Center for Independent Experts (CIE) Peer Review Report

Joint US-Canada Technical Review Panel for the Pacific Whiting Stock Assessment
Watertown Hotel
Seattle, Washington
February 21-24, 2012

by
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Executive Summary

The assessment of Pacific hake/whiting was reviewed. The main driver of this assessment is an acoustic survey conducted every second year. This survey and especially its 2011 results were also reviewed. All was found to be according to the principle of best scientific information available. The modeling was very advanced, and the use of an alternative model to the base model, which ran in parallel to verify the basic model runs, is to be commended. Given the complexity of modern assessment models this type of quality control is very important.

The most important issue in the assessment was the inconsistencies between the last two acoustic observations. The 2009 observation indicated a large stock in 2012 and adjacent years, while the 2011 observation a small stock in 2012 and adjacent years. The models favored the 2011 point of various reasons mainly related to the age composition data and the fact that 2011 is the terminal year in the analysis. This leaves the 2009 observation as a severe outlier in the acoustic data series, like the 2001 observation was. Due to these two outliers it must be concluded that there is a large uncertainty in the acoustic data and this also materializes in very wide confidence limits of the stock size estimates in the recent years and in the forecast years. Therefore, the assessment does not contribute much information to the management of this stock in the near future.

It is recommended that acoustic surveys be conducted every year to improve the precision in the assessment. Even in case that more ship time is not allocated to this work it might be preferable to use the present survey effort spent in surveys to be spread over two years because the internal variation (sampling error) in the survey seems small compared to the between years external variation (process error). A further argument for a survey every year is the importance of the incoming year classes, due to the very large year to year variation in recruitment. Management Strategy Evaluations are suggested to investigate the feasibility of any changes made of this kind.

A good recruitment index time series is desirable in order to improve the precision in the assessment. The ongoing research to see whether the acoustic survey can provide an age-1 index seems promising and should be pursued.

Background

The present Scientific Review Group (SRG) meeting to review draft stock assessment documents prepared by the Canada/US Joint Technical Committee (JTC), was organized by the Canada/US Pacific Hake/Whiting Treaty.

The meeting was welcomed by Jim Hastie, leader of the NWSFC in Seattle.

The meeting was well attended, 25-30 participants, including a handful or so of stakeholders. The rest were from the Joint Technical Committee (JTC), the Pacific Hake / Whiting Acoustic Survey Team, SRG Technical Advisors (under which category the CIE reviewers belonged), individual scientists and students. There was a roundtable presentation.

Description of the Individual Reviewer's Role in the Review Activities,

The CIE reviewers were fully participated in the scientific Review Group (SRG) review discussions, and their advice were sought as consensus was formed. However, the CIE experts were not voting members of the SRG, but no voting took place.

It is a complex stock and assessment to review. Therefore, it might be an idea for the future to select the same reviewers for a number of years, in order to improve the depth of the review.

Summary of Findings for each ToR

1. *The SRG will review the stock assessment criteria and methods and survey methodologies used by the JTC and provide a written technical review of the stock assessment and its scientific advice on annual potential yield.*

   The SRG went through the stock assessment and the acoustic survey and further details of this can be found under findings for ToRs 10-15 below.

2. *The SRG will operate with co-chairs, one from the United States and one from the Canada, as chosen by the membership of the SRG.*

   Richard Methot, NWFSC, NMFS, NOAA and Greg Workman, PBS, DFO co-chaired the meeting.

3. *The SRG meeting will be chaired by an SRG member. From year to year, the responsibility to chair the meeting will be shifted among SRG members at the discretion of the SRG.*

   See above.

4. *In 2012, the SRG will be able to operate with 2 US member s and 2 Canadian members. If two independent members are appointed before the SRG meets on Feb 21, 2012, they will be treated as full members of the SRG.*

   Mike Prager, NMFS, NOAA, retired, and Kendra Holt, PBS, DFO were members of SRG in addition to the two co-chairs. John Simmonds, CIE, Henrik Sparholt, CIE, and Tom Carruthers, University of British Columbia (UBC) were appointed before 21 February 2012, as independent members or as called at the meeting Technical Advisors.

5. *SRG meetings will be conducted as public meetings including opportunity for public comment.*

   There were a handful of attendees from the general public. They were allowed to speak and their input was specifically requested each day of the meeting.

6. *The SRG at its discretion will occasionally seek advice from external experts to expand its capacity to review survey and assessment methodologies;*

   Dezhang Chu, NWFSC, NMFS, NOAA, and Rebecca Thomas, NWFSC, NMFS, NOAA, were invited to present the Pacific Hake / Whiting Acoustic Survey.

7. *The SRG will seek consensus in all matters and will document the range of discussion regarding this consensus to the extent feasible. Where full consensus cannot be reached, minority reports will be included to convey alternative viewpoints. If an issue cannot be resolved without a vote, then only full SRG members will have a vote. External experts commissioned by the SRG will be expected to fully participate in review discussions and their advice will be sought as consensus is formed; However, external experts will not be voting members of the SRG.*

   The CIE experts participated fully in the discussions. There were no cases where consensus was not reached and voting was therefore not invoked.

8. *All draft stock assessment and survey documents will be provided to the SRG through the JTC.*

   All draft stock assessment and survey as well as background documents were sent out to the CIE experts in due time before the meeting, about 2 weeks before the meeting, allowing time for careful readings. See bibliography list in Appendix 1.

9. *Material provided to the SRG through public comment will not be considered part of the technical work to be reviewed, but it may be taken into account when reviewing the work of the JTC. If public comment is directly considered in the review, both source and content of that comment will be documented in the SRG report.*

   Only public comments as oral testimony were presented and only on specific issues like anecdotal information about where the commercial catch and fishery took place in mainly 2011 and about the 2009 situation with Humboldt squid and its interactions with the fishery for hake and for the acoustic survey.

10. *The SRG will discuss the technical merits and deficiencies of the survey methodology, input data and analytical models during the open review panel meeting and work with the JTC to correct any deficiencies.*

    The acoustic survey is very extensive and covers the distribution areas of the stock well. The CV estimated within the survey is nicely narrow, around 0.1. The survey and the data analysis used to obtain biomass and age distribution estimates are conducted according to the best available science and standards. However, when included together with other data in the modeling, it is clear that there is a substantial addition variation that is not accounted for and which remains largely unexplainable, biologically or otherwise. The last two survey biomass estimates, one from 2009 and one from 2011, were grossly inconsistent as judged from the assessment model. A great number of details of the survey were discussed and they almost all were concluded to have been satisfactorily dealt in the approach used. A few might need further considerations. These are mentioned below.

    Inter-calibration between ships is not yet done for various reasons, but has been attempted. Maybe this is something for which time each year should be set aside. There are several acoustic surveys in other parts of the world where 10% of the ship time is set aside for ship inter-

calibration in order to add to the quality control each year.

Movements of hake during the survey time, which is as long as about 100 days, could also be a problem. If the two vessels start in the middle of the area south-north wise and move each way (north and south respectively) it might be an approach that reduces the effect of hake migration during the survey. A shortening of the survey time might also be helpful.

The judging of species within the echogram is highly subjective in the way it is done at present. For some other acoustic surveys in other areas of the world this is done objectively by just applying the trawl catches to the SA data. It might be useful to develop some simple metrics to shed some light on this subjective judging, and for others to evaluate how important these might be to the overall acoustic result and its variance. One part of such initiative could be to try to estimate also the biomass of other species. If these are small compared to hake it might indicate the species split is not a major problem for the survey estimate; if not, it might potentially signal a problem.

Kriging might be replaced by a simpler, more robust and transparent plain average mean approach around a grid. The data and survey design represents such an approach, so this should work fine.

Various analyses showed that the 2001 and 2009 estimates were a substantial under-estimate and a substantial over-estimate, respectively. Timing of survey vs. timing of hake being available to the survey in terms of being at the shelf area might be one explanation for the low 2001 estimate. This survey was conducted about a month earlier than it is normally conducted. However, this was mainly speculation and not substantiated by any analysis. The 2009 estimate was unusual in that Humboldt squid were extraordinarily plentiful and mixed with hake. Squid biomass in 2009 might have been at the same order of magnitude as the Pacific hake biomass according to preliminary estimates done, but not documented. The TS value for squid is uncertain and so is its trawl catchability. Furthermore, it cannot be ruled out that this squid predated substantially on hake and thus imposed an extra natural mortality on hake compared to the one used in the assessment model. No analysis was presented due to too few stomach data. But one squid was found with 110 hake otoliths in its stomach.

At the first day of the meeting there was a revision to the 2011 acoustic biomass estimate presented, compared to the estimate in the papers distributed prior to the meeting. This was due a correction of a miscoding of data for kriging. It did not change the results by more than a few percentages. A new assessment was run and presented at the meeting.

It was stated that the estimate of hake biomass in Canadian waters was about 40000 t in 2011, while the commercial fishery was about 50000 t. This was suggested to be due to hake being outside the Canadian survey area in deep waters, but it might also be due to hake migrating from US to Canadian waters when the survey was conducted and when the fishery took place.

For the US, acoustic calibration values from the past about 5 years were presented on the second day after a request from the reviewers. These showed that there might be a decrease in SV gain values and a little bit more scatter than could be expected. However, these values were relatively sound and could not explain more than at most 5% of the large acoustic estimate in 2009. For Canada, calibration values from approximately the past 2 years were presented on the second day after a request from the reviewers. These values were also relative sound and could not explain more than at most a few percent of the large acoustic estimate in 2009.

The data on catch in weight are regarded as quite precise and without major mis-reporting. The data by area could not be shown in details because that would violate rules about confidential

data. This hampered somewhat the ability to assess this stock properly. Plots showing the catch by area and season could have informed the assessment about possible missing aggregations of hake in the survey, seasonal migration of hake, etc.

Biological data on maturity were only available for a few years in the mid-1990s. It was suggested that it would be useful to have such data for every year because this could improve the SSB estimates, improve the S/R relationship and keep track of density dependent as well as evolutionary effects on maturity. Such data can be collected at a relatively low cost.

The age determination data and data quality were good. It was especially appreciated that the bias around large year classes was recognized, quantified and taken account of in the modeling. This is something which could be very useful to do also in other fish stock assessments.

The modeling done was of a very high standard. Clearly the modelers had an extraordinary good feeling for the data and the models used.

The decision to base the assessment on the SS Base model and verify it by the CCAM model seems very sound. It is unusual to see two different models used simultaneously as done here and it is a very effective way of making quality control of the coding, the input data, and the settings in the model runs. It is highly recommended to continue this approach in the future.

A nice set of sensitivity runs were also presented by the assessment team and these helped very much in understanding the dynamics of the stock.

The main issue with the assessment was the large downward revision of the stock size in recent years. By adding the new data from 2011 to the model, the SSBs in recent years are now estimated to be substantially lower than estimated last year. From sensitivity analysis presented this was clearly due to the low acoustic survey estimate for 2011. In the present assessment it appears that the 2009 acoustic survey estimate was about a factor of two too high. Quite a long discussion took place in order to understand why the models did not compromise more evenly between the 2009 and the 2011 acoustic estimates, but fitted mostly to the 2011 data. One sensitivity run requested by the reviewers and the assessment group came back the next day with the results. The request was to see the impact of reducing the age composition weighting (to 10). It did not alter the results. The reasons for the models to "favor" the 2011 acoustic observation seem to be linked to the feature that the terminal year's observations have a large influence in the model estimates, and to the effects of the new age distribution observations in the light of the selection pattern (fixed over time) used in the models.

Further details of the models are given below.

The SS base case assessment model represented a good compromise between complexity and simplicity for the hake assessment. It was recommended to stay with this model for the future years, except maybe for minor amendments that might become prudent to include.

Selectivity in fisheries is assumed to be constant over time in the present model. This is a quite strong assumption. However, over time a lot of ways to deal with this problem have been explored, and there seems to be no obvious better solution. Still the SRG suggested maybe some kind of following strong year class in the selectivity could be considered, as well as maybe a simple VPA could be done to check the changes in selectivity over time.

It was also suggested to explore the measurement error model of the acoustic survey. In acoustic survey time series, it is often seen that a few years have very odd estimates and the rest pretty good ones. Maybe a meta-analysis of acoustic surveys world-wide could be of help in such an

approach, to identify statistical distributions that can handle such a situation appropriately.

MSE (Management Strategy Evaluation) seems to be a useful thing to consider. An MSE could both be aimed at the intensity and frequency of the acoustic survey and at the harvest control rule to recommend to managers.

11. *The SRG report will document relevant meeting discussions;*

The SRG report was produced and it fairly reflected the meeting discussions.

12. *Requests to the JTC for additional analyses will be provided in writing by the SRG;*

Analysis of calibrations of the acoustic equipment over time was requested and provided during the meeting – see further comments above.

The base model was run with down weighting of the age composition data to see whether this could explain the "favoring" of the 2011 acoustic observation over the 2009 in the base model. This was requested during the meeting and the runs produced within a day.

An error in the acoustic estimate for 2011 was corrected. The SRG agreed with JTC that it would not need the updated runs at the meeting because it was a relatively small correction and would not influence the main results substantially. It was agreed that the JTC could make all the updates after the meeting and email a revised summary report to the SRG for confirmation. These were emailed 28 February 2012 and were found to be done correctly. The updated base model has a median 34% depletion level for the spawning stock biomass surviving to the start of 2013 if the default harvest rate for 2012 of 252,000 mt is caught, and a 5% risk that the spawning stock in 2013 will be lower than 8% of the equilibrium virgin stock. However, as no limit reference point is defined this non-trivial risk of a severe stock depletion needs to be judged by managers on an *ad hoc* basis.

All three requests were provided in writing.

13. *The SRG will work with the JTC to achieve a base case model result and to describe the uncertainty around this base case, including uncertainty represented by alternative model scenarios and uncertainty resulting from the statistical variance of the base case itself;*

This was done towards the end of the meeting and continued afterwards by email.

14. *The SRG will seek a consensus position with the JTC on the recommended annual potential yield;*

This was achieved by email correspondence within a week after the end of the meeting.

15. *The SRG will provide recommendations to the JMC and JTC regarding issues that will need additional research before being tabled for review in subsequent years;*

Such a table is included in the SRG report.

16. A complete SRG report will be provided to the JMC by March 1, 2012.

A complete SRG report was sent to JMC March 1, 2012.

Conclusions and Recommendations

The science reviewed was at a very high level and clearly met the criterion of the best scientific information available. One can always do more of course and in hindsight make improvements. Suggestions for doing further action and improvements are provided in various places in the present report.

It is recommended that annual acoustic surveys be conducted. This is because 1) the unexplained annual variation in the survey results is large and therefore it is important to get twice as many observation points, 2) the recruitment is fluctuating wildly from year to year and the stock and the fisheries is based on the strong years classes appearing at irregular intervals, and 3) there is no reliable recruitment index.

In order to check whether the current survey intensity is too high, it is suggested that some simple analysis with the data from the existing surveys be conducted. One such analysis could be to split the data from each year's survey into two data series consisting of every alternating transects and calculate the CV of each. If the CVs increase only a little it would be better to spread the current survey effort over two years.

The analysis of the acoustic survey team to come up with an age-1 recruitment index seems to be a sensible thing to pursue. Annual surveys would make such a recruitment index time series even more relevant.

In order to understand the importance and usefulness of the suggestions above in terms of better assessment and advice, Management Strategy Evaluation analysis is recommended.

Maturity and maybe fecundity data should be sampled every year in order to better monitor the spawning stock, reproductive output, density dependent changes over time, and possible evolutionary changes in the stock due to fishing.

There seems to be an overall lack of fundamental knowledge of the biology of the stock. This includes spawning area, how and when fish migrate to and from this area, overwintering areas, and the general migration and distribution horizontally and vertically of hake during the fishing and the survey seasons. Information about predation mortality resulting from cannibalism, ling cod, squid, and sea lions are also scarce.

The management of Pacific hake seems to lack limit reference points for fishing mortality and for stocks size, which should be avoided with a high probability, as requested in Annex II in the UN Fish Stocks Agreement or UNFSA of 1995 as well as in other international agreements.

Further suggestions for improvements are given above under ToRs 10.

Appendix 1: Bibliography of materials provided for review

Primary Documents for Review:

2012 draft stock assessment for Pacific hake/Whiting *(PDF 9.7MB)*: Online

2012 Pacific Hake Integrated Acoustic and Trawl Survey Methods *(PDF 506KB)*: Online

Background Documents:

2003 Agreement with Canada on Pacific hake / Whiting *(PDF 611 KB):* Online

Pacific Whiting Act of 2006, Implementation of Whiting Treaty *(PDF 172 KB):* Online

2010 Amendment to Pacific Whiting Act of 2006, Implementation of Whiting Treaty *(PDF 122KB)*: Online

Provisional Terms of Reference for the Joint Technical Committee *(PDF 622KB)*: Online

Technical Description of the Stock Synthesis Assessment Program

SRG Meeting Agenda

2011 Pacific hake/whiting stock assessment

2011 Joint Review of the Pacific hake/whiting stock assessment

Interim Terms of Reference for the Scientific Review Group.

Appendix 2: A copy of the CIE Statement of Work

Attachment A: Statement of Work

External Independent Peer Review by the Center for Independent Experts

Joint US-Canada Technical Review Panel for the Pacific Whiting Stock Assessment

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. CIE reviewers are 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. Each 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.

Project Description: The U.S. and Canada are in the process of implementing the U.S.-Canada Agreement on Pacific hake and Whiting, This new agreement formalizes past scientific and stock assessment collaboration through the creation of two new scientific bodies: a Joint Technical Committee, charged with producing an annual stock assessment, and a Scientific Review Group, to provide peer review of the technical committee's work. These groups will include scientists appointed by each Party, as well as independent members referred by the Advisory Panel, a panel of private sector advisors. A fourth body, the Joint Management Committee, will consider the scientific advice and recommend to the Parties each year an overall total allowable catch

Two independent reviewers, provided by the CIE, are requested to participate in the Scientific Review Group meeting. The Agreement calls for the SRG to be comprised of up to six scientific experts, with two jointly appointed by each Party (U.S. and Canada) and two independent members appointed jointly by the Parties from a list supplied by the Advisory Panel. At this point in time, not all members of the SRG committee have been formally selected or appointed by the two Parties and therefore, participation of the CIE reviewers may vary.

It is anticipated that the CIE reviewers will participate in the review panel meeting as "officially invited members" of the SRG rather than "formally appointed members", as outlined in the Pacific hake Agreement. However, it is not yet clear what their role and status at the meeting will be due to uncertainties in the international process of appointing members and crafting the SRG Terms of Reference. CIE participation in official SRG discussions and decisions will be at the discretion of the SRG co-chairs. However, it is hoped that their roles will be no less than discussants, seated at the SRG table, if not de facto, fully functioning SRG members

The Pacific hake (or whiting, *Merluccius productus*) benchmark stock assessment will provide the basis for the management of the largest groundfish fisheries off the West Coast of the U.S. and British Columbia. For example, in 2010, Pacific whiting fishery accounted for 85% of the landed catch and 32% ex-vessel revenue of the U.S. Pacific coast groundfish fishery. The technical review will take place during a formal, public, multiple-day meeting of fishery stock assessment experts. 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 Reviewers: Two CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. One CIE reviewer shall have working knowledge and recent experience in the application of in fish population dynamics, with experience in the integrated analysis modeling approach, using age-and size-structured models, use of MCMC to develop confidence intervals, and use of Generalized Linear Models in stock assessment models. One CIE reviewer shall have expertise in fisheries acoustic surveys as they apply to and are used in fishery stock assessments. Each CIE reviewer's duties shall not exceed a maximum of 16 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 scheduled in Seattle, Washington during February 21-24, 2012.

Statement of Tasks: Each 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 reviewers with the background documents, reports, 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 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 CIE reviewers who are non-US citizens. For this reason, the CIE reviewers 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 the CIE reviewers the necessary background information and reports 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. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

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 reviewers 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 Reports: 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.

Other Tasks – Contribution to Summary Report: Each CIE reviewer may assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review. Each CIE reviewer is not required to reach a consensus, and should provide a brief summary of the reviewer's views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer 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 reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate in the panel review meeting in Seattle, Washington during February 21-24, 2012.
3) In Seattle, Washington during February21-24, 2012 as specified herein, conduct an independent peer review in accordance with the ToRs (**Annex 2**).
4) No later than March 9, 2012, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and Dr. David Die, CIE Regional Coordinator, via email to 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. **The following dates are**

tentative, and the Project Contact will provide firm dates for the panel review meeting no later than August 1, 2011.

January 2, 2012	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
January 21, 2012	NMFS Project Contact sends the CIE Reviewers the pre-review documents
February 21-24, 2012	Each reviewer participates and conducts an independent peer review during the panel review meeting
March 9, 2012	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
March 23, 2012	CIE submits CIE independent peer review reports to the COTR
March 30, 2012	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: This 'Time and Materials' task order may require an update or modification due to possible changes to the terms of reference or schedule of milestones resulting from the fishery management decision process of the NOAA Leadership, Fishery Management Council, and Council's SSC advisory committee. A request to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent changes. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on changes. 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 reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports 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 reports) to the COTR (William Michaels, via 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) each CIE report shall completed with the format and content in accordance with **Annex 1**,
(2) each CIE report 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 Science Director, and these reports will be made publicly available.

Support Personnel:

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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. Reviewers 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. Reviewers 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. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

   d. Reviewers 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 (February 6, 2012)

2012 Panel Review for US-Canada Pacific Whiting Agreement
Scientific Review Group

The SRG bases its interim terms of reference for 2012 on the language of the US-Canada Pacific Whiting Agreement, and on the Pacific Fishery Management Council's Stock Assessment and Review (STAR) terms of reference which have been the basis for Pacific whiting stock assessment review for over ten years. The SRG will revisit these terms of reference before 2013 and submit proposed revisions to the Joint Management Committee (JMC) for approval.

From the agreement language:
"*A Scientific Review Group (SRG) is hereby established to provide independent peer review of the work of the Joint Technical Committee (JTC). The SRG shall comprise up to six scientific experts, with up to two appointed by each Party and two independent members appointed jointly by the Parties from a list supplied by the Advisory Panel. All SRG members shall be different individuals than those who serve on the JTC. The Advisory Panel may also nominate, for appointment by the Parties, two public advisors to participate in SRG meetings. The public advisors shall have the right to provide their views on all aspects of the work of the SRG, both orally and in writing. The Parties shall jointly bear the travel expenses of the independent members and the public advisors for meetings of the SRG. In addition, SRG members may seek advice from others as they deem appropriate. SRG meetings shall be open to the public. The SRG shall meet annually, and more often as necessary, to:*
(a) propose its terms of reference for approval by the JMC;
(b) review the stock assessment criteria and methods and survey methodologies used by the JTC;
(c) provide, by no later than March 1 of each year, unless otherwise directed by the JMC, a written technical review of the stock assessment and its scientific advice on annual potential yield; and
(d) perform other duties and functions that may be referred to it by the JMC."

Pacific Whiting Scientific Review Group
Interim terms of reference for 2012.

1. The SRG will review the stock assessment criteria and methods and survey methodologies used by the JTC and provide a written technical review of the stock assessment and its scientific advice on annual potential yield;
2. The SRG will operate with co-chairs, one from the United States and one from the Canada, as chosen by the membership of the SRG;
3. The SRG meeting will be chaired by a SRG member. From year to year, the responsibility to chair the meeting will be shifted among SRG members at the discretion of the SRG;
4. In 2012, the SRG will be able to operate with 2 US member s and 2 Canadian members. If two independent members are appointed before the SRG meets on Feb 21, 2012, they will be treated as full members of the SRG;
5. SRG meetings will be conducted as public meetings including opportunity for public comment;
6. The SRG at its discretion will occasionally seek advice from external experts to expand its capacity to review survey and assessment methodologies;
7. The SRG will seek consensus in all matters and will document the range of discussion regarding this consensus to the extent feasible. Where full consensus cannot be reached, minority reports will be included to convey alternative viewpoints. If an issue cannot be resolved without a vote, then only full SRG members will have a vote. External experts commissioned by the SRG will be expected to fully participate in review discussions and

their advice will be sought as consensus is formed; however external experts will not be voting members of the SRG.

8. All draft stock assessment and survey documents will be provided to the SRG through the JTC;
9. Material provided to the SRG through public comment will not be considered part of the technical work to be reviewed, but it may be taken into account when reviewing the work of the JTC. If public comment is directly considered in the review, both source and content of that comment will be documented in the SRG report;
10. The SRG will discuss the technical merits and deficiencies of the survey methodology, input data and analytical models during the open review panel meeting and work with the JTC to correct any deficiencies;
11. The SRG report will document relevant meeting discussions;
12. Requests to the JTC for additional analyses will be provided in writing by the SRG;
13. The SRG will work with the JTC to achieve a base case model result and to describe the uncertainty around this base case, including uncertainty represented by alternative model scenarios and uncertainty resulting from the statistical variance of the base case itself;
14. The SRG will seek a consensus position with the JTC on the recommended annual potential yield;
15. The SRG will provide recommendations to the JMC and JTC regarding issues that will need additional research before being tabled for review in subsequent years;
16. A complete SRG report will be provided to the JMC by March 1, 2012.

Annex 3: Tentative Agenda

Joint US-Canada Scientific Review Group Meeting
For the Technical Peer Review of the
2012 Pacific Hake / Whiting Stock Assessment
February 21-24, 2012
Seattle, WA 98105

Tuesday, February 21, 2011

TBD a.m.	Welcome and Introductions
	Review the Status of the Pacific hake / Whiting Treaty
8:15 a.m.	Review the Meeting Agenda (Panel Chair)
	Review Terms of Reference for Assessments
	Review Meeting Assignment of reporting duties
9:00 a.m.	Data Presentations
	- Overview of the 2011 Hake/Whiting Fisheries
	o Canadian Waters
	o U.S. Waters
10:15 a.m.	Coffee Break
10: 45 a.m.	Acoustic Survey: Design and Analysis
12:00 p.m.	Lunch (on your own)
1:00 p.m.	Acoustic Survey
3:00 p.m.	Coffee Break
3:30 p.m.	Overview of the Data Sources for the 2012 Assessment
5:30 p.m.	Adjourn for the day.

Wednesday, February 22, 2012

8:00 a.m.	JTC Model Presentations
12:00 p.m.	Lunch On Your Own
1:00 p.m.	Q&A session with the JTC
	- Panel develops list of model runs / analyses for the JTC
5:30 p.m.	Adjourn for day.

Thursday, February 23, 2012

8:00 a.m.	JTC presentation(s) of requested model runs/analyses.
11:00 a.m.	Panel Discussion
12:00 p.m.	Lunch On Your Own.
1:00 p.m.	Panel discussion.
	- Identification of base model and elements for the decision table.

- Panel develops third list of model runs for decision table and begins drafting STAR report.

Friday, February 24, 2011

9:00 a.m.	JTC presentation(s) of third set of requested model runs/analyses.
10:00 a.m.	Panel discussion. - Discuss MCMC runs for base case model and decision table - Panel agree to process for completing final SRG Peer Review report - SRG finishes report
12:00 p.m.	Lunch on your own
5:00 p.m.	SRG Adjourn.

Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Scientific Review Group (SRG) Members:

Richard Methot, co-chair, NWFSC, NMFS, NOAA
Greg Workman, co-chair, PBS, DFO
Mike Prager, NMFS, NOAA, retired
Kendra Holt, PBS, DFO

Joint Technical Committee (JTC) Members

Ian Stewart, NWFSC, NMFS, NOAA
Robyn Forrest, PBS, DFO
Nathan Taylor, PBS, DFO
Chris Grandin, PBS, DFO
Allan Hicks, NWFSC, NMFS, NOAA

Pacific Hake / Whiting Acoustic Survey Team Presenters

Dezhang Chu, NWFSC, NMFS, NOAA
Rebecca Thomas, NWFSC, NMFS, NOAA

SRG Technical Advisors

John Simmonds, CIE
Henrik Sparholt, CIE
Tom Carruthers, UBC

In addition, some stakeholders, interested members of the public and students participated in the meeting.