santa_Cruz_Sunset-1.jpg</i>	
<i>Santa_Cruz_Sunset-2.jpg</i>	
<i>SSS.pptx</i>	<i>Workshop presentation</i>
<i>SSS_STAR panel.pptx</i>	<i>Response to Panel request</i>
<i>vulnerability vs. depletion.pptx</i>	<i>Response to Panel request</i>
<i>Wetzel_Data_Poor_STARpanel.pdf</i>	<i>Workshop presentation</i>

<i>Wetzel_ResponseToPanel_1.pdf</i>	<i>Response to Panel request</i>
<i>Wetzel_ResponseToPanel_2.pdf</i>	<i>Response to Panel request</i>
<i>Wetzel_SimpleSS_Simulation Testing.pdf</i>	<i>Response to Panel request</i>
<i>Weztel_SSS_Sim_flatfish_constant_[FIXED].pdf</i>	<i>Response to Panel request</i>
<i>Z_BackgroundMaterials_1995_Butterworth_ &amp; Punt.pdf</i>	<i>Background documents circulated in advance</i>
<i>Z_BackgroundMaterials_1996 Punt &amp; Butterworth.pdf</i>	<i>Background documents circulated in advance</i>
<i>Z_BackgroundMaterials_1997 Punt &amp; Butterworth.pdf</i>	<i>Background documents circulated in advance</i>
<i>Z_BackgroundMaterials_1999 Punt &amp; Butterworth.pdf</i>	<i>Background documents circulated in advance</i>
<i>Z_BackgroundMaterials_2000 Punt &amp; Butterworth.pdf</i>	<i>Background documents circulated in advance</i>

## References

Bentley, N and K. Stokes. 2009. Contrasting Paradigms for Fisheries Management Decision Making: How Well Do They Serve Data-Poor Fisheries? *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science* 1:391–401, 2009

Dick, E.J. and A.D. MacCall. In Press. Depletion-Based Stock Reduction Analysis: A catch-based method for determining sustainable yields for data-poor fish stocks

Francis, R.I.C.C. In Press. Data weighting in statistical fisheries stock assessment models. *Can. J. Fish. Aquat. Sci.*, March 2011

MacCall, A. D. 2009. Depletion-corrected average catch: a simple formula for estimating sustainable yields in data-poor situations. *ICES Journal of Marine Science*, 66: 2267–2271.

## **APPENDIX 2**

### **Attachment A: Statement of Work for Dr. Kevin Stokes**

#### **External Independent Peer Review by the Center for Independent Experts**

##### **Workshop for Data Limited Stock Assessments Methods**

**Scope of Work and CIE Process:** The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. The CIE reviewer is selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. The CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from [www.ciereviews.org](http://www.ciereviews.org).

**Project Description:** Approximately 30% of the 92 groundfish stocks along the west coast have been assessed by traditional stock assessment methods. Many of the stocks remain unassessed due to the limited availability of data or other resources needed to prepare and review assessments. This workshop will be held to evaluate expeditious methods for assessing stock status and appropriate harvest rates for data-limited species. These methods will be necessary to develop stronger scientific guidance for setting annual catch limits for the currently unassessed species. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

**Requirements for CIE Reviewer:** Two CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. The CIE reviewers shall have working knowledge and recent experience in the application of fishery stock assessment methods, especially for data-limited stocks. Each CIE reviewer's duties shall not exceed a maximum of 14 days to complete all work tasks of the peer review described herein.

**Location of Peer Review:** Each CIE reviewer shall conduct an independent peer review during the panel review meeting tentatively scheduled in Santa Cruz, California during 25-29 April 2011.

**Statement of Tasks:** The CIE reviewers shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

**Prior to the Peer Review:** Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewer with the background documents, report, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact is also responsible for providing the Chair a copy of the SoW in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Foreign National Security Clearance: When the CIE reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for each CIE reviewer if a non-US citizens. For this reason, each CIE reviewer shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: <http://deemedexports.noaa.gov/sponsor.html>).

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to each CIE reviewer the necessary background information and report for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. Each CIE reviewer is responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. Each CIE reviewer shall read all documents in preparation for the peer review.

**The NMFS Project Contact will provide list of background documents with estimated page numbers by 1 December 2009**

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact is responsible for ensuring that the Chair understands the contractual role of the CIE reviewer as specified herein. The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

Contract Deliverables - Independent CIE Peer Review Report: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

**Specific Tasks for CIE Reviewer:** The following chronological list of tasks shall be completed by the CIE reviewers in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

- 1) Conduct necessary pre-review preparations, including the review of background material and report provided by the NMFS Project Contact in advance of the peer review.
- 2) Participate during the panel review meeting in Santa Cruz, California during 25-29 April 2011.
- 3) During the review meeting in Santa Cruz, California during 25-29 April 2011 as specified herein, and each CIE reviewer shall conduct an independent peer review in accordance with the ToRs (**Annex 2**).
- 4) No later than 13 May 2011, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Mr. Manoj Shrivani, CIE Lead Coordinator, via email to [shivlanim@bellsouth.net](mailto:shivlanim@bellsouth.net), and CIE Regional Coordinator, via email to David Die [ddie@rsmas.miami.edu](mailto:ddie@rsmas.miami.edu). Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

**Schedule of Milestones and Deliverables:** CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

21 March 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
11 April 2011	NMFS Project Contact sends the CIE Reviewer the pre-review documents
<b>25-29 April 2011</b>	The reviewer participates and conducts an independent peer review during the panel review meeting
13 May 2011	The CIE reviewer submits draft CIE independent peer review report to the CIE Lead Coordinator and CIE Regional Coordinator
27 May 2011	The CIE submits CIE independent peer review report to the COTR
3 June 2011	The COTR distributes the final CIE report to the NMFS Project Contact and regional Center Director

**Modifications to the Statement of Work:** Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

**Acceptance of Deliverables:** Upon review and acceptance of the CIE independent peer review report by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, this report shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review report) to the COTR (William Michaels, via [William.Michaels@noaa.gov](mailto:William.Michaels@noaa.gov)).

**Applicable Performance Standards:** The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:

- (1) the CIE reports shall be completed with the format and content in accordance with **Annex 1**,
- (2) the CIE reports shall address each ToR as specified in **Annex 2**,
- (3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

**Distribution of Approved Deliverables:** Upon acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in \*.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

**Key Personnel:**

William Michaels, Program Manager, COTR  
 NMFS Office of Science and Technology  
 1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910  
[William.Michaels@noaa.gov](mailto:William.Michaels@noaa.gov) Phone: 301-713-2363 ext 136

Manoj Shivilani, CIE Lead Coordinator

Northern Taiga Ventures, Inc.  
10600 SW 131<sup>st</sup> Court, Miami, FL 33186  
[shivlanim@bellsouth.net](mailto:shivlanim@bellsouth.net) Phone: 305-383-4229

Stacey Miller (NMFS Project Contact)  
NMFS Northwest Fisheries Science Center, 2032 SE OSU Drive, Newport OR 97365  
[Stacey.Miller@noaa.gov](mailto:Stacey.Miller@noaa.gov) Phone: 206-437-5670

Elizabeth Clarke  
NMFS Northwest Fisheries Science Center, 2725 Montlake Blvd. E, Seattle WA 98112  
[Elizabeth.Clarke@noaa.gov](mailto:Elizabeth.Clarke@noaa.gov) Phone: 206-860-5616

### **Annex 1: Format and Contents of CIE Independent Peer Review Report**

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.
2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.
  - a. The reviewer should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.
  - b. The reviewer should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.
  - c. The reviewer should elaborate on any points raised in the Summary Report that they feel might require further clarification.
  - d. The reviewer shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.
  - e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.
3. The reviewer report shall include the following appendices:
  - Appendix 1: Bibliography of materials provided for review
  - Appendix 2: A copy of the CIE Statement of Work
  - Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

**Annex 2: Terms of Reference**

**Review of Assessment Methods  
for Data-Poor Stocks**

**Santa Cruz Lab  
NMFS Southwest Fisheries Science Center  
110 Shaffer Road  
Santa Cruz, CA 95060  
April 25-29, 2011**

The requirement in the re-authorized Magnuson-Stevens Act (2007) to set annual catch limits (ACLs) based on science recommendations implies some kind of basic assessment is required for all stocks in fishery management plans (FMPs). This mandate has led to an increased focus on assessing “data-poor” stocks. Many data-poor stocks are of minor economic importance and assessing all of them using size/age structured models would be difficult given data limitations and the resources required. Simple assessment methods that use historical catches and available trend or size-composition information could potentially be applied to many data-poor stocks. These methods could be used to set ACLs, and to identify stocks which may be at risk of depletion that would be elevated to high priority for more detailed assessments.

With just a few exceptions, overfishing limits (OFLs) for all of the stocks in the Pacific Council’s Groundfish FMP were developed for 2011-2012 biennial specifications process during January to June, 2010, using new assessment methods designed for data-poor stocks. These methods included Depletion-Corrected Average Catch (DCAC) and Depletion-Based Stock Reduction Analysis (DB-SRA). The methods were applied by NMFS Southwest Fisheries Science Center staff and reviewed by PFMC’s Groundfish Subcommittee of the Scientific and Statistical Committee and endorsed by the full SSC. However, the methods and their application did not receive the level of review afforded by a stock assessment review (STAR) panel process and in June, 2010, the PFMC requested a formal review of data-poor methodologies:

*“The Council also requested a formal review of methodologies for determining harvest specifications for data-poor stocks. Such methods include catch-based approaches as well as those that might be considered rudimentary assessments, and should include the methodology used in the current biennial specifications process as well as reasonable alternatives to that methodology.” Source:  
<http://www.pcouncil.org/wp-content/uploads/0610decisions.pdf>*

The Data-Poor Methodology Review Panel will meet during the week of April 25-29, 2011, in Santa Cruz, California. Based on the Council’s request, the primary objective of this panel is different than a STAR panel, where the objective is to review and endorse a stock assessment for use by the Council in developing management measures. The objective of the methodology review meeting will

be to provide a list of endorsed methods for use on data-poor or data-limited stocks in the Pacific Council's Groundfish FMP. Depletion-Corrected Average Catch (DCAC) and Depletion-Based Stock Reduction Analysis (DB-SRA) will be reviewed at the meeting. Several developments of these methods have been proposed, which could raise stocks from Category 3 (catch-based only) to Category 2 in the Groundfish FMP tier system. Category 2 stocks are those where a basic assessment model is fit to trend information. For each method reviewed, a standard set of questions/issues will be addressed by the Methodology Review Panel as follows.

1. What are the data requirements of the method?
2. What are the conditions under which the method is applicable?
3. What are the assumptions of the method?
4. Is the method correct from a technical perspective?
5. How robust are model results to departures from model assumptions and atypical data inputs?
6. Does the model provide estimates of uncertainty? How comprehensive are those estimates?
7. What level of review is appropriate for assessments conducted using the method?

The technical teams presenting new methods should provide a document to the panel least two weeks prior to the review meeting describing: 1) input data, 2) model development, 3) model testing and evaluation, 4) example applications. Since robustness is a key attribute in stock assessments, examples should be provided for operating models or already assessed stocks for which the assumptions of the simpler models are not met.

## **APPENDIX 3**

### **PERTINENT INFORMATION FROM THE REVIEW**

#### **A) Participants List**

##### **Review Panel Members:**

Martin Dorn (Chair), NMFS, Alaska Fisheries Science Center, Scientific and Statistical Committee (SSC)  
Jim Berkson, NMFS, Southeast Fisheries Science Center, RTR Unit at Virginia Tech  
André Punt, University of Washington, SSC  
Kevin Stokes, Center for Independent Experts (CIE)

##### **Pacific Fishery Management Council (Council) Advisors:**

John DeVore, Pacific Fishery Management Council Staff  
John Budrick, California Department of Fish and Game (CDFG), PFMC Groundfish Management Team (GMT)  
Gerry Richter, Pt. Conception Groundfishermen's Association, PFMC Groundfish Advisory Subpanel (GAP)

##### **Technical Team:**

Jason Cope, NMFS, Northwest Fisheries Science Center (NWFSC)  
E.J. Dick, NMFS, SWFSC  
Daniel Hively, UCSC  
Alec MacCall, NMFS, SWFSC  
Steve Ralston, NMFS, SWFSC  
Chantel Wetzel, NWFSC, University of Washington  
Maria DeYoreo, UCSC

##### **Others in Attendance:**

Linsey Arnold, Oregon State University  
Ray Conser, NMFS, SWFSC, SSC  
John Field, NMFS, SWFSC  
Jim Hastie, NMFS, NWFSC  
Susan Hilber, Oregon Department of Fish and Wildlife (ODFW)  
Kristen Honey, Stanford University  
Meisha Key, CDFG, SSC  
Lynn Mattes, ODFW, GMT  
Steve Munch, NMFS, SWFSC  
Corey Niles, Washington Department of Fish and Wildlife (WDFW), GMT  
Brad Pettinger, Oregon Trawl Commission  
Steve Ralston, NMFS, SWFSC  
Will Satterthwaite, UCSC  
Andrew Shelton, UCSC  
Rick Starr, California Sea Grant  
Deb Wilson-Vandenberg, CDFG

## B) Meeting Agenda

### ***MONDAY, APRIL 25, 2011***

- A. Call to Order Martin Dorn  
(8 a.m.)  
1. Introduction  
2. Logistics and Goals of the Review Panel Meeting
- B. Overview of the Depletion-Corrected Average Catch Methodology Alec MacCall  
(9 a.m.)
- C. Depletion-Based Stock Reduction Analysis Development E.J. Dick and Alec MacCall  
(10 a.m.)
- D. DCAC, DB-SRA, and SS3 Simulation Chantel Wetzel  
(1:30 p.m.)
- E. DCAC and DB-SRA Application E.J. Dick  
(3:30 p.m.)

### ***TUESDAY, APRIL 26, 2011***

- F. Mimicking DB-SRA / Age-Structured Production Models in SS3 Jason Cope  
(8 a.m.)
- G. Catch, Life History, and Length Compositions in SS3  
1. Introduction Steve Ralston  
(10 a.m.)  
2. Operating Model Dan Hively  
(10:30 a.m.)  
3. Simulation Results E.J. Dick and Dan Hively  
(2 p.m.)
- H. Extended DB-SRA  
1. Introduction E.J. Dick  
(3 p.m.)  
2. Development of Abundance Indices Alec MacCall and Jason Cope  
(3:30 p.m.)  
3. Model description E.J. Dick  
(4 p.m.)

I. Panel Assignments  
(5 p.m.) Martin Dorn

**WEDNESDAY, APRIL 27, 2011**

J. Extended DB-SRA (Continued)  
1. Application to selected stocks  
(8 a.m.) E.J. Dick and Alec MacCall  
2. Extended DB-SRA in SS3  
(10 a.m.) Jason Cope

K. Review work assignments  
(1 p.m.) Martin Dorn

**THURSDAY, APRIL 28, 2011**

Follow-up and Review Work Assignments  
(8 a.m.) Martin Dorn

**FRIDAY, APRIL 29, 2011**

Review Work Assignments and Report Writing  
(8 a.m.) Martin Dorn  
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