

**Center for Independent Experts (CIE) Peer Review Report
STAR Panel on shortspine thornyhead and longspine thornyhead
NOAA Fisheries
Northwest Fisheries Science Center
2725 Montlake Blvd.
July 22-26, 2013**

By

**Jean-Jacques Maguire
CIE reviewer**

August 2013

Executive summary

The assessment documents for shortspine thornyhead and longspine thornyhead were made available at the required date, sufficiently in advance of the meeting to allow for an in-depth review. The documents for the two species were well prepared and contained the required information. Electronic files of the input and output of the models were also made available.

The assessments for both species do represent the best available scientific information. Absolute estimates from both assessments are uncertain but trends in relative changes in stock size appear relatively robust. The two species are not overfished and overfishing is not occurring.

As is the case for most stock assessments on the west coast of the USA, the two assessments use Stock Synthesis. As indicated in previous reviews of assessments using Stock Synthesis, the software is a highly flexible assessment tool in which it is possible to use several sources of information (growth information, catch, length and age frequencies, indices of stock sizes, etc.) to evaluate stock status. Stock Synthesis can provide stock estimates and fisheries management reference points even when very little data is available and sometimes it may be difficult to distinguish if the assessment results are influenced more by the available data or by the assumptions in the assessment model. For the two thornyhead assessments reviewed, if the available growth equations are considered sufficiently reliable, or if a more reliable growth function could be derived, they could be used to calculate approximate catch at age to be used in VPA type assessment approaches to estimate the scale of biomass.

Background

Both shortspine thornyhead and longspine thornyhead are long-lived and are targets of the slope trawl fishery off the west coast of the USA. These species were last assessed in 2005 and the results are no longer considered “adequate” as defined by NMFS HQ’s S/T office. In addition, landings of both species have increased since they were last assessed, as fishing effort has been diverted from shelf to deeper slope depths, in order to promote rebuilding of depleted shelf species. The assessments reviewed were therefore to be considered as benchmark assessments for longspine thornyhead and shortspine thornyhead.

Assessments for these two stocks are expected to provide the basis for the management of the groundfish fisheries off the West Coast of the U.S. including providing scientific basis for setting OFLs and ABCs as mandated by the Magnuson-Stevens Act. The technical review took place during a formal, public, multiple-day meeting of fishery stock assessment experts in Seattle, WA, during July 22 - 26, 2013.

Shortspine thornyhead occur from Baja, Mexico to the Bering Sea and are most abundant in the 180-450 m depth range. They are associated with Dover sole, sablefish and longspine thornyhead. Previous stock assessments of shortspine thornyhead were carried in 1990, 1991, 1994, 1997, 1998, 2001, and 2005. The 2013 stock assessment was presented to the STAR Panel by Dr. Ian Taylor (lead STAT author). He reviewed the fishery, the data used in the analysis, and the Stock Synthesis (SS3) modeling approach.

Longspine thornyhead also occur from the southern tip of Baja California, to the Aleutian Islands. There appears to be no distinct geographic breaks in stock abundance along the west coast. Adult longspine thornyhead are bottom dwellers, and inhabit the deep waters of the continental slope throughout their range. The 2005 assessment was the first to consider longspine thornyheads (*Sebastobus altivelis*) separate from shortspine thornyhead (*S. alascanus*), although the two species made up a single market category in the historical fishery, are often difficult to separate in early landings data, and are similar in many respects. The stock assessment was presented to the STAR Panel by Dr. Andi Stephens (lead STAT author). She reviewed the fishery, the data used in the analysis, and the Stock Synthesis (SS3) modeling approach. Fisheries are grouped into a single fleet because the non-trawl fisheries component is always less than 5% of the total catches.

Shortspine thornyhead grows much larger than longspine and could weigh 10 times more. The depth range where young shortspine live is much shallower than where similar size longspine live.

The two lead STAT authors worked closely together in preparing the assessments and to the extent possible, the Panel strove to ensure a consistent treatment of the catch data, influence of fishery regulations, and population vital rates for both stock assessments. Both assessments cover distribution from the Mexican border in the south to the Canadian border in the north.

For both assessments, multiple model runs were conducted and reviewed to examine model assumptions and structure, and to identify uncertainties in the data and assessment model. Panel discussion focused on the appropriate use of the data and construction of the model.

The STAT teams are thanked for their willingness to respond to requests and their dedication in finding possible solutions to difficult assessment problems. The contributions from the GMT and GAP Advisors are also gratefully acknowledged.

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

I downloaded and reviewed the main assessment papers when they became available. I attended the STAR Panel from July 22-26 and recorded the Panel's requests. I took active part on the discussions for the two species being reviewed. I prepared this report subsequent to the STAR Panel meeting.

Summary of Findings for each ToR

The consolidated first draft of the STAR Panel report was available shortly before the deadline for the CIE report. According to the first draft of the STAR Panel report there do not seem to be divergent views, but it is not possible to be certain that this is the case until the STAR Panel report is finalized. It can be expected that there is more emphasis on the absolute estimates of biomass (see volatility of the assessments below) in this report than will be the case in the STAR Panel report.

Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g. previous assessments and STAR panel report when available) prior to review panel meeting.

Both the shortspine thornyhead and longspine thornyhead assessment documents were complete, very well researched, very well documented and very clearly presented. Both incorporated the results of recent research, and they included sensitivity runs and a retrospective analysis. Further sensitivity runs were requested by the Panel for both species leading to new base cases, more sensitivity runs and retrospective analyses of the new base cases.

For shortspine thornyhead, the assessment document notes that the center of distribution varies by size geographically as illustrated in Figure 1.

This apparent shift to the south and into deeper waters as shortspine thornyhead grow could be due to active migration or passive drift with currents. The observed pattern does not seem consistent with the exploitation history where the majority of the catch was in the south by trawlers. If the exploitation rate had been higher in the south, the expectation would have been to observe smaller fish. While not of primary management importance, it would be interesting to know if the prevailing currents at the depths where shortspine thornyhead occur could explain the apparent shift in distribution.

For shortspine thornyhead, new maturity observations were available (Figure 2). Given the highly unusual pattern, the maturity data used in the previous assessment should be retained until the results are confirmed. Further studies should be undertaken to assess maturity by size.

Evidence for ontogenetic movement

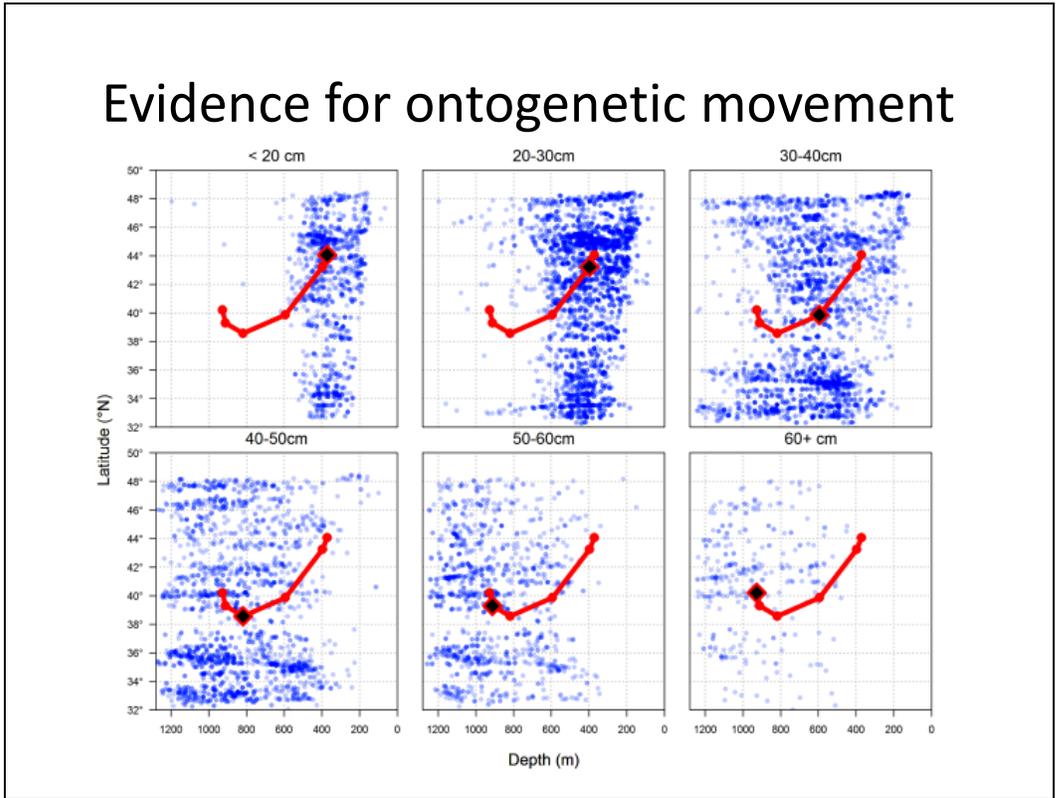


Figure 1

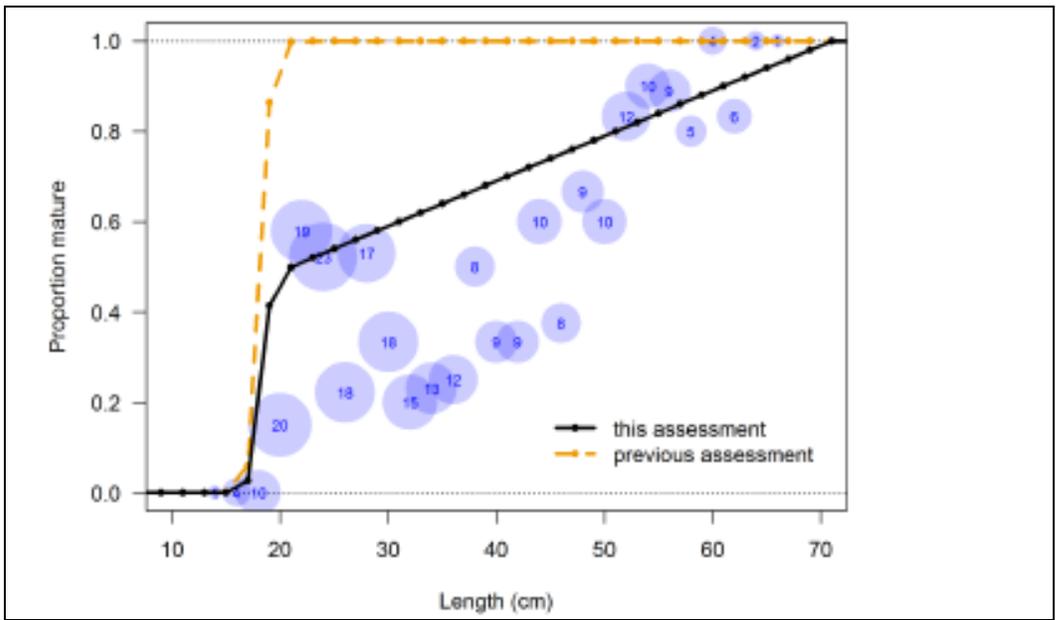


Figure 2

In the draft assessment documents, the distribution in the survey for both species is shown using similar plots (see Figure 3 for longspine). The choice of symbol and scale

makes it very difficult to interpret the figure other than to conclude that there are no longspine in shallow waters. A better way to illustrate the geographic distribution should be sought.

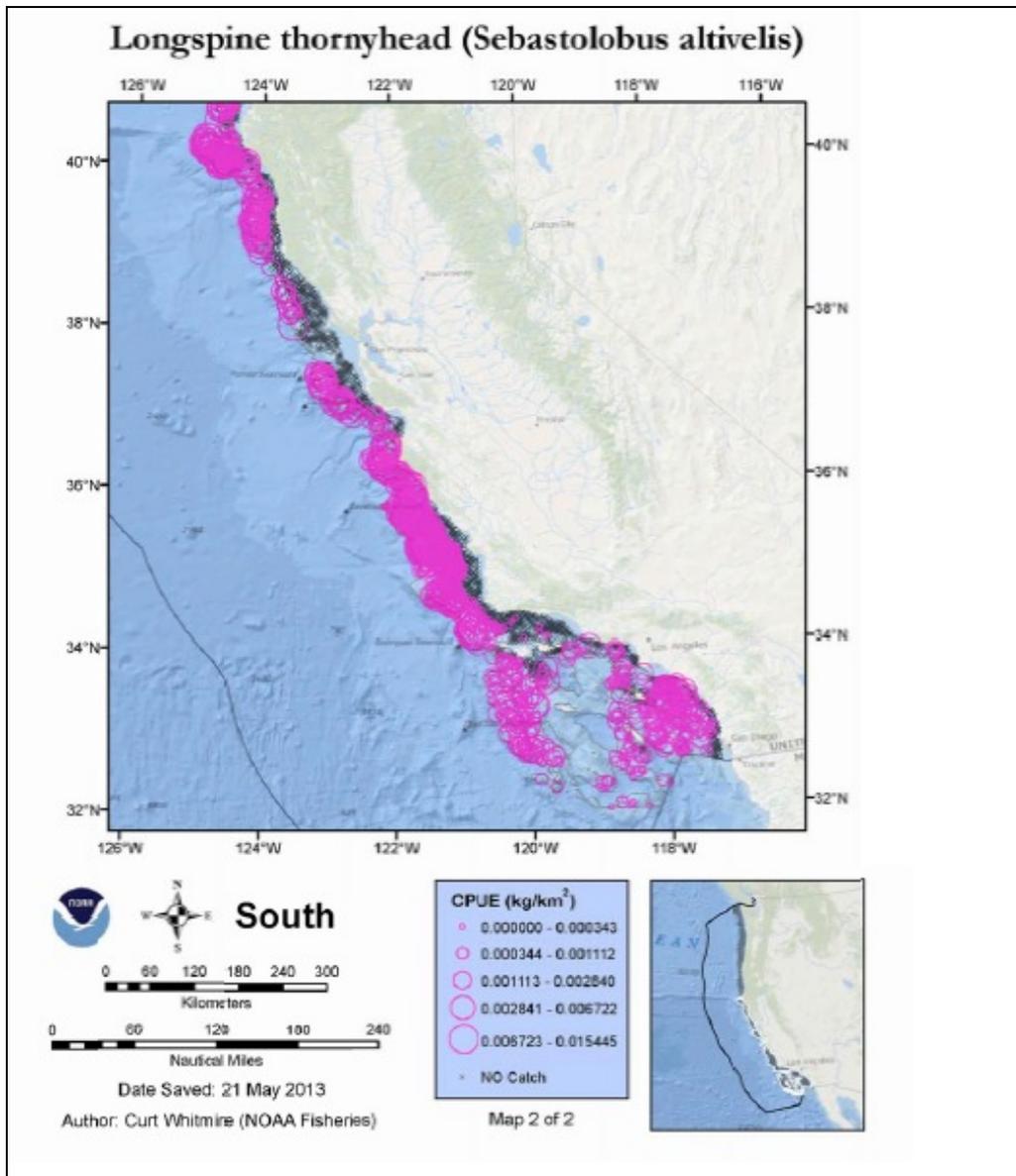


Figure 3

Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.

Following the initial presentation and discussion of the assessments, the Panel made written requests to the STAT for additional analyses. Upon completion, the STAT presented the results to the Panel, which in turn made additional requests related to the questions and issues arising from the new material. This process was repeated five times

for shortspine thornyhead and four times for longspine thornyhead during the week until new base cases were achieved and the uncertainty was better characterized.

Stock structure

There are shortspine and longspine thornyheads outside of the assessment area in Mexico and Canada. Both species are believed to be relatively sedentary once individuals settle to the bottom and the existence of individuals outside of the assessment area may not be important once thornyheads settle. Depending on the prevailing currents at the depth where the eggs and larvae are found, and given the relatively long pelagic phase of gelatinous masses of eggs which float to the surface, eggs produced in the assessment area can be expected to move out of the area and it is also possible that the assessment area would receive eggs from outside the area. It might be useful to investigate the source / sink relationships for both species with thornyheads outside of the assessment area. This might be achieved by looking at existing physical oceanographic experiments.

Volatility of the assessments

The assessments for both species were very professionally done with systematic and comprehensive evaluation of the data and results. However, the results for both species were volatile with small changes in model configuration / parameters leading to unexpectedly large changes in absolute estimates while trends generally remained similar. Now that the index of abundance from the NWFSC combo survey is sufficiently long, consideration could be given to use the results as a relative index of stock size to be used in making management decisions.

I participated in a 1995 review of the Dover sole, thornyheads and sablefish assessments. Other members of the 1995 review panel included Amos Duncan, then with the Georgia Marine Extension Services, Robert N. O'Boyle, then with DFO, Ana M. Parma, then with the International Pacific Halibut Commission, and Tony Smith from CSIRO. Our conclusion was that because of multiple changes in survey coverage, design, gear changes etc., the triennial slope survey information for those species could not be used either as relative indices of stock size or as absolute estimates. Survey design, coverage, gear and protocol were subsequently standardized and post-1995 slope survey results would be expected to be useable as index of stock size. One of the Panel's first requests was therefore a run using data for the triennial shelf survey from 1995 only. The results (Figure 4) showed a substantial change in the absolute biomass estimates while trends remained similar.

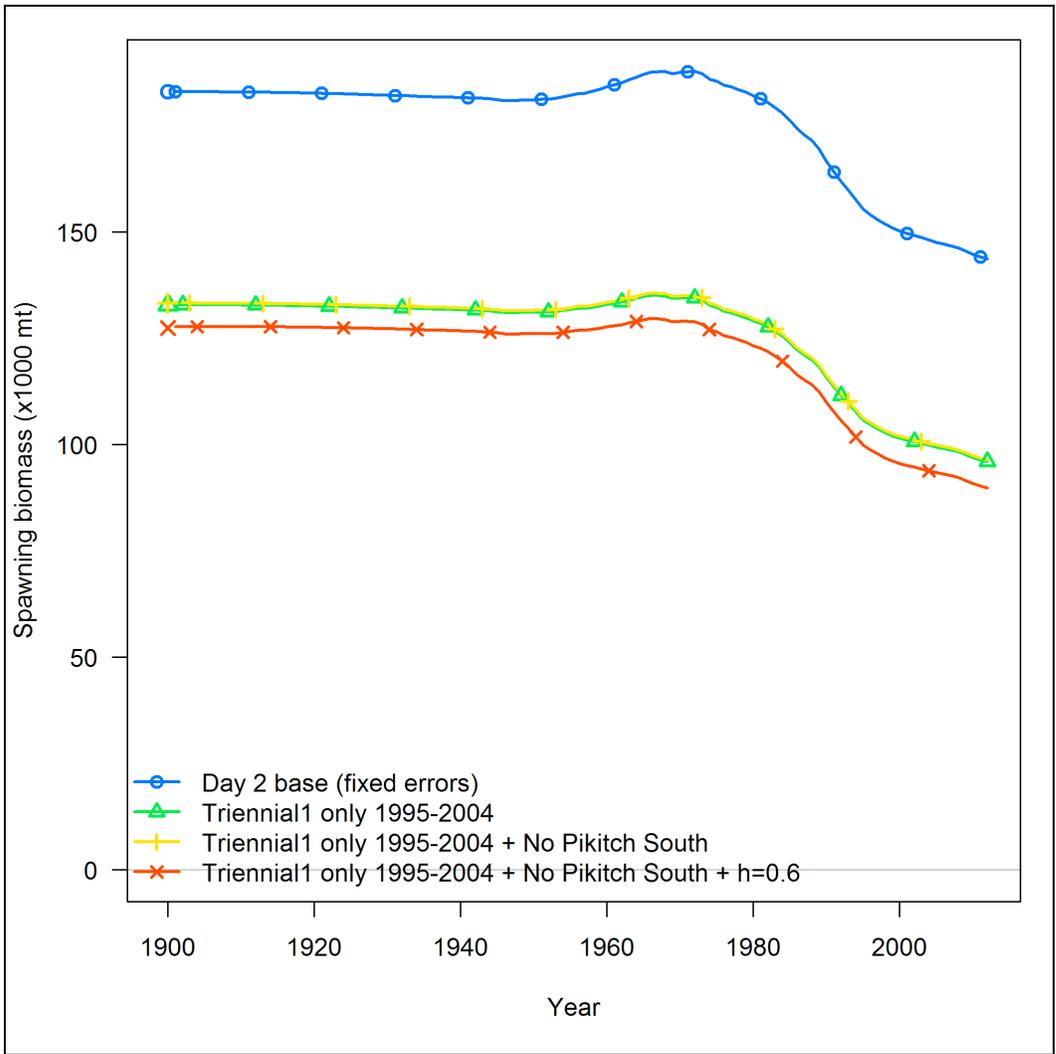


Figure 4

Results of intermediate runs in Figure 5 for shortspine thornyhead illustrate the volatility of the absolute estimates of biomass:

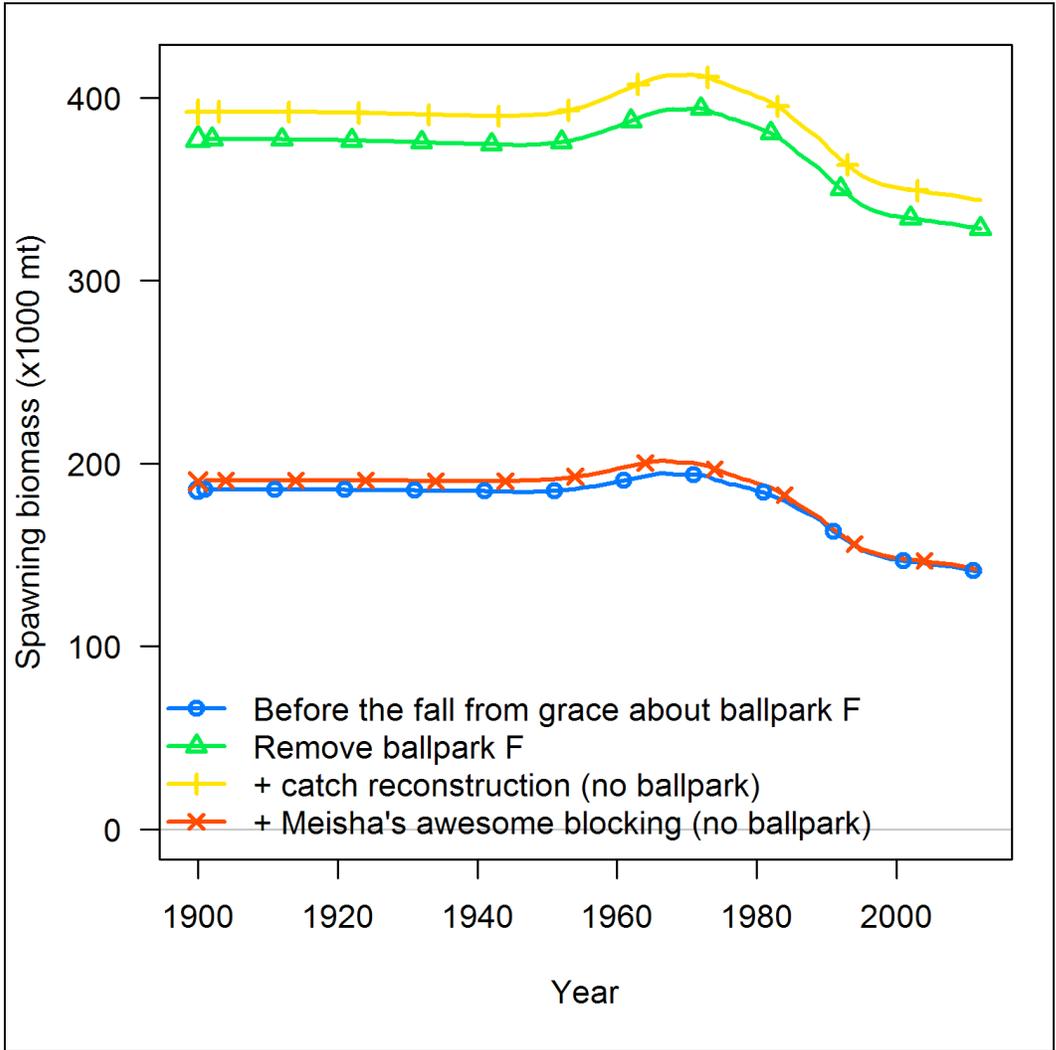


Figure 5

The blue line was a tentative base case at the beginning of the meeting. Noting that the sum of components of the likelihoods did not equal the total likelihood led to discovering that the SS3 version used did not automatically turn off an approximate fishing mortalities feature which was traditionally used in the early phases of model fitting then automatically turned off. This feature was used in the 2005 assessment and had no impact. Removing the ballpark F produced the green line, about twice the biomass of the tentative base case. Changing the blocking for estimating retention, without the ballpark F produced the red line, very close to the tentative base case. Such large differences in absolute estimate were not expected from changing the blocks for selectivity. This could be due to the new blocking which implies different starting parameters.

The retrospective analysis (Figure 6) also shows the volatility of the assessment results for shortspine thornyhead:

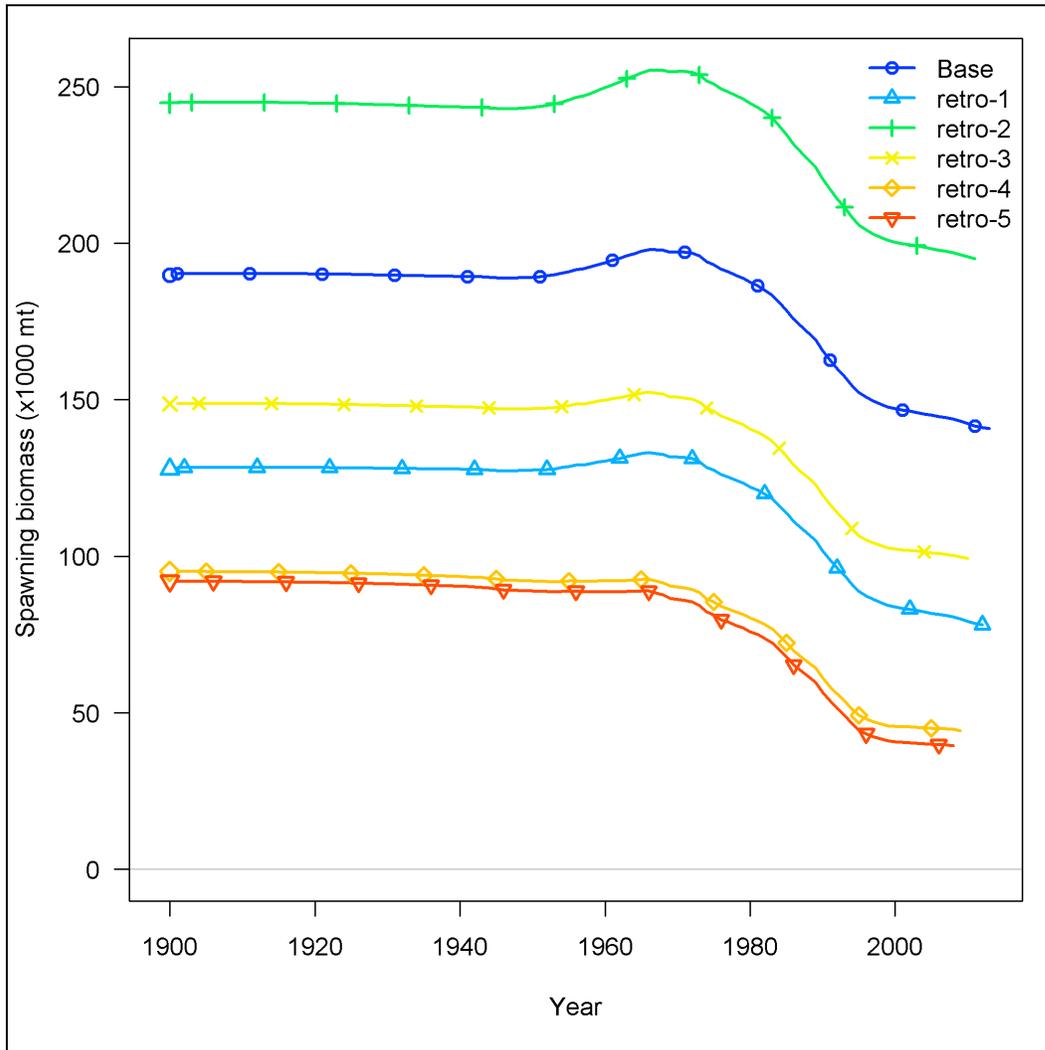


Figure 6

The longspine thornyhead SS3 results (Figure 7) proved similarly volatile when recruitment deviations were not estimated:

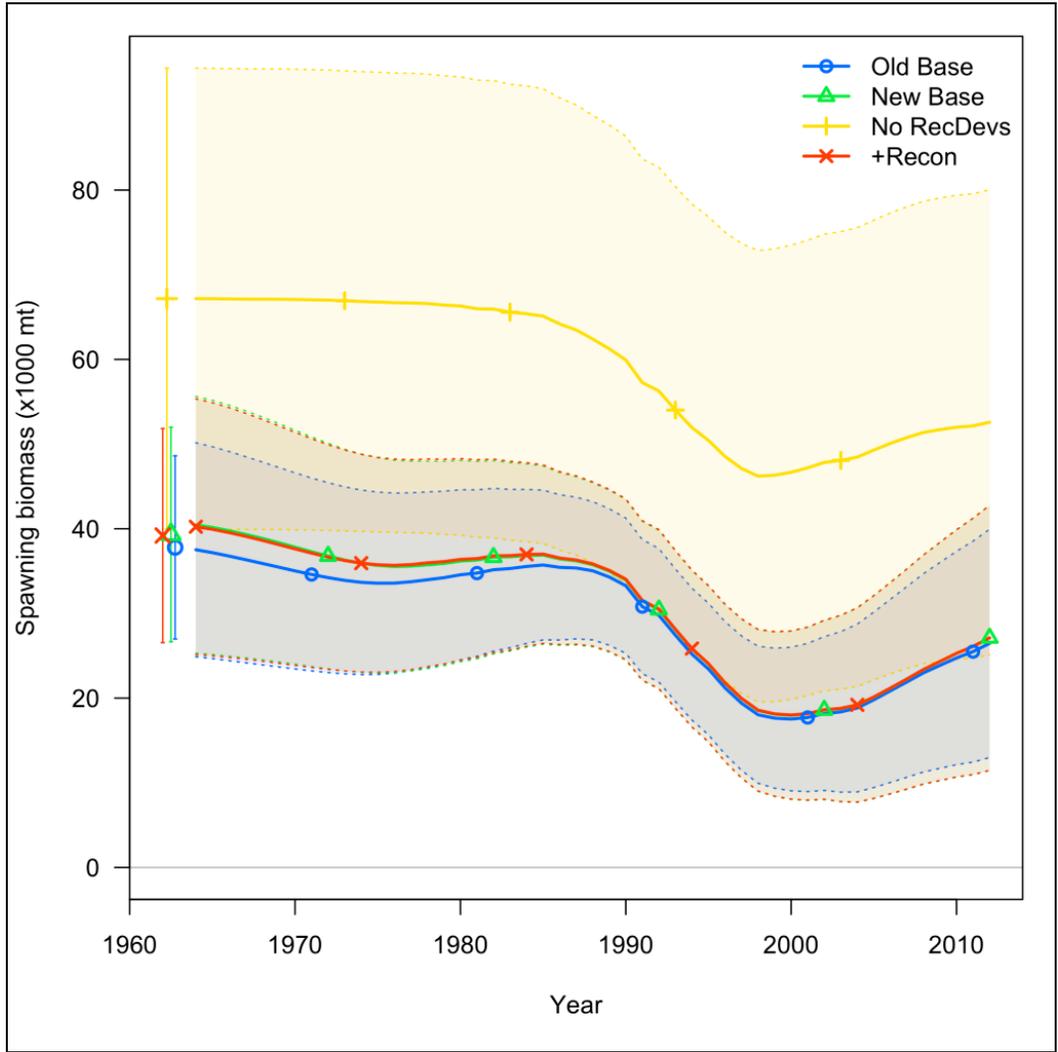


Figure 7

A further illustration of the volatility of the results can be obtained by comparing the results of the current base case with the results of the previous (2005) assessment (Figure 8):

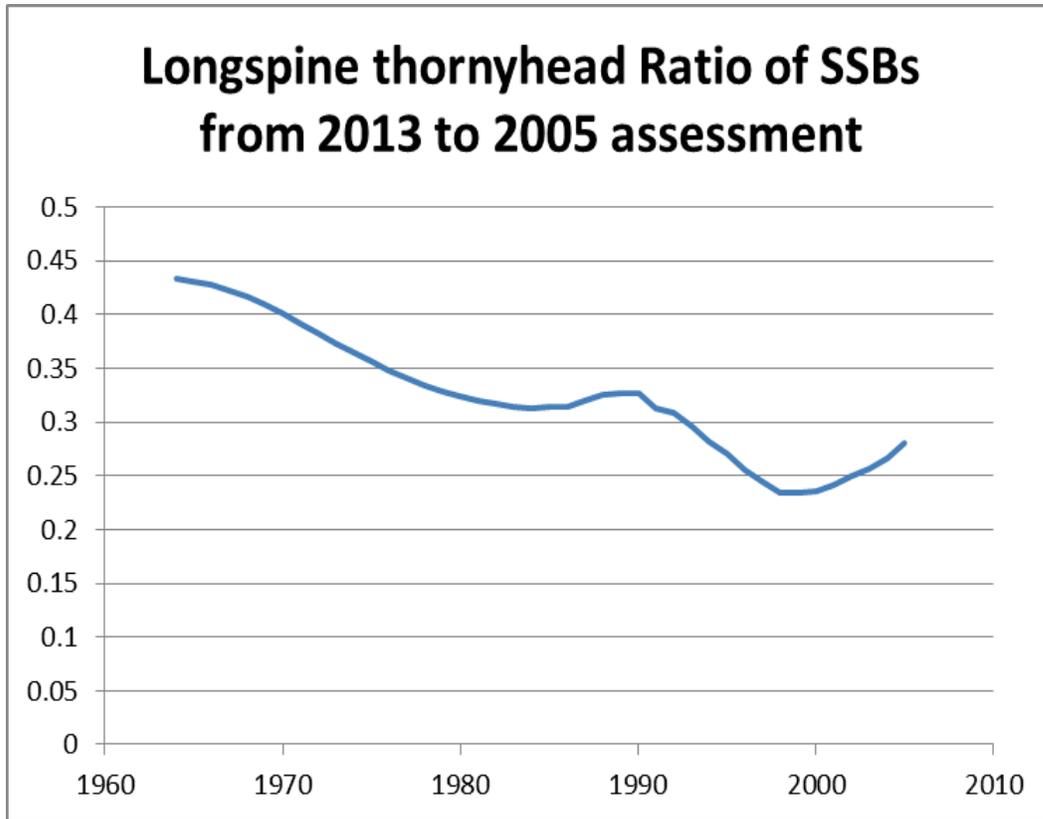


Figure 8

Figure 8 shows that the SSB from the current assessment is only 25-30% of the previous SSB estimates.

Important fishery data (historical catches and discards) and key population vital rates (maturity, age and growth) are lacking for shortspine and longspine thornyhead – making the stock assessments only marginally sufficient to estimate the status of the resource.

Evaluate model assumptions, estimates, and major sources of uncertainty.

Model assumptions of the final base cases are the result of back and forth exchanges with the STAT team. At this stage they are considered the most reasonable ones, given the data available.

As indicated earlier, the absolute estimates of biomass (and therefore of recruitment and fishing mortality) are highly volatile. This may not have been apparent in previous assessments where catchability was fixed rather than estimated. As there is an unknown,

but possibly significant proportion of the population that is outside of the survey area, particularly for longspine thornyhead, there is no scientific basis to choose what catchability should be. In this context, it is worth noting that the vulnerability of longspine thornyhead to the fishery would be expected to be less than that of shortspine thornyhead because of the former's smaller size and because it is distributed outside of the fishery. Yet, the assessment results suggest a nearly 10 fold greater catchability for longspine compared with shortspine.

There are some concerns on historical catch, fishing policy changes, and the design on retention and selectivity. The differences in the survey and the fishery selectivity do not match the expectations. Fishery selectivity time changing and their selectivity patterns should be consistent.

Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.

The iterations with the STAT team during the Panel meeting led to what can be considered a reasonable interpretation of the data. There are no further suggestions for improvements and no technical deficiencies have been found. The uncertainty relates to the scale of the estimates for both species. The trends seem relatively robust to various treatment of the data. As indicated elsewhere in this report, VPA type analyses could be used to try to confirm the scale of biomass estimates. Alternatively, simpler methods based on the survey results could be used to make management decisions.

Determine whether the science reviewed is considered to be the best scientific information available.

The assessments for both species do represent the best available scientific information. Absolute estimates from both assessments are uncertain but trends in relative changes in stock size appear relatively robust. The two species are not overfished and overfishing is not occurring.

When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.

Results from the NWFSC combo survey suggest stability or a slight increase in stock size for shortspine since the beginning of the survey in 2003. This suggests that current removals are not resulting in stock decreases. For longspine, the NWFSC combo survey shows slightly more variability over the years, but also a clearer increase. The survey results could be used directly (e.g. section 4.4 in ICES Methods WG 2011 (<http://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/SSGSUE/2>)).

011/WGMG11.pdf)). This would provide a more stable, and probably sounder, basis to formulate advice. The approach used by ICES for data limited stocks could also be considered (<http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2012/ADHOC/DLS%20Guidance%20Report%202012.pdf>).

I endorse the research recommendations in the STAR Panel report, but would emphasize investigating simpler methods to provide advice based on the results of the NWFSC combo survey. Ageing studies would be helpful to confirm a general growth function but it may not be practical / useful to attempt to collect sufficient samples to estimate yearly catch at age in the future (it should be noted that this does not conflict with the recommendation above to derive approximate catch at age for past years to use VPA type approaches to get a better idea on the scale of the biomass).

The vulnerability of longspine thornyhead to the fishery would be expected to be less than that for shortspine thornyhead because of their smaller size and because a greater proportion of the assessed population is expected to be distributed outside of the fishery. Yet, the catchability for longspine thornyhead is approximately 10 fold greater than that for shortspine thornyhead. This may be an artifact of the data and model configuration however.

Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

There were no areas of disagreement between the STAT team and the review Panel or within the review Panel itself. Pacific Fisheries Management Council advisors were astonished at the huge difference in absolute spawning stock biomass estimates small changes in model settings could generate. Panel members being more familiar with this type of models were less impressed.

Conclusions and Recommendations in accordance with the ToRs.

There is an apparent shift in the distribution with size for shortspine thornyhead. While not of primary management importance, it would be interesting to know if the prevailing currents at the depths where shortspine thornyhead occur could explain the apparent shift in distribution.

New maturity data for shortspine thornyhead show an anomalous pattern. Further studies should be undertaken to assess maturity by size.

In the draft assessment documents, the distribution in the survey for both species is shown using similar plots (see example below for longspine). The choice of symbol and scale makes it very difficult to interpret the figure other than to conclude that there are no longspine in shallow waters. A better way to illustrate the geographic distribution should be sought.

The assessment areas for both species are arbitrarily set at the Mexican and Canadian borders. It is known that individuals of both species are found outside of the assessment area. It might be useful to investigate the source / sink relationships for both species with thornyheads outside of the assessment area. This might be achieved by looking at existing physical oceanographic experiments.

The absolute biomass estimates from alternative model configurations varied substantially for both species. Now that the index of abundance from the NWFSC combo survey is sufficiently long, consideration could be given to use the results as a relative index of stock size to be used in making management decisions. In this context, if reliable growth function could be derived, they could be used to calculate approximate catch at age to be used in VPA type assessment approaches to estimate the scale of biomass.

The STAR review process is well structured, guidelines are comprehensive and clear, and having the possibility of a "mop up" panel in the autumn is a brilliant idea which reduces the pressure on the STAT teams and on the Panels themselves while making it possible to resolve issues. I have observed that more stakeholders are involved in the NMFS peer review processes in the Northeast and to a lesser extent in the Southeast, but this is not a criticism - there are several possible reasons for this, including that stakeholders here have trust in the product of the STAR process.

Appendix 1: Bibliography of materials provided for review

Taylor, I. and Stephens, A. 2013. Stock Assessment of Shortspine Thornyhead in 2013. Pre-STAR DRAFT.

Stephens, A. and Taylor, I. 2013. Stock Assessment and Status of Longspine Thornyhead (*Sebastes altivelis*) off California, Oregon and Washington in 2013. Pre-STAR DRAFT.

Background Materials

Hamel, O. Development of prediction intervals and priors for the natural mortality rate using multiple meta-analyses using life-history correlates. NOAA Fisheries, Northwest Fisheries Science Center, Seattle. 4/28/2013.

NWFSC Observer Program. 2013. Data Products for Stock Assessment Authors. 8Jan. 2013.

Stewart, I.J. and Hamel, O.W. In press. Bootstrapping to inform effective sample sizes for length- or age-composition data used in stock assessments.

Thorson, J. Estimating a Bayesian prior for steepness in Pacific rockfishes (*Sebastes* spp.) off the U.S. West Coast for the 2013 assessment cycle. April 1, 2013.

Thorson, J. T. and Ward, E. Accounting for space-time interactions in index standardization models.

Wallace, J. R. Applying the U.S. West Coast's First Major Trawl Bycatch and Mesh Size Studies to Fishery data using Post-hoc Fishing Strategies and Geographical Area. DRAFT. June 28, 2013.

Previous Thornyhead Stock Assessments

Fay, G. 2005. Stock Assessment and Status of Longspine Thornyhead (*Sebastes altivelis*) off California, Oregon and Washington in 2005.

Hamel, O.W. 2005. Status and Future Prospects for the Shortspine Thornyhead Resource in Waters off Washington, Oregon, and California as Assessed in 2005.

Longspine thornyhead STAR Panel Report. 2005.

Shortspine Thornyhead STAR Panel Report. 2005.

Stock Synthesis Model-Related Documents

Method, R. D. 2012. User Manual for Stock Synthesis Model Version 3.24f. Updated October 3, 2012. NOAA Fisheries, Seattle, Washington.

Method, R. D. Stock Synthesis Technical Description.

Appendix 2: A copy of the CIE Statement of Work

External Independent Peer Review by the Center for Independent Experts

Stock Assessment Review (STAR) Panel for Longspine and Shortspine Thornyheads

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: Benchmark assessments will be conducted for longspine thornyhead and shortspine thornyhead. Both species are long-lived and are major targets of the slope trawl fishery. In addition, these species were last assessed in 2005 and therefore no longer considered "adequate" as defined by NMFS HQ's S/T office. Additionally, landings of each have climbed since their last assessments, as fishing effort has been diverted from shelf to deeper slope depths, in order to promote rebuilding of depleted species.

Assessments for these two stocks will provide the basis for the management of the groundfish fisheries off the West Coast of the U.S. including providing scientific basis for setting OFLs and ABCs as mandated by the Magnuson-Stevens Act. The technical review will take place during a formal, public, multiple-day meeting of fishery stock assessment experts. Participation of external, independent reviewer is an essential part of the review process. 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 of the CIE reviewers will participate in all STAR panels held in 2013 to provide a level of consistency between the STAR panels. The CIE reviewers shall be active and engaged participants throughout panel discussions and able to voice concerns, suggestions, and improvements while respectfully interacting with other review panel members, advisors, and stock assessment technical teams. The CIE reviewers shall have excellent

communication skills in addition to working knowledge and recent experience 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. 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 scheduled in Seattle, Washington during the dates of 22-26, July 2013.

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.

Documents to be provided to the CIE reviewers prior to the STAR Panel meeting include:

- The current draft stock assessment reports;
- Previous stock assessments and STAR panel review reports of shortspine and longspine thornyheads;
- The Pacific Fishery Management Council's Scientific and Statistical Committee's Terms of Reference for Stock Assessments and STAR Panel Reviews;
- Stock Synthesis (SS) Documentation
- Additional supporting documents as available.
- An electronic copy of the data, the parameters, and the model used for the assessments (if requested by reviewer).

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 during the panel review meeting in Seattle, Washington during the dates of 22-26 July, 2013 as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).
- 3) No later than 9 August 2013, each CIE reviewer shall submit an independent peer review report addressed to the “Center for Independent Experts,” and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and to 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.

June 17, 2013	CIE sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
July 8, 2013	NMFS Project Contact sends the CIE Reviewers the pre-review documents
July 22-26, 2013	Each reviewer participates and conducts an independent peer review during the panel review meeting
August 9, 2013	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
August 23, 2013	CIE submits CIE independent peer review reports to the COR
August 30, 2013	The COR distributes the final CIE reports 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 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 be 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 Center Director.

Support Personnel:

William Michaels, Program Manager, COTR
NMFS Office of Science and Technology
1315 East West Hwy, SSMC3, F/ST4, Silver Spring, MD 20910
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Manoj Shivlani, CIE Lead Coordinator
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Terms of Reference for the Peer Review

1. Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g. previous assessments and STAR panel report when available) prior to review panel meeting.
2. Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.
3. Evaluate model assumptions, estimates, and major sources of uncertainty.
4. Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.
5. Determine whether the science reviewed is considered to be the best scientific information available.
6. When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.
7. Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

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

Technical Reviewers

Meisha Key, Scientific and Statistical Committee (SSC), Panel Chair

Yan Jiao, Center for Independent Experts (CIE)

Jean-Jacques Maguire, Center for Independent Experts (CIE)

Ray Conser, Fish Stock Assessment Consulting

Panel Advisors

John DeVore, Pacific Fishery Management Council (PFMC), Staff Officer

Corey Niles PFMC Groundfish Management Team (GMT)

Pete Leipzig, PFMC Groundfish Advisory Subpanel (GAP) Alternate

Stock Assessment (STAT) Teams

Shortspine Thornyhead STAT

Ian Taylor, Northwest Fisheries Science Center (NWFSC)

Andi Stephens, Northwest Fisheries Science Center (NWFSC)

Longspine Thornyhead STAT

Andi Stephens, Northwest Fisheries Science Center (NWFSC)

Ian Taylor, Northwest Fisheries Science Center (NWFSC)