Proposed Terms of Reference

Acoustic Trawl Methodology Review for Use in
Coastal Pelagic Species Stock Assessments
January 30- February 2, 2018
Southwest Fisheries Science Center, La Jolla, CA, USA

Background

The National Marine Fisheries Service (NMFS) conducts scientific surveys to assess abundance estimates and trends in fish populations, for use in fisheries management decisions and other purposes. NMFS and the Pacific Fishery Management Council (Council) are jointly responsible for ensuring that survey design, protocols, and abundance estimates represent best scientific information available, and work cooperatively to ensure independent peer review of scientific products related to fisheries management. To this end, the Council developed a Terms of Reference (ToR) to guide review of methodologies that are used in fisheries management decisions (See Appendix 1). In advance of such methodology reviews, NMFS and the Council will work with the Council's Scientific and Statistical Committee (SSC) to designate a methodology review panel, which includes a Chair, at least one member independent of the Council (often designated by the Center for Independent Experts [CIE]), and at least two additional members.

For each methodology review, a meeting-specific ToR is produced to provide guidance on key questions to be addressed, additional background on any prior methodology reviews, and to describe expectations relative to the review. This document is the meeting-specific ToR that will be used to guide the January 30 – February 2, 2018 methodology review of the Southwest Fisheries Science Center's (SWFSC) acoustic-trawl survey methodology (ATM) for coastal pelagic species (CPS) off the United States West Coast.

Scope

The Methodology Review (MR) Panel will conduct the review of the ATM currently used to produce biomass estimates for Pacific sardine stock assessments. The Pacific sardine stock is assessed annually by SWFSC scientists, and the Council uses the resulting biomass estimates to establish an annual harvest guideline and other harvest specifications. The ATM biomass estimates for three other coastal pelagic species (Pacific mackerel, two sub-stocks of northern anchovy, and jack mackerel) have not been approved for use in Council stock assessments (PFMC 2011). It is the intent of this review to also evaluate the usefulness of the ATM for these stocks even though portions of their populations are outside the range of the ATM survey, either in international waters or in shallow nearshore waters that the ATM survey is not able to sample in its present configuration.

The MR Panel will review current ATM survey methodology and results in the context of recent stock assessment documents and any other pertinent acoustic information for CPS, work with the ATM team to make recommendations for any necessary modifications, and will produce a Panel report for consideration by the Council and for use by the SWFSC. That

report will describe in detail the technical merits and deficiencies, recommendations for remedies, unresolved problems and major uncertainties, and recommendations for future research and data collection (see page 6, Appendix 1). This ATM ToR provides guidance as to the scope and range of issues that this methodology review should cover. Appendix 1 contains the Council's ToR for the methodology review process for groundfish and coastal pelagic species for 2017 and 2018.

Background information from previous ATM methodology reviews: The Council first approved the use of the ATM at its April 2011 meeting after the ATM underwent a methodology review in February 2011, with the following conclusion:

> *"Overall, the Panel is satisfied that the design of the acoustic-trawl surveys, as well as the methods of data collection and analysis are adequate for the provision of advice on the abundance of Pacific sardine, jack mackerel, and Pacific mackerel, subject to caveats, in particular related to the survey areas and distributions of the stocks at the times of the surveys. The Panel concluded that estimates from the acoustic-trawl surveys can be included in the 2011 Pacific sardine stock assessment as 'absolute estimates', contingent on the completion of two tasks. Estimates of absolute abundance for the survey area can be used as estimates of the biomass of jack mackerel in US waters (even though they may not cover all US waters). The estimates of abundance for Pacific mackerel are more uncertain as measures of absolute abundance than for jack mackerel or Pacific sardine. A major concern for this species is that a sizable (currently unknown) fraction of the stock is outside of the survey area. However, the present surveys cannot provide estimates of abundance for the northern anchovy stocks for use in management. The Panel notes that the acoustic-trawl method potentially could be applied to survey CPS currently in low abundances, e.g., northern anchovy and Pacific herring, but the sampling design would need to differ from that used in the present surveys." (see Acoustic-Trawl Survey Method for Coastal Pelagic Species: Report of Methodology Review Panel Meeting Agenda Item C.3.a Attachment 1)*

Based on this conclusion, the ATM survey estimates of Pacific sardine abundance collected in 2006, 2008, 2010 and 2011 were incorporated into the 2011 Pacific sardine stock assessment. Since then, ATM abundance estimates collected both during spring and summer continue to be used as an integral part of the sardine assessment, including 2017. However, questions continue to be raised as to how well the ATM survey adequately samples the Pacific sardine population as well as other CPS (Pacific mackerel, jack mackerel and northern anchovy), mainly due to the unknown fraction of the population outside the survey area, either in the upper water column above the sensors or in spatial extent (e.g., Mexican waters, or nearshore or offshore areas where National Oceanic & Atmospheric Association (NOAA) vessels are unable to sample). (See Pacific Sardine STAR Panel Meeting Report, PFMC, April 2017).

Although the original MR Panel concluded that vessel avoidance had been studied using appropriate methods and there was no evidence of substantial avoidance effects, they did recommend further study, including that "long-term research should use more advanced

instrumentation and methods for studying potential vessel effects and avoidance. In particular, the Panel suggests that a vessel by vessel study following the model of the Bering Sea comparative studies be conducted" (from NMFS 2011).

The ATM survey was also reviewed as part of the 2014 CIE Sardine-Hake (SaKe) Methodology Review, the report of which was presented to the Council as a joint report from the Northwest Fisheries Science Center (NWFSC) and the SWFSC at the June 2014 meeting (Agenda Item F.1.c Fisheries Science Center Report). All of these summary reports as well as reports from individual CIE reviewers identified above will be provided as background material for the review.

Items to be addressed during the 2018 methodology review. The methodology ToR requires a draft methodology report to be made available at least two weeks prior to the review meeting. That report should address the following items, for consideration during the review meeting, and will follow the Council's ToR (Appendix 1).

1. **ATM survey documentation**.
   Document the ATM survey design, protocols (sampling, data filtering, etc), and estimation methods, including the following:
   a. delineate the survey area (sampling frame);
   b. specify the spatial stratification (if any) and transect spacing within strata planned in advance (true stratification);
   c. specify the rule for stopping a transect (offshore boundary by species);
   d. specify the rules for conducting trawls to determine species composition;
   e. specify the rules for adaptive sampling (including the stopping rule); and
   f. specify the rules for post-stratification, and in particular how density observations are taken into account in post-stratification. Alternative post-stratification without taking into account densities should be considered (PFMC 2017).

2. **Estimated target strengths of CPS from the California Current.**
   Current ATM estimates rely on target strengths of similar CPS species identified in other studies around the world. The ability to measure target strengths of live fish collected from the survey area can now be conducted at the Technology Tank at the SWFSC, La Jolla, CA. Target strengths of CPS from the California Current should be provided for the review meeting.

3. **Trawl survey design protocols for using a CPS preferred habitat model to determine adaptive sampling areas**.
   In relation to a preferred habitat model for Pacific sardine, as well as other coastal pelagic species:
   a. Investigate sensitivity of the catch series to the threshold used in the environmental-based method (currently 50 percent favorable habitat) to further delineate the southern and northern subpopulations of Pacific sardine and potentially other CPS, such as northern anchovy.
   b. Further validate the environmental-based stock splitting method. It may be possible to develop simple discriminant factors to differentiate the two sub-populations by comparing

metrics from areas where mixing does not occur.

c. To the extent possible, address the fact that low population size likely affects the probability of acoustic detection in a non-linear way. This could create a negatively biased estimate at low population levels and potentially a non-detection threshold below which the stock size cannot be reliably assessed.
d. Evaluate the costs and benefits of targeting sampling effort based on the preferred habitat model for Pacific sardine in terms of biomass estimates for Pacific sardine and for other CPS stocks.

4. **Effects of trawl survey design**.

In relation to trawl survey design, the following should be considered and addressed:

a. The consequences of the time delay and difference in diurnal period of the acoustic surveys versus trawling need to be understood; validation or additional research is critical to ensure that the fish caught in the trawls from the night time scattering layer share the same species, age and size structure as the fish ensonified in the daytime clusters. To the extent possible, the ATM team should conduct paired trawls during daytime acoustic sampling, to validate (to generate a correction factor) nighttime species composition trawls.
b. Consider suitable sample sizes of CPS in the ATM survey. The ability of a single vessel following fixed transects along the entire northern sardine subpopulation region over a single period to sufficiently observe and sample a highly mobile schooling species that exhibits high variability in recruitment, migratory patterns and timing, school structure, and depth distribution, remains a core challenge. The relatively small sample size of sardine for biological analysis remains a concern related to acoustic expansions, population model estimates, and projection forecasts that depend on age composition and size-at-age information. Conduct an analysis of effect of fish sample size on the uncertainty in the ATM biomass estimates and model outputs. Use this information to re-evaluate and revise the sampling strategy for size and age data that includes target sample sizes for strata. (see Pacific Sardine STAR Panel Meeting Report, PFMC, April 2017).
c. Test the efficiency and selectivity of the trawl by comparing samples from the same area taken with the survey trawl and purse seine.
d. Estimate trawl selectivity. Cameras attached to the trawl in front of the cod end have been developed and used extensively since the 2013 surveys to observe and quantify fish behavior and Marine Mammal Excluder Device (MMED) performance. The ATM team should report on findings from the camera research and quantify the selectivity of the trawl. If unquantifiable, describe state-of-the-art acoustic and optic technology to investigate fish behavior and escapement at various critical positions of the trawl, and how the data would be incorporated into the biomass estimation process.

5. **Effects of upgrading from the Simrad EK60 to EK80.**

After 10+ years of service, Simrad discontinued the EK60 series and introduced the EK80 series of transceivers and control software, which shifts from narrow-bandwidth transmit pulses to wide-bandwidth pulses using existing hull-mounted transducers. The ATM team should review the initial outcomes of the EK80 and provide information on the proposed benefits including 1) fish echoes captured from more complete band of frequencies allowing improvement in species identification, 2) increased range resolution allowing detection of fish close to the bottom and individual fish within an aggregation, 3) increased signal-to-noise

ratio allowing improvements in detection capabilities and effective range, 4) extension and miniaturization of wide-band technology allowing autonomous deployment on smaller vessels (i.e., rigid hull inflatables which could sample nearshore areas, surface buoys, deep moorings, and ROVs).

6. **Effects of vessel avoidance for the upper water column.**
Multibeam systems (Simrad EK80s, ME70, MS70, and SX90) are now available on the FSV Reuben Lasker. These represent state-of-the-art instrumentation that will improve overall survey effectiveness and clarify issues related to school behavior around the survey vessel. These systems must be fully utilized to clarify vessel impact factors, and the ATM team should estimate what proportion of biomass is missed with the standard down-looking sonar.

7. **ATM survey design in areas where the ATM vessel is currently not sampling.**
The 2017 Council STAR Panel concluded that lack of nearshore coverage by the ATM survey persists. The ATM team should, to the extent possible, describe ways (e.g., cooperative sampling, use of drones, etc.) to achieve the goal of providing an estimate of abundance or correction factor for those unsurveyed areas.

   The ATM team should also address the potential effects of reduced sea days, relative to generating estimates of un-sampled areas, as well as relative to the conduct of the overall survey itself. The ATM team should provide information on what a sufficient number of sea days is, and information on tradeoffs between spatial coverage and transects, etc.

8. **ATM data analysis and quantification of uncertainty**.
Provide the appropriate level of documentation of data analysis and the degree to which the proposed methods describe and quantify the major sources of uncertainty. For each CPS stock under consideration (Pacific sardine, central subpopulation of northern anchovy, northern subpopulation of northern anchovy, Pacific mackerel, and jack mackerel), and to the extent possible, provide sufficient information for the review panel to determine whether the results of ATM survey as reviewed are suitable for:
   a. inclusion as an index of relative abundance as one of multiple inputs into an integrated stock assessment;
   b. inclusion as an index of absolute abundance (i.e. survey Q = 1) as one of multiple inputs into an integrated stock assessment;
   c. use as an estimate of absolute biomass for direct application of a harvest control rule for one or more management years.

References

PFMC 2011. Report of the 2011 ATM Methodology Review, April 2011 Agenda Item C.3.a, Attachment 1.

PFMC 2017. Report of the 2017 Pacific Sardine STAR Panel Meeting, April 2017 Agenda Item G.5.a., STAR Panel Report.

Appendix 1: Council Terms of Reference for the Methodology Review Process for Groundfish and Coastal Pelagic Species for 2017 and 2018

TERMS OF REFERENCE

FOR THE

METHODOLOGY REVIEW PROCESS FOR GROUNDFISH AND COASTAL PELAGIC SPECIES FOR 2017-2018

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Introduction

This document lays out general procedures for methodology and data reviews related to the assessment and management of coastal pelagic species (CPS) and groundfish by the Pacific Fishery Management Council (Council). It clarifies the responsibilities of the proponents of new methods or data sets being considered for use in CPS or groundfish stock assessment and the responsibilities of participants in the review process. Each review is likely to have additional requirements that will be defined in a set of Specific Terms of Reference (TOR), which should conform to the general terms defined in this document. Although these General Terms of Reference focus on methodology and data reviews for CPS and groundfish stock assessments, they may be applied to methods in other areas, including economic analyses and ecosystem-based fishery management. In the text below the term "methodology review" should be understood to mean "methodology and data review".

The methodology review process provides for peer review as referenced in the 2006 Reauthorization of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSRA), which states that "the Secretary and each Regional Fishery Management Council may establish a peer review process for that Regional Fishery Management Council for scientific information used to advise the Regional Fishery Management Council about the conservation and management of the fishery" (see MSRA section 302(g)(1)(E)). National Standard 2 (NS2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (published July 19, 2013) provides guidance and standards to be followed when establishing a peer review process pursuant to MSA section 302(g)(1)(E) including guidance on the timing, scope of work, peer reviewer selection and process transparency. The methodology review process follows these standards and is fully compliant with NS2. The peer review process is not a substitute for the Council's Scientific and Statistical Committee (SSC), and should work in conjunction with the SSC. This document will be included in the Council's Statement of Organization, Practices and Procedures as documentation of part of the review process that underpins the SSC's scientific advice.

Parties involved in implementing the peer review process described here are the Council; Council staff; members of Council Advisory Bodies, including the SSC; the relevant Management Team and Advisory Panel CPSMT and CPS, and the GMT and GAP for groundfish); the National Marine Fisheries Service (NMFS); state agencies; and interested persons (including external reviewers).

Unlike Stock Assessment Review (STAR) panels, methodology review panels do not occur on a regular timetable but are instead established by the Council to provide peer and in-depth review of major changes to the methodology on which stock assessments are based. Consequently, the outcomes from a methodology review are recommendations regarding whether a particular methodology should be applied in future stock assessments, and on recommended (or required) improvements and modifications. Existing methodologies could be reviewed, particularly if they are key to stock assessments and have not been reviewed for many years or if incremental changes in how the methodology is applied have occurred.

Methodology reviews may be appropriate when a major new data source is introduced or when a major change in the stock assessment modeling is contemplated. In both cases, a methodology review is needed when the change(s) from how assessments have been conducted in the past are deemed to be more than what a STAR panel can reasonably be expected to handle. The introduction of a new survey will generally require a methodology review, as will a change to a new stock assessment modeling platform. However, changes to the structure of a previously reviewed assessment model (e.g., changes in selectivity year-blocking) fall within the scope of a standard STAR panel review.

No explicit guidelines for what topics can be covered in a methodology review are provided here, but typical examples would be evaluation of: (a) proposed major new data types which if included in an assessment could change its outcomes markedly (e.g., the aerial survey for Pacific sardine), (b) proposed changes to the design of existing surveys, (c) existing data inputs to assessments which have not been reviewed in depth by a Council-sponsored peer-review panel for many years (e.g., the egg production method for Pacific sardine), (d) data or model results that contribute to ecosystem-based management of CPS and groundfish stocks, and (e) proposed major changes to stock assessment methods that fall outside the scope of a normal STAR panel review (for example, a change to the stock assessment modelling platform).

Changes to harvest control rules could also be considered by a methodological review. Care must be taken to separate the scientific analysis supporting the change (e.g., the structure and technical aspects of simulation studies used to compare a revised control rule against the *status quo*) and the management objectives used to measure performance (e.g., minimize year-to-year catch variance, maximize long-term average catch, etc.). The former are amenable to methodological review (provided adequate background analyses have been completed), but the latter are management decisions – not well suited to

a methodological review.
These TOR reflect how previous methodology reviews have been undertaken. Nevertheless, no set of guidelines can be expected to deal with every contingency, and all participants should anticipate the need to be flexible and address new issues as they arise.

Methodology Review Goals and Objectives

The general goals and objectives for the methodology review process are to:

1. Ensure that research surveys, data collection, data analyses and other scientific techniques in support of CPS and groundfish stock assessments are the best available scientific information and facilitate the use of information by the Council.
2. Provide recommendations regarding whether, and if so, how a particular methodology can be applied in future stock assessments.
3. Meet the MSRA and other legal requirements.
4. Follow a detailed calendar and fulfil explicit responsibilities for all participants to produce required outcomes and reports.
5. Provide an independent external review of survey and analytical methods used to develop data to inform CPS and groundfish stock assessments.
6. Increase understanding and acceptance of CPS and groundfish research methodologies and review by all members of the Council family.
7. Ensure that methodologies not directly related to stock assessments, such as economic analyses or ecosystem-based fishery management approaches, undergo adequate peer review, as appropriate.
8. Identify research needed to improve assessments, reviews, surveys, analyses, and fishery management in the future.

Criteria for Evaluating Proposals Meriting Review

All proposals must clearly and thoroughly describe how the proposed methodology will improve assessment and management for the stock(s) in question. Any proposed empirical methods must have been field tested, and there should be available data for one or more years. Untested or experimental methods are typically not appropriate for this type of review. Rather, field methods should have been adequately developed, and applied to form a proof of concept for the proposed method. Furthermore, the analytical methods that will be used to analyze collected data must have been developed, although the proposal need not include a description of those methods. The proponents should be confident that the analysis method will have been applied for illustrative purposes by the time of the review meeting. In addition, to demonstrate the potential to improve assessment and management, a proposed method should satisfy at least one of the following criteria:

- The proposed methodology directly addresses a key uncertainty identified during a previous assessment or STAR panel report, increases the number of data sources that are available for inclusion in an assessment, or provides a dataset that enables application of a new method of assessment (or category of assessment) that was not possible previously.
- The proposed method provides an analytical framework relevant to the identification or revision of reference points or harvest control rules.
- For methodologies such as economic analyses or other models, the proposed methodology should demonstrate benefit and applicability to Council processes such as alternatives analyses, data reporting (e.g., SAFE document), or other relevant processes.

Responsibilities of Methodology Review Participants

Shared Responsibilities

All parties have a stake in ensuring adequate technical review of stock assessments and the information on which they are based. The National Marine Fisheries Service (NMFS), as the designee of the Secretary of Commerce, must determine that the best scientific advice has been used when it approves fishery management recommendations made by the Council. The Council uses statements from the SSC to determine whether the information on which it will base its recommendation represents the "best available" science. Fishery managers and scientists providing technical documents to the Council for use in management need to ensure their work is technically correct.

The Council, the NMFS, and the Secretary of Commerce share primary responsibility to create and foster a successful peer review process. The Council will oversee the process and involve its standing advisory committees, especially the SSC. The SSC will designate a member to coordinate, oversee, and facilitate each methodology review. Together, the NMFS and the Council will consult with all interested parties to plan, prepare terms of reference, and develop a calendar of events for each methodology review and a list of deliverables for final approval by the Council. The NMFS and the Council will share fiscal and logistical responsibilities and both should ensure that there are no conflicts of interest in the process[1].

The peer-review process is sponsored by the Council, because the Federal Advisory Committee Act (FACA) limits the ability of the NMFS to establish advisory committees. FACA specifies a procedure for convening advisory committees that provide consensus recommendations to the federal government. The intent of FACA was to limit the number of advisory committees; ensure that advisory committees fairly represent affected parties; and ensure that advisory committee meetings, discussions, and reports are carried out and prepared in full public view. Under FACA, advisory committees must be chartered by the Department of Commerce through a rather cumbersome process. However, the Sustainable Fisheries Act exempts the Council from FACA per se, but requires public notice and open meetings similar to those under FACA.

General Responsibilities of Proponents for New Methodology or Data Sets

New methods or data sets will be used in producing CPS or groundfish stock assessments (or in providing management advice) if there is a reasonable expectation that doing so will result in an improved assessment relative to a status quo assessment that did not use the new method or data set.

Proposing a New Methodology for Review

The proponents of new methods or data sets for use in CPS or groundfish stock assessments will submit a 1-2 page proposal for consideration by the SSC and the Council. The proposal should be submitted by the briefing book deadline of the appropriate Council meeting, and should address the following:

- Title
- Name of proposers (including the researchers who will participate at the methodology review and will be expected to conduct analyses during that review).
- How the proposed methodology will improve assessment and management for the stock(s) in question.
- Outline of methods (field and analytical).
- Proponents of methods to be reviewed should be prepared to present their proposal to the SSC, the relevant MT, and the full Council. Proponents should also include a description of the funding, logistics, or other factors that would indicate the likelihood of success of the proposed methodology
- If appropriate, the proposed methodology should be field tested, and preferably there will be available data for one or more years. Untested or experimental methods are typically not appropriate for this type of review.
- Methodology reviews are intended for methods or data sets that apply to a range of stocks. A STAR panel would be more appropriate for reviewing methods or data sets that apply to only one or to a small number of related stocks.

[1] The final NS2 guidelines state: a "[A] conflict of interest is any financial or other interest which conflicts with the service of the individual on a review panel because it: (A) Could significantly impair the reviewer's objectivity; or (B) Could create an unfair competitive advantage for a person or organization; (C) Except for those situations in which a conflict of interest is unavoidable, and the conflict is promptly and publicly disclosed, no individual can be appointed to a review panel if that individual has a conflict of interest that is relevant to the functions to be performed. Conflicts of interest include, but are not limited to, the personal financial interests and investments, employer affiliations, and consulting arrangements, grants, or contracts of the individual and of others with whom the individual has substantial common financial interests, if these interests are relevant to the functions to be performed".

Responsibilities of Methodology Proponents

If the Council recommends review of the methodology, the proponents will appoint a representative to coordinate work with the panel and attend the panel meeting. A representative of the proponents should attend the SSC meeting at which the

outcomes from the panel review are discussed. The proponents are responsible for preparing two versions of the methodology review document:

1) a "draft", including an executive summary, for discussion during the review meeting; and
2) a "final" version for presentation to the SSC, the Council, and the relevant Management Team and Advisory Panel.

Management Team Responsibilities

The Management Team (MT) is responsible for identifying and evaluating potential management actions based on the best available scientific information. In particular, the MT makes Annual Catch Limit (ACL) and Annual Catch Target (ACT) recommendations to the Council.

A representative of the relevant MT may be appointed by the MT chair and, if appointed, will serve as a liaison to the methodology review panel meeting and will participate in discussions. The MT representative will not serve as a member of the panel. The MT representative should be prepared to advise the panel on fishing regulations or practices that may influence data used in assessments and the nature of the fishery in the future (this will be more relevant for some of the topics which are considered by methodology reviews than others).

Advisory Panel Responsibilities

It is the responsibility of the AP representative to ensure that AP concerns regarding the issue being reviewed are conveyed to the panel. The chair of the AP may appoint a representative to participate in a methodology review. If appointed, the AP representative will serve as an advisor to the review meeting. The AP representative will participate in review discussions as an advisor to the panel, in the same capacity as the MT advisor. The AP representative may provide appropriate data and advice to the review meeting and will report to the AP on the meeting.

Scientific and Statistical Committee Responsibilities

The SSC will assign at least one member to each methodology review. One of the SSC members will chair the review meeting, and present the report of the meeting to the SSC and the Council. The SSC will review any additional analytical work arising from the review meeting, will serve as arbitrator to resolve disagreements that arose during the review meeting, and will make recommendations to the Council (e.g., whether the reviewed methodology provides the “best available science”, and hence could be used for stock assessment and developing conservation and management measures).

Council Staff Responsibilities

Council staff will be assigned to coordinate, monitor and document the review process. Council staff will be responsible for timely issuance of meeting notices and distribution of appropriate documents. Council staff will coordinate with the panel chair and the NMFS to assure that all documents are received on time, and are complete. Council staff will coordinate materials and presentations for Council meetings relevant to Council decision making. Council staff will also collect and maintain file copies of reports from each methodology review, the documents considered during the review, SSC, Management Team, and Advisory Panel comments and reports, letters from the public, and any other relevant information.

A primary role for Council staff assigned to each methodology review will be to monitor review meetings and SSC activities to ensure compliance with these TOR. Council staff will identify inconsistencies with the TOR that occur during review meetings and work with the panel chair to develop solutions and to correct them. Council staff will work with the panel chair to finalize the panel report and provide it to the Council.

National Marine Fisheries Service Responsibilities

The NMFS will assign a coordinator to work with the Council, other agencies, groups, or interested persons that carry out assessment work to assist in organizing methodology reviews. The NMFS coordinator will identify independent panelists following criteria for reviewer qualifications. The costs associated with these reviewers will be borne by the NMFS. The NMFS coordinator will work with methodology proponents to facilitate delivery

of materials by scheduled deadlines and in compliance with other requirements of these terms of reference, to the extent possible and with the assistance of the assigned Council staff officer and the panel chair.

General Review Panel Responsibilities

The objective of a methodology review panel is to complete a detailed evaluation of a topic selected by the Council which could have a major impact on stock assessments or the provision of scientific advice and to make a recommendation regarding whether the methodology represents the best available scientific information for the Council. The general responsibilities of the panel are to:

1. review documents pertinent to the topic under consideration;
2. evaluate the technical merits and deficiencies of the proposed method(s) during the panel meeting and work with the proponents to correct deficiencies;
3. provide recommendations for alternative methods or modifications to proposed methods, or both, as appropriate during the panel meeting;
4. provide recommendations on application of the methods to the stock assessment and/or management process;
5. document meeting discussions; and
6. provide complete panel reports.

The panel chair has, in addition, the responsibility to:

7. review revised documents and panel reports before they are forwarded to the SSC.

Review panels may have additional responsibilities that are defined in the Specific Terms of Reference for the review.

Panel Composition

Methodology review panels normally include a chair, at least one "external" member (i.e., who is outside the Council family and not involved in management or assessment of West Coast fisheries, often designated by the Center for Independent Experts [CIE]), and at least two additional members. Selection of the external and independent panelists should be based on expertise, independence, and a balance between outside expertise of the topic being reviewed and in-depth knowledge of West Coast fisheries, data sets available for those fisheries, and relevant modelling approaches. Panelists should be knowledgeable about the specific approaches being reviewed. In addition, selected reviewers should not have financial or personal conflicts of interest with the scientific information, subject matter, or work product under review, either current to the meeting, within the previous year (at minimum), or anticipated. Reviewers who are federal employees should comply with all applicable federal ethics requirements. Reviewers who are not federal employees will be screened for conflicts of interest either through existing financial disclosure processes used by the SSC and CIE, or under the NOAA Policy on Conflicts of Interest for Peer Review Subjects.

Reviewers should not have contributed or participated in the development of the work product or scientific information under review and reviewer responsibilities should rotate across the available pool of qualified reviewers, when possible.
In addition to panel members, methodology review meetings will include Council staff to help advise the panel and assist in recording meeting discussions and results, and may include MT and AP representatives with responsibilities as laid out above. The length of a methodology review meeting will be selected by the SSC and could range one to five days.

The panel chair is responsible for: 1) developing an agenda, 2) ensuring that the panel follows the TOR, 3) guiding the participants in the review (proponents and panel) to mutually agreeable solutions, 4) coordinating review of documents, and 5) providing Council staff with a camera ready and suitable electronic version of the panel report. The panel, those proposing the methodology, the MT and AP representatives, and the public are legitimate meeting participants that should be accommodated during discussions. It is the panel chair's responsibility to manage discussions and public comment so that work can be completed.

Conduct of a Review

The methods review is by design a transparent process, and panel meetings are open to the public and are announced on the Council's website, through Council meeting notices and in the Federal Register at least 23 days prior to the panel meeting. The Council posts background materials on its ftp site prior to the meeting and makes hard copies available upon request. The panel's review solely concerns technical aspects of the method. It is therefore important that the panel strive for a risk neutral perspective in its reports and deliberations. Methods or results that have a flawed technical basis, or are questionable on other grounds, should be identified by the panel and a recommendation made that they should be excluded from consideration in developing management advice. The panel should comment on the degree to which the uncertainty associated with the method being reviewed is quantified (e.g., through confidence or prediction intervals) because uncertainty is taken into account during the management process.

Recommendations and requests to the proponents for additional information, and new or revised analyses must be clear, explicit, and in writing. Panel recommendations and requests to the proponents should reflect the consensus opinion of the entire panel and not the minority view of a single individual or individuals on the panel. A written summary of discussion on significant technical points and lists of all panel requests and recommendations and requests to the proponents are required in the panel report, which should be completed (at least in draft form) prior to the end of the review meeting. It is the chair and panel's responsibility to carry out any follow-up review of work that is required.

The panel's primary duty is to conduct a peer review of the proposed methodology. Methodology panel meetings are not workshops, although the involvement of the panel in shaping the methodology is greater during methodology reviews than during STAR panels. This is particularly the case when the outside reviewers have considerably more experience with a given methodology than the proponents and the reviewers from within the Council family. In the course of this review, the panel may ask for a reasonable number of additional analyses, as well as for additional details of the proposed methodology. It would not be unusual for this evaluation to result in a change to the initial methodology, provided both the panel and the proponents agree. Panels are expected to be judicious in their requests of the proponents, recognizing that some issues uncovered during a review are best flagged as research priorities (and use of the methodology possibly deferred until those issues are resolved). The panel should not impose as a requirement their preferred methodologies when such is a matter of professional opinion. Rather, if the panel finds that a method is inadequate, it should document and report that opinion.

Panels and proponents are required to make an honest attempt to resolve any areas of disagreement during the review meeting. Occasionally, fundamental differences of opinion remain between the panel and the proponents that cannot be resolved by discussion. In such cases, the panel must document the areas of disagreement in its report. In exceptional circumstances, the proponents may choose to submit a supplemental report supporting its view, but in the event that such a step is taken, an opportunity must be given to the panel to prepare a rebuttal. These documents will then be appended to the panel report as part of the record of the review meeting. Panel members may have fundamental disagreements that cannot be resolved during the meeting. In such cases, panel members may prepare a minority report that will become part of the record of the review meeting. The SSC will then review all information pertaining to panel or panel/proponent disputes, and issue a recommendation.

Additional analyses required by the panel should be completed by the proponents during the review meeting. It is the obligation of the panel chair, in consultation with other panel members, to prioritize requests for additional analyses. It is the panel's responsibility to track progress if follow-up work by the proponents is required after the review meeting. In particular, the chair is responsible for communicating with proponents (by phone, e-mail, or any other convenient means) to determine if the revised analyses and documents are complete and ready to be presented to the SSC.

Review Panel Report

The panel chair is responsible for preparing the final draft of the panel report, obtaining the panel's approval, and providing the report to the Council for inclusion in the Briefing Book. The chair will appoint members of the panel (the "external" members and other members) to act as rapporteurs who will draft the report according to guidance by the panel chair on format and level of detail. The aim of the report is to provide information to the SSC on whether it should recommend the methodology for use in Council assessments and, if necessary, what additional work must be completed before the methodology can be used. The report is not meant as a detailed summary of the methodology, nor is it meant to be the minutes of the meeting. The report may include Appendices which summarize work presented to the panel in response to requests. The chair will solicit comment on the draft report from the proponents and the MT and AP advisors. The purpose of this review is limited to ensuring that the report is technically accurate, and reflects the discussion that occurred at the meeting, and should not be viewed as an opportunity to reopen debate on issues. The chair will be the final arbiter on wording changes suggested by proponents and the MT and AP advisors—i.e., the report is the Panel's report of the meeting. Any detailed commentary by MT and AP advisors should be drafted separately, reviewed by the full advisory body, and included in the Briefing Book.

The proponents will distribute "draft" documents fully describing the methodology to the panel, Council staff, and the MT and AP representatives at least two weeks prior to the review meeting. The proponents are responsible for bringing analysis methods and relevant data (in digital format) to the review meeting so that data can be analyzed on site and sensitivity analyses conducted. In most cases, the proponents should produce a revised document outlining the methodology (and preliminary results / responses to the panel recommendations) three weeks after the end of the panel meeting (including any internal agency review). The proponents and the panel may disagree on technical issues, but "final" documents must include

a point-by-point response by the proponents to each of the panel recommendations.

The draft and final reports on the methodology should include information that addresses the following:

- Data requirements of a new methodology or documentation of how information in a new data set was collected.
- The situations/stocks for which the methodology or data are applicable.
- The assumptions of the methodology and whether those assumptions are likely to be satisfied by data sets to which the method would be applied.
- An evaluation of robustness of the methodology to departures from the underlying assumptions.
- An application of a new methodology to real or simulated data, including an evaluation of the bias and accuracy of the results.
- An evaluation of how the new method(s) or data set(s) would improve stock assessments or the provision of management advice.

The final methods review panel reports are posted on the Council's website at www.pcouncil.org.

Suggested Template for Methodology Review Panel Report:

- Summary of the Methodology Review Panel meeting, containing:
  - names and affiliations of panel members;
  - topic(s) being reviewed; and
  - list of analyses requested by the Panel, the rationale for each request, and a brief summary the responses to each request.
- Comments on the technical merits and/or deficiencies of the methodology and recommendations for remedies. Comments should address each of the following issues:
  - What are the data requirements of the methodology?
  - What are the situations/stocks for which the methodology is applicable?
  - What are the assumptions of the methodology?
  - Is the methodology correct from a technical perspective?
  - How robust are results to departures from the assumptions of the methodology?
  - Does the methodology provide estimates of uncertainty? How comprehensive are those estimates?
  - Will the new methodology or data set result in improved stock assessments or management advice?
- Areas of disagreement regarding panel recommendations:
  - among panel members (including concerns raised by the MT and AP representatives); and
  - between the panel and proponents.
- Unresolved problems and major uncertainties, e.g., any issues that could preclude use of the methodology.
- Management, data or fishery issues raised by the public and MT and AP representatives during the panel review.
- Prioritized recommendations for future research and data collection.